ToMCAT data products

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Contents

This document describes in detail the structure and semantics of experiment data collected as a part of the ASIST ToMCAT project (https://ml4ai.github.io).

1 Overview

The experiment involves a three person team participating in one or two search and rescue (SAR) missions simulated in the Minecraft environment. Before participants execute this experiment, they individually attend a 'pre-session' where:

- They fill consent forms,
- We measure their head circumference to enable setting up brain data caps before they arrive at the main session,
- We ask them to perform a speech elicitation task

The group session typically occurs a few days to few weeks later. The group session has multiple phases:

- Rest state task
- Finger tapping task
- Affective task
- Ping pong competitive task
- Ping pong cooperative task
- Hands-on Minecraft training
- Saturn A mission
- Saturn B mission

The number of Saturn B missions in the data is fewer than the number of Saturn A missions, since frequently there were unexpected technical issues or delays during the group session such that we ran out of time before the Saturn B mission could be run.

During all these phases, for each participant, we record the following:

- EKG
- EEG
- fNIRS
- Eye tracking data
- Testbed messages
- Audio of participants' spoken dialog
- Facial video
- Screen captures

2 Raw data

In what follows, strings enclosed by a pair of angle brackets (<>) indicate placeholders for more specific strings (i.e., variables). We break the directory structure for raw ToMCAT data into three parts `<root>/<study>/<raw_data>`. As an experiment is run, data is written to the LangLab Linux computer called "cat". `<root>` on cat is `/data/cat`. The data gets mirrored onto the LangLab Linux computer called "tom", where `<root>` is `/data/tom`. This is done by the script `sync_tom_and_cat`, which is called by the script `pull_tomcat_data`. Ideally, `sync_tom_and_cat` should also be called from the main driver script as soon as the experiment is over, but currently we do not do this.

The script `pull_tomcat_data` transfers the data to the IVILAB machine *i03.cs.arizona.edu*, and makes two backups of it. Ideally, we would also create off-site backups, but we do not do this yet. The data is is written to `/tomcat_raw_<N>` where `<N>` is 1, 2, 3, or 4, and backed up to `/tomcat_raw_<N>_B1` and `/tomcat_raw_<N>_B2`. The script `pull_tomcat_data` then makes links to those multiple data locations from `/tomcat/data/raw` and provides access via NFS to the compute servers *laplace.cs.arizona.edu* and *gauss.cs.arizona.edu*. Thus, on those IVILAB machines, `<ROOT>` is `/tomcat/data/raw`. The directory structure pattern for `<study>` under the root directory is

```
<facility>/experiments/<study>
```

For this experiment, `<facility>` is *LangLab*, and `<study>` is `study_3_pilot`. This study name is a bit misleading, but makes senses as this study gradually morphed from an initial pilot study to a real one as we developed the system, but most data is informative.

`<raw_data>` has two subdirectories, "presession" and "group", containing data from the pre-session experiments and main experiments separately. In both cases, we put the data from one experimental instance into a directory named `exp_<yyyy>_<mm>_<dd>_<hh>`. Since we only run one main session at a time, and they last from most of an hour to over three hours, hourly time resolution suffices to disambiguate them. However, presessions take only 15 to 30 minutes, and so a presession directory can hold data for multiple participants.

The group session runs are post processed so that all presession data for the participants in the group are linked from the group data directory. This matching cannot be done before the group experiment is finished because we do not know in advance whether there will be no-shows or other last minute changes.

To further clarify directory naming, on the IVILAB compute servers, the data for the first valid group session is in:

```
/tomcat/data/raw/LangLab/experiments/study_3_pilot/group/exp_2022_09_30_10
```

However, this might be reported differently because of the linking described above. Specifically, the previous example is equivalent to:

```
/tomcat_raw_1/data/LangLab/experiments/study_3_pilot/group/exp_2022_09_30_10
```

In the original data there are some group experiment directories with time strings earlier than the above example, but those are all preliminary pilot experiments. We keep the raw data regardless, but all directories with serious issues are filtered out when we create derived data sets for general consumption.

2.1 Raw data structure for group sessions

As mentioned above, a post-processing step links all needed presession files into the group experimental runs. We describe the final group session data with needed presession data included.

Each of the three participants are associated by the name of the iMac device they use during the experiment. The iMac devices are named as lion, tiger, and leopard. We define <cat> $\in \{leopard, lion, tiger\}$ and <Cat> $\in \{Leopard, Lion, Tiger\}$, and use <cat> or <Cat> to represent the three instances.

KOBUS SAYS: Also, I understand we changed formats mid stream. We need to specify these differences ←

here.

Prior to April 2023, we recorded physio data for each station to a separate XDF file, and the rest of the data (baseline task observations, Minecraft data, etc.) to separate files. However, we realized that timestamps were not synchronized across different XDF files. Furthermore, recording the non-physio data to separate files made it difficult to synchronize timestamps between physio and non-physio data. To overcome these limitations, starting in April 2023, we made a substantial change to the recording setup such that all data was now streamed through LSL and only a single XDF file would be written to at a time. The only data we excluded from the XDF files was the raw face and screen capture images—however, we did push the timestamps (corresponding to when the images were captured) onto LSL, resulting in them being written to the XDF file as well.

We call the pre-April 2023 setup *v1*, and the subsequent setup *v2*. For redundancy, we retain the existing mechanisms from v1 that were recording to non-XDF files—thus, there is some overlap in the directory structure for the v1 and v2 recording outputs. However, with the exception of images, the XDF files supersede the non-XDF files for the v2 recording setup. In the directory structure shown below, we denote which directories are only present in v1 or v2 data using comments starting with an octothorpe (#).

Underneath each experiment (`<raw_data>`) directory (i.e., `<root>/<study>/group/exp_<yyyy>_<mm>_<dd>_<hh>`), we have the following file/directory structure:

```
redcap_data/
    team_data.csv

baseline_tasks/
    affective/
        individual_<participantID>_<timestamp>.csv
        individual_<participantID>_<timestamp>_metadata.json
        team_<timestamp>.csv
        team_<timestamp>_metadata.json
    finger_tapping/
        <timestamp>.csv
        <timestamp>_metadata.json
    ping_pong/
        competitive_<team>_<timestamp>.csv
        competitive_<team>_<timestamp>_metadata.json
        cooperative_0_<timestamp>.csv
        cooperative_0_<timestamp>_metadata.json
    rest_state/
        <timestamp>.csv

lsl/ # Only for experiments starting April 2023
    block_1.xdf
    block_2.xdf

minecraft/
    MinecraftData_Trial-<trial_num>_ID-<fancy_string>.metadata
```

```
<cat>/
    eeg_fnirs_pupil/  # Only for experiments before April 2023
        <cat>_eeg_fnirs_pupil.xdf

    audio/ # Only for sessions on or after 2022-10-07
          ... 3 to 4 .wav files # Prior to 2023-04-17
            Trial-<trial_id>_Team-<team_num>_Member-<player_num>.wav
        block_2/ # On or after 2023-04-17
            Trial-<trial_id>_Team-<team_num>_Member-<participant_id>.wav
    face_images/
        ffmpeg.log
        ... a large number of .png files
        <yyyy-mm-dd>T<hh_mm_ss.sssssssss>Z.png
    presession/
        participant_<participant_ID>.wav
        participant_<participant_ID>Task2.wav
    pupil_recorder/000/ and 001/
        blinks.pldata
        blinks_timestamps.npy
        eye0.intrinsics
        eye0.mp4
        eye0_timestamps.npy
        eye1.intrinsics
        eye1.mp4
        eye1_timestamps.npy
        fixations.pldata
        fixations_timestamps.npy
        gaze.pldata
        gaze_timestamps.npy
        info.player.json
        notify.pldata
        notify_timestamps.npy
        pupil.pldata
        pupil_timestamps.npy
        user_info.csv
        world.intrinsics
        world.mp4
        world_timestamps.npy
    redcap_data/
        <cat>_post_game_survey_data.csv
        <cat>_self_report_data.csv
    screenshots/
        ffmpeg.log
        ... a large number of .png files
        <yyyy-mm-dd>T<hh_mm_ss.sssssssss>Z.png

  testbed_logs/ # On or after 2022-10-27
```

```
asist_logs_<yyyy>_<mm>_<dd>_<hh>_<mm>_<ss>/
    ASR_Agent/logs/
        <yyyy>-<mm>-<dd>_<hh>-<mm>-<ss>.0.log
    dozzle_logs/
        ac_aptima_ta3_measures.log
        AC_CMUFMS_TA2_Cognitive.log
        ac_cmu_ta1_pygl_fov_agent.log
        ac_cmu_ta2_beard.log
        ac_cmu_ta2_ted.log
        ac_gallup_ta2_gelp.log
        ac_gallup_ta2_gold.log
        ac_ihmc_ta2_dyad-reporting.log
        ac_ihmc_ta2_joint-activity-interdependence.log
        ac_ihmc_ta2_location-monitor.log
        ac_ihmc_ta2_player-proximity.log
        AC_UAZ_TA1_ASR_Agent-heartbeat.log
        AC_UAZ_TA1_ASR_Agent.log
        AC_UAZ_TA1_ASR_Agent-Mosquitto.log
        ac_uaz_ta1_speechanalyzer_adminer_1.log
        AC_UAZ_TA1_SpeechAnalyzer-db.log
        AC_UAZ_TA1_SpeechAnalyzer-heartbeat.log
        AC_UAZ_TA1_SpeechAnalyzer.log
        AC_UAZ_TA1_SpeechAnalyzer-mmc.log
        ac_ucf_ta2_playerprofiler_container.log
        asistdataingester.log
        clientmap.log
        cmuta2-ted-ac.log
        cra_psicoach_agent.log
        crazy_ritchie.log
        dozzle.log
        elasticsearch.log
        filebeat.log
        heartbeat-speech_analyzer_agent.log
        heartbeat-uaz_tmm_agent.log
        kibana.log
        logstash.log
        malmocontrol_Local.log
        Measures_Agent_Container.log
        metadata-docker_metadata-app_1.log
        metadata-docker_pgadmin_1.log
        metadata-docker_postgres_1.log
        metadata-web_metadata-web_1.log
        minecraft-server0.log
        mmc.log
        mosquitto.log
        mqttvalidationservice.log
        nginx.log
        Rutgers_Agent_Container.log
```

speech_analyzer_agent.log
speechanalyzer_db_1.log
uaz_dialog_agent.log
uaz_tmm_agent.log
vosk.log

`tmp/`

(This is a sub-directory were temporary files are stored by experiment processes during the experiment.)

Examples of files stored in this directory:

audio_streamer_<cat>.log
audio_streamer_<cat>.pid
baseline_tasks_cheetah_competitive_ping_pong.log
baseline_tasks_cheetah_cooperative_ping_pong.log
baseline_tasks_<cat>.log
<cat>_port_forwarding.log
<cat>_port_forwarding.pid
minecraft_<cat>.log
minecraft_<cat>.pid
minecraft_server.log
minecraft_server.pid
testbed_down.log
testbed_up.log
trial_id_watcher.log
trial_id_watcher.pid

data_inventory.log *(Only for sessions starting 2023-04-17)*

data_inventory.run *(Only for sessions starting 2023-04-17)*

time_difference.txt *(Only for sessions starting 2023-04-17)*

trial_info.json

Description of the files.

Excluding log files, debugging, and other infrastructure files, the format and the data for each file listed above is detailed as follows:

redcap_data/ ...

team_data.csv

(comma delimited, 1st row is a header, complex strings double-quoted)

This CSV file is the Team Data record for the experiment exported from the REDCap database. The Team Data is info and notes created by the experimenters regarding the experiment. The data is inputted into REDCap after the experiment has been completed. A summary of data contained in this file is: Team ID, Session Date/Time, Participant's IDs, Absent Participants, Experimenters that subbed-in, Problems/Issues with Participants, Problems/Issues with

Equipment, and Additional Notes regarding the Session.

Team Data Fields:

- `record_id -`
  REDCap Team Data Record ID.
- `redcap_survey_identifier - (can be blank)`
  Survey ID that identifies the REDCap Survey Form used to input the Team Data.
- `team_data_timestamp - (can be blank)`
  Timestamp of when the Team Data Record was created.
- `team_id - [##]`
  Team ID assigned to the Experiment.
- `testing_session_date - [yyyy-mm-dd hh:nn] (hh in 24 hour)`
  Experiment Session Date and Time.
- `subject_id - [#####, #####, #####]`
  IDs of the Participants that participated in the Experiment. Lion's ID, Tiger's ID, Leopard's ID. (If an experimenter sat-in, the ID will be entered as 99999 for that position).
- `real_participant_attend - [No/Yes] (can be blank)`
  Did any of the actual participants with assigned subject IDs not attend?
- `real_participant_absent - (can be blank)`
  If `real_participant_attend`=Yes, a list of the subject ID(s) that was scheduled to attend but did not attend.
- `research_team_participation - [No/Yes] (can be blank)`
  Did a research team member play as a mock participant during the testing session?
- `participants_issues - [No/Yes] (can be blank)`
  Were there any problems/issues with the participants during the testing session?
- `participants_issues_details - (can be blank)`
  If `participants_issues`=Yes, bulleted list of participant-related issues during the testing session.
- `equipment_issues - [No/Yes] (can be blank)`
  Were there any problems/issues with the equipment during the testing session?
- `equipment_issues_details - (can be blank)`
  If `equipment_issues`=Yes, bulleted list of equipment-related issues related during the testing session.
- `additional_notes - (can be blank)`
  Any additional notes regarding the testing session.
- `team_data_complete - [Incomplete/Unverified/Complete]`
  Status of this Team Data Record.

baseline_tasks/ ...

affective/ ...

individual_<participantID>_<timestamp>.csv

(semicolon delimited text file, 1st row is a header)

This CSV file is the Baseline Individual Affective Task Data/Statistics for each Participant.

The Participant ID is in the of the file name. There will be three of these files in the directory. One for each Participant, Lion, Tiger, and Leopard. A summary of data contained in this file is: Record Timestamp (in Global, Monotonic, and Human formats), Name of Image being shown to the Participant, Subject ID (Participant ID), The Participant's Arousal Score, The Participant's Valence Score, and the Event Type (`start_affective_task`, `show_blank_screen`, `show_cross_screen`, `show_image`, `show_rating_screen`, `intermediate_selection`, `final_submission`).

Baseline Individual Affective Task Fields:

- `time - [##########.######] (in seconds)`
  Unix Time https://www.unixtimestamp.com/.
- `monotonic_time - [#######.#########] (in seconds)`
  How long since the computer that hosts the task was booted up.
- `human_readable_time - [yyyy-mm-ddThh:nn:ss.######Z] (hh in 24 hour)`
  UTC-0 time in human-readable format.
- `image_path -`
  Name of image being shown to the Participant. You can see these images in the code of baseline task.
- `subject_id - [#####]`
  Participant ID. (If an experimenter sat-in, the ID will be entered as 99999 for that Participant)
- `arousal_score - [-2 to +2]`
  Arousal measure of emotion (calm vs. intense).
- `valence_score - [-2 to +2]`
  Valence measure of emotion (unpleasant vs. pleasant).
- `event_type -`
  What event and when. (`start_affective_task`, `show_blank_screen`, `show_cross_screen`, `show_image`, `show_rating_screen`, `intermediate_selection`, `final_submission`).

individual_<participantID>_<timestamp>_metadata.json
(JSON data format)
Baseline Individual Affective Task Participant configuration information. This is the sequence that the computer shows for each image: blank screen, cross screen, blank screen, image, rating screen. The timing for each screen is specified in this JSON file as shown below.

Participant Configuration Information JSON File:

```
{
    "participant_ids":
        ["#####"] ("99999" for subbing-in experimenter),
    "blank_screen_milliseconds": [####],
    "cross_screen_milliseconds": [####],
    "individual_image_timer": [##.#] (in seconds),
    "individual_rating_timer": [##.#] (in seconds),
    "team_image_timer": [##.#] (in seconds),
```

```
    "team_discussion_timer": [##.#] (in seconds),
    "team_rating_timer": [##.#] (in seconds)
}
```

team_<timestamp>.csv
(semicolon delimited text file, 1st row is a header)
This CSV file is the Baseline Team Affective Task Data/Statistics. A summary of data contained in this file is: Record Timestamps (in Global, Monotonic, and Human formats), Name of Image being shown to the Participants, Subject ID (Participant ID), The Participant's Arousal Score (blank if this participant was not selected to score this image), The Participant's Valence Score (blank if this participant was not selected to score this image), and the Event Type (`start_affective_task`, `show_blank_screen`, `show_cross_screen`, `show_image`, `show_rating_screen`, `intermediate_selection`, `final_submission`).

Baseline Team Affective Task Fields:

- `time` - [##########.######] (in seconds)
  Unix Time https://www.unixtimestamp.com/.
- `monotonic_time` - [#######.#########] (in seconds)
  How long since the computer that hosts the task was booted up.
- `human_readable_time` - [yyyy-mm-ddThh:nn:ss.######Z] (hh in 24 hour)
  UTC-0 time in human-readable format.
- `image_path` - [Team###.jpg]
  Name of image being shown to the participants. You can see these images in the code of baseline task.
- `subject_id` - [#####]
  Participant ID. (If an experimenter sat-in, the ID will be entered as 99999 for that Participant)
- `arousal_score` - [-2 to +2]
  Arousal measure of emotion (calm vs. intense, will be blank if this participant was not selected to score this image).
- `valence_score` - [-2 to +2]
  Valence measure of emotion (unpleasant vs. pleasant, will be blank if this participant was not selected to score this image).
- `event_type` -
  What event and when. (`start_affective_task`, `show_blank_screen`, `show_cross_screen`, `show_image`, `show_rating_screen`, `intermediate_selection`, `final_submission`).

team_<timestamp>_metadata.json
(JSON data format)
Baseline Team Affective Task Participant configuration information. This is the sequence that the computer shows for each image: blank screen, cross screen, blank screen, image, rating screen. The timing for each screen is specified in this JSON file as shown below.

Team Configuration Information JSON File:

```
{
    "participants_ids": [
        ("#####","#####","#####"; "99999" for experimenter)
        "<lion_participant_id>",
        "<tiger_participant_id>",
        "<leopard_participant_id>"
    ],
    "blank_screen_milliseconds": [####],
    "cross_screen_milliseconds": [####],
    "individual_image_timer": [##.#] (in seconds),
    "individual_rating_timer": [##.#] (in seconds),
    "team_image_timer": [##.#] (in seconds),
    "team_discussion_timer": [##.#] (in seconds),
    "team_rating_timer": [##.#] (in seconds)
}
```

finger_tapping/ ...

<timestamp>.csv

(semicolon delimited text file, 1st row is a header)

This CSV file is the Baseline Finger Tapping Task Data/Statistics. A summary of data contained in this file is: Record Timestamp (Unix Time, Monotonic, and Human-readable formats), Row Data Event (team, individual), Countdown Timer (integer - 10 to 0), Was a Tap on Keyboard recorded for each participant (0 = no-tap, 1 = tap). The last three column (Fields) names for the Tap Data are the IDs of the Participants (`<lion_participant_id>`, `<tiger_participant_id>`, `<leopard_participant_id>`, If an experimenter sat-in, the column name will be "99999" for that Participant).

