Human Communication and Multimodal Computation

Lecture 1.2: Datasets

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Originally developed with Tadas Baltrušaitis

Outline

- Course project assignment
- Resources for the course project
  - Common topics in affective computing
  - Common research questions in affective computing
  - Available multimodal and social video datasets
  - Tools for annotation and feature extraction
- Project discussions
  - Identifying topics of interest
  - Begin forming project groups

Course Project

Course Project

Explore a <u>new</u> Affective Computing research question!

- Potential data sources
    - Existing multimodal datasets
    - Online videos (e.g., YouTube)
    - Your own video dataset [message us soon!]
    - Run a new study [you may need IRB approval]
- Your dataset should be **multimodal** or **interpersonal**
- The goal is for projects to be interesting from both *computational* and *psychological* perspectives

Course Project

1. **Preproposal report** (in 2 weeks)
2. **Proposal presentation and report** (in 5 weeks)
3. **Midterm homework assignment** (in 8 weeks)
4. **Midterm presentation and report** (in 11 weeks)
5. **Final presentation and report** (in 15 weeks)

Course Project

1. **Preproposal report**
   - Define your <u>topic</u>
   - Define your <u>dataset</u>
   - Define your <u>teammates</u>

   Start thinking about potential *research questions* and hypotheses
   Start thinking about specific *psychological phenomena* to study
   Start thinking about specific *behaviors* and *features* to study
   Start thinking about *tasks* that each teammate will be assigned to

Course Project

2. **Proposal presentation and report**
   - Briefly describe and motivate your topic area
   - Briefly describe your dataset and research questions
   - Present a <u>literature review</u> of related work and theories
   - Present a <u>construct conceptualization</u> for your phenomena
   - Present results of a <u>qualitative analysis</u> of your data
   - *Present plans for annotations and features*

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Course Project

3. **Midterm homework assignment**
   - Practice statistical modeling using our example data
   - Formalize your study hypotheses in statistical terms
   - Plan how to apply statistical methods to your project

Course Project

4. **Midterm presentation and report**
   - Briefly restate your topic, data, and research questions
   - Present <u>statistical summaries</u> of your main variables
   - Present results of your <u>statistical hypothesis testing</u>
   - Provide some <u>interpretation</u> of your statistical results
   - *Present plans for predictive modeling*

Course Project

5. **Final presentation and report**
   - Briefly restate your topic, data, and research questions
   - Briefly restate the results of your hypothesis testing
   - Present results of your <u>predictive modeling</u>
   - Describe how you <u>integrated</u> multimodal or social data

Common Topics

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Common topics in affective computing

- **Affective states** – emotions, moods, and feelings
- **Cognitive states** – thinking and information processing
- **Personality** – patterns of acting, feeling, and thinking
- **Pathology** – health, functioning, and disorders
- **Social processes** – groups, cultures, and perception

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Common topics in affective computing

- **Affective states** ←
- Cognitive states
- Personality
- Pathology
- Social processes

- Anger
- Disgust
- Fear
- Happiness
- Sadness
- Positivity
- Activation
- Pride
- Desire

- Frustration
- Anxiety
- Contempt
- Shame
- Guilt
- Wonder
- Relaxation
- Pain
- Envy

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Common topics in affective computing

- Affective states
- **Cognitive states** ←
- Personality
- Pathology
- Social processes

> - Engagement
> - Interest
> - Attention
> - Concentration
> - Effort
> - Surprise
> - Confusion
> - Agreement
> - Doubt
> - Knowledge

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Common topics in affective computing

- Affective states
- Cognitive states
- **Personality**
- Pathology
- Social processes

- Outgoing
- Assertive
- Energetic
- Sympathetic
- Respectful
- Trusting
- Organized
- Productive
- Responsible
- Pessimistic
- Anxious
- Moody
- Curious
- Artistic
- Creative
- Sincere
- Modest
- Fair

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Common topics in affective computing

- Affective states
- Cognitive states
- Personality
- **Pathology**
- Social processes

- Depression
- Anxiety
- Trauma
- Addiction
- Schizophrenia
- Antagonism
- Detachment
- Disinhibition
- Negative Affectivity
- Psychoticism

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Common topics in affective computing

- Affective states
- Cognitive states
- Personality
- Pathology
- **Social processes** ←

- Rapport
- Cohesion
- Cooperation
- Competition
- Status
- Conflict
- Attraction
- Persuasion
- Genuineness
- Culture
- Skillfulness

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Common research questions

- **How are psychological phenomena related to behavior?**
    - *Which behaviors are related to a phenomenon, and what is the nature of this relationship (e.g., necessary, sufficient)?*
    - *Are the behaviors that people believe/perceive to be related to a phenomenon actually related to that phenomenon?*

- **How are psychological phenomena related to one another?**
    - *What can we learn about someone's traits based on the states that we observe them in (as inferred from behavior)?*
    - *Are the relationships between two phenomena mirrored in the relationships between the behaviors they are linked to?*

Common research questions

- **What can we learn about psychological phenomena from analyzing and comparing multiple modalities of behavior?**

  - *Are behaviors from all modalities (verbal, vocal, visual) equally related to the psychological phenomenon?*

  - *What happens to perceptions of the psychological phenomenon when the modalities seem to diverge?*

