



Universiteit Utrecht

# Computational Approaches for Behavioral and Clinical Science

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# Social and Affective Computing @UU

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#### Computer analysis of human behavior



A.A. Salah, T. Gevers, (eds.) Computer Analysis of Human Behavior, Springer Verlag, 2011

# Applications of affective and social computing I

 Automated coding: Finding a suitable abstraction of behaviors, and providing transcripts or descriptions.

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# Applications of affective and social computing I

- Automated coding: Finding a suitable abstraction of behaviors, and providing transcripts or descriptions.
- Indexing, search, and retrieval: This is the primary usage of analysis technology for multimedia applications, but also useful for archival analyses.
- Quality assessment: Data acquisition quality, as well as data biases can be assessed automatically.

# Applications of affective and social computing II

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- Diagnosis and prediction: Automatic estimation of indicators, and classification of behaviors.
- Longitudinal analysis: Manual analysis of longitudinal data is costly, tedious, and error-prone. This is one of the most promising areas of automatic analysis.
- Training and simulation: Training the human experts benefits from automatic tools, including newer technologies such as augmented and virtual reality.

### Methodological Issues and Challenges

- Language gap
- Model complexity
- Qualitative vs. quantitative assessment
- Pseudoscience and validity
- Racial and other biases
- Model usefulness and explainability

#### Levels of analysis



#### Subtle facial signals



H. Dibeklioglu, A.A. Salah, and T. Gevers. Are you really smiling at me? Spontaneous versus posed smiles. In Proc. ECCV 2012 (3):525-538, 2012.

#### Multimodal emotion estimation



Kaya, H., F. Gürpınar, A.A., Salah "Video Based Emotion Recognition in the Wild using Deep Transfer Learning and Score Fusion," *Image and Vision Computing,* vol.65, pp. 66-75, 2017.

#### Explainable models



This gentleman is invited for an interview due to his high apparent agreeableness and neuroticism impression. The impressions of agreeableness, conscientousness, extraversion, neuroticism and openness are primarily gained from facial features.



This gentleman is not invited due to his low apparent agreeableness, neuroticism, extraversion and openness scores. The impressions of agreeableness, conscientousness, extraversion, neuroticism and openness are primarily gained from facial features.

Kaya, H., F. Gurpinar, A.A. Salah, "Multi-modal Score Fusion and Decision Trees for Explainable Automatic Job Candidate Screening from Video CVs," CVPR Workshops, Honolulu, 2017. (ChaLearn LAP Winner)

#### Automatic Mania Level Estimation

- A new audio-visual BD corpus.
  - 46 patients and 49 controls.
  - Collected on admittance to the hospital.
  - Longitudinal data.
  - YMRS and MADRS annotations.
- Direct approach to classify video sessions into BD and normal classes.
- Indirect approach to predict emotional expressions, followed by correlation analysis and regression for YMRS scores.
- Unweighted Average Recall (UAR) reported for experiments.
- AVEC 2018 Challenge: Predicting level of mania.

Ciftci, E., H. Kaya, A.A. Salah, H. Gulec, "The Turkish Audio-Visual Bipolar Disorder Corpus," ACII Asia, Beijing, 2018.

Ringeval, F., B. Schuller, M. Valstar, R. Cowie, H. Kaya, M. Schmitt, S. Amirparian, N. Cummins, D. Lalanne, A. Michaud, E. Ciftci, H. Gulec, A.A. Salah, M. Pantic, "AVEC 2018 Workshop and Challenge: Bipolar Disorder and Cross-Cultural Affect Recognition," AVEC, Seoul, 2018.

#### Breath in Normal vs. Emotional Speech



Figure 1: Visualization of Breath (red), Silence (Green), Speech (Light Blue) Patterns

AA Akdag Salah, M Ocak, H Kaya, E Kavcar, and AA Salah. Hidden in a Breath: Tracing the Breathing Patterns of Survivors of Traumatic Events. In *Proc. Digital Humanities*, 2019.

Akdag Salah, A.A., A.A. Salah, H. Kaya, M. Doyran, E. Kavcar, "The sound of silence: Breathing analysis for finding traces of trauma and depression in oral history archives", *Digital Scholarship in the Humanities*, accepted for publication.

# Affective computing for interaction analysis

- How do we use affect to answer the relevant questions?
  - Is the interaction going well?
  - What are the factors underlying successful/failed interactions?
  - What are the social dynamics?
  - What are the links between neural activation, emotions, personality?
  - How do subjects respond to the particular actions of the system?

#### Affect analysis in play therapy

- Analysis of child behaviour during play therapy
  - Child Play Therapy Instrument (CPTI)
- Developing an automatic (affect) analysis system
  - Aiding psychotherapists with insights
  - Supplementing CPTI with affective analysis
  - Help with content-based retrieval of archival episodes

Halfon, S., M. Doyran, A.A. Salah, "Multimodal Affect Analysis of Psychodynamic Play Therapy," Psychotherapy Research, vol. 31, no. 3, pp. 402-417, 2021.

Doyran, M., B. Türkmen, E.A. Oktay, S. Halfon, A.A. Salah, 'Video and text based affect analysis of children in play theraphy,' Proc. ICMI, Souzhou, 2019.

Halfon, S., E. A. Oktay and A. A. Salah, "Assessing affective dimensions of play in psychodynamic child psychotherapy via text analysis", Proc. 7th Int. Workshop on Human Behavior Understanding (HBU), pp. 15–34, Springer, 2016.

#### Affect analysis framework



# Emotional text analysis for Turkish



- Starting from Warriner et al.'s work, a lexicon with 15,222 words is prepared.
- Additional processing for 120 emoticons, 98 abbreviations, 50 interjections, 71 modifiers
- Sentence level affect is produced by calculating word level affect, applying modifiers, applying negation, and a summation of scores.

Aydın Oktay, E., K. Balcı, A.A. Salah, "Automatic assessment of dimensional affective content in Turkish multi-party chat messages," Proc. ICMI 2015.

Halfon, S., E. Aydın Oktay, A.A. Salah, "Assessing Affective Dimensions of Play in Psychodynamic Child Psychotherapy via Text Analysis," Proc. 7th Int. Workshop on Human Behavior Understanding (HBU), 2016.

- Social and affective computing have matured to a point. We can produce human-AI hybrid decision support systems now.
- Computational tools based on machine learning and pattern recognition approaches can bring new perspectives to behavioral and clinical research.
- These tools need to be tested much more extensively.
- Depression, schizophrenia, Alzheimer's, autism disorders are studied widely; bipolar disorder and psychotherapy are studied much less, but there is a lot of co-morbidity.





# THANKS!

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