Baseline Individual Affective Task Fields:

- `time` - [##########.######] (in seconds)
  Unix Time https://www.unixtimestamp.com/.
- `monotonic_time` - [#######.#########] (in seconds)
  How long since the computer that hosts the task was booted up.
- `human_readable_time` - [yyyy-mm-ddThh:nn:ss.######Z] (hh in 24 hour)
  UTC-0 time in human-readable format.
- `event_type` -
  What event and when. (team, individual).
- `countdown_timer` - [##] (intiger - 10 to 0)
  Countdown Timer.
- `<lion_participant_id>` - [0 or 1]
  Tap on keyboard from Lion (0 = no-tap, 1 = tap).
- `<tiger_participant_id>` - [0 or 1]
  Tap on keyboard from Tiger (0 = no-tap, 1 = tap).

- `<leopard_participant_id>` - [0 or 1]
  Tap on keyboard from Leopard (0 = no-tap, 1 = tap).

<timestamp>_metadata.json
(JSON data format)
Baseline Finger Tapping Task configuration information. The configuration information in this file: `participants_ids` `session` `seconds_per_session` `seconds_count_down` `square_width` and `count_down_message`.

Finger Tapping Configuration Information JSON File:

```
{
    "participants_ids": [
        ("#####","#####","#####"; "99999" for experimenter)
        "<lion_participant_id>",
        "<tiger_participant_id>",
        "<leopard_participant_id>"
    ],
    "session": [ (typical: "0,1,0,1")
        (0 or 1),
        (0 or 1),
        (0 or 1),
        (0 or 1)
    ],
    "seconds_per_session": [ (typical: "10.0" for all)
        ##.#,
        ##.#,
        ##.#,
        ##.#
    ],
    "seconds_count_down": [##.#] (typical: "10.0"),
    "square_width": [###] (typical: "200")
    "count_down_message": ["string"]
    (example: "Practice session:
     Press SPACEBAR and observe the squares")
}
```

ping_pong/ ...
competitive_<team>_<timestamp>.csv
(semicolon delimited text file, 1st row is a header)
This CSV file is for the Baseline Competitive Ping-Pong Task Data/Statistics. The <team> in the file name is "0" for Lion vs Tiger and "1" for Leopard vs Cheetah. (If an experimenter sat-in, the column name will be "99999" for that Participant). (For <team> = "1" in the file name, the participant2 ID will always be "exp"). A summary of data contained in this file is:

Record Timestamp (Unix Time, Monotonic, and Human-readable formats), Score on Left, Score on Right (For <team> = "1" in the file name, right score will be for experimenter on "Cheetah"), Game Started (False = countdown for game to start, True = game has started), Ball's X Coordinates, Ball's Y Coordinates, Participant 1 Paddle X Coordinates, Participant 1 Paddle Y Coordinates, Participant 2 Paddle X Coordinates , Participant 2 Paddle Y Coordinates, Seconds Timer on Screen (If game has not started, `started = False`, the `seconds` will count down from 10 to 0. If game has started, `started = True`, the `seconds` will count down from 120 to 0.)

Baseline Competitive Ping-Pong Task Fields:

- `time - [##########.######] (in seconds)`
  Unix Time https://www.unixtimestamp.com/.
- `monotonic_time - [#######.#########] (in seconds)`
  How long since the computer that hosts the task was booted up.
- `human_readable_time - [yyyy-mm-ddThh:nn:ss.######Z] (hh in 24h)`
  UTC-0 time in human-readable format.
- `score_left - [##]`
  Current score for left team participant.
- `score_right - [##]`
  Current score for right team participant (For <team> = "1" in the file name, right score will be for experimenter on "Cheetah").
- `started - [False or True]`
  Has the Ping-Pong game started.
- `ball_x - [####] -`
  The ball's X coordinate on the screen.
- `ball_y - [####] -`
  The ball's Y coordinate on the screen.
- `<participant1_id>_x - [####] -`
  Participant1's (left team) paddle's X coordinate on the screen.
- `<participant1_id>_y - [####] -`
  Participant1's (left team) paddle's Y coordinate on the screen.
- `<participant2_id>_x - [####] -`
  Participant2's (right team) paddle's X coordinate on the screen (For <team> = "1" in the file name, the participant2 ID will always be "exp").
- `<participant2_id>_y - [####] -`
  Participant2's (right team) paddle's Y coordinate on the screen (For <team> = "1" in the file name, the participant2 ID will always be "exp").
- `seconds - [###]`
  Seconds left in game (120 counts down to 0).

competitive_<team>_<timestamp>_metadata.json
(JSON data format)
Baseline Competitive Ping-Pong Configuration Information. (For <team> = "1" in the file name, the participant2 ID will always be "exp"). The configuration information in

this file: `left_team participant ID`, `right_team participant ID`, `client_window_height`, `client_window_width`, `session_time_seconds`, `seconds_count_down`, `count_down_message`, `paddle_width`, `paddle_height`, `ai_paddle_max_speed`, `paddle_speed_scaling`, `paddle_max_speed`, `ball_x_speed`, `ball_bounce_on_paddle_scale`.

Baseline Competitive Ping-Pong Configuration Information JSON File:

```
{
    "left_team": [
        "#####" (left team participant ID, "99999" for experimenter)
    ],
    "right_team": [
        "#####" (right team participant ID, "99999" for experimenter,
        "exp" for <team> = "1" in file name.)
    ],
    "client_window_height": [####] (typical: 1440),
    "client_window_width": [####] (typical: 2560),
    "session_time_seconds": [###.#] (typical: 120.0),
    "seconds_count_down": [##.#] (typical: 10.0),
    "count_down_message": ["string"]
    (typical:"Move the mouse to move the blue paddle"),
    "paddle_width": [##] (typical: 20),
    "paddle_height": [###] (typical: 120),
    "ai_paddle_max_speed": [##] (typical: 13),
    "paddle_speed_scaling": [#.#] (typical: 0.6),
    "paddle_max_speed": [###.#] (typical: null),
    "ball_x_speed": [##] (typical: 9),
    "ball_bounce_on_paddle_scale": [#.##] (typical: 0.25)
}
```

cooperative_0_<timestamp>.csv
(semicolon delimited text file, 1st row is a header)
This CSV file is for the Baseline Cooperative Ping-Pong Task Data/Statistics. For the Cooperative Ping-Pong Task, the participants on Lion, Tiger and Leopard play together as a team and play against the AI machine. (If an experimenter sat-in, the column name will be "99999" for that Participant). A summary of data contained in this file is: Record Timestamp (Unix Time, Monotonic, and Human-readable formats), Score on Left, Score on Right, Game Started (False = countdown for game to start, True = game has started), Ball's X Coordinates, Ball's Y Coordinates, Participant 1 Paddle X Coordinates, Participant 1 Paddle Y Coordinates, Participant 2 Paddle X Coordinates, Participant 2 Paddle Y Coordinates, Seconds Timer on Screen (If game has not started, `started = False`, the `seconds` will count down from 10 to 0. If game has started, `started = True`, the `seconds` will count down from 120 to 0.)

Baseline Cooperative Ping-Pong Task Fields:

- `time - [##########.######] (in seconds)`
  Unix Time https://www.unixtimestamp.com/.
- `monotonic_time - [#######.#########] (in seconds)`
  How long since the computer that hosts the task was booted up.
- `human_readable_time - [yyyy-mm-ddThh:nn:ss.######Z] (hh in 24h)`
  UTC-0 time in human-readable format.
- `score_left - [##]`
  Current score for left team.
- `score_right - [##]`
  Current score for "AI" team.
- `started - [False or True]`
  Has the Ping-Pong game started.
- `ball_x - [####]`
  The ball's X coordinate on the screen.
- `ball_y - [####]` -
  The ball's Y coordinate on the screen.
- `<left_team_participant1_id>_x - [####]` -
  Participant1's (left team) paddle's X coordinate on the screen.
- `<left_team_participant1_id>_y - [####]` -
  Participant1's (left team) paddle's Y coordinate on the screen.
- `<left_team_participant2_id>_x - [####]` -
  Participant2's (left team) paddle's X coordinate on the screen.
- `<left_team_participant2_id>_y - [####]` -
  Participant2's (left team) paddle's Y coordinate on the screen.
- `<left_team_participant3_id>_x - [####]` -
  Participant3's (left team) paddle's X coordinate on the screen.
- `<left_team_participant3_id>_y - [####]` -
  Participant3's (left team) paddle's Y coordinate on the screen.
- `ai_x - [####]` -
  AI's (right team) paddle's X coordinate on the screen.
- `ai_y - [####]` -
  AI's (right team) paddle's Y coordinate on the screen.
- `seconds - [###]`
  Seconds left in game (120 counts down to 0).

cooperative_0_<timestamp>_metadata.json
(JSON data format)
Baseline Cooperative Ping-Pong Configuration Information. The configuration information in this file: `left_team (participant IDs for Lion, Tiger, and Leopard)`, `right_team ("ai")`, `client_window_height`, `client_window_width`, `session_time_seconds`, `seconds_count_down`, `count_down_message`, `paddle_width`, `paddle_height`, `ai_paddle_max_speed`, `paddle_speed_scaling`, `paddle_max_speed`, `ball_x_speed`, `ball_bounce_on_paddle_scale`.

Baseline Cooperative Ping-Pong Configuration Information JSON File:

```
{
    "left_team": [
        "#####", (left team member 1 ID, "99999" for experimenter)
        "#####", (left team member 2 ID, "99999" for experimenter)
        "#####"  (left team member 3 ID, "99999" for experimenter)
    ],
    "right_team": [
        "ai"
    ],
    "client_window_height": [####] (typical: 1440),
    "client_window_width": [####] (typical: 2560),
    "session_time_seconds": [###.#] (typical: 120.0),
    "seconds_count_down": [##.#] (typical: 10.0),
    "count_down_message": ["string"]
    (typical:"Move the mouse to move the blue paddle"),
    "paddle_width": [##] (typical: 20),
    "paddle_height": [###] (typical: 90),
    "ai_paddle_max_speed": [##] (typical: 20),
    "paddle_speed_scaling": [#.#] (typical: 0.6),
    "paddle_max_speed": [###.#] (typical: null),
    "ball_x_speed": [##] (typical: 12),
    "ball_bounce_on_paddle_scale": [#.##] (typical: 0.4)
}
```

rest_state/ ...

<timestamp>.csv

(semicolon delimited text file, 1st row is a header)

This CSV file records the Start Time and End Time for the Baseline Rest State. A summary of data contained in this file is: Record Timestamp (Unix Time, Monotonic, and Human-readable formats), and Event Type (`"start_rest_state" or "end_rest_state"`).

Baseline Rest State Timestamp CSV Fields:

- `time - [##########.######] (in seconds)`
  Unix Time https://www.unixtimestamp.com/.
- `monotonic_time - [#######.#########] (in seconds)`
  How long since the computer that hosts the task was booted up.
- `human_readable_time - [yyyy-mm-ddThh:nn:ss.######Z] (hh in 24h)`
  UTC-0 time in human-readable format.
- `event_type - [string]`
  Start or End of Rest State (`"start_rest_state" or "end_rest_state"`).

lsl/ ... ***(Only for experiments starting April 2023)***

block_1.xdf
(Extensible Data Format XDF, binary file format)
The `block_1.xdf` contains data files and data streams for the Baseline Tasks portion of the Experiment. You must use a XDF viewer program to view or extract the data contained in this file. Some common software packages used to view or extract data from this XDF file are: MNE-Python, Matplotlib, and Qtgraph. A summary of data recorded in this XDF file is: fNIRS LSL Streams, EEG LSL Streams, Baseline Data, Filenames of the Face and Screen Images, and Pupil Data.
* *Due to "Lion's" EEG Amplifier being in shop for repair, the EEG Data for "Lion" is missing in this file for the following experiments:* `exp_2023_04_17_13`, `exp_2023_04_18_14`, `exp_2023_04_21_10` `exp_2023_04_24_13`, *and* `exp_2023_04_27_14`.

Data files and streams contained in the `block_1.xdf`:

- `fNIRS LSL Streams` -
  fNIRS LSL Streams being transmitted from the "NIRx - Aurora" software programs running on the "fNIRS Server Computer" during the Baseline Tasks portion of the Experiment for participants on Lion, Tiger, and Leopard.
- `EEG LSL Streams` -
  EEG LSL Streams being transmitted from the "Brain Vision - LSL-actiChamp" software programs running on the "EEG Server Computer" during the Baseline Tasks portion of the Experiment for participants on Lion, Tiger, and Leopard.
- `Baseline Data for all Tasks` -
  All records that are outputted to the Baseline Tasks CSV files are also recorded in this XDF file for all Baseline Tasks.
- `Filenames of the Face Images` -
  The Filenames of all Face Images created during the Baseline Tasks portion of the Experiment for participants on Lion, Tiger, and Leopard.
- `Filenames of the Screen Images` -
  The Filenames of all Face Images created during the Baseline Tasks portion of the Experiment for participants on Lion, Tiger, and Leopard.
- `Pupil Data` -
  Pupil Data files recorded from the "Pupil Labs - Pupil Capture" software programs running on the participant's iMacs, Lion, Tiger, and Leopard during the Baseline Tasks portion of the Experiment.

block_2.xdf
(Extensible Data Format XDF, binary file format)
The `block_2.xdf` contains data files and data streams for the Minecraft portion of the Experiment. You must use a XDF viewer program to view or extract the data contained in this file. Some common software packages used to view or extract data from this XDF file are: MNE-Python, Matplotlib, and Qtgraph. A summary of data recorded in this XDF file is: fNIRS LSL Streams, EEG LSL Streams, Individual and Central Audio, Filenames of the Face and Screen Images, and Pupil Data.
* *Due to "Lion's" EEG Amplifier being in shop for repair and a configuration problem, the EEG Data for "Lion" is missing in this file for the following experiments:*
`exp_2023_04_17_13`, `exp_2023_04_18_14`, `exp_2023_04_21_10`, `exp_2023_04_24_13`

exp_2023_04_27_14, exp_2023_05_01_13, *and* exp_2023_05_02_14.

Data files and streams contained in the block_2.xdf:

- fNIRS LSL Streams -
  fNIRS LSL Streams being transmitted from the "NIRx - Aurora" software programs running on the "fNIRS Server Computer" during the Minecraft portion of the Experiment for participants on Lion, Tiger, and Leopard.
- EEG LSL Streams -
  EEG LSL Streams being transmitted from the "Brain Vision - LSL-actiChamp" software programs running on the "EEG Server Computer" during the Minecraft portion of the Experiment for participants on Lion, Tiger, and Leopard.
- Minecraft Messages -
  A series of JSON strings recording the messages sent to and from participants during the three Minecraft missions, Training, Saturn A, and Saturn B.
- Individual Audio -
  Audio Signals captured during the Minecraft portion of the Experiment from each participant's microphone, Lion, Tiger, and Leopard.
- Central Audio -
  This is Audio File from the central array microphone located in the center of the experiment room that picks up all audio in the room during the experiment.
- Filenames of the Face Images -
  The Filenames of all Face Images created during the Minecraft portion of the Experiment for participants on Lion, Tiger, and Leopard.
- Filenames of the Screen Images -
  The Filenames of all Face Images created during the Minecraft portion of the Experiment for participants on Lion, Tiger, and Leopard.
- Pupil Data -
  Pupil Data files recorded from the "Pupil Labs - Pupil Capture" software programs running on the participant's iMacs, Lion, Tiger, and Leopard during the Minecraft portion of the Experiment.

minecraft/ ...

MinecraftData_Trial-<trial_num>_ID-<fancy_string>.metadata

(Minecraft Metadata format)

This file stores the Minecraft metadata for each experiment trial (mission).

<*trial_num*> is the trial number assigned to each mission.

For "Saturn A" and "B" missions, its format is typically "T#####".

For "Hands on Training" mission, it will be "Training".

<*fancy_string*> is the unique ID for the trial mission.

Example: "126bc586-8838-4691-8745-7d5737bb1bec".

Example of the data and structure stored in this file:


```
{
    "@timestamp": "2023-05-03T19:06:19.351Z",
    "@version": "1", "host": "f08722420ace",
    "header":
        {
            "version": "0.6",
            "message_type": "agent",
```

```
            "timestamp": "2023-05-03T19:06:19.350127Z"
        },
    "msg":
        {
            "experiment_id": "acc43931-4f24-494f-b570-e3c52d9481b5",
            "timestamp": "2023-05-03T19:06:19.350127Z",
            "version": "0.1", "source": "AC_CMUFMS_TA2_Cognitive",
            "trial_id": "126bc586-8838-4691-8745-7d5737bb1bec",
            "sub_type": "rollcall:response"
        },
    "data":
        {
            "version": "0.0.3",
            "status": "up",
            "uptime": 6233.19814,
            "rollcall_id": "3e2027ea-5a52-4d7a-94df-81fddb03c43d"
        },
    "topic": "agent/control/rollcall/response"
}
```


<cat>/ ...

eeg_fnirs_pupil/ ... ***(Only for experiments before April 2023)***

<cat>_eeg_fnirs_pupil.xdf

(Extensible Data Format XDF, binary file format)

The `<cat>_eeg_fnirs_pupil.xdf` contains <cat> data files and data streams for the Experiment. You must use a XDF viewer program to view or extract the data contained in this file. Some common software packages used to view or extract data from this XDF file are: MNE-Python, Matplotlib, and Qtgraph. A summary of data recorded in this XDF file is: fNIRS LSL Streams, EEG LSL Streams, and Pupil Data.

Data files and streams contained in the `<cat>_eeg_fnirs_pupil.xdf`:

- `fNIRS LSL Streams` -
  fNIRS LSL Streams being transmitted from the "NIRx - Aurora" software programs running on the "fNIRS Server Computer" during the Experiment for participants on Lion, Tiger, and Leopard.
- `EEG LSL Streams` -
  EEG LSL Streams being transmitted from the "Brain Vision - LSL-actiChamp" software programs running on the "EEG Server Computer" during the Experiment for participants on Lion, Tiger, and Leopard.
- `Pupil Data` -
  Pupil Data files recorded from the "Pupil Labs - Pupil Capture" software programs running on the participant's iMacs, Lion, Tiger, and Leopard during the Experiment.

audio/ ...
(Only for sessions on or after 2022-10-07 and prior to 2023-04-17, 3 to 4 .wav files.)

Trial-<trial_id>_Team-<team_num>_Member-<player_num>.wav
(WAV - Waveform Audio File Format, RIFF "little-endian" data, mono 48000 Hz)
This file is the audio recording from the participant's microphone during the Minecraft Trials (Missions). Example of file name:
`Trial-0720f53b-df85-42a8-ba44-0508094653b4_Team-4_Member-Player877.wav`

audio/block_2/ ...
(Only for sessions on or after 2023-04-17, 3 to 4 .wav files.)