- **How do social processes influence the connections between psychological phenomena and behaviors?**

  - *Are the same behaviors perceived differently by (or for) different individuals (e.g., genders, ages, cultures)?*

  - *Is the coordination of two peoples' behavior influenced by context (e.g., their relationship, what they are doing)?*

Affective states

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Audio-visual Emotion Challenge 2011/2012

- Part of a larger [SEMAINE](#) corpus

- Sensitive Artificial Listener paradigm

- Labeled for four dimensional emotions (per frame)

  - Arousal, expectancy, power, valence

- Has transcripts
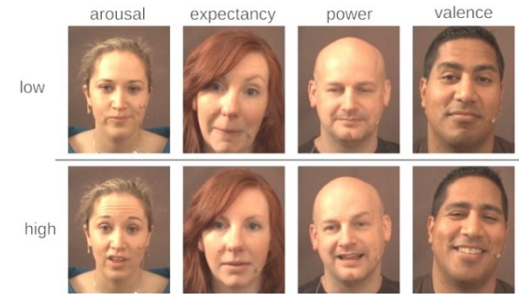
[AVEC 2011/2012](#)
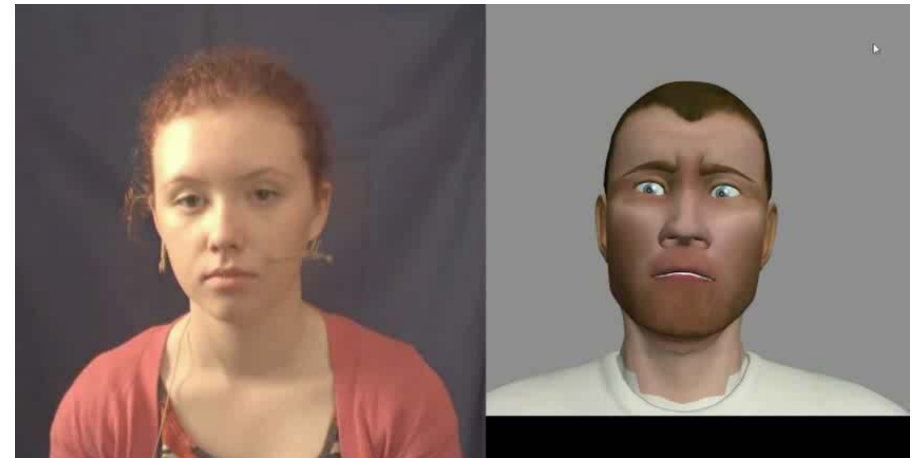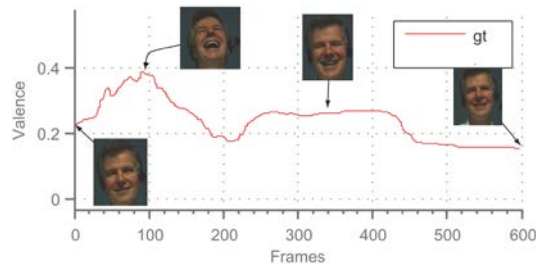
[**AVEC 2011 – The First International Audio/Visual Emotion Challenge**, B. Schuller et al., 2011]

Audio-visual Emotion Challenge 2013/2014

- Reading specific text in a subset of videos

- Labeled for emotion per frame (valence, arousal, dominance)

- Performing an HCI task
  - Reading aloud a text in German
  - Responding to a number of questions

- 100 audio-visual sessions

- Provide extracted audio-visual features

[AVEC 2013/2014](#)

[**AVEC 2013 – The Continuous Audio/Visual Emotion and Depression Recognition Challenge**, Valstar et al. 2013]

Audio-visual Emotion Challenge 2015/2016

- RECOLA dataset
- Audio-Visual emotion recognition
- Labeled for dimensional emotion per frame (arousal, valence)
- Includes physiological data
- 27 participants
- French, audio, video, ECG and EDA
- Collaboration task in video conference
- Broader range of emotive expressions

AVEC 2015
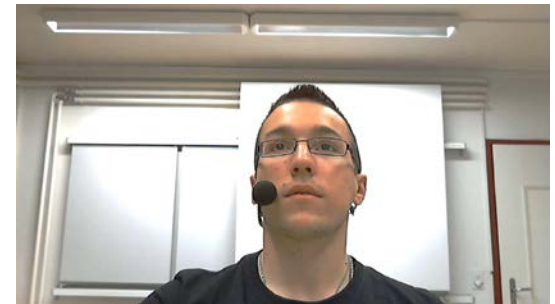
[**Introducing the RECOLA Multimodal Corpus of Remote Collaborative and Affective Interactions**, F. Ringeval et al., 2013]

HUMAN

- Over 5 hours of interviews
- Different cultures
- Different languages
- Range of emotions
- Unlabeled

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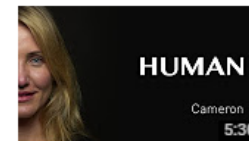
# The Interactive Emotional Dyadic Motion Capture (IEMOCAP)

- 12 hours of data

- Video, speech, motion capture of face and hands, text transcriptions

- Dyadic sessions where actors perform improvisations or scripted scenarios

- Categorical labels (6 basic emotions plus excitement, frustration) as well as dimensional labels (valence, activation and dominance)

