**Objective**

Same as the first seminar presentation:

We aim in this project to create a Multimodal deception detection website that integrates information from multiple modalities such as verbal, nonverbal, physiological, and contextual cues to detect deception.

**Challenges so far (and optionally how we dealt with them)**

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| --- | --- |
| **Problem description** | **Proposed solution (or explanation)** |
| In Real-life trial data, the recurrent appearance of the same subject in multiple videos (often displaying a consistent veracity of either lying or saying the truth in most of the sample videos that contain that subject) and the fact that there is unequal gender distribution in the dataset where the deceptive videos have much more females than males compared to the truthful ones (Out of the 61 deceptive videos, only 14 videos feature male subjects and 47 videos feature female subjects while truthful videos have 25 videos featuring females and 35 videos featuring males ) which makes using a random split susceptible to bias problems with regards to gender or even specific subjects. | Manually splitting the dataset into train and test splits where the test splits contain subjects that has never been seen in the training set, in addition to the test set featuring an equal gender distribution to accurately validate the model without any bias problems. |
| In Real-life trial data, some videos are of poor quality and some videos even feature more than one subject in the frame or more than one subject having a dialogue, some videos are not even usable with the subject not clearly seeable or heard. | Some videos were cropped and clipped to feature only one subject in the frame, and some videos (about three videos) were completely removed because they were unusable |
| Techniques and models that achieved good results in the experiments on Real life trial data (specially in video modality) do not achieve even remotely similar results on MU3D. And there are no well sourced research papers that have attempted deception detection on the MU3D dataset, unlike Real life trial data which has very good research done into it already. | MU3D dataset was collected using surveying and asking students to record themselves lying or telling the truth knowingly, which might affect the subjects’ physiological behavior which could make it much harder for an AI model to detect deception through visual cues, unlike Real life trial data which was assembled from real life trials that feature the subjects lying or telling the truth in a natural setting. Due to this we chose to continue experimenting on Real life trial dataset for now. |
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**System architecture (I will do it soon)**

**Explanation of finished phases:**

**Regarding the AI part and models training:**

**The following is done on Real life trial dataset:**

Video based (based on visual cues)

Audio and text based (based on non-visual verbal cues)

Multimodal (late fusion) of Video + Audio + Text using weighed averaging and majority voting.

- Specific explanation with scientific background can be found in the “Method.doc” in each modality’s folder.

- Signals and annotations extraction is not completely done yet as it has proved to be challenging to extract these signals with a reliable accuracy given the poor quality of the dataset used “Real-life trial data”

- Other multimodal fusion techniques like early fusion and hybrid fusion are yet to be tried.

**Regarding the web app**

Backend is mostly finished (excluding the log-in and sign-up functionality) using a simple Django API, and frontend is done using vanilla HTML, CSS and JS as the project is too small to need a framework like React at this current stage.

**Regarding the documentation**

System diagrams are done, experiments results are documented and methods behind these results with scientific background is also documented.

What is left is to add more scientific explanations for the background section with detailed explanation of every used technique/technology. Also adding an introduction section and a conclusion and future works section in addition to other things like list of figures and list of tables.

**Description of dataset**NOTE: MU3D achieves poor results (50% accuracy) in video modality regardless of techniques used, so we chose to focus more on the other dataset “Real-life trial data” which is evident in the results section

**-Real-life trial data description**

* The dataset was released in 2015.
* It comprises a collection of 121 real-life courtroom trial videos. This includes 60 videos featuring truthful testimonies and 61 featuring deceptive ones.
* The 121 videos contain 59 different subjects with the same subjects appearing in multiple videos.
* The number of female subjects is 23 and that of male subjects is 36.
* Accompanying the dataset, there are annotations detailing various gestures and behavioral indicators observed within the videos.

**-MU3D description** (not necessary as we didn’t use it so far)

* The dataset was released in 2017.
* MU3D is a free resource containing 320 videos of Black and White subjects, female and male, telling truths and lies. There are eighty subjects (20 Black female, 20 Black male, 20 White female, and 20 White male). Each subjects generated four different videos (i.e., positive truth, negative truth, positive lie, negative lie)
* This database is accompanied by an excel codebook which includes data pertinent to the videos and targets included in the database.

**Experiments & Results**

Can be found for each specific modality in the “Model scores.doc” in each modality’s folder.

**Short Demo**

We will add this once the frontend and backend are integrated (soon) and we can take screenshots to put into the presentation.

**What’s Next**

What is left to be done in the project is:

(add a time plan or Gantt chart for it)

1. Experiment with early fusion and hybrid fusion techniques.
2. Experiment more with the MU3D dataset.
3. Implement full application functionality with regards to adding the login and signup features.
4. Develop a reliable solution for signals extraction (if possible).
5. Continue with the documentation.