Trial-<trial_id>_Team-<team_num>_Member-<participant_id>.wav
(WAV - Waveform Audio File Format, RIFF "little-endian" data, mono 48000 Hz)
This file is the audio recording from the participant's microphone during the Minecraft Trials (Missions). Example of file name:
`Trial-f4f65fe1-e105-4e67-8682-f9b3dc4eedb1_Team-34_Member-00131.wav`

face_images/ ... ***(Only for experiments before April 2023)***
Face Image Files <yyyy-mm-dd>T<hh_mm_ss.sssssssss>Z.png
(PNG - Portable Network Graphic, raster image file)
Participant Face Image files recorded from the built-in "web camera" on the Lion, Tiger, and Leopard iMacs. The files are recorded at a frequency of 10Hz and have a resolution of 1280 x 720, 8-bit/color RGB, non-interlaced. Typically, there will be over 50,000 files per <cat> for the experiment.

screenshots/ ... ***(Only for experiments before April 2023)***
Screenshot Image Files <yyyy-mm-dd>T<hh_mm_ss.sssssssss>Z.png
(PNG - Portable Network Graphic, raster image file)
Screenshot Image files recorded from the participant's iMac (Lion, Tiger, or Leopard). The files are recorded at a frequency of 10Hz and have a resolution of 1280 x 720, 8-bit/color RGB, non-interlaced. Typically, there will be over 50,000 files per <cat> for the experiment.

face_images/block_1/ ... ***(Only for experiments starting April 2023)***

Face Image Files (block_1):
<seq ######>_<yyyy-mm-dd>_<hh_mm_ss.sss.AM/PM> <ms last image ###>.png
(PNG - Portable Network Graphic, raster image file)
Participant Face Image files (block_1) recorded from the built-in "web camera" on the Lion, Tiger, and Leopard iMacs during the Baseline Tasks portion of the Experiment. The files are recorded at a frequency of 10Hz and have a resolution of 1280 x 720, 8-bit/color RGB, non-interlaced. Typically, there will be over 15,000 files in this directory per <cat> for the experiment.

face_images/block_2/ ... ***(Only for experiments starting April 2023)***
Face Image Files (block_2):
<seq ######>_<yyyy-mm-dd>_<hh_mm_ss.sss.AM/PM> <ms last image ###>.png
(PNG - Portable Network Graphic, raster image file)
Participant Face Image files (block_2) recorded from the built-in "web camera" on the Lion, Tiger, and Leopard iMacs during the Minecraft portion of the Experiment. The files are recorded at a frequency of 10Hz and have a resolution of 1280 x 720, 8-bit/color RGB, non-interlaced. Typically, there will be over 30,000 files in this directory per <cat> for the experiment.

screenshots/block_1/ ... ***(Only for experiments starting April 2023)***
Screenshot Image Files (block_1):
<seq ######>_<yyyy-mm-dd>_<hh_mm_ss.sss.AM/PM> <ms last image ###>.png
(PNG - Portable Network Graphic, raster image file)
Screenshot Image files (block_1) recorded from the participant's iMac (Lion, Tiger, or Leopard) during the Baseline Tasks portion of the Experiment. The files are recorded at a frequency of 5Hz and have a resolution of 1280 x 720, 8-bit/color RGB, non-interlaced. Typically, there will be over 8,000 files in this directory per <cat> for the experiment.

screenshots/block_2/ ... ***(Only for experiments starting April 2023)***
Screenshot Image Files (block_2):
<seq ######>_<yyyy-mm-dd>_<hh_mm_ss.sss.AM/PM> <ms last image ###>.png
(PNG - Portable Network Graphic, raster image file)
Screenshot Image files (block_2) recorded from the participant's iMac (Lion, Tiger, or Leopard) during the Minecraft Tasks portion of the Experiment. The files are recorded at a frequency of 5Hz and have a resolution of 1280 x 720, 8-bit/color RGB, non-interlaced. Typically, there will be over 14,000 files in this directory per <cat> for the experiment.

presession/ ...

participant_<participant_ID>.wav

(Symbolic Link to a file in the "presession" directory, WAV - Waveform Audio File Format, RIFF "little-endian" data, WAVE audio, mono 48000 Hz)

This is a Symbolic Link to file "participant_<participant_ID>.wav" in the presession's directory that has the presession files for this <cat>'s participant.

The "participant_<participant_ID>.wav" was created in the participant's presession and is the audio recording of the participant speaking the first task:

The first task is where the participant sees a map with two locations, start and end, marked. The participant is given written instructions to explain to their "friend" how to get from start to end with as much detail as possible. Once the participant understand the instructions, their voice for this task will be recoded.

Example of the Symbolic Link mapping:

```
participant_<participant_ID>.wav ->
    <presession directory>/participant_<participant_ID>.wav
```

participant_<participant_ID>Task2.wav

(Symbolic Link to a file in the "presession" directory, WAV - Waveform Audio File Format, RIFF "little-endian" data, WAVE audio, mono 48000 Hz)

This is a Symbolic Link to file "participant_<participant_ID>Task2.wav" in the presession's directory that has the presession files for this <cat>'s participant.

The "participant_<participant_ID>Task2.wav" was created in the participant's presession and is the audio recording of the participant speaking the second task:

The second task is where the participant is asked to read aloud a passage that contains words we would expect them to use during the experiment. An example of the passage is "Minecraft is a multiplayer online game where players take roles such as medic, engineer, and transporter...".

Example of the Symbolic Link mapping:

```
participant_<participant_ID>Task2.wav ->
    <presession directory>/participant_<participant_ID>Task2.wav
```

pupil_recorder/ 000/ and 001/...

blinks.pldata

(proprietary binary file used by the Pupil Player.)

This file contains a sequence of independently msgpack-encoded messages for recorded Eye Blinks. Pupil Core's Blink Detector leverages the fact that 2D pupil confidence drops rapidly in both eyes during a blink as the pupil becomes obscured by the eyelid, followed by a rapid rise in confidence as the pupil becomes visible again. The Blink Detector processes 2D pupil confidence values by convolving them with a filter. The filter response – called

'activity' – spikes the sharper the confidence drop is and vice versa for confidence increases. Blinks are subsequently detected based on onset and offset confidence thresholds and a filter length in seconds. The "Pupil Lab - Pupil Player" application uses this file to play back Eye Blink data during playback. More information about the data contained in this file can be found at:
Pupil Labs - Basic Concepts - Blinks
https://docs.pupil-labs.com/neon/basic-concepts/data-streams/#blinks

blinks_timestamps.npy
(NPY binary format:
A simple format for saving numpy arrays to disk with the full information about them.
The .npy format is the standard binary file format in NumPy for persisting a single arbitrary NumPy array on disk. The format stores all of the shape and dtype information necessary to reconstruct the array correctly even on another machine with a different architecture. The format is designed to be as simple as possible while achieving its limited goals. You can use numpy.load() to access the timestamps in Python.)
Eye Blink timestamps for the Pupil Capture glasses and system. Blinks are subsequently detected based on onset and offset confidence thresholds and a filter length in seconds. The "Pupil Lab - Pupil Player" application uses this file to play back Eye Blink data during playback.

eye0.intrinsics
(proprietary binary file used by the Pupil Player.)
This file stores camera intrinsics persistencies for the right eye.
More information about the data contained in this file can be found at:
Pupil Labs - User Guide - Camera Intrinsics Persistency
https://docs.pupil-labs.com/core/software/pupil-capture/

eye0.mp4
(MP4 file: *formally ISO/IEC 14496-14:2003*
is a digital multimedia container format most commonly used to store video and audio.)
This file contains video of the participant's right eye and pupil recorded from the pupil capture sensor mounted on the right side of the "Pupil Capture Glasses". The sensors, right and left eyes, record IR video at 200 Hz with a resolution of 192x192px. The two sensors are synced in hardware, such that they record images at the exact same time. The resulting images a concatenated in a single video stream of 384x192px resolution.

eye0_timestamps.npy
(NPY binary format:
A simple format for saving numpy arrays to disk with the full information about them.

The .npy format is the standard binary file format in NumPy for persisting a single arbitrary NumPy array on disk. The format stores all of the shape and dtype information necessary to reconstruct the array correctly even on another machine with a different architecture. The format is designed to be as simple as possible while achieving its limited goals. You can use numpy.load() to access the timestamps in Python.)
This file contains timestamps that relate to the video captured in "eye0.mp4" (right eye).

eye1.intrinsics
(proprietary binary file used by the Pupil Player.)
This file stores camera intrinsics persistencies for the left eye.
More information about the data contained in this file can be found at:
Pupil Labs - User Guide - Camera Intrinsics Persistency
`https://docs.pupil-labs.com/core/software/pupil-capture/`

eye1.mp4
(MP4 file *formally ISO/IEC 14496-14:2003*
is a digital multimedia container format most commonly used to store video and audio.)
This file contains video of the participant's left eye and pupil recorded from the pupil capture sensor mounted on the left side of the "Pupil Capture Glasses". The sensors, right and left eyes, record IR video at 200 Hz with a resolution of 192x192px. The two sensors are synced in hardware, such that they record images at the exact same time. The resulting images a concatenated in a single video stream of 384x192px resolution.

eye1_timestamps.npy
(NPY binary format:
A simple format for saving numpy arrays to disk with the full information about them.
The .npy format is the standard binary file format in NumPy for persisting a single arbitrary NumPy array on disk. The format stores all of the shape and dtype information necessary to reconstruct the array correctly even on another machine with a different architecture. The format is designed to be as simple as possible while achieving its limited goals. You can use numpy.load() to access the timestamps in Python.)
This file contains timestamps that relate to the video captured in "eye1.mp4" (left eye).

fixations.pldata
(proprietary binary file used by the Pupil Player.)
This file stores fixation data to be used by the Pupil Player. The two primary types of eye movements exhibited by the visual system are fixations and saccades. During fixations, the eyes are directed at a specific point in the environment. A saccade is a very quick movement where the eyes jump from one fixation to the next. Properties like the fixation duration are of significant importance for studying gaze behaviour.

More information about the data contained in this file can be found at:
Pupil Labs - Basic Concepts - Fixations
https://docs.pupil-labs.com/neon/basic-concepts/data-streams/#fixations

fixations_timestamps.npy
(NPY binary format:
A simple format for saving numpy arrays to disk with the full information about them.
The .npy format is the standard binary file format in NumPy for persisting a single arbitrary NumPy array on disk. The format stores all of the shape and dtype information necessary to reconstruct the array correctly even on another machine with a different architecture. The format is designed to be as simple as possible while achieving its limited goals. You can use numpy.load() to access the timestamps in Python.)
This file contains timestamps that relate to the fixations captured in "fixations.pldata".

gaze.pldata
(proprietary binary file used by the Pupil Player.)
This file stores gaze data to be used by the Pupil Player. The Neon Companion app can provide gaze data in real-time. When using a OnePlus 8 Companion device, the available framerate is +120 Hz (the achieved framerate varies from 200Hz in the first minute of a recording to 120Hz for longer recordings). More information about the data contained in this file can be found at:
Pupil Labs - Basic Concepts - Gaze
https://docs.pupil-labs.com/neon/basic-concepts/data-streams/#gaze

gaze_timestamps.npy
(NPY binary format:
A simple format for saving numpy arrays to disk with the full information about them.
The .npy format is the standard binary file format in NumPy for persisting a single arbitrary NumPy array on disk. The format stores all of the shape and dtype information necessary to reconstruct the array correctly even on another machine with a different architecture. The format is designed to be as simple as possible while achieving its limited goals. You can use numpy.load() to access the timestamps in Python.)
This file contains timestamps that relate to the gaze data captured in "gaze.pldata".

info.player.json
(JSON data format)
Pupil Capture application's metadata about this participant.
Information contained in this file:
duration_s (capture duration in seconds),
meta_version (metadata version),

min_player_version (min player version),
recording_name (recording name),
recording_software_name ("recording software name),
recording_software_version (recording software version),
recording_uuid (recording UUID),
start_time_synced_s (synced start time in second),
start_time_system_s (system start time in second),
system_info (system info metadata).

Pupil Capture Application Participant Information JSON File:

```
{
    "duration_s": [####.########, (Example: 2107.33979455)],
    "meta_version": [string, (Example:"2.3")],
    "min_player_version": [string, (Example: "2.0")],
    "recording_name": [string, (Example: "2023_05_01")],
    "recording_software_name": [string, (Example: "Pupil Capture")],
    "recording_software_version": [string, (Example: "3.5.7")],
    "recording_uuid":
        [string, (Example: "7078d724-c0f9-478f-bdb8-d81495bbc9f7")],
    "start_time_synced_s":
        [####.############, (Example: 5604.700757881999)],
    "start_time_system_s":
        [####.############, (Example: 1682975254.133834)],
    "system_info":
        [string, (Example: "User: LabWorker, Platform: Darwin,
         Machine: tiger, Release: 20.6.0,
         Version: Darwin Kernel Version 20.6.0:
         Wed Jan 12 22:22:42 PST 2022;
         root:xnu-7195.141.19~2/RELEASE_X86_64")]
}
```

notify.pldata

(proprietary binary file used by the Pupil Player.)

This file stores "Notification Messages" to be used by the Pupil Player. Pupil uses special messages called notifications to coordinate all activities. Notifications are key-value mappings with the required field subject. Subjects are grouped by categories *category.command_or_statement*. Example: *recording.should_stop*

More information about the data contained in this file can be found at:

Pupil Labs - IPC Backbone Message Format

https://docs.pupil-labs.com/developer/core/network-api/#notification-message

notify_timestamps.npy

(NPY binary format:

A simple format for saving numpy arrays to disk with the full information about them.

The .npy format is the standard binary file format in NumPy for persisting a single arbitrary NumPy array on disk. The format stores all of the shape and dtype information necessary to reconstruct the array correctly even on another machine with a different architecture. The format is designed to be as simple as possible while achieving its limited goals. You can use numpy.load() to access the timestamps in Python.)
This file contains timestamps that relate to the "Notification Messages" data captured in "notify.pldata".

pupil.pldata
(proprietary binary file used by the Pupil Player.)
This file stores "Pupil Capture" data to be used by the Pupil Player. More information about the data contained in this file can be found at:
Pupil Labs - Developer - Core - Recording Format - pldata Files
`https://docs.pupil-labs.com/developer/core/recording-format/#recording-format`

pupil_timestamps.npy
(NPY binary format:
A simple format for saving numpy arrays to disk with the full information about them.
The .npy format is the standard binary file format in NumPy for persisting a single arbitrary NumPy array on disk. The format stores all of the shape and dtype information necessary to reconstruct the array correctly even on another machine with a different architecture. The format is designed to be as simple as possible while achieving its limited goals. You can use numpy.load() to access the timestamps in Python.)
This file contains timestamps that relate to the "Pupil Capture" data captured in "pupil.pldata".

user_info.csv
(semicolon delimited text file, 1st row is a header)
The Pupil Capture optionally stores information about the User in this file. In the ToM-CAT Experiment, this option is not enabled. Therefor, the file only contains the header.
user_info.csv Fields:

- `key - [text]`
- `value - [text]`
- `name - [text]`
- `additional_field - [text]`
- `change_me - [text]`

world.intrinsics
(proprietary binary file used by the Pupil Player.)
This file stores camera intrinsics persistencies for the World camera.

More information about the data contained in this file can be found at:
Pupil Labs - Core - Terminology - World
https://docs.pupil-labs.com/core/terminology/#world
And at:
Pupil Labs - Core - Terminology - Camera Intrinsics
https://docs.pupil-labs.com/core/terminology/#camera-intrinsics

world.mp4
(MP4 file *formally ISO/IEC 14496-14:2003*
is a digital multimedia container format most commonly used to store video and audio.)
This file contains video of the participant's physical scene field of view. The World Camera is mounted on top center of the "Pupil Capture Glasses". More information about the video contained in this file can be found at:
Pupil Labs - Core - Terminology - World
https://docs.pupil-labs.com/core/terminology/#world

world_timestamps.npy
(NPY binary format:
A simple format for saving numpy arrays to disk with the full information about them.
The .npy format is the standard binary file format in NumPy for persisting a single arbitrary NumPy array on disk. The format stores all of the shape and dtype information necessary to reconstruct the array correctly even on another machine with a different architecture. The format is designed to be as simple as possible while achieving its limited goals. You can use numpy.load() to access the timestamps in Python.)
This file contains timestamps that relate to the "World Video" captured in "world.mp4".

redcap_data/ ...
<cat>_self_report_data.csv
(semicolon delimited text file, 1st row is a header)
This file has information and answers for the following categories: "Subject Information Sheet", "Informed Consent Form - Multiple Subject-Two Sessions", "COVID-19 Screening", "Demographics Survey", "Big Five Inventory - 2 Short Form (BFI-2-SF)", "Attachment Style Questionnaire", "Pre-Session Notes For Research Team ONLY", "Session 1 Notes For Research Team ONLY", and "Informed Consent Form - Multiple Subject-Four Sessions".

<cat>_self_report_data.csv Fields:

- `record_id - [text]`
  Record ID created by REDCap system.
- `redcap_event_name - [text]("Pre-Session")`
  Event when this information was collected.

- redcap_survey_identifier - [text](can be blank)
  Survey Identifier.
- subject_information_sheet_timestamp - [text](can be blank)
  Sheet Timestamp.
- subject_id - [#####](Required)
  Subject ID assigned to participant.
- head_size - [text]
  Participant's Head Size (cm).
- presession_date - [text](yyyy-mm-dd hh:mm:ss)
  Pre-Session Date.
- presession_exp_initials - [text]
  Pre-Session Experimenter(s) (Initials only).
- session1_date - [text](yyyy-mm-dd hh:mm:ss)
  Session 1 Date.
- team_id - [text]
  Team ID that has been assigned to this participant.
- session1_exp_initials - [text]
  Session 1 Experimenter(s) (Initials only).
- session2_date - [text](yyyy-mm-dd hh:mm:ss)
  Session 2 Date.
- session2_exp_initials - [text]
  Session 2 Experimenter(s) (Initials only).
- subject_information_sheet_complete - [0=Incomplete, 1=Unverified, 2=Complete]
  Subject Information Sheet Complete.
- informed_consent_form_timestamp - [text](yyyy-mm-dd hh:mm:ss)
  Informed Consent Form Timestamp.
- consent_date - [text](yyyy-mm-dd)
  Consent Form date.
- informed_consent_form_complete - [0 = Incomplete; 1 = Unverified; 2 = Complete]
  Informed Consent Form Complete.
- informed_consent_form_multiple_subjecttwo_sessions_timestamp - [text](yyyy-mm-dd hh:mm:ss)
  Informed Consent Form Multiple Subject Two Sessions Timestamp.
- consent_date_2 - [text](yyyy-mm-dd)
  Consent Form 2 date.
- informed_consent_form_multiple_subjecttwo_sessions_complete - [0 = Incomplete; 1 = Unverified; 2 = Complete]
  Informed Consent Form Multiple Subject Two Sessions Complete.

- covid19_screening_timestamp - [text](yyyy-mm-dd hh:mm:ss)
  COVID-19 Screening Timestamp.
- covid_symptoms___1 - [checkbox]
  Fever or chills.
- covid_symptoms___2 - [checkbox]
  Cough.

- `covid_symptoms___3 - [checkbox]`
  Shortness of breath or difficulty breathing.
- `covid_symptoms___4 - [checkbox]`
  Fatigue.
- `covid_symptoms___5 - [checkbox]`
  Muscle or body aches.
- `covid_symptoms___6 - [checkbox]`
  Headache.
- `covid_symptoms___7 - [checkbox]`
  New loss of taste or smell.
- `covid_symptoms___8 - [checkbox]`
  Sore throat.
- `covid_symptoms___9 - [checkbox]`
  Congestion or runny nose.
- `covid_symptoms___10 - [checkbox]`
  Nausea or vomiting.
- `covid_symptoms___11 - [checkbox]`
  Diarrhea.
- `covid_symptoms___12 - [checkbox]`
  No Symptoms now or in the past 72 hours.
- `covid_symptoms___13 - [checkbox]`
  Not applicable, I recovered from COVID-19 in the last 90 days.
- `covid_symptoms___14 - [checkbox]`
  Yes, I have symptoms or was diagnosed with COVID-19 in the past 10 days.
- `covid_close_contact - [1 = No; 2 = Yes I was in contact]`
  During the past 14 days, have you been in close contact (within 6 feet for 15 minutes or more) with a confirmed case or someone with symptoms of COVID-19?.
- `covid19_screening_complete - [0 = Incomplete; 1 = Unverified; 2=Complete]`
  COVID-19 Screening Complete.