- Geared towards audio (low quality video)

[**IEMOCAP: interactive emotional dyadic motion capture database**, C. Busso et al, 2008]

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Acted Facial Expressions in the Wild - AFEW

- Part of EmotiW Challenge
- Audio-Visual emotion labels – acted emotion clips from movies
    - 1400 video sequences of about 330 subjects
- Labelled for six basic emotions + neutral
- Movies are known, can extract the subtitles/script of the scenes
- Audio includes soundtrack as well
- Shots not always perfectly segmented
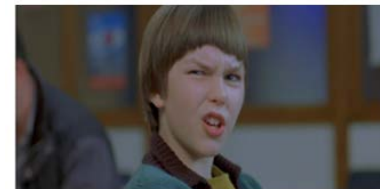
[**Acted Facial Expressions In The Wild Database**, A. Dhall, R. Goecke, S. Lucey, T. Gedeon, 2011]

MOSI - link

- 2-5 minute long videos
- Total 93 videos with 89 speakers
- Segmented
- Transcribed
- Statements labeled for subjectivity (objective vs. subjective)
- Labeled for sentiment intensity (highly negative to highly positive on a 7 point scale)
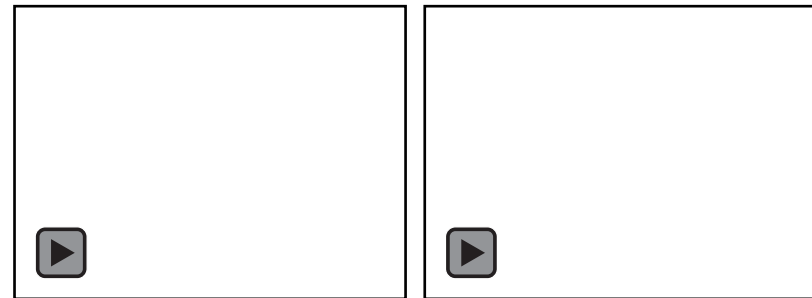
[**MOSI: Multimodal Corpus of Sentiment Intensity and Subjectivity Analysis in Online Opinion Videos**, Zadeh et al., 2016]

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Persuasive Opinion Multimedia (POM)

- 1,000 online movie review videos
- Positive and negative sentiment
- Audio-visual
- Transcribed
- Good quality audio
- Speaking about a film
- 500 reviews with 5 stars
- 500 reviews with 1-2 stars
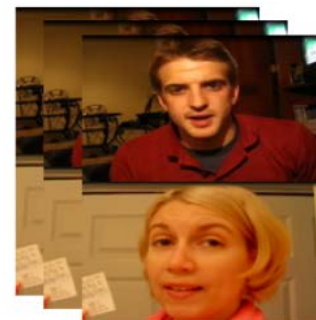
Positive opinions
(5-star ratings)
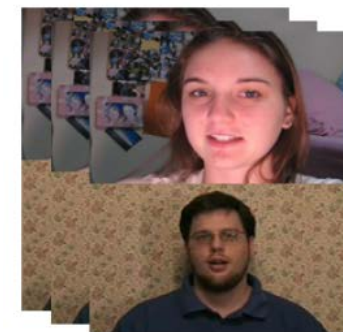
Negative opinions
(1- or 2-star ratings)

[**Computational Analysis of Persuasiveness in Social Multimedia: A Novel Dataset and Multimodal Prediction Approach**, Park et al. 2014]

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Multimodal Opinion Utterances Dataset (MOUD)

- 80 videos from YouTube

- 15 males, 65 females

- 30 second segments

- Discuss a single opinion

- Labeled for sentiment at the utterance level {Positive, Negative, Neutral}

- Acoustic, Visual, and Linguistic features

[**Utterance-Level Multimodal Sentiment Analysis**, Perez-Rosas et al. 2013]

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Video Summarization Database (COGNIMUSE)

- Segments from 8 movies and 4 travel documentaries
- Labeled for "saliency" (attention-capturing moments)
  - Interesting sounds, visuals, semantics, etc.
- Labeled for affective dimensions (arousal and valence)
- Labeled with text summaries of the segments

[**COGNIMUSE: A multimodal video database…**, Zlatintsi et al. 2017]

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LIRIS-ACCEDE and MediaEval Databases [link]

- Clips from 160 films annotated for affect:
  - Pairwise comparisons on affective **arousal** and **valence**
  - Momentary ratings on affective **arousal** and **valence**
  - Some have annotations of **violence** in each clip
  - Some have annotations of **scary** (fear-inducing) segments

[**The MediaEval 2018 Emotional Impact of Movies Task,** Dellandrea et al. 2018]

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Cognitive states

User experience dataset - link

- 58 sessions
- More that 6 hours of recordings of people playing video games
- Demographic information
- Labelled for engagement, frustration, and challenge
- Played two games and have preference ratings
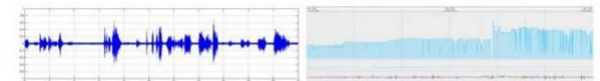- Audio-visual data (audio noisy)
- Gameplay data
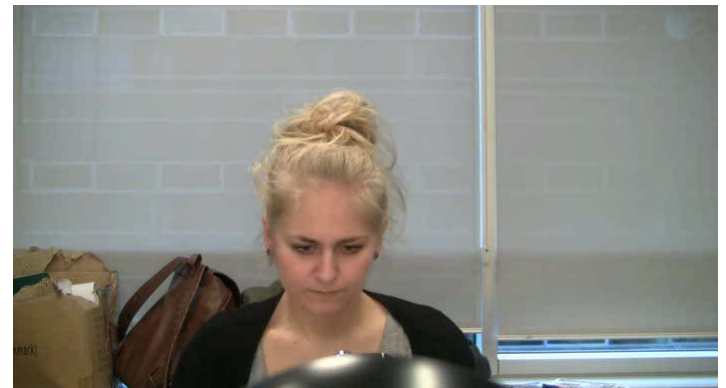
[**The Platformer Experience Dataset,** K. Karpouzis, N. Shaker, G. Yannakakis, S. Asteriadis, **2015**]

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The Multimodal Dyadic Behavior Dataset (MMDB)

Overhead View Kinect Video + 8 Side View VGA Videos

Speech, Electrodermal and Accelerometry Data

- We introduce a new publicly-available dataset containing over 160 sessions of a 3–5 minute child-adult interaction.

- Semi structure play

- Broad range of social behaviors

- Number of cameras and sensors

- Labels – engagement, responsiveness, attention

Wearing a Book   Tickling

Greeting   Playing Ball   Looking through a Book

[**Decoding Children's Social Behavior**, Rehg et al., 2013]

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Video Summarization Database ([COGNIMUSE](#))

- Segments from 8 movies and 4 travel documentaries
- Labeled for "saliency" (attention-capturing moments)
  - Interesting sounds, visuals, semantics, etc.
- Labeled for affective dimensions (arousal and valence)
- Labeled with text summaries of the segments

[**COGNIMUSE: A multimodal video database…**, Zlatintsi et al. 2017]

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Personality

Persuasive Opinion Multimedia (POM)

- 1,000 online movie review videos
- A number of speaker traits/attributes labeled – confidence, credibility, passion, persuasion, big 5 personality traits…
- Video, audio and text
- Good quality audio
- Some videos are more difficult because of home recording
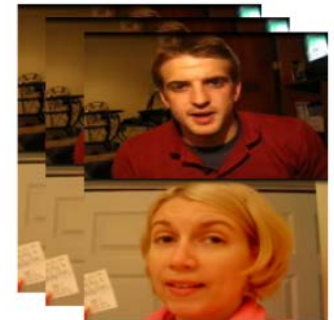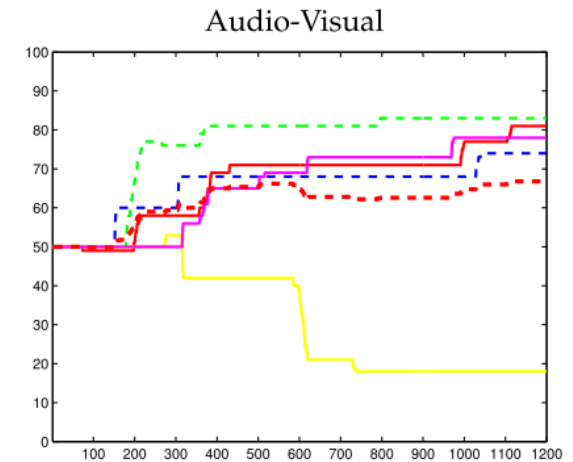

Positive opinions
(5-star ratings)
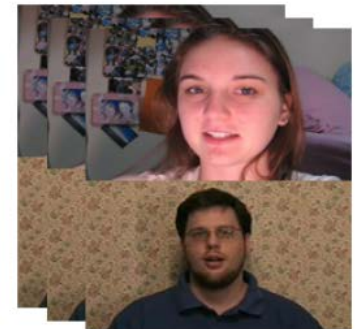
Negative opinions
(1- or 2-star ratings)

[**Computational Analysis of Persuasiveness in Social Multimedia: A Novel Dataset and Multimodal Prediction Approach**, Park et al. 2014]

MAPTRAITS - link

- Annotations of a subset of traits
    - Big 5 personality traits
    - Engagement
    - Facial attractiveness
    - Vocal attractiveness
    - Likability
- Two types of labels
    - Quantized – 11 subjects (ordinal)
    - Continuous – 10 subjects (continuous)
- Annotation of the traits changing over time

Audio-Visual

[MAPTRAITS 2014: The First Audio/Visual Mapping Personality Traits Challenge, O. Celiktutan et al., 2014]

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YouTube Personality Dataset - link

- Contains 404 YouTube vloggers personality annotations for the big 5

- Contains audio and visual features already computed

- Includes transcripts

- Does not contain the actual videos ☹, need to rely on existing features

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Synergetic Social Scene Analysis (SALSA)

- Uninterrupted recordings of an indoor social event
- 18 subjects interacting at a poster session and cocktail party
- Data on position, pose, and F-formation (social groups)
- Self-reported personality (big five traits)

Sociometric Badge
- Audio
- Infrared
- Accelerom.
- Bluetooth

Tracking
Pose estimation
Diarization
F-formation
Analysis of
    Social Interact.
Personality

[Analyzing free-standing conversational groups, Alameda-Pineda et al. 2015]

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Pathology

Audio-visual Emotion Challenge (AVEC 2013/2014)