- `demographics_survey_timestamp - [text](yyyy-mm-dd hh:mm:ss)`
  Demographics Survey Timestamp.
- `age - (Required)[text]`
  Your age in years.
- `sex - (Required)[1 = Male; 2 = Female; 3 = Other; 4 = Prefer not to say]`
  What is your sex?
- `hisp - (Required)[0 = No; 1 = Yes]`
  Are you of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture of origin (Hispanic)?.
- `race - (Required)`
  `[0 = European American; 1 = African American; 2 = Asian American;`
  `3 = Native Hawaiian or Pacific Islander; 4 = Non-Hispanic White; 5 = Other]`
  Which best describes your racial background?.

- `income - (Required)`
  `[0 = $0 - $25,000; 1 = $25,000 - $ 50,000; 2 = $50,000 - $75,000;`
  `3 = $75,000 - $ 100,000; 4 = $100,000 - $150,000; 5 = Greater than $150,000]`
  What is your typical yearly household income before taxes?
- `edu - (Required)`
  `[0 = Less than high-school; 1 = High-school; 2 = Professional program;`
  `3 = Some college; 4 = Undergraduate degree; 5 = Graduate degree]`
  What is the highest level of education you have completed?
- `exp - (Required)`
  `[0 = Never played them; 1 = Have played them occasionally;`
  `2 = Have played them fairly often; 3 = Have played them regularly for years]`
  How much experience do you have playing video games?
- `exp_mc - (Required)`
  `[0 = Never played it; 1 = Have played it occasionally;`
  `2 = Have played it fairly often; 3 = Have played it regularly for years]`
  How much experience do you have playing Minecraft?
- `handedness - (Required)`
  `[0 = Right-handed; 1 = Left-handed; 2 = Ambidextrous]`
  Which is your dominant hand?
- `trackpad_preference - (Required)`
  `[0 = Trackpad; 1 = Mouse; 2 = Doesn't matter]`
  Do you prefer using a trackpad or mouse when working on the computer?
- `sph_label - ("SPEECH/HEARING & LANGUAGE")[text]`
  Label for the speech/hearing or language impairments.
- `shl_impairements - (Required)[0 = No; 1 = Yes]`
  Do you have any speech/hearing or language impairments?
- `shl_impairment_specify - [text]`
  Please specify the speech/hearing or language impairment?
- `shl_impairment_agediagnosis - [text]`
  When was the first time you got diagnosed with the speech/hearing or language impairment?
- `shl_impairment_therapy - [text]`
  Do you currently see a speech therapist or other healthcare professional for the impairment?
- `first_language - [text]`
  What would you say is your first language(s)?
- `languages_spoken - [text]`
  What languages do you speak on a daily/weekly/monthly basis?
- `language_age_learned - [text]`
  At what age did you learn the language? (For example, if you learned Spanish when you were 5 years-old, then enter the name of the language and in parentheses the age; so Spanish (5-years-old).).
- `countries_live_one_year - [text]`
  What countries did you live in for more than one year?
- `major_schooling_country - [text]`
  Where did you complete the majority of your schooling?

- health_label - ("HEALTH")[text]
  Label for the health questions.
- health_concussion - (Required)[0 = No; 1 = Yes]
  Have you ever been diagnosed with or experienced concussions?
- health_seizure - (Required)[0 = No; 1 = Yes]
  Have you ever been diagnosed with or experienced seizures?
- health_trauma - (Required)[0 = No; 1 = Yes]
  Have you ever been diagnosed with or experienced other neurological trauma (e.g., traumatic brain injury)?
- health_other_trauma_specify - [text]
  Other neurological trauma.
- health_medications - (Required)[0 = No; 1 = Yes]
  Are you currently taking any psychoactive medication (e.g., anti-depressants, ADHD medication, etc.)?
- health_vision - (Required)[0 = No; 1 = Yes]
  Do you have any visual impairments other than wearing glasses/contacts, such as partial or full colorblindness?
- health_vision_specify - [text]
  Visual impairments.
- demographics_survey_complete - [0 = Incomplete; 1 = Unverified; 2=Complete]
  Demographics survey complete.

- big_five_inventory_2_short_form_bfi2s_timestamp - [text](yyyy-mm-dd hh:mm:ss)
  Big five inventory 2 short form timestamp.
- bfi2_q1 - I am someone who: Tends to be quiet.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q2 - I am someone who: Is compassionate, has a soft heart.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q3 - I am someone who: Tends to be disorganized.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q4 - I am someone who: Worries a lot.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q5 - I am someone who: Is fascinated by art, music, or literature.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q6 - I am someone who: Is dominant, acts as a leader.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q7 - I am someone who: Is sometimes rude to others.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q8 - I am someone who: Has difficulty getting started on tasks.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q9 - I am someone who: Tends to feel depressed, blue.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q10 - I am someone who: Has little interest in abstract ideas.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]

- bfi2_q11 - I am someone who: Is full of energy.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q12 - I am someone who: Assumes the best about people.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q13 - I am someone who: Is reliable, can always be counted on.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q14 - I am someone who: Is emotionally stable, not easily upset.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q15 - I am someone who: Is original, comes up with new ideas.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q16 - I am someone who: Is outgoing, sociable.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q17 - I am someone who: Can be cold and uncaring.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q18 - I am someone who: Keeps things neat and tidy.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q19 - I am someone who: Is relaxed, handles stress well.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q20 - I am someone who: Has few artistic interests.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q21 - I am someone who: Prefers to have others take charge.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q22 - I am someone who: Is respectful, treats others with respect.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q23 - I am someone who: Is persistent, works until the task is finished.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q24 - I am someone who: Feels secure, comfortable with self.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q25 - I am someone who: Is complex, a deep thinker.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q26 - I am someone who: Is less active than other people.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q27 - I am someone who: Tends to find fault with others.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q28 - I am someone who: Can be somewhat careless.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q29 - I am someone who: Is temperamental, gets emotional easily.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- bfi2_q30 - I am someone who: Has little creativity.
  [1=Disagree strongly; 2=Disagree a little; 3=Neutral; 4=Agree a little; 5=Agree strongly]
- big_five_inventory_2_short_form_bfi2s_complete -
  Big five inventory 2 short form complete.
  [0 = Incomplete; 1 = Unverified; 2=Complete]

- attachment_style_questionnaire_timestamp - [text](yyyy-mm-dd hh:mm:ss)
  Attachment style questionnaire timestamp.
- attach_q1 - I find it relatively easy to get close to other people.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q2 - I feel confident that other people will be there for me when I need them.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q3 - I feel confident about relating to others.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q4 - I am confident that other people will like and respect me.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q5 - I find that others are reluctant to get as close as I would like.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q6 - I worry that others won't care about me as much as I care about them.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q7 - I worry a lot about my relationships.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q8 - I often feel left out or alone.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q9 - I prefer to keep to myself.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q10 - I find it hard to trust other people.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q11 - I have mixed feelings about being close to others.
  [1 (totally disagree) to 6 (totally agree)]
- attach_q12 - While I want to get close to others, I feel uneasy about it.
  [1 (totally disagree) to 6 (totally agree)]
- attachment_style_questionnaire_complete -
  Attachment style questionnaire complete.
  [0 = Incomplete; 1 = Unverified; 2=Complete]

- presession_notes_for_research_team_only_timestamp - [text](yyyy-mm-dd hh:mm:ss)
  Presession notes for research team only timestamp.
- notes_presession_date - [text](yyyy-mm-dd hh:mm:ss)
  Notes Presession Date.
- notes_presession_exp___1 - [checkbox]
  Paloma Bernardo.
- notes_presession_exp___2 - [checkbox]
  Savannah Boyd.
- notes_presession_exp___3 - [checkbox]
  Valeria Pfeifer.
- notes_presession_exp___4 - [checkbox]
  Eric Andrews.
- notes_presession_exp___5 - [checkbox]
  Diheng Zhang.

- notes_presession_exp___6 - [checkbox]
  Ashley Minks.
- notes_presession_exp___7 - [checkbox]
  Daria Letson.
- notes_presession_consentedby___1 - [checkbox]
  Paloma Bernardo.
- notes_presession_consentedby___2 - [checkbox]
  Savannah Boyd.
- notes_presession_consentedby___3 - [checkbox]
  Valeria Pfeifer.
- notes_presession_consentedby___4 - [checkbox]
  Payal Khosla.
- notes_presession_consentedby___5 - [checkbox]
  Eric Andrews.
- notes_presession_consentedby___6 - [checkbox]
  Diheng Zhang.
- notes_credit_type___1 - [checkbox]
  SONA.
- notes_credit_type___2 - [checkbox]
  Amazon gift card.
- notes_credit_granted___1 - [checkbox]
  Yes.
- notes_credit_granted___2 - [checkbox]
  In process.
- notes_speech_baseline - [text]
  Speech Baseline Notes.
- notes_other - [text]
  Other Notes.
- presession_notes_for_research_team_only_complete -
  Presession notes for research team only complete.
  [0 = Incomplete; 1 = Unverified; 2=Complete]

- session_1_notes_for_research_team_only_timestamp - [text](yyyy-mm-dd hh:mm:ss)
  Session 1 notes for research team only timestamp.
- session1notes_session_date - [text](yyyy-mm-dd hh:mm:ss)
  Session 1 Notes Session Date.
- notes_session_exp_v2___1 - [checkbox]
  Paloma Bernardo.
- notes_session_exp_v2___2 - [checkbox]
  Savannah Boyd.
- notes_session_exp_v2___3 - [checkbox]
  Valeria Pfeifer.
- notes_credit_type_v2___1 - [checkbox]
  SONA.

- notes_credit_type_v2___2 - [checkbox]
  Amazon gift card.
- notes_credit_granted_v2___1 - [checkbox]
  Yes.
- notes_credit_granted_v2___2 - [checkbox]
  In process.
- notes_other_v2 - [text]
  Other Notes.
- note_session_observations_v2 - [text]
  Testing Session #1 Observations (upload the hardcopy).
- session_1_notes_for_research_team_only_complete -
  Session 1 notes for research team only complete.
  [0 = Incomplete; 1 = Unverified; 2=Complete]

<cat>_post_game_survey_data.csv
(semicolon delimited text file, 1st row is a header)
This file is the participant's answers to the REDCap's "Post Game Survey". The survey is presented to the participant at the end of the experiment.
<cat>_post_game_survey_data.csv Fields:

- record_id - [text]
  Record ID created by REDCap system.
- redcap_survey_identifier - [text]
  Survey Identifier.
- subject_information_sheet_timestamp - [text](yyyy-mm-dd hh:mm:ss)
  Sheet Timestamp.
- subject_id - [#####](Required)
  Subject ID assigned to participant.
- session1_date - [text](yyyy-mm-dd hh:mm:ss)
  Session 1 Date.
- session1_exp_initials - [text]
  Session 1 Experimenter(s) (Initials only).
- session1_comp_name - Computer Name.
  [1=Cheetah; 2=Lion; 3=Tiger; 4=Leopard]
- session1_player_name - [text]
  Minecraft Player Name.
- session1_game_crash - Did the game crash between missions?
  [1=Yes; 0=No]
- session1_updated_player_name - [text]
  Updated Player Name.
- subject_information_sheet_complete -
  Subject information sheet complete.
  [0 = Incomplete; 1 = Unverified; 2=Complete]
- postgame_survey_timestamp - [text](yyyy-mm-dd hh:mm:ss)
  Postgame survey timestamp.

- post_game_survey_subject_id - [#####](Required)
  Postgame survey Subject ID assigned to participant.
- survey_date - [text](yyyy-mm-dd hh:mm:ss)
  Survey Date.

Please indicate how much you felt the emotions DUE TO THE AGENT (not due to how the game went):

- agent_calm - calm or relaxed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- agent_anxious - anxious or stressed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- agent_excited - excited or energized.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- agent_sad - sad or depresse.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- agent_guilty - guilty or ashamed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- agent_angry - frustrated or angry.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- agent_happy - happy or content.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- agent_lonely - lonely or ignored.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- agent_proud - confident or proud.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- agent_friendly - friendly or amused.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]

Please indicate how much you felt the emotions during the game DUE TO HOW THE ENTIRE GAME WENT (not due to how the game went):

- game_calm - calm or relaxed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- game_anxious - anxious or stressed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- game_excited - excited or energized.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- game_sad - sad or depressed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- game_guilty - guilty or ashamed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- game_angry - frustrated or angry.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- game_happy - happy or content.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]

- game_lonely - lonely or ignored.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- game_proud - confident or proud.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- game_friendly - friendly or amused.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]

Please indicate your impression of the AGENT by dragging the sliding bar between the pairs of adjectives below. The closer the bar is to the adjective, the more certain you are of your evaluation:

- agent_intell - (Slider) "Intelligent" (0) <-> (100) "Unintelligent".
- agent_care - (Slider) "Cares about me" (0) <-> (100) "Doesn't care about me".
- agent_honest - (Slider) "Honest" (0) <-> (100) "Dishonest".
- agent_expert - (Slider) "Inexpert" (0) <-> (100) "Expert".
- agent_concern -(Slider) "Concerned about me" (0) <-> (100) "Unconcerned about me".
- agent_trust - (Slider) "Untrustworthy" (0) <-> (100) "Trustworthy".
- agent_comp - (Slider) "Incompetent" (0) <-> (100) "Competent".
- agent_insens - (Slider) "Insensitive" (0) <-> (100) "Sensitive".
- agent_honor - (Slider) "Honorable" (0) <-> (100) "Dishonorable".
- agent_bright - (Slider) "Bright" (0) <-> (100) "Stupid".
- agent_understand - (Slider) "Not understanding" (0) <-> (100) "Understanding".
- agent_phoney - (Slider) "Phoney" (0) <-> (100) "Genuine".

Overall, how much do you agree or disagree with the following statements:

- agent_well - I got along with the agent pretty well.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- agent_smooth - The interaction with the agent was smooth.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- agent_acc - I felt accepted and respected by the agent.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- agent_like - I think the agent is likeable.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- agent_enjoy - I enjoyed the interaction.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- agent_awk - The interaction with the agent was forced, awkward and strained.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- agent_place - The agent said things that were out of place.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- agent_play - If I were to play the video game again, I would want to have the agent there.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- agent_perform - I think having the agent there helped me to perform better in the game.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]

How much did you feel the following emotions during the game DUE TO THE OTHER TEAM MEMBER(S) (e.g., not due to due to the agent or how the game went):

- team_calm - calm or relaxed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- team_anxious - anxious or stressed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- team_excited - excited or energized.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- team_sad - sad or depressed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- team_guilt - guilty or ashamed.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- team_angry - frustrated or angry.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- team_happy - happy or content.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- team_lonely - lonely or ignored.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- team_proud - confident or proud.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]
- team_friendly - friendly or amused.
  [0=not at all; 1=small amount; 2=moderate amount; 3=large amount; 4=very large amount]

Please indicate your impression of THE OTHER TEAM MEMBER(S) by sliding the bar between the pairs of adjectives below. The closer the bar is to the adjective, the more certain you are of your evaluation:

- team_intel - (Slider) "Intelligent" (0) <-> (100) "Unintelligent".
- team_care - (Slider) "Cares about me," (0) <-> (100) "Doesn't care about me".
- team_honest - (Slider) "Honest" (0) <-> (100) "Dishonest".
- team_expert - (Slider) "Inexpert" (0) <-> (100) "Expert".
- team_concern - (Slider) "Concerned about me" (0) <-> (100) "Unconcerned about me".
- team_trust - (Slider) "Untrustworthy" (0) <-> (100) "Trustworthy".
- team_comp - (Slider) "Incompetent" (0) <-> (100) "Competent".
- team_insens - (Slider) "Insensitive" (0) <-> (100) "Sensitive".
- team_honor - (Slider) "Honorable" (0) <-> (100) "Dishonorable".
- team_bright - (Slider) "Bright" (0) <-> (100) "Stupid".
- team_understand - (Slider) "Not understanding" (0) <-> (100) "Understanding".
- team_phoney - (Slider) "Phoney" (0) <-> (100) "Genuine".

Please answer the following questions about THE OTHER TEAM MEMBER(S):

- team_wrong - It seemed like my emotional reaction was wrong or incorrect because of my team member's responses.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- team_forget - I felt like I should forget about my feelings and move on because of my team member's responses.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]

- team_minimize - It seemed like my feelings were minimized because of my team member's responses.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- team_insult - I felt insulted when I shared my feelings.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- team_irrat - I felt like my feelings were irrational because of my team member's responses.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- team_crit - I felt my team members were being critical of my feelings.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- team_fault - I felt like my feelings were my fault because of my team member's response.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- team_ignore - I felt ignored when I shared my feelings.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- team_impt - I felt like my feelings were unimportant because of my team member's response.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- team_weak - I felt weak because of my team member's response to my emotional reactions.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]

Overall, how much do you agree or disagree with the following statements:

- team_along - I got along with my team members pretty well.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_smooth - The interaction with my team members was smooth.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_accept - I felt accepted and respected by my team members.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_like - I think my team members are likable.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_enjoy - I enjoyed the interaction.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_awk - The interaction with my team members was forced, awkward and strained.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_place - My team members said things that were out of place.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_likeme - I believe other group members liked me.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_genuine - I felt that I was a genuine member of the group.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_part - During the game, I got to participate whenever I wanted to.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_listen - Other members of the group really listened to what I had to say.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]

- team_ilike - I liked the group I was in.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_interact - I enjoyed interacting with this group very much.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_itrust - I trusted group members.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_fit - The group was composed of people who fit together.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_cohesion - There was a feeling of unity and cohesion in the group.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_work - Compared to other groups I have been a part of in life, this group worked well together.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_knit - We were a closely knit group.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_like_mem - I like the members of the group.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_work_well - Our group worked well together.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_decisision - This group used effective decision making techniques.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_express - This group provided for comfortable expression for members.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_organize - I believe we approached the game in an organized manner.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_accomplish - The group accomplished what it set out to do.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_approp - I believe our group's decisions were appropriate.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_alt - I believe we selected the right alternatives.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_influ - I believe I had a lot of influence on group decisions.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]
- team_contrib - I contributed important information during the decision process.
  [-2=Strongly Disagree; -1=Disagree Slightly; 1=Agree Slightly; 2=Agree Strongly]

Please answer the following questions about how the agent made you feel:

- agent_emot1 - It seemed like my emotional reaction was wrong or incorrect because of the agent's response.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- agent_emot2 - I felt like I should forget about my feelings and move on because of the agent's response.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]
- agent_emot3 - It seemed like my feelings were minimized because of the agent's reaction.
  [5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]

- `agent_emot4` - I felt insulted when I shared my feelings.
  `[5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]`
- `agent_emot5` - I felt like my feelings were irrational because of the agent's response.
  `[5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]`
- `agent_emot6` - I felt the agent was being critical of my feelings.
  `[5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]`
- `agent_emot7` - I felt like my feelings were my fault because of the agent's response.
  `[5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]`
- `agent_emot8` - I felt ignored when I shared my feelings.
  `[5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]`
- `agent_emot9` - I felt like my feelings were unimportant because of the agent's response.
  `[5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]`
- `agent_emot10` - I felt weak because of the agent's response to my emotional reactions.
  `[5=Strongly Agree; 4=Agree; 3=Neither Agree nor Disagree; 2=Disagree; 1=Strongly Disagree]`
- `know_team_members` - Did you know any of the other team members?
  `[1 = Yes; 0 = No]`
- `know_person_at_cheetah - [text]`
  Did you know the team member on Computer 1: Cheetah? If so, then to what extent have you known this team member?
- `know_person_at_lion - [text]`
  Did you know the team member on Computer 2: Lion?If so, then to what extent have you known this team member?
- `know_person_at_tiger - [text]`
  Did you know the team member on Computer 3: Tiger?If so, then to what extent have you known this team member?
- `know_person_at_leopard - [text]`
  Did you know the team member on Computer 4: Leopard?If so, then to what extent have you known this team member?
- `postgame_survey_complete -`
  Postgame survey complete.
  `[0 = Incomplete; 1 = Unverified; 2=Complete]`

testbed_logs/ ... *(On or after 2022-10-17)*

asist_logs_<teamid>_<yyyy>_<mm>_<dd>_<hh>_<mm>_<ss>/ASR_Agent/logs/ ...