- Reading specific text in a subset of videos
- Performing an HCI task
    - Reading aloud a text in German
    - Responding to a number of questions
- 100 audio-visual sessions
- Provide extracted audio-visual features
- Three types of depression labels
    - Self-reported depression score per session
    - Beck Depression Index-II (BDI)
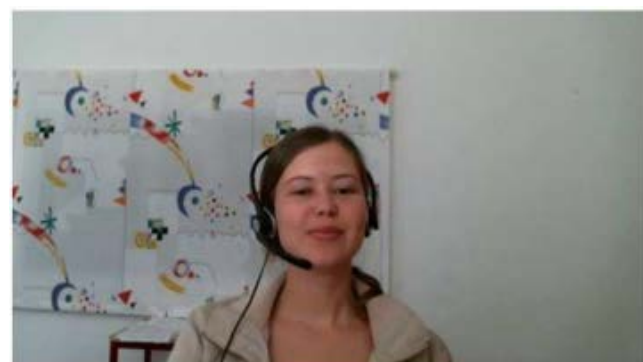
AVEC 2013/2014

[**AVEC 2013 – The Continuous Audio/Visual Emotion and Depression Recognition Challenge**, Valstar et al. 2013]

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Distress Analysis Interview Corpus (DAIC)

- Part of AVEC 2016 challenge
- Clinical interviews to support the diagnosis of distress
  - Anxiety (STAI)
  - Depression (PHQ-8)
  - Post-traumatic stress (PCL-C/PCL-M)
- Audio-visual (features) data (no videos themselves)
- Data transcribed and annotated for verbal and non-verbal features
- 189 session of interactions
- Session ~16 minutes

[**AVEC 2016 – Depression, Mood, and Emotion Recognition Workshop and Challenge**, M. Valstar et al., 2016]

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Psychosis Symptoms Dataset

- 24 sessions
- Semi structured interviews
  - 6 to 14 questions asked by an experience clinician
- Dyadic interactions
- Audio-visual data
- Transcribed
- Psychosis symptoms
  - PANSS
  - BPRS
  - MADRS
- Long term
  - 4 interactions with follow up

Social processes

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Emergent LEAder corpus (ELEA) - link

- 102 participants – 21 teams
- Labeled for leadership related elements, self and external labels
- Can be used both for personality and for dyadic behaviors
- Performing a winter-survival tasks
- Video and audio recordings
- Diarized data using a directional microphone

[**An Audio Visual Corpus for Emergent Leader Analysis**, Dairazalia Sanchez-Cortes, Oya Aran, and Daniel Gatica-Perez, 2011]

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The Tower Game Dataset

- 112 videos
- Two scenarios eliciting interaction
  - Architect-builder
  - Distinct-objective
- Labeled for
  - Joint attention
  - Entrainment
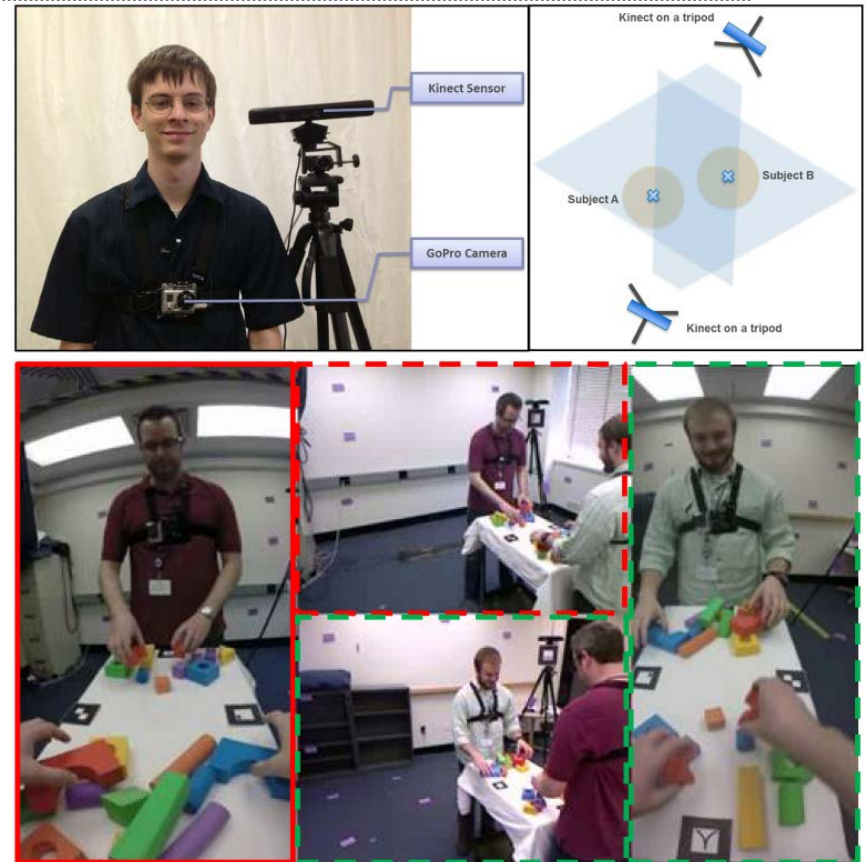
[**The Tower Game Dataset: A multimodal dataset for analyzing social interaction predicates**, David A. Salter et al., 2015]

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MAHNOB-Mimicry - link

- 40 participants

- Synchronized cameras from multiple views – 15 cameras and 3 microphones

- Political discussions and a role-playing game

- Annotations for dialogue acts, turn-taking, affect, and head gestures
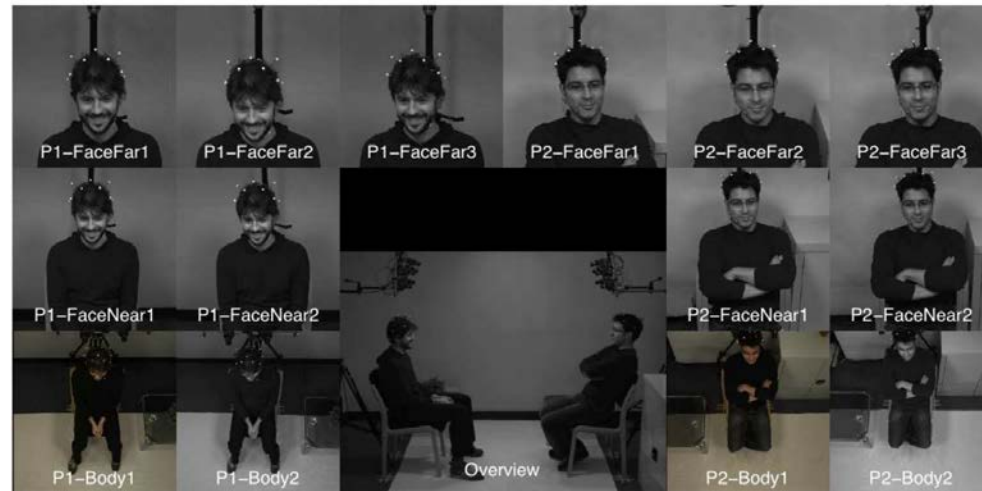
[**The MAHNOB Mimicry Database: A database of naturalistic human interactions**, Sanjay Bilakhia, Stavros Petridis, Anton Nijholt, Maja Pantic, 2011]

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Canal 9 Political Debates - link

- 72 political debates recorded by the Canal 9, Switzerland
- 42 hours of edited hi-quality audiovisual recordings
- Up to 5 participants
- Annotation
  - Speaker segmentation
  - Group of opponents – agreement and disagreement

Full Group   Personal Shot   Multiple Participants

[**Canal9: A Database of Political Debates for Analysis of Social Interactions**, Vinciarelli et al., 2009]

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AMI meeting corpus - link

- 100 hours of meeting recordings
- Close-talking and far-field microphones
- Individual and room-view video cameras
- Output from a slide projector and an electronic whiteboard
- Lots of annotations
  - Dialogue acts
  - Head and hand gestures
  - Gaze
  - etc.

[**Announcing the AMI Meeting Corpus**. Jean Carletta et al., 2006]

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Multimodal Collective Intelligence Dataset By CoEx Lab

- Dyad interaction over Skype

- 6 collaborative cognitive tasks over Skype.

- Performance graded using collective intelligence score.

- Post and pre experiment surveys

- Demographic information

- Audio-visual, EDA, heart rate, EEG, joint positions

- 40-50 dyads available for most modalities. Additional data collection is in progress.

- **Looking for teammates. Please Contact! - Prerna Chikersal (prerna@cmu.edu)**
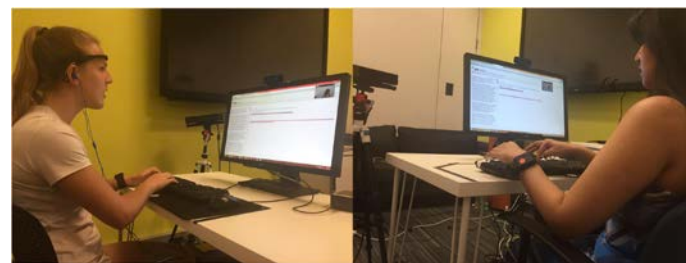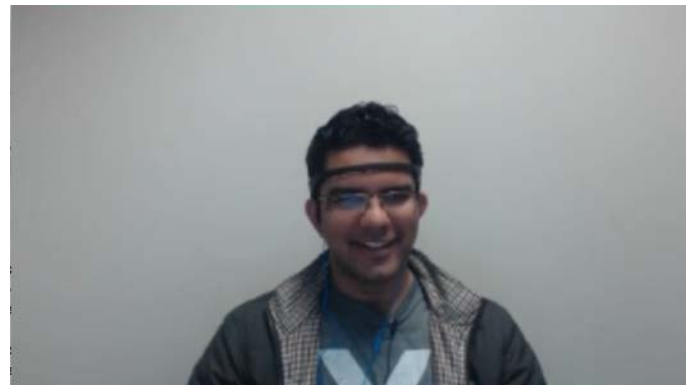
HAPpy PEople Images - HAPPEI

- Groups of people in various social contexts

- Labeled for happiness of individuals and of the group

- Not multimodal ☹

[**Automatic Group Happiness Intensity Analysis,** A. Dhall, R. Goecke and T. Gedeon, 2015]

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The Multimodal Dyadic Behavior Dataset ([MMDB](#))

- We introduce a new publicly-available dataset containing over 160 sessions of a 3–5 minute child-adult interaction.