(Only for experiments on or after 2022-10-17) **<yyyy>-<mm>-<dd>_<hh>-<mm>-<ss>.0.log**

This file contains log entries for the "ASR Agent".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>: <info> <message>"

asist_logs_<teamid>_<yyyy>_<mm>_<dd>_<hh>_<mm>_<ss>/dozzle_logs/ ...

(Only for experiments on or after 2022-10-17)

ac_aptima_ta_measures.log
This file contains log entries for the "Analytic Component - Aptima - TA3 - Measures".
Format: (Text File)
"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"
Examples of data in this file:
"2023-04-17 20:07:43,273 | MeasuresAgent | INFO — Starting Agent Loop."
"2023-04-17 20:07:43,273 | asistagenthelper.ASISTAgentHelper | INFO — Starting ASIST."
"2023-04-17 20:07:43,273 | MeasuresAgent | INFO — Agent is now running..."

AC_CMUFMS_TA2_Cognitive.log
This file contains log entries for the "Analytic Component - Carnegie Mellon University - Functional Modeling Systems - TA2 - Cognitive". This agent, written in Python, computes the current cognitive load for the overall team, as well as arelated probability of forgetting by the overall team. These are computed solely with respect tointeractions with victims, not marker blocks.

It publishes on only a coarse grained schedule, publishing a message to the bus only when therehas been an interaction that can be expected to make a substantial change to the cognitive load,and does not continuously reflect the fine-grained changes reflecting decay of memories over shortperiods of time.
Format: (Text File)
"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"
Examples of data in this file:
"2023-04-17 20:07:49,122 | AC_CMUFMS_TA2_Cognitive | INFO — Starting Agent..."
"2023-04-17 20:07:49,122 | asistagenthelper.ASISTAgentHelper | INFO — Starting ASIST..."
"2023-04-17 20:07:49,122 | asistagenthelper.ASISTAgentHelper | INFO — Starting MQTT..."

ac_cmu_ta1_pygl_fov_agent.log
This file contains log entries for the "Analytic Component - Carnegie Mellon University - TA1 - PYGL FOV Agent".
Format: (Text File)
"<info> : <message>"
Examples of data in this file:
"INFO:FoVWorker:[FoVWorker]: Creating a new participant: 00133"
"INFO:FoVWorker:[FoVWorker]: Participant Block ID: 1"
"INFO:FoVWorker:[FoVWorker]: Participant Block Color: (0, 0, 2)"

ac_cmu_ta2_beard.log
This file contains log entries for the "Analytic Component - Carnegie Mellon University - TA2 - Beard".
Format: (Text File)
"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"
Examples of data in this file:
"2023-04-17 22:06:40,236 | ac_cmu_ta2_beard | INFO — Trial Event: start"
"2023-04-17 22:06:40,237 | ac_cmu_ta2_beard | INFO — Resetting full state!"
"2023-04-17 22:08:09,793 | ac_cmu_ta2_beard | INFO — - Mission Event: Start"

ac_cmu_ta2_ted.log
This file contains log entries for the "Analytic Component - Carnegie Mellon University - TA2 - Ted".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"

Examples of data in this file:

"2023-04-17 20:08:07,721 | ac_cmu_ta2_ted | INFO — Starting Agent Loop separate thread."

"2023-04-17 20:08:07,721 | ac_cmu_ta2_ted | INFO — Agent is now running..."

"2023-04-17 22:08:09,793 | ac_cmu_ta2_ted | INFO — - Mission Event: Start"

AC_CORNELL_TA2_TEAMTRUST.log
This file contains log entries for the "Analytic Component - Cornell University - TA2 - TEAMTRUST".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"

Examples of data in this file:

"2023-04-17 22:46:14,842 | AC_CORNELL_TA2_TEAM_TRUST | INFO — Published goal alignment. Time: 925937"

"2023-04-17 22:46:18,716 | AC_CORNELL_TA2_TEAM_TRUST | INFO — Published Compliance message. Time: 929814"

"2023-04-17 22:46:36,181 | AC_CORNELL_TA2_TEAM_TRUST | INFO — Goal update event: observations/events/player/rubble_destroyed"

ac_gallup_ta2_gelp.log
This file contains log entries for the "Analytic Component - University of New Mexico-Gallup Campus - TA2 - GELP".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"

Examples of data in this file:

"2023-04-17 22:27:03,110 | Gallup_Agent_GELP | INFO — (1) curr_data_obj: <currently silenced>"

"2023-04-17 22:27:03,110 | Gallup_Agent_GELP | INFO — Variable type for curr_data_obj['message']: <class 'dict'>"

"2023-04-17 22:27:03,110 | Gallup_Agent_GELP | INFO — (2) Completed type check."

ac_gallup_ta2_gold.log
This file contains log entries for the "Analytic Component - University of New Mexico-Gallup Campus - TA2 - GOLD".

Format: (Text File)

"<info>"

Examples of data in this file:

"ImportError: cannot import name 'AutoModelForSequenceClassification' from 'nltk.tokenize' (/usr/local/lib/python3.8/site-packages/nltk/tokenize/__init__.py)"
"Agent gallup_agent_gold.py crashed with exit code 1. Restarting.."

ac_ihmc_ta2_dyad-reporting.log
This file contains log entries for the "Analytic Component - Institute for Human & Machine Cognition - TA2 DYAD-REPORTING".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"

Examples of data in this file:

"2023-04-17 20:07:46,592 | IHMCProximityAC | INFO — Starting IHMC's Dyad AC Agent"
"2023-04-17 20:07:46,592 | IHMCProximityAC | INFO — Dyad Ranges: [[0.0, 13.0, 1.0], [13.0, 20.0, 0.5]]"
"2023-04-17 20:07:46,592 | IHMCProximityAC | INFO — Starting Agent Loop on a separate thread."

ac_ihmc_ta2_joint-activity-interdependence.log
This file contains log entries for the "Analytic Component - Institute for Human & Machine Cognition - TA2 joint-activity-interdependence".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"

Examples of data in this file:

"2023-04-17 20:07:47,932 | asistagenthelper.ASISTAgentHelper | INFO — Starting ASIST Agent Loop: ac_ihmc_ta2_joint-activity-interdependence"
"2023-04-17 20:07:47,932 | asistagenthelper.ASISTAgentHelper | INFO — Starting the MQTT Bus pub/sub system..."
"2023-04-17 20:07:47,935 | asistagenthelper.ASISTAgentHelper | INFO — - Connected to the Message Bus."

ac_ihmc_ta2_location-monitor.log
This file contains log entries for the "Analytic Component - Institute for Human & Machine Cognition - TA2 location-monitor".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"

Examples of data in this file:

"2023-04-17 20:07:45,234 | LocationMonitor | INFO — Starting Agent Loop on a separate thread."
"2023-04-17 20:07:45,235 | LocationMonitor | INFO — Agent is now running..."
"2023-04-17 22:06:40,236 | LocationMonitor | INFO — New Trial_id: f4f65fe1-e105-4e67-8682-f9b3dc4eedb1 using map: Saturn_2.9_3D_Training"

ac_ihmc_ta2_player-proximity.log
This file contains log entries for the "Analytic Component - Institute for Human & Machine Cognition - TA2 player-proximity".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"

Examples of data in this file:

"2023-04-17 20:07:46,193 | IHMCProximityAC | INFO — Starting IHMC's Proximity AC Agent"

"2023-04-17 20:07:54,289 | IHMCProximityAC | INFO — Pre populating Distance Matrices..."

"2023-04-17 22:08:10,356 | IHMCProximityAC | INFO — 'elapsed_milliseconds': 555, 'participants': ['callsign': 'red', 'participant_id': '00131', 'role': 'Medical_Specialist', 'current_location': 'sga', 'distance_to_participants': ['id': 'blue', 'distance': 6.0,..."

AC_UAZ_TA1_ASR_Agent-heartbeat.log

This file contains log entries for the "Analytic Component - University of Arizona - TA1 ASR Agent-heartbeat".

Format: (Text File)

"PING asr_agent (<ip>) <statistics info>..."

Examples of data in this file:

"PING asr_agent (<ip>) 56(84) bytes of data.
64 bytes from AC_UAZ_TA1_ASR_Agent.asist_net(<ip>): icmp_seq=1 ttl=64 time=0.249ms
— asr_agent ping statistics —
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.249/0.249/0.249/0.000 ms"

AC_UAZ_TA1_ASR_Agent.log

This file contains log entries for the "Analytic Component - University of Arizona - TA1 ASR Agent".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>: <info>"

Examples of data in this file:

"2023-04-17 20:07:52: <info> Connection to Mosquitto broker established!"

"2023-04-17 20:07:52: <info> Starting speechAnalyzer in websocket mode"

"2023-04-17 22:06:40: <info> Accepted connection: participant_id = 1 sample_rate = 48000"

AC_UAZ_TA1_ASR_Agent-Mosquitto.log

This file contains log entries for the "Analytic Component - University of Arizona - TA1 ASR Agent-Mosquitto".

Format: (Text File)

"<timestamp in seconds>: <info>"

(<timestamp> = number of seconds elapsed since Jan 1, 1970 (midnight UTC/GMT))

Examples of data in this file:

"1681762071: mosquitto version 2.0.14 starting"

"1681762071: Config loaded from /mosquitto/config/mosquitto.conf."

"1681762071: Opening ipv4 listen socket on port 1883."

ac_uaz_ta1_speechanalyzer_adminer_1.log
This file contains log entries for the "Analytic Component - University of Arizona - TA1 Speechanalyzer Adminer 1".

Format: (Text File)

"[<date_time_stamp] <info>"

Examples of data in this file:

"[Mon Apr 17 20:07:55 2023] PHP 7.4.32 Development Server (http://[::]:8080) started"

AC_UAZ_TA1_SpeechAnalyzer-db.log
This file contains log entries for the "Analytic Component - University of Arizona - TA1 SpeechAnalyzer-db".

Format: (Text File)

"<agent messages>...
<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>.<SSS> UTC <info>"

Examples of data in this file:

"PostgreSQL init process complete; ready for start up."
"2023-04-17 20:07:57.213 UTC [1] LOG: listening on IPv4 address "0.0.0.0", port 5432"
"2023-04-17 20:07:57.213 UTC [1] LOG: listening on IPv6 address "::", port 5432"

AC_UAZ_TA1_SpeechAnalyzer-heartbeat.log
This file contains log entries for the "Analytic Component - University of Arizona - TA1 SpeechAnalyzer-heartbeat".

Format: (Text File)

""PING speech_analyzer (<ip>) <statistics info>...""

Examples of data in this file:

"PING speech_analyzer (<ip>) 56(84) bytes of data.
— speech_analyzer ping statistics —
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.227/0.227/0.227/0.000 ms"

AC_UAZ_TA1_SpeechAnalyzer.log
This file contains log entries for the "Analytic Component - University of Arizona - TA1 SpeechAnalyzer".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>: <info>"

Examples of data in this file:

"2023-04-17 20:08:01: <info> SpeechAnalyzer version: 4.1.6"
"2023-04-17 20:08:02: <info> Connection to Mosquitto broker established!"
"2023-04-17 22:06:49: <info> data:"sentiment":"emotions":"anger":0.05,"disgust":0.02..."

AC_UAZ_TA1_SpeechAnalyzer-mmc.log
This file contains log entries for the "Analytic Component - University of Arizona - TA1 SpeechAnalyzer-mmc".

Format: (Text File)

"INFO: <info>"

Examples of data in this file:

"INFO: Started server process [1]"

"INFO: Application startup complete."

"INFO: Uvicorn running on http://0.0.0.0:8001 (Press CTRL+C to quit)"

ac_ucf_ta2_playerprofiler_container.log

This file contains log entries for the "Analytic Component - UCF TA2 Playerprofiler Container".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"

"<message bus messages>..."

Examples of data in this file:

"2023-04-17 20:08:15,705 | asistagenthelper.ASISTAgentHelper | INFO — Starting MQTT Bus system..."

"2023-04-17 20:08:15,711 | asistagenthelper.ASISTAgentHelper | INFO — - Connected to the Message Bus."

"subscribe observations/events/player/rubble_destroyed qos = 2"

asistdataingester.log

This file contains log entries for the "Asist Data Ingester".

Format: (Text File)

"info: <info>"

Examples of data in this file:

"info: AsistDataIngester.Startup[0]"

"info: AsistDataIngester.Services.MQTTService[0]
MQTTService: MQTT Client Initializing
MQTT STARTING UP"

clientmap.log

This file contains log entries for the "Client Map".

Format: (Text File)

"<messages>", "<json text>"

Examples of data in this file:

"> server2@1.0.0 start /Server2"

"> node server.js"

"{
showGlobalPositions: false,
Saturn_A_Text: {
Medic: {..."

cmuta2-ted-ac.log

This file contains log entries for the "CMUTA2-TED-AC".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <info> | <message>"

Examples of data in this file:

"2022-03-25 23:52:31,684 | cmuta2-ted-ac | INFO — Starting Agent Loop on a separate thread."

"2022-03-25 23:52:31,684 | asistagenthelper.ASISTAgentHelper | INFO — Starting ASIST Agent Loop: cmuta2-ted-ac"

"2022-03-25 23:52:31,684 | asistagenthelper.ASISTAgentHelper | INFO — Starting the MQTT Bus pub/sub system..."

cra_psicoach_agent.log

This file contains log entries for the "CRA PSICOACH Agent".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss> INFO <info>"

Examples of data in this file:

"2022-03-25 23:52:24 INFO CoachController$:146 - Loading Map: Saturn"

"2022-03-25 23:52:25 INFO MqttConnectionHandler:145 - Listening for messages"

"2022-03-25 23:52:25 INFO DefaultAgentEventSource:48 - StatusEvent[State(ok), Status(SequenceNumber(0))]"

crazy_ritchie.log

This file contains log entries for the "Docker Container System - Crazy Ritchie".

Format: (Text File)

"<messages from Docker>"

Examples of data in this file:

"Hello from Docker!"

"This message shows that your installation appears to be working correctly."

dozzle.log

This file contains log entries for the "Dozzle". Dozzle is a simple and responsive application that provides you with a web based interface to monitor your Docker container logs live. It doesn't store log information, it is for live monitoring of your container logs only.

Format: (Text File)

"<messages from Dozzle>"

Examples of data in this file:

"level=info msg="Dozzle version v3.10.2""

"level=info msg="Accepting connections on :8080""

elasticsearch.log

This file contains log entries for the "Elasticsearch Application". The Elasticsearch's application is used to log and monitor your cluster and diagnose issues. If you run Elasticsearch as a service, the default location of the logs varies based on your platform and installation.

Format: (Text File)

"<messages from Elasticsearch> (JSON format)"

Examples of data in this file:

"{"type": "server", "timestamp": "2023-04-17T20:07:41,218Z", "level": "INFO",
"component": "o.e.n.Node", "cluster.name": "docker-cluster", "node.name": "<node>",
"message": "version[7.16.2], pid[7],
build[default/docker/<docker_id>/2021-12-18T19:42:46.604893745Z],
OS[Linux/5.15.0-58-generic/amd64],
JVM[Eclipse Adoptium/OpenJDK 64-Bit Server VM/17.0.1/17.0.1+12]" }"

filebeat.log
This file contains log entries for the "Filebeat". Filebeat is a lightweight shipper for forwarding and centralizing log data. Installed as an agent on your servers, Filebeat monitors the log files or locations that you specify, collects log events, and forwards them either to Elasticsearch or Logstash for indexing.

Format: (Text File)

"<messages from Filebeat>"

heartbeat-speech_analyzer_agent.log
This file contains log entries for the "Heartbeat-Speech Analyzer Agent".

Format: (Text File)

"<Heartbeat messages from the Speech Analyzer Agent>"

heartbeat-uaz_tmm_agent.log
This file contains log entries for the "Heartbeat-UAZ TMM Agent".

Format: (Text File)

"Heartbeat messages from the UAZ TMM Agent"

kibana.log
This file contains log entries for the "Kibana Tool". Kibana is a data visualization and exploration tool used for log and time-series analytics, application monitoring, and operational intelligence use cases. It offers powerful and easy-to-use features such as histograms, line graphs, pie charts, heat maps, and built-in geospatial support.

Format: (Text File)

"<messages from Kibana> (JSON format)"

Examples of data in this file:

"{"type":"log","@timestamp":"2023-02-21T20:50:07+00:00",
"tags":["info","plugins-service"],"pid":7,"message":"Plugin "metricsEntities" is disabled."}"

logstash.log
This file contains log entries for the "Logstash". Logstash is an open server-side data processing pipeline that ingests data from a multitude of sources, transforms it, and then sends it to your favorite "stash."

Format: (Text File)

"<messages from Logstash>"

Examples of data in this file:

"[2023-02-21T20:50:06,152][INFO][org.reflections.Reflections] Reflections took 36 ms to scan 1 urls, producing 20 keys and 40 values"
"[2023-02-21T20:50:07,345][WARN][logstash.outputs.elasticsearch][main] Restored connection to ES instance {:url=>"http://elasticsearch:9200/"}"

malmocontrol_Local.log
This file contains log entries for the "Malmo Control Local".
Format: (Text File)
"<message_type>: <message>"
Examples of data in this file:
"info: Microsoft.AspNetCore.DataProtection.KeyManagement.XmlKeyManager[0] User profile is available. Using '/root/.aspnet/DataProtection-Keys' as key repository; keys will not be encrypted at rest."
"info: Microsoft.AspNetCore.DataProtection.KeyManagement.XmlKeyManager[58] Creating key {<key>} with creation date <date>, activation date <date>, and expiration date <date>."