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- Broad range of social behaviors

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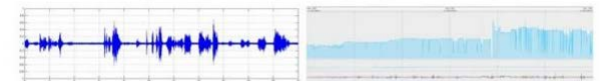
Speech, Electrodermal and Accelerometry Data

Wearing a Book   **Tickling**

Greeting   **Playing Ball**   **Looking through a Book**

[**Decoding Children's Social Behavior**, Rehg et al., 2013]

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ICT rapport corpus - link

- 165 interactions
- Speaker and listener paradigm
- 2-3 minute interactions
- Audio-visual
- Transcribed
- Labelled
  - Rapport
  - Personality
  - Head gestures

[**Creating Rapport with Virtual Agents**, J. Gratch et al., 2007]

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SSPNet Conflict Corpus – link

- 1430 clips
- 30 seconds each
- 45 political debates
- Audio-visual data
- Labels
  - Conflict level intensity

[**Collecting Data for Socially Intelligent Surveillance and Monitoring Approaches: The Case of Conflict in Competitive Conversations**, A.Vinciarelli et al., 2013]

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Cicero

- 14 subjects
- Giving a 5-15 minute presentation
- Virtual audience
- Public speaking assessed by experts
    - Flow of speech
    - Pacing
    - Posture stiffness
    - Nervousness
    - Eye contact
    - Overall performance
- Audio-visual data

[**Cicero - Towards a Multimodal Virtual Audience Platform for Public Speaking Training**, Batrinca 2013]

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MAPTRAITS - <u>link</u>

- Annotations of a subset of traits
  - Big 5 personality traits
  - Engagement
  - Facial attractiveness
  - Vocal attractiveness
  - Likability
- Two types of labels
  - Quantized – 11 subjects (ordinal)
  - Continuous – 10 subjects (continuous)
- Annotation of the traits changing over time

Audio-Visual

[MAPTRAITS 2014: The First Audio/Visual Mapping Personality Traits Challenge, O. Celiktutan et al., 2014]

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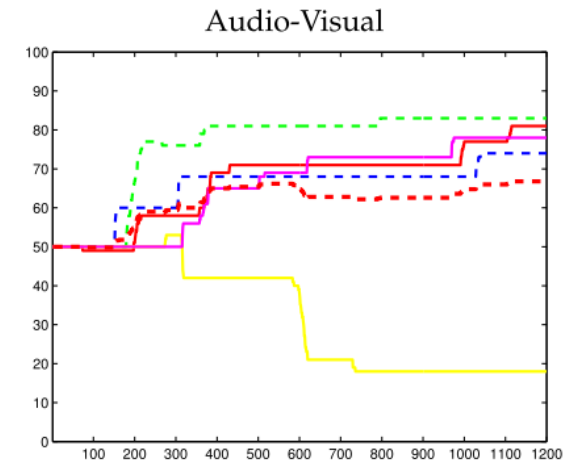
Green Persuasive Database - link

- 16 subjects

- 8 recordings of 25-48 minutes

- One person's goal is to persuade another

- Labels

  - Persuasiveness over time

Multimodal Focused Interaction Dataset (MFI)

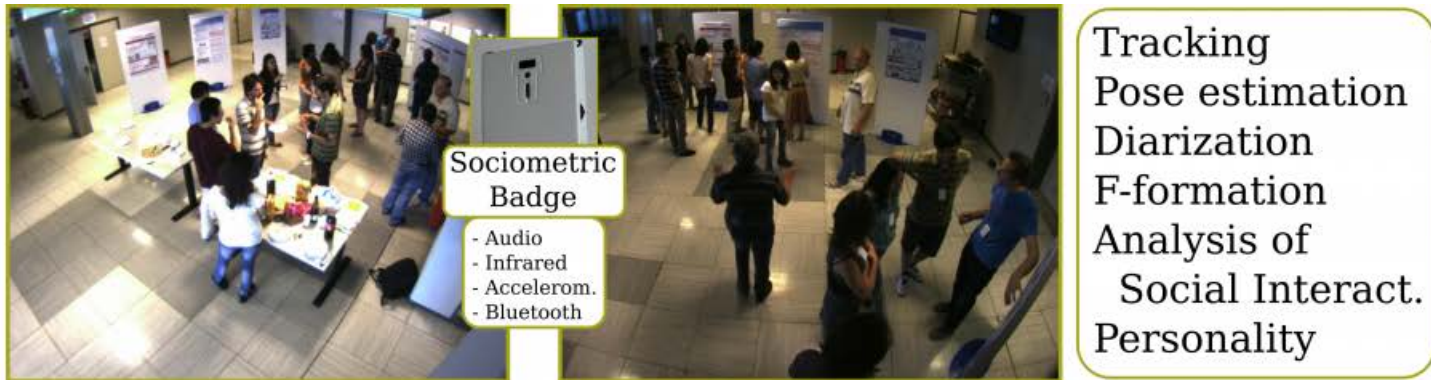- 19 videos from 1 subject

- Video from shoulder-mounted camera

- Voice activity detection from microphone

- Accelerometer, gyroscope, magnetometer, GPS

- Segments labeled as:
  {Focused interaction, focused interaction walk, unfocused interaction, no interactions}