Measures_Agent_Container.log
This file contains log entries for the "Measures Agent Container".
Format: (Text File)
"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <info>"
Examples of data in this file:
"2022-03-25 23:52:15,812 | MeasuresAgent | INFO — Starting Agent Loop on a separate thread."
"2022-03-25 23:52:15,812 | asistagenthelper.ASISTAgentHelper | INFO — Starting ASIST Agent Loop: AC_Aptima_TA3_measures"
"2022-03-25 23:52:15,812 | MeasuresAgent | INFO — Agent is now running..."

metadata-docker_metadata-app_1.log
This file contains log entries for the "Metadata-Docker Metadata-App 1".
Format: (Text File)
"«hh>:<mm>:<ss>.<SSS> [<source>] <info>"
Examples of data in this file:
"20:50:00.354 [main] INFO io.micronaut.runtime.Micronaut - Startup completed in 2561ms. Server Running: http://<id>:8080"
"21:24:33.731 [MQTT Call:<id>] INFO m.a.service.DefaultExperimentService - 1 row(s) affected."
"21:24:33.745 [MQTT Call:<id>] INFO m.a.service.DefaultExperimentService - id returned: 79."

metadata-docker_pgadmin_1.log
This file contains log entries for the "Metadata-Docker Page Admin 1".
Format: (Text File)
"[<yyyy>-<mm>-<dd> <hh>:<mm>:<ss> <offset>] [<num>] [INFO] <info>"

Examples of data in this file:
"[2023-02-21 20:50:14 +0000] [1] [INFO] Starting gunicorn 20.1.0"
"[2023-02-21 20:50:14 +0000] [1] [INFO] Listening at: http://[::]:80 (1)"
"[2023-02-21 20:50:14 +0000] [1] [INFO] Using worker: gthread"

metadata-docker_postgres_1.log
This file contains log entries for the "Metadata-Docker Post Gres 1".
Format: (Text File)
"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> UTC [<num>] LOG: <info>"
Examples of data in this file:
"2023-02-21 20:49:56.254 UTC [1] LOG: starting PostgreSQL 13.4 on x86_64-pc-linux-musl, compiled by gcc (Alpine 10.3.1_git20210424) 10.3.1 20210424, 64-bit"
"2023-02-21 20:49:56.254 UTC [1] LOG: listening on IPv4 address "0.0.0.0", port 5432"
"2023-02-21 20:49:56.254 UTC [1] LOG: listening on IPv6 address "::", port 5432"

metadata-web_metadata-web_1.log
This file contains log entries for the "Metadata-Web 1".
Format: (Text File)
"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> UTC [<num>] LOG: <info>"

minecraft-server0.log
This file contains log entries for the "Minecraft-Server0".
Format: (Text File)
"[init] <info>" , "[<hh>:<mm>:<ss>] [source] [process]: <info>" , "<message>"
Examples of data in this file:
"[init] Running as uid=1000 gid=1000 with /data
as 'drwxrwsrwx 15 1000 701 4096 Feb 21 20:50 /data'"
"[20:50:38] [main/INFO] [LaunchWrapper]:
Using primary tweak class name net.minecraftforge.fml.common.launcher.FMLServerTweaker"

mmc.log
This file contains log entries for the "MMC".
Format: (Text File)
"INFO: <info>"
Examples of data in this file:
"INFO: Started server process [1]"
"INFO: Application startup complete."
"INFO: Uvicorn running on http://0.0.0.0:8001 (Press CTRL+C to quit)"

mosquitto.log
This file contains log entries for the "Mosquitto".
Format: (Text File)
"<timestamp in seconds>: <info>"
(<timestamp> = number of seconds elapsed since Jan 1, 1970 (midnight UTC/GMT))

Examples of data in this file:

"1677012585: mosquitto version 1.6.9 starting"

"1677012585: Config loaded from /mosquitto/config/mosquitto.conf."

"1677012585: Opening ipv4 listen socket on port 1883."

mqttvalidationservice.log

This file contains log entries for the "Mosquitto Validation Service".

Format: (Text File)

"<message_type>: <message>"

Examples of data in this file:

"info: MQTTValidationService.Startup[0]
MQTTValidationService starting up"

"warn: ValidationServices.Services.Validator[0]
Loading Topic: agent/control/rollcall/request"

nginx.log

This file contains log entries for the "Nginx".

Format: (Text File)

"<init_info>" "<ip> - - [<dd>/<mmm>/<yyyy>:<hh>:<mm>:<ss> <offset>] <info>"

Examples of data in this file:

"/docker-entrypoint.sh: Configuration complete; ready for start up"

"192.168.0.19 - - [21/Feb/2023:21:01:46 +0000] "GET /ClientMap/map HTTP/1.1" 302 66 "-"
"Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/110.0.0.0 Safari/537.36""

Rutgers_Agent_Container.log

This file contains log entries for the "Rutgers Agent Container".

Format: (Text File)

"<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> | <agent> | <num> | <info>"

Examples of data in this file:

"2023-02-21 20:50:26,877 | RutgersAgentHelper | 499 | INFO — Published threat room communication"

"2023-02-21 20:50:26,878 | RutgersAgent | 34 | INFO — Starting Agent Heartbeat Loop on a separate thread."

"2023-02-21 20:50:26,878 | asistagenthelper.ASISTAgentHelper | 283 | INFO — Starting the MQTT Bus pub/sub system..."

speech_analyzer_agent.log

This file contains log entries for the "Speech Analyzer Agent".

Format: (Text File)

"<message>"

Examples of data in this file:

"Starting speechAnalyzer in websocket mode"

speechanalyzer_db_1.log
This file contains log entries for the "Speech Analyzer DB 1".

Format: (Text File)

"<init_messages>" , "<yyyy>-<mm>-<dd> <hh>:<mm>:<ss>,<SSS> UTC [<num>] LOG: <info>"

Examples of data in this file:

"Success. You can now start the database server using:"
"2022-03-25 23:52:22.559 UTC [35] LOG: listening on Unix socket "/var/run/postgresql/.s.PGSQL.5432""
"2022-03-25 23:52:22.570 UTC [36] LOG: database system was shut down at 2022-03-25 23:52:21 UTC"

uaz_dialog_agent.log
This file contains log entries for the "UAZ Dialog Agent".

Format: (Text File)

"[<info_type>] <info>" , "<hh>:<mm>:<ss>.<SSS> [<process>] INFO <info>"

Examples of data in this file:

"[info] Loading settings from plugins.sbt ..."
*"[warn] * org.codehaus.plexus:plexus-utils:3.0.17 is selected over 2.1, 1.5.5"*
"20:51:08.026 [run-main-0] INFO o.c.a.extraction.TomcatRuleEngine$ - masterRulesPath: /org/clulab/asist/grammars/master.yml"

uaz_tmm_agent.log
This file contains log entries for the "UAZ TCPdump utility - Traffic Management Microkernel (TMM) Agent" regarding the connections to "Mosquitto".

Format: (Text File)

"<message line>"

Examples of data in this file:

"Trying to connect to mosquitto:1883..."
"Connection established!"
"Waiting for mission to start..."

vosk.log
This file contains log entries for the "Vosk Speech Recognition Toolkit and API".

Format: (Text File)

"LOG (<API Function Call>) <info>"

Examples of data in this file:

"LOG (VoskAPI:ReadDataFiles():model.cc:213) Decoding params beam=13 max-active=7000 lattice-beam=6"
"LOG (VoskAPI:ReadDataFiles():model.cc:216) Silence phones 1:2:3:4:5:11:12:13:14:15"
"LOG (VoskAPI:RemoveOrphanNodes():nnet-nnet.cc:948) Removed 0 orphan nodes."

data_inventory.log *(Only for sessions starting 2023-04-17)*

(Bar "|" Delimeted Text File Format)

This file contains the result of a "Data Inventory Process" for this Experiment Directory and Sub-directories. The file is created by the "data_inventory.sh" Bash Script application file that is located in the GitHub "tomcat" repository:
tomcat/human_experiments/lab_software/data_inventory/data_inventory.sh
The "data_inventory.sh" application will scan the Experiment Directory/Sub-directories and based on the specifications specified in the "data_inventory.tbl" file, will report in this "data_inventory.log" if expected Experiment files are found or missing, the file(s) is within the correct size range, and the file count is within range for that directory.
The top line of this file will indicate the path/experiment this data inventory log is for.
Example: *"Experiment Directory: /<directory_path>/<exp_yyyy_mm_dd_hh>/"*
This file "data_inventory.log" has the following columns:

- `Status` Status of the file(s) being sought.
- `Description` Description of the file(s) being sought.
  (The wildcard character "" can be used in Directory and File Names)*
- `Directory` The specified Directory/Sub-directory that contains the sought file(s).
- `File(s)` The File Name or Files Group Name being sought.
  (Large numbers are truncated: "K" = thousand, "M" = million, "G" = giga)
- `Min_Size` Specified Minimum Size of File(s).
- `Max_Size` Specified Maximum Size of File(s).
- `Min_Count` Specified Minimum File Count.
- `Max_Count` Specified Maximum File Count.
- `File_Size` Actual File Size.
- `File_Count` Actual Directory File Count.

data_inventory.run *(Only for sessions starting 2023-04-17)*

(Bash Script File)

This file is a Bash Script, created by the "Data Inventory Process" at the same time as the "data_inventory.log" file, described above, and can be run in a Linux, MAC or WLS terminals by exeucuting: ***./data_inventory.run***.
The script will display the same "Data Inventory" data for the Experiment that is in the "data_inventory.log" file, but in a easier to read color format with data grouping page breaks.

time_difference.txt *(Only for sessions starting 2023-04-17)*

(Text file format)

This file has a single line that shows the time difference, in seconds, between server CAT's internal time clock and the internet's global time server.
Example of the data stored in this file:

"CAT: 0.001064300537109375 seconds"

trial_info.json

(JSON data format)

This file is trial information for the 3 Minecraft Missions (Hands on Training, Saturn A, Saturn B).

Information contained in this file:

ids (Minecraft Trial ID's),

numbers (Minecraft Trial Numbers),

Minecraft Trial Information JSON File:

```
{
    "id": [string, string, string]
        (Example:
            ["30ea9972-bf9f-4aa9-b7c3-09ab451ed6fb",
             "82d31fa8-62f0-4411-9190-da2ce83e30c3",
             "293a7003-5f12-4d55-92d0-2224ef2151cf"]
        ),
    "number": [string, string, string]
        (Example:
            ["Training", "T00081", "T00082"]
}
```

3 Physiological data extraction

The ToMCAT dataset incorporates various types of physiological data, including EEG, fNIRS, EKG, GSR, and Gaze, all of which are stored in .xdf files. For the sake of convenience and readability, these files should be transformed into a more accessible format, e.g., CSV. This transformation can be accomplished using a Python script located at `tomcat/human_experiments/lab_software/data_extraction/tomcat-physio-data-extraction/run_physio_data_extraction.py`. This script takes the experiment directory as input and works harmoniously with both the old and new data pipelines.

For the old data pipeline (v1), the required file structure is as outlined below:

```
exp_*/
 lion/eeg_fnirs_pupil/lion_eeg_fnirs_pupil.xdf
 tiger/eeg_fnirs_pupil/tiger_eeg_fnirs_pupil.xdf
 leopard/eeg_fnirs_pupil/leopard_eeg_fnirs_pupil.xdf
```

Conversely, the new data pipeline requires this file structure:

```
exp_*/lsl/
  block_1.xdf
  block_2.xdf
```

The script produces output files for both the old and new data pipelines, following this organization:

```
exp_*/
 lion/
      EEG.csv
      Gaze.csv
      NIRS.csv
      NIRS_raw.csv
 tiger/
      EEG.csv
      Gaze.csv
      NIRS.csv
      NIRS_raw.csv
 leopard/
      EEG.csv
      Gaze.csv
      NIRS.csv
      NIRS_raw.csv
```

In the case of the new data pipeline (v2), an additional folder is created with the following structure:

```
exp_*/
 baseline_tasks/
      affective/
           individual_<cat>_<participantID>_<timestamp>.csv
           individual_<cat>_<participantID>_<timestamp>_metadata.json
           team_<timestamp>.csv
           team_<timestamp>_metadata.json
      finger_tapping/
           <timestamp>.csv
           <timestamp>_metadata.json
      ping_pong/
           competitive_0_<timestamp>.csv
           competitive_1_<timestamp>.csv
           cooperative_0_<timestamp>.csv
      rest_state/
           <timestamp>.csv
```

However, in case any of these files do not exist due to unexpected circumstances, the script will still proceed to extract the remaining available data.

4 Derived Data Description

The synchronized EEG, fNIRS, EKG and GSR signals generated by the steps described in the previous section are located in the following tables:

- eeg_sync
- fnirs_sync
- ekg_sync

EEG signal columns	Description (topological location of the subject's brain)
`<subject>_eeg_AFF1h`	Left anterior frontal region
`<subject>_eeg_F7`	Left frontal region
`<subject>_eeg_FC5`	Left fronto-central region
`<subject>_eeg_C3`	Left central region
`<subject>_eeg_T7`	Left temporal region
`<subject>_eeg_TP9`	Left temporal-parietal region
`<subject>_eeg_Pz`	Central parietal region
`<subject>_eeg_P3`	Left parietal region
`<subject>_eeg_P7`	Left parietal region
`<subject>_eeg_O1`	Left occipital region
`<subject>_eeg_O2`	Right occipital region
`<subject>_eeg_P8`	Right parietal region
`<subject>_eeg_P4`	Right parietal region
`<subject>_eeg_TP10`	Right temporal-parietal region
`<subject>_eeg_Cz`	central region
`<subject>_eeg_C4`	Right central region
`<subject>_eeg_T8`	Right temporal region
`<subject>_eeg_FC6`	Right fronto-central region
`<subject>_eeg_FCz`	Central fronto-central region
`<subject>_eeg_F8`	Right frontal region
`<subject>_eeg_AFF2h`	Right anterior frontal region

Table 1: EEG signal descriptions, specifying the topological locations on the subject's brain. Each entry provides the label of the signal column corresponding to the EEG electrode location. For a visual representation of these electrode locations, refer to Figure 2.

- gsr_sync

The column *frequency* indicates the frequency of the shared clock which is 200Hz by default. If we include other frequencies in the feature, the value in this column can be used to select the desired one.

Not all experiments may have data present in the tables due to a couple of primary reasons. Firstly, time constraints can result in certain tasks remaining incomplete in some experiments. Secondly, the recorded signals are compromised during certain tasks can also lead to the absence of signals in the tables.

In cases where only two participants participated in the sections, signals for the third participant are spurious but they were synchronized and saved to the sync tables for a computational choice. However, they can be filtered out by joining with the *data_validity* table.

Table 12, Table 13 and Table 14 detail the mapping between the montage in Figure 2 and the naming convention used in the EEG and fNIRS sync tables.

fNIRS raw signal columns	Description (topological location of the subject's brain)
<subject>_fnirs_S1-D1_760	'F3-F5': left frontal region
<subject>_fnirs_S1-D2_760	'F3-F1': left frontal region
<subject>_fnirs_S2-D1_760	'Af7-F5': left anterior frontal region
<subject>_fnirs_S2-D3_760	'Af7-Fp1': left anterior frontal region
<subject>_fnirs_S3-D1_760	'Af3-F5': left anterior frontal region
<subject>_fnirs_S3-D3_760	'Af3-Fp1': left anterior frontal region
<subject>_fnirs_S3-D4_760	'Af3-Afz': left anterior frontal region
<subject>_fnirs_S4-D2_760	'Fz-F1': left frontal region
<subject>_fnirs_S4-D4_760	'Fz-Afz': central frontal region
<subject>_fnirs_S4-D5_760	'Fz-F2': right frontal region
<subject>_fnirs_S5-D3_760	'Fpz-Fp1': left frontal polar region
<subject>_fnirs_S5-D4_760	'Fpz-Afz': central frontal polar region
<subject>_fnirs_S5-D6_760	'Fpz-Fp2': right frontal polar region
<subject>_fnirs_S6-D4_760	'Af4-Afz': right anterior frontal region
<subject>_fnirs_S6-D6_760	'Af4-Fp2': right anterior frontal region
<subject>_fnirs_S6-D7_760	'Af4-F6': right anterior frontal region
<subject>_fnirs_S7-D5_760	'F4-F2': right frontal region
<subject>_fnirs_S7-D7_760	'F4-F6': right frontal region
<subject>_fnirs_S8-D6_760	'Af8-Fp2': right anterior frontal region
<subject>_fnirs_S8-D7_760	'Af8-F6': right anterior frontal region
<subject>_fnirs_S1-D1_850	'F3-F5': left frontal region
<subject>_fnirs_S1-D2_850	'F3-F1': left frontal region
<subject>_fnirs_S2-D1_850	'Af7-F5': left anterior frontal region
<subject>_fnirs_S2-D3_850	'Af7-Fp1': left anterior frontal region
<subject>_fnirs_S3-D1_850	'Af3-F5': left anterior frontal region
<subject>_fnirs_S3-D3_850	'Af3-Fp1': left anterior frontal region
<subject>_fnirs_S3-D4_850	'Af3-Afz': left anterior frontal region
<subject>_fnirs_S4-D2_850	'Fz-F1': left frontal region
<subject>_fnirs_S4-D4_850	'Fz-Afz': central frontal region
<subject>_fnirs_S4-D5_850	'Fz-F2': right frontal region
<subject>_fnirs_S5-D3_850	'Fpz-Fp1': left frontal polar region
<subject>_fnirs_S5-D4_850	'Fpz-Afz': central frontal polar region
<subject>_fnirs_S5-D6_850	'Fpz-Fp2': right frontal polar region
<subject>_fnirs_S6-D4_850	'Af4-Afz': right anterior frontal region
<subject>_fnirs_S6-D6_850	'Af4-Fp2': right anterior frontal region
<subject>_fnirs_S6-D7_850	'Af4-F6': right anterior frontal region
<subject>_fnirs_S7-D5_850	'F4-F2': right frontal region
<subject>_fnirs_S7-D7_850	'F4-F6': right frontal region
<subject>_fnirs_S8-D6_850	'Af8-Fp2': right anterior frontal region
<subject>_fnirs_S8-D7_850	'Af8-F6': right anterior frontal region

Table 2: Table of fNIRS raw signal descriptions, mapping the source (S) to the detector (D) for various topological locations on the subject's brain. These signals where recorded using the Aurora fNIRS software. Each channel is recorded using light wavelengths of 760nm and 850nm. For a visual representation of these electrode locations, refer to Figure 2.

fNIRS raw signal columns	Description (topological location of the subject's brain)
<subject>_fnirs_S1-D1_HbO	'F3-F5': left frontal region
<subject>_fnirs_S1-D2_HbO	'F3-F1': left frontal region
<subject>_fnirs_S2-D1_HbO	'Af7-F5': left anterior frontal region
<subject>_fnirs_S2-D3_HbO	'Af7-Fp1': left anterior frontal region
<subject>_fnirs_S3-D1_HbO	'Af3-F5': left anterior frontal region
<subject>_fnirs_S3-D3_HbO	'Af3-Fp1': left anterior frontal region
<subject>_fnirs_S3-D4_HbO	'Af3-Afz': left anterior frontal region
<subject>_fnirs_S4-D2_HbO	'Fz-F1': left frontal region
<subject>_fnirs_S4-D4_HbO	'Fz-Afz': central frontal region
<subject>_fnirs_S4-D5_HbO	'Fz-F2': right frontal region
<subject>_fnirs_S5-D3_HbO	'Fpz-Fp1': left frontal polar region
<subject>_fnirs_S5-D4_HbO	'Fpz-Afz': central frontal polar region
<subject>_fnirs_S5-D6_HbO	'Fpz-Fp2': right frontal polar region
<subject>_fnirs_S6-D4_HbO	'Af4-Afz': right anterior frontal region
<subject>_fnirs_S6-D6_HbO	'Af4-Fp2': right anterior frontal region
<subject>_fnirs_S6-D7_HbO	'Af4-F6': right anterior frontal region
<subject>_fnirs_S7-D5_HbO	'F4-F2': right frontal region
<subject>_fnirs_S7-D7_HbO	'F4-F6': right frontal region
<subject>_fnirs_S8-D6_HbO	'Af8-Fp2': right anterior frontal region
<subject>_fnirs_S8-D7_HbO	'Af8-F6': right anterior frontal region
<subject>_fnirs_S1-D1_HbR	'F3-F5': left frontal region
<subject>_fnirs_S1-D2_HbR	'F3-F1': left frontal region
<subject>_fnirs_S2-D1_HbR	'Af7-F5': left anterior frontal region
<subject>_fnirs_S2-D3_HbR	'Af7-Fp1': left anterior frontal region
<subject>_fnirs_S3-D1_HbR	'Af3-F5': left anterior frontal region
<subject>_fnirs_S3-D3_HbR	'Af3-Fp1': left anterior frontal region
<subject>_fnirs_S3-D4_HbR	'Af3-Afz': left anterior frontal region
<subject>_fnirs_S4-D2_HbR	'Fz-F1': left frontal region
<subject>_fnirs_S4-D4_HbR	'Fz-Afz': central frontal region
<subject>_fnirs_S4-D5_HbR	'Fz-F2': right frontal region
<subject>_fnirs_S5-D3_HbR	'Fpz-Fp1': left frontal polar region
<subject>_fnirs_S5-D4_HbR	'Fpz-Afz': central frontal polar region
<subject>_fnirs_S5-D6_HbR	'Fpz-Fp2': right frontal polar region
<subject>_fnirs_S6-D4_HbR	'Af4-Afz': right anterior frontal region
<subject>_fnirs_S6-D6_HbR	'Af4-Fp2': right anterior frontal region
<subject>_fnirs_S6-D7_HbR	'Af4-F6': right anterior frontal region
<subject>_fnirs_S7-D5_HbR	'F4-F2': right frontal region
<subject>_fnirs_S7-D7_HbR	'F4-F6': right frontal region
<subject>_fnirs_S8-D6_HbR	'Af8-Fp2': right anterior frontal region
<subject>_fnirs_S8-D7_HbR	'Af8-F6': right anterior frontal region

Table 3: fNIRS raw signal descriptions, mapping the source (S) to the detector (D) for various topological locations on the subject's brain. HbO, or oxyhemoglobin, and HbR, or deoxyhemoglobin, are the two types of hemoglobin measured. For a visual representation of these electrode locations, refer to Figure 2.