[Multimodal egocentric analysis of focused interactions, Bano et al., 2018]

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Synergetic Social Scene Analysis (SALSA)

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Sociometric Badge
- Audio
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- Bluetooth

Tracking
Pose estimation
Diarization
F-formation
Analysis of
    Social Interact.
Personality

[SALSA: A novel dataset for multimodal group behavior analysis, Alameda-Pineda et al. 2015]

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Tools for annotation and analysis

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Annotation tools

- Transcriber
  - http://trans.sourceforge.net/en/presentation.php
- ANVIL
  - http://www.anvil-software.de/
- ELAN
  - http://www.lat-mpi.eu/tools/elan/
- CARMA
  - http://carma.jmgirard.com/

ELAN

- Deals with .eaf files (lots of datasets are annotated in this format)

- Allows to export data to various formats easilly

- Easy to do event annotations

- Deals with multiple video audio files
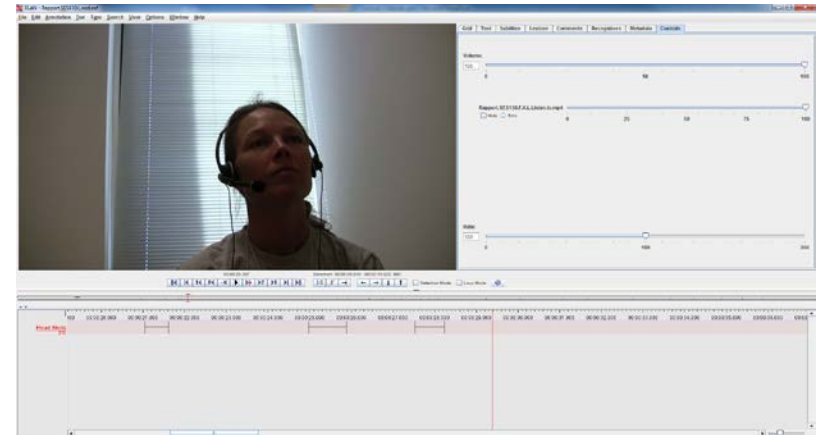
CARMA

Continuous Affect Rating and Media Annotation

- Collect dimensional ratings of videos in real-time

- Review and compare multiple judges' ratings

- Saves annotations in simple .csv files

Automatic Annotations (Speech)

- CMU Sphinx
  http://cmusphinx.sourceforge.net/

- Hidden Markov Model Toolkit
  http://htk.eng.cam.ac.uk/

- Google Cloud Speech-to-Text
  https://cloud.google.com/speech-to-text/

- Microsoft Azure Speech-to-Text API
  https://azure.microsoft.com/en-us/services/cognitive-services/speech-to-text/

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Automatic Annotations (Verbal)

- SRI Language Modeling Toolkit (language models)
  http://www.speech.sri.com/projects/srilm/

- Parsers by Kenji Sagae (syntactic parsers)
  http://www.sagae.org/software.html

- LIWC2015 (text analysis)
  http://liwc.wpengine.com/

- LightSIDE (text mining, GUI)
  http://ankara.lti.cs.cmu.edu/side/download.html

- MALLET (document classification, topic modeling)
  http://mallet.cs.umass.edu/

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Automatic Annotations (Vocal)

- COVAREP (feature extraction, speech analysis)
  http://covarep.github.io/covarep/

- Praat (feature extraction, speech analysis, segmentation, GUI)
  http://www.fon.hum.uva.nl/praat/

- OpenEAR (feature extraction, emotion classification)
  http://sourceforge.net/projects/openart/

- OpenSmile (feature extraction)
  https://www.audeering.com/opensmile/

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Automatic Annotations (Visual)

- Watson Head Tracker (head pose)
  http://sourceforge.net/projects/watson/

- EyeAPI (eye location)
  https://staff.fnwi.uva.nl/r.valenti/index.php?content=EyeAPI

- OpenFace (landmarks, head pose, action units, gaze)
  https://github.com/TadasBaltrusaitis/OpenFace

- Emotient (action units, emotion estimation)
  https://imotions.com/emotient/

- OpenPose (body, foot, face, hand tracking)
  https://github.com/CMU-Perceptual-Computing-Lab/openpose

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Machine Learning Toolboxes

- Weka 3 (data mining)
  https://www.cs.waikato.ac.nz/ml/weka/

- LibSVM (support vector machines)
  https://www.csie.ntu.edu.tw/~cjlin/libsvm/

- HCRF (hidden-state conditional random fields)
  https://sourceforge.net/projects/hcrf/

- Bayes Net Toolbox (Bayesian networks)
  https://github.com/bayesnet/bnt

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Deep Learning Toolboxes

- Torch or PyTorch
  http://torch.ch/ or https://pytorch.org/

- Keras
  http://keras.io/

- Theano
  http://deeplearning.net/software/theano/

- Caffe
  http://caffe.berkeleyvision.org/

- TensorFlow
  https://www.tensorflow.org/

Project groups

- The goal is to form project groups of 2, 3, or 4 students
- Teams should be interesting in similar topic areas
- Pick two of the following topics
    - Affective states
    - Cognitive states
    - Personality
    - Pathology
    - Social processes
- Chat with other people who picked one of your topics
- Discuss specific areas of interest within each topic