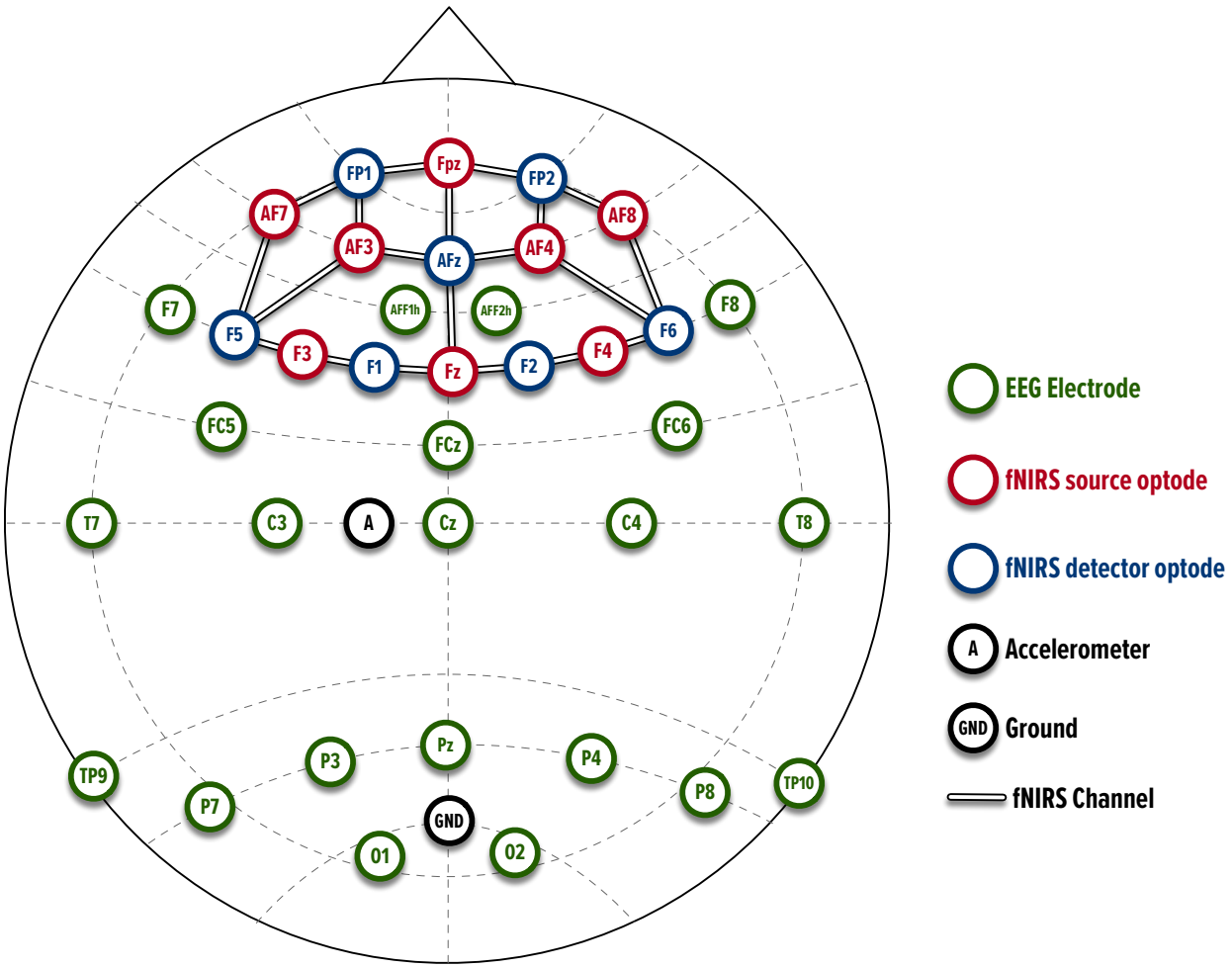

Figure 1: The montage we used for combined EEG/fNIRS data acquisition. EEG electrodes were located in the anterior frontal (AFF1h, AFF2h), frontal (F7, F8), frontocentral (FC5, FCz, FC6), central (C3, Cz, C4), occipital (O1, O2), temporal (T7, T8) and parietal (P7, P3, Pz, P4, P8) regions. fNIRS optodes were located in frontal (Fz, F1, F2, F3, F4, F5, F6), anterior frontal (AF3, AF4, AFz, AF7, AF8), frontal polar (FP1, FPz, FP2). The line is the channel formed when fNIRS source optode (red) and fNIRS detector (blue) optode are combined.

5 Derived data

5.1 Synchronization of EEG, EKG, GSR, and fNIRS Signals

In multimodal neuroimaging studies, synchronizing signals from multiple modalities is a crucial step to conducting comprehensive studies on all these modalities together. The discrepancy between EEG and fNIRS signals' time series is an issue that researchers encounter frequently due to the limitations of recording hardware or the necessity to remove invalid signals. Additionally, these two modalities have distinct recording rates, further complicating their alignment. To facilitate comprehensive evaluation of EEG and fNIRS signals, it is essential to synchronize these two signals.

We plotted histograms of the EEG and fNIRS signals to check they were sampled at the expected hardware frequency (10Hz for fNIRS and 500Hz for EEG). This is important because the filtering

step assumes samples are equally spaced. Having confirmed that, the synchronization process is a two-step approach involving the noise artifacts removal from the signals, followed by resampling and synchronization of the interpolated signals at the desired sampling rate.

Removing Noise in EEG Signals with Notch Filter

EEG signals often exhibit susceptibility to artifacts, an interference that can be attributed to several sources. For instance, physiological factors such as eye movements or blinks can induce such artifacts [3], as can environmental elements like fluorescent lighting or grounding complications [4].

Upon thorough examination and visualization of the raw EEG data, we identified a consistent 60 Hz electrical disturbance within the signal, along with corresponding harmonics. An anomalous peak was also noted around the 5 Hz mark, potentially attributable to a grounding irregularity or an other environmental factors.

With the aid of MNE-Python [1], we efficiently mitigated these intrusive noises by deploying a notch filter. The filter was configured with a frequency of 60 Hz, a transition bandwidth of 9 Hz, and notch widths of 2 Hz.

Mitigating Artifacts in fNIRS Signals Utilizing Bandpass Filter

fNIRS signals are often susceptible to motion artifacts (MA) stemming from physiological activities, including cardiac and respiratory disturbances. These artifacts become particularly noticeable in the measurement of oxyhemoglobin (HbO) and deoxyhemoglobin (HbR) concentrations within the signal channels.

To address these challenges, we employed a bandpass filter as an effective noise reduction strategy. The filter was calibrated in line with the recommendations provided by [5]. With a low cutoff bandwidth of 0.01 Hz and a high cutoff bandwidth of 0.2 Hz for the 4th order Butterworth method, the filter was tailored to selectively allow signal components within this frequency range while attenuating components outside the range.

Pre-processing EKG and GSR Signals

To remove noise and improve peak-detection accuracy for EKG signals, we employed a finite impulse response (FIR) filter with 0.67 Hz low cutoff frequency, 45 Hz high cutoff frequency, and order of $1.5 \times$ sampling rate (where sampling rate is 500 Hz) implemented by NeuroKit2 [6].

We removed noise and smoothed the GSR signals using a low-pass filter with a 3 Hz cutoff frequency and a 4^{th} order Butterworth filter, both implemented by Neurokit2.

Synchronization of EEG, EKG, GSR, and fNIRS Signals

After the EEG, EKG, GSR, and fNIRS signals are pre-processed to remove noise, the signals are upsampled to 2000Hz using the FFT-based resampling method `mne.filter.resample` available in the Python MNE library [1].

For each experiment, we define a common clock with initial time starting 2 minutes before the beginning of the first task (rest state) and end time set to 2 minutes after the final task (typically Minecraft). We create equally spaced ticks in this clock at the frequency of 200Hz. Then, the signals are downsampled to this clock's scale via linear interpolation.

Mapping to the Task Data

Mapping between signals and data will depend on the task being performed. For instance, one can choose to map a signal to the closest data observation or a collection of them. Therefore, we opted for providing the timestamp as a column in the synchronized signals tables so that they can be used for alignment with the task observations.

A Description of deprecated derived data products (generated 2023-08-28)

The filtering and synchronization process of raw signals was updated to make it easier to use and reduce unnecessary complexities. For reference, below is a description of the derived data products prior to 2024-02-22, and how they were created.

1 Derived Data Description

The signals generated by this step correspond to the data in the following tables in the new SQLite3 database that was released 2024-02-22:

- eeg_sync
- fnirs_sync
- ekg_sync
- gsr_sync

The column *frequency* indicates the frequency of the shared clock which is 200Hz by default. If we include other frequencies in the feature, the value in this column can be used to select the desired one.

1.1 Derived Data Files

The following folders contain several versions of derived data at various synchronization frequencies:

- `fnirs_10hz` contains synchronized fNIRS signals and task data at 10 Hz sampling rate.
- `fnirs_500hz` contains synchronized fNIRS signals and task data at 500 Hz sampling rate.
- `eeg_500hz` contains synchronized EEG signals and task data at 500 Hz sampling rate.
- `ekg_500hz` contains synchronized EKG signals and task data at 500 Hz sampling rate.
- `gsr_500hz` contains synchronized GSR signals and task data at 500 Hz sampling rate.
- `fnirs_eeg_ekg_gsr_120hz` contains synchronized fNIRS, EEG, EKG, and GSR signals and task data at 120 Hz sampling rate.
- `fnirs_eeg_ekg_gsr_1200hz` contains synchronized fNIRS, EEG, EKG, and GSR signals and task data at 1200 Hz sampling rate.

Each derived data folder contains synchronized fNIRS, EEG, EKG, and/or GSR signals for each task and for the entire experiment for each experiment:

```
exp_*/
    all.csv
    rest_state.csv
    finger_tapping.csv
    affective_individual_lion.csv
    affective_individual_tiger.csv
    affective_individual_leopard.csv
    affective_team.csv
    ping_pong_competitive_lion_tiger.csv
    ping_pong_competitive_leopard_cheetah.csv
    ping_pong_cooperative.csv
    minecraft_saturn_a.csv
    minecraft_saturn_b.csv
```

Time columns	Description
timestamp_unix	Unix time (in seconds, with 0.1 microsecond resolution) of when the signals and the task data were recorded and synchronized.

Table 4: Columns of time that are common in all CSV files of derived data.

Channel	Description
event_type	Event labels for the rest state task. Event types include start_task signifying the start of the task, and end_task signifying the end of rest state task.

Table 5: Rest State Task columns information in the CSV file rest_state.csv of the derived data.

Each experiment contains the following CSV files, with columns described in 1.2:

- all.csv contains the synchronized signal of all participants for the entire recording sessions, including signals and data in all tasks.
- rest_state.csv contains the synchronized signal and rest state task data.
- finger_tapping.csv contains the synchronized signal and finger tapping task data.
- affective_individual_lion.csv contains the synchronized signal and individual affective task data for participant using the Lion computer in the lab.
- affective_individual_tiger.csv contains the synchronized signal and individual affective task data for participant using the Leopard computer in the lab.
- affective_individual_leopard.csv contains the synchronized signal and individual affective task data for participant using the Leopard computer in the lab.
- affective_team.csv contains the synchronized signal and team affective task data.
- ping_pong_competitive_lion_tiger.csv contains the synchronized signal and ping pong competitive task data between participants sitting on Lion and Tiger stations.
- ping_pong_competitive_leopard_cheetah.csv contains the synchronized signal and ping pong competitive task data between a participant sitting on Leopard station and an experimenter sitting on the Cheetah station.
- ping_pong_cooperative.csv contains the synchronized signal and ping pong cooperative task data between three participants against an artificial intelligent agent.
- minecraft_hands_on_training.csv contains the synchronized signal and Minecraft search-and-rescue hands-on training mission data.
- minecraft_saturn_a.csv contains the synchronized signal and Minecraft search-and-rescue Saturn A mission data.
- minecraft_saturn_b.csv contains the synchronized signal and Minecraft search-and-rescue Saturn B mission data.

Not all experiments may include the aforementioned CSV files, due to a couple of primary reasons. Firstly, time constraints can result in certain tasks remaining incomplete in some experiments. Secondly, instances where the experiment involves only two participants or the recorded signals are compromised during certain tasks can also lead to the absence of these CSV files.

1.2 Derived Data Columns Descriptions

The columns in each aforementioned CSV file (e.g., rest_state.csv, ping_pong_cooperative.csv) are detailed in Table 4, Table 5, Table 6, Table 7, Table 8, Table 9, Table 10, Table 11, Table 12, Table 13, and Table 14.

Channel	Description
event_type	Event labels for the finger tapping task. Event types include start_fingertapping_task signifying the start of the task and the practice period, individual for the period during which the participants must tap in rhythm by themselves, and team for the period during which the participants must tap in synchronized rhythm with other participants.
countdown_timer	This is the timer displayed to the participants on the monitor signifying the remaining duration of the task's phase.
lion_spacebar_pressed	0 for when the participant on the Lion computer is not pressing and holding down on the spacebar, and 1 for when the participant is pressing and holding down the space bar.
tiger_spacebar_pressed	0 for when the participant on the Tiger computer is not pressing and holding down on the spacebar, and 1 for when the participant is pressing and holding down the space bar.
leopard_spacebar_pressed	0 for when the participant on the Leopard computer is not pressing and holding down on the spacebar, and 1 for when the participant is pressing and holding down the space bar.

Table 6: Finger Tapping Task columns information in the CSV file finger_tapping.csv of the derived data.

Channel	Description
event_type	Event labels for the individual affective task. Event types include start_affective_task signifying the start of the task, intermediate_selection signifying when a participant selects an arousal rating or a valence rating after observing an image, and final_submission signifying when a participant submits the arousal and valence score for an image. For experiments recorded in April, 2023 onward, there are additional events, including show_blank_screen for when a participant's monitor began rendering the blank, black screen, show_cross_screen for when the monitor began rendering the black background with a plus symbol in the middle of the screen to center the participant's attention, show_image for when the monitor began rendering an image at the center of the screen in front of a black background, and show_rating_screen for when the monitor began rendering the arousal and valence rating screen at the center of the screen.
image_path	The image file that was rendered on the participants' monitors.
arousal_score	The arousal score selected by the participant during the intermediate_selection and final_submission events.
valence_score	The valence score selected by the participant during the intermediate_selection and final_submission events.

Table 7: Individual Affective Task columns information in the CSV files affective_individual_lion.csv, affective_individual_tiger.csv, and affective_individual_leopard.csv of the derived data.

Channel	Description
lion_event_type	Similar event types to Table 7, but also include event show_observe_message signifying when the monitor displayed the message instructing the participants to quietly observe the image, show_discuss_message for when the monitor displayed the message instructing the participants to share and discuss their emotional experience with each other, and show_rater_selected_message for when the monitor displayed the message notifying the participant who has been selected to input the shared arousal and valence rating. The events come from the participant sitting on the Lion computer in the lab.
tiger_event_type	Similar to the event types of the participant sitting on the Lion computer, but the events come from the participant sitting on the Tiger computer.
leopard_event_type	Similar to the event types of the participant sitting on the Lion computer, but the events come from the participant sitting on the Leopard computer.
image_path	The image file that was rendered on the participants' monitors.
arousal_score	The arousal score selected by the participant during the intermediate_selection and final_submission events.
valence_score	The valence score selected by the participant during the intermediate_selection and final_submission events.

Table 8: Team Affective Task columns information in the CSV file affective_team.csv of the derived data.

2 Derived data

2.1 Synchronization of EEG, EKG, GSR, and fNIRS Signals

In multimodal neuroimaging studies, synchronizing signals from multiple modalities is a crucial step to conducting comprehensive studies on all these modalities together. The discrepancy between EEG and fNIRS signals' time series is an issue that researchers encounter frequently due to the limitations of recording hardware or the necessity to remove invalid signals. Additionally, these two modalities have distinct recording rates, further complicating their alignment. To facilitate comprehensive evaluation of EEG and fNIRS signals, it is essential to synchronize these two signals.

The synchronization process is a two-step approach involving the noise artifacts removal from the signals, followed by resampling and synchronization of the interpolated signals at the desired sampling rate.

Removing Noise in EEG Signals with Notch Filter

EEG signals often exhibit susceptibility to artifacts, an interference that can be attributed to several sources. For instance, physiological factors such as eye movements or blinks can induce such artifacts [3], as can environmental elements like fluorescent lighting or grounding complications [4].

Upon thorough examination and visualization of the raw EEG data, we identified a consistent 60 Hz electrical disturbance within the signal, along with corresponding harmonics. An anomalous peak was also noted around the 5 Hz mark, potentially attributable to a grounding irregularity or an other environmental factors.

Channel	Description
player_&_station	Player &'s station (Lion, Tiger, Leopard, or Cheetah).
task_started	Value 0 for when the task is in practice mode: the ball stayed fixed at the center of the screen, while the players were allowed to move the paddles along the vertical axis. Value 1 for when the task is not in practice mode: the ball moved and the players could score points against the other side.
seconds	The countdown match timer (seconds) displayed on the screen of each player.
ball_position_x	The x-axis coordinate of the ball's top left pixel, with the lower number located on the left side of the screen, and the higher number on the right side.
ball_position_y	The y-axis coordinate of the ball's top left pixel, with the lower number located toward the top of the screen, and the higher number toward the bottom.
player_&_paddle_position_x	The x-axis coordinate of player &'s paddle's top left pixel, with the lower number located on the left side of the screen, and the higher number on the right side. The x-axis coordinate is fixed, and the lower number indicates that player &'s paddle was on the left side and the higher number indicates that player &'s paddle was on the right side.
player_&_paddle_position_y	The y-axis coordinate of player &'s paddle's top left pixel, with the lower number located toward the top of the screen, and the higher number toward the bottom.
player_&_score	The current score for the player &.

Table 9: Ping Pong Competitive Task columns information in the CSV files ping_pong_competitive_lion_tiger.csv and ping_pong_competitive_leopard_cheetah.csv of the derived data.

With the aid of MNE-Python [1], we efficiently mitigated these intrusive noises by deploying a notch filter. The filter was configured with a frequency of 60 Hz, a transition bandwidth of 9 Hz, and notch widths of 2 Hz.

Mitigating Artifacts in fNIRS Signals Utilizing Bandpass Filter

fNIRS signals are often susceptible to motion artifacts (MA) stemming from physiological activities, including cardiac and respiratory disturbances. These artifacts become particularly noticeable in the measurement of oxyhemoglobin (HbO) and deoxyhemoglobin (HbR) concentrations within the signal channels.

To address these challenges, we employed a bandpass filter as an effective noise reduction strategy. The filter was calibrated in line with the recommendations provided by [5]. With a low cutoff bandwidth of 0.01 Hz and a high cutoff bandwidth of 0.2 Hz for the 4th order Butterworth method, the filter was tailored to selectively allow signal components within this frequency range while attenuating components outside the range.

Channel	Description
player_&_station	Player &'s station (Lion, Tiger, or Leopard).
task_started	Value 0 for when the task is in practice mode: the ball stayed fixed at the center of the screen, while the players were allowed to move the paddles along the vertical axis. Value 1 for when the task is not in practice mode: the ball moved and the players could score points against the other side.
seconds	The countdown match timer (seconds) displayed on the screen of each player.
ball_position_x	The x-axis coordinate of the ball's top left pixel, with the lower number located on the left side of the screen, and the higher number on the right side.
ball_position_y	The y-axis coordinate of the ball's top left pixel, with the lower number located toward the top of the screen, and the higher number toward the bottom.
player_&_paddle_position_x	The x-axis coordinate of player &'s paddle's top left pixel, with the lower number located on the left side of the screen, and the higher number on the right side. The x-axis coordinate is fixed, and the lower number indicates that player &'s paddle was on the left side and the higher number indicates that player &'s paddle was on the right side.
player_&_paddle_position_y	The y-axis coordinate of player &'s paddle's top left pixel, with the lower number located toward the top of the screen, and the higher number toward the bottom.
ai_paddle_position_x	The x-axis coordinate of the artificial intelligent agent's paddle's top left pixel, with the lower number located on the left side of the screen, and the higher number on the right side. The x-axis coordinate is fixed, and the artificial intelligent agent was on the right side.
ai_paddle_position_y	the y-axis coordinate of the artificial intelligent agent's paddle's top left pixel, with the lower number located toward the top of the screen, and the higher number toward the bottom.
team_score	The current score of the team of participants.
ai_score	The current score of the artificial intelligence agent.

Table 10: Ping Pong Cooperative Task columns information in the CSV file ping_pong_cooperative.csv of the derived data.

Channel	Description
`points`	The current score of the team. The team scored points for rescuing victims in a search-and-rescue mission in Minecraft.

Table 11: Minecraft Hands-on Training `minecraft_hands_on_training.csv`, Saturn A `minecraft_saturn_a.csv`, and Saturn B `minecraft_saturn_b.csv` columns information in the CSV files of the derived data.

EEG signal columns	Description (topological location of the subject's brain)
`<subject>_eeg_AFF1h`	Left anterior frontal region
`<subject>_eeg_F7`	Left frontal region
`<subject>_eeg_FC5`	Left fronto-central region
`<subject>_eeg_C3`	Left central region
`<subject>_eeg_T7`	Left temporal region
`<subject>_eeg_TP9`	Left temporal-parietal region
`<subject>_eeg_Pz`	Central parietal region
`<subject>_eeg_P3`	Left parietal region
`<subject>_eeg_P7`	Left parietal region
`<subject>_eeg_O1`	Left occipital region
`<subject>_eeg_O2`	Right occipital region
`<subject>_eeg_P8`	Right parietal region
`<subject>_eeg_P4`	Right parietal region
`<subject>_eeg_TP10`	Right temporal-parietal region
`<subject>_eeg_Cz`	central region
`<subject>_eeg_C4`	Right central region
`<subject>_eeg_T8`	Right temporal region
`<subject>_eeg_FC6`	Right fronto-central region
`<subject>_eeg_FCz`	Central fronto-central region
`<subject>_eeg_F8`	Right frontal region
`<subject>_eeg_AFF2h`	Right anterior frontal region
`<subject>_eeg_GSR`	Right hand
`<subject>_eeg_EKG`	4^{th} Intercostal space

Table 12: EEG signal descriptions, specifying the topological locations on the subject's brain. Each entry provides the label of the signal column corresponding to the EEG electrode location. For a visual representation of these electrode locations, refer to Figure 2.

Pre-processing EKG and GSR Signals

To remove noise and improve peak-detection accuracy for EKG signals, we employed a finite impulse response (FIR) filter with 0.67 Hz low cutoff frequency, 45 Hz high cutoff frequency, and order of 1.5 × sampling rate (where sampling rate is 500 Hz) implemented by NeuroKit2 [6].

We removed noise and smoothed the GSR signals using a low-pass filter with a 3 Hz cutoff frequency and a 4^{th} order Butterworth filter, both implemented by Neurokit2.

fNIRS raw signal columns	Description (topological location of the subject's brain)
<subject>_fnirs_S1-D1_760	'F3-F5': left frontal region
<subject>_fnirs_S1-D2_760	'F3-F1': left frontal region
<subject>_fnirs_S2-D1_760	'Af7-F5': left anterior frontal region
<subject>_fnirs_S2-D3_760	'Af7-Fp1': left anterior frontal region
<subject>_fnirs_S3-D1_760	'Af3-F5': left anterior frontal region
<subject>_fnirs_S3-D3_760	'Af3-Fp1': left anterior frontal region
<subject>_fnirs_S3-D4_760	'Af3-Afz': left anterior frontal region
<subject>_fnirs_S4-D2_760	'Fz-F1': left frontal region
<subject>_fnirs_S4-D4_760	'Fz-Afz': central frontal region
<subject>_fnirs_S4-D5_760	'Fz-F2': right frontal region
<subject>_fnirs_S5-D3_760	'Fpz-Fp1': left frontal polar region
<subject>_fnirs_S5-D4_760	'Fpz-Afz': central frontal polar region
<subject>_fnirs_S5-D6_760	'Fpz-Fp2': right frontal polar region
<subject>_fnirs_S6-D4_760	'Af4-Afz': right anterior frontal region
<subject>_fnirs_S6-D6_760	'Af4-Fp2': right anterior frontal region
<subject>_fnirs_S6-D7_760	'Af4-F6': right anterior frontal region
<subject>_fnirs_S7-D5_760	'F4-F2': right frontal region
<subject>_fnirs_S7-D7_760	'F4-F6': right frontal region
<subject>_fnirs_S8-D6_760	'Af8-Fp2': right anterior frontal region
<subject>_fnirs_S8-D7_760	'Af8-F6': right anterior frontal region
<subject>_fnirs_S1-D1_850	'F3-F5': left frontal region
<subject>_fnirs_S1-D2_850	'F3-F1': left frontal region
<subject>_fnirs_S2-D1_850	'Af7-F5': left anterior frontal region
<subject>_fnirs_S2-D3_850	'Af7-Fp1': left anterior frontal region
<subject>_fnirs_S3-D1_850	'Af3-F5': left anterior frontal region
<subject>_fnirs_S3-D3_850	'Af3-Fp1': left anterior frontal region
<subject>_fnirs_S3-D4_850	'Af3-Afz': left anterior frontal region
<subject>_fnirs_S4-D2_850	'Fz-F1': left frontal region
<subject>_fnirs_S4-D4_850	'Fz-Afz': central frontal region
<subject>_fnirs_S4-D5_850	'Fz-F2': right frontal region
<subject>_fnirs_S5-D3_850	'Fpz-Fp1': left frontal polar region
<subject>_fnirs_S5-D4_850	'Fpz-Afz': central frontal polar region
<subject>_fnirs_S5-D6_850	'Fpz-Fp2': right frontal polar region
<subject>_fnirs_S6-D4_850	'Af4-Afz': right anterior frontal region
<subject>_fnirs_S6-D6_850	'Af4-Fp2': right anterior frontal region
<subject>_fnirs_S6-D7_850	'Af4-F6': right anterior frontal region
<subject>_fnirs_S7-D5_850	'F4-F2': right frontal region
<subject>_fnirs_S7-D7_850	'F4-F6': right frontal region
<subject>_fnirs_S8-D6_850	'Af8-Fp2': right anterior frontal region
<subject>_fnirs_S8-D7_850	'Af8-F6': right anterior frontal region

Table 13: Table of fNIRS raw signal descriptions, mapping the source (S) to the detector (D) for various topological locations on the subject's brain. These signals where recorded using the Aurora fNIRS software. Each channel is recorded using light wavelengths of 760nm and 850nm. For a visual representation of these electrode locations, refer to Figure 2.

fNIRS raw signal columns	Description (topological location of the subject's brain)
<subject>_fnirs_S1-D1_HbO	'F3-F5': left frontal region
<subject>_fnirs_S1-D2_HbO	'F3-F1': left frontal region
<subject>_fnirs_S2-D1_HbO	'Af7-F5': left anterior frontal region
<subject>_fnirs_S2-D3_HbO	'Af7-Fp1': left anterior frontal region
<subject>_fnirs_S3-D1_HbO	'Af3-F5': left anterior frontal region
<subject>_fnirs_S3-D3_HbO	'Af3-Fp1': left anterior frontal region
<subject>_fnirs_S3-D4_HbO	'Af3-Afz': left anterior frontal region
<subject>_fnirs_S4-D2_HbO	'Fz-F1': left frontal region
<subject>_fnirs_S4-D4_HbO	'Fz-Afz': central frontal region
<subject>_fnirs_S4-D5_HbO	'Fz-F2': right frontal region
<subject>_fnirs_S5-D3_HbO	'Fpz-Fp1': left frontal polar region
<subject>_fnirs_S5-D4_HbO	'Fpz-Afz': central frontal polar region
<subject>_fnirs_S5-D6_HbO	'Fpz-Fp2': right frontal polar region
<subject>_fnirs_S6-D4_HbO	'Af4-Afz': right anterior frontal region
<subject>_fnirs_S6-D6_HbO	'Af4-Fp2': right anterior frontal region
<subject>_fnirs_S6-D7_HbO	'Af4-F6': right anterior frontal region
<subject>_fnirs_S7-D5_HbO	'F4-F2': right frontal region
<subject>_fnirs_S7-D7_HbO	'F4-F6': right frontal region
<subject>_fnirs_S8-D6_HbO	'Af8-Fp2': right anterior frontal region
<subject>_fnirs_S8-D7_HbO	'Af8-F6': right anterior frontal region
<subject>_fnirs_S1-D1_HbR	'F3-F5': left frontal region
<subject>_fnirs_S1-D2_HbR	'F3-F1': left frontal region
<subject>_fnirs_S2-D1_HbR	'Af7-F5': left anterior frontal region
<subject>_fnirs_S2-D3_HbR	'Af7-Fp1': left anterior frontal region
<subject>_fnirs_S3-D1_HbR	'Af3-F5': left anterior frontal region
<subject>_fnirs_S3-D3_HbR	'Af3-Fp1': left anterior frontal region
<subject>_fnirs_S3-D4_HbR	'Af3-Afz': left anterior frontal region
<subject>_fnirs_S4-D2_HbR	'Fz-F1': left frontal region
<subject>_fnirs_S4-D4_HbR	'Fz-Afz': central frontal region
<subject>_fnirs_S4-D5_HbR	'Fz-F2': right frontal region
<subject>_fnirs_S5-D3_HbR	'Fpz-Fp1': left frontal polar region
<subject>_fnirs_S5-D4_HbR	'Fpz-Afz': central frontal polar region
<subject>_fnirs_S5-D6_HbR	'Fpz-Fp2': right frontal polar region
<subject>_fnirs_S6-D4_HbR	'Af4-Afz': right anterior frontal region
<subject>_fnirs_S6-D6_HbR	'Af4-Fp2': right anterior frontal region
<subject>_fnirs_S6-D7_HbR	'Af4-F6': right anterior frontal region
<subject>_fnirs_S7-D5_HbR	'F4-F2': right frontal region
<subject>_fnirs_S7-D7_HbR	'F4-F6': right frontal region
<subject>_fnirs_S8-D6_HbR	'Af8-Fp2': right anterior frontal region
<subject>_fnirs_S8-D7_HbR	'Af8-F6': right anterior frontal region

Table 14: fNIRS raw signal descriptions, mapping the source (S) to the detector (D) for various topological locations on the subject's brain. HbO, or oxyhemoglobin, and HbR, or deoxyhemoglobin, are the two types of hemoglobin measured. For a visual representation of these electrode locations, refer to Figure 2.

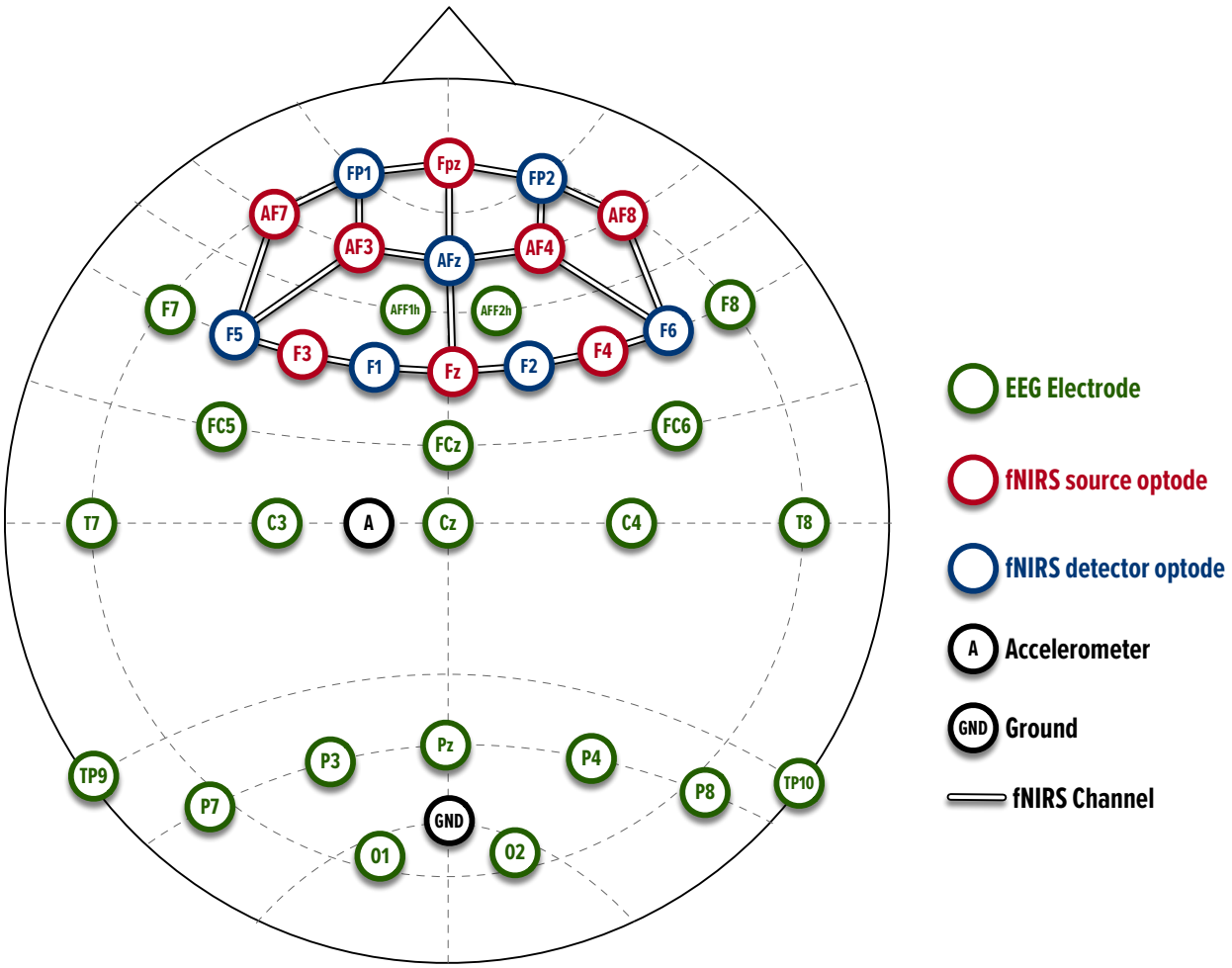

Figure 2: The montage we used for combined EEG/fNIRS data acquisition. EEG electrodes were located in the anterior frontal (AFF1h, AFF2h), frontal (F7, F8), frontocentral (FC5, FCz, FC6), central (C3, Cz, C4), occipital (O1, O2), temporal (T7, T8) and parietal (P7, P3, Pz, P4, P8) regions. fNIRS optodes were located in frontal (Fz, F1, F2, F3, F4, F5, F6), anterior frontal (AF3, AF4, AFz, AF7, AF8), frontal polar (FP1, FPz, FP2). The line is the channel formed when fNIRS source optode (red) and fNIRS detector (blue) optode are combined.

Synchronization of EEG, EKG, GSR, and fNIRS Signals

After the EEG, EKG, GSR, and fNIRS signals are pre-processed to remove noise, the signals are re-sampled to a common sampling rate using the FFT-based resampling method `mne.filter.resample` available in the Python MNE library [1]. To synchronize the signals, we generate a time series matching the common sampling rate of the resampled signals, with the first timestamp rounded to the nearest second. Then, the signals are interpolated to this generated time series via linear interpolation.

2.2 Synchronizing Task Data with EEG and fNIRS Resampled Signals

Understanding the relationship between participants' behaviors, environmental stimuli, and neuroimaging data requires a precise synchronization of task data with the corresponding EEG and

fNIRS signals. By aligning these data streams, we can examine the influence of environmental stimuli on the participants' neuroimaging signals, which in turn, impact their behavior and task performance.

The process of integrating EEG and fNIRS signals with task data starts with grouping of signals by the tasks during which they were recorded, followed by the synchronization of the task data to the corresponding EEG and fNIRS signals.

Grouping EEG, EKG, GSR, and fNIRS Signals by Task

The preliminary step in our approach to synchronizing EEG, EKG, GSR, and fNIRS signals with the task data involves the grouping of the signals by the tasks during which the signals were recorded. The task data can be categorized into two distinct types: status-based and event-based data.

Status-based task data This type of task data represent the current state of the task, such as task score. For each task, the grouping process of these data begins by including the signals recorded immediately before the task initiation and immediately following task completion. This ensures no data is overlooked at the boundaries of the task. Subsequently, all signals recorded between these two points are included, forming a complete set of signals associated with the task.

Event-based task data This type of task data, on the other hand, correspond to specific events that occur during the task, such as affective task arousal or the submission of a valence score. For each task, we determine the EEG, EKG, GSR, and fNIRS entry associated with the first event and the last event. These signal entries, as well as all entries recorded between these points, are included into the data set related to the task.

Synchronizing Task Data with EEG, EKG, GSR, and fNIRS Signals

Having grouped the EEG, EKG, GSR, and fNIRS signals according to task type, we then proceed to synchronize these signal entries with their respective task data.

Status-based task data The synchronization is accomplished by assigning the status data recorded closest in time to each EEG, EKG, GSR, and fNIRS signal entry. This method ensures that each EEG, EKG, GSR, and fNIRS entry is paired with the most representative status data.

Event-based task data We assign each event data to the EEG, EKG, GSR, and fNIRS signal entry recorded at the time closest to the occurrence of the event. Those EEG, EKG, GSR, and fNIRS signal entries without a corresponding event data are left unassigned, signifying that no specific event occurred during these recordings.

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