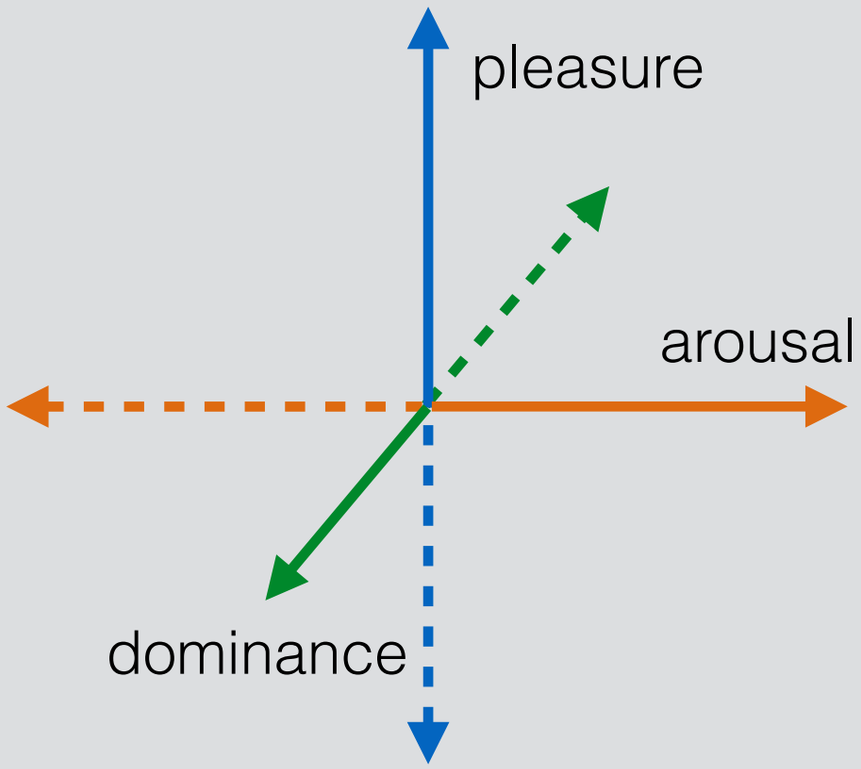
THE HEBREW UNIVERSITY OF JERUSALEM

A Model between **Action Units** and **Affect Descriptives**



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Hebrew University, Jerusalem

Action Units (AU)

Emotion?

Image taken from: Pantic, M. (2009). Machine analysis of facial behaviour: Naturalistic and dynamic behaviour. Philosophical Transactions of the Royal Society of London B: Biological Sciences, 364(1535), 3505-3513.

ARTNATOMY

Action Units (AU)

Happiness

=

{ AU6, AU12 }

=

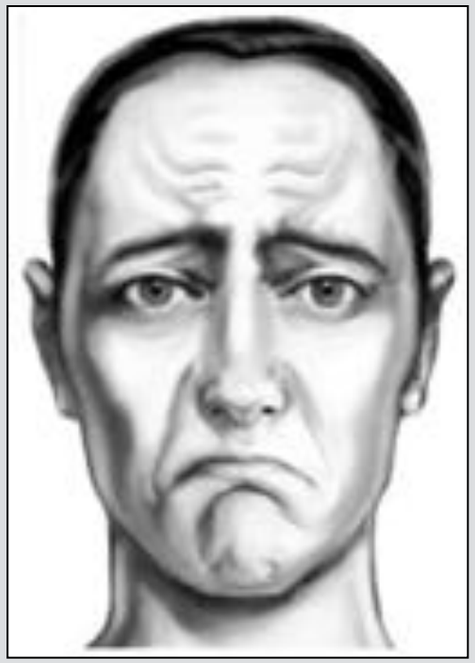
{ AU6, AU1, AU12, AU4 }

Sadness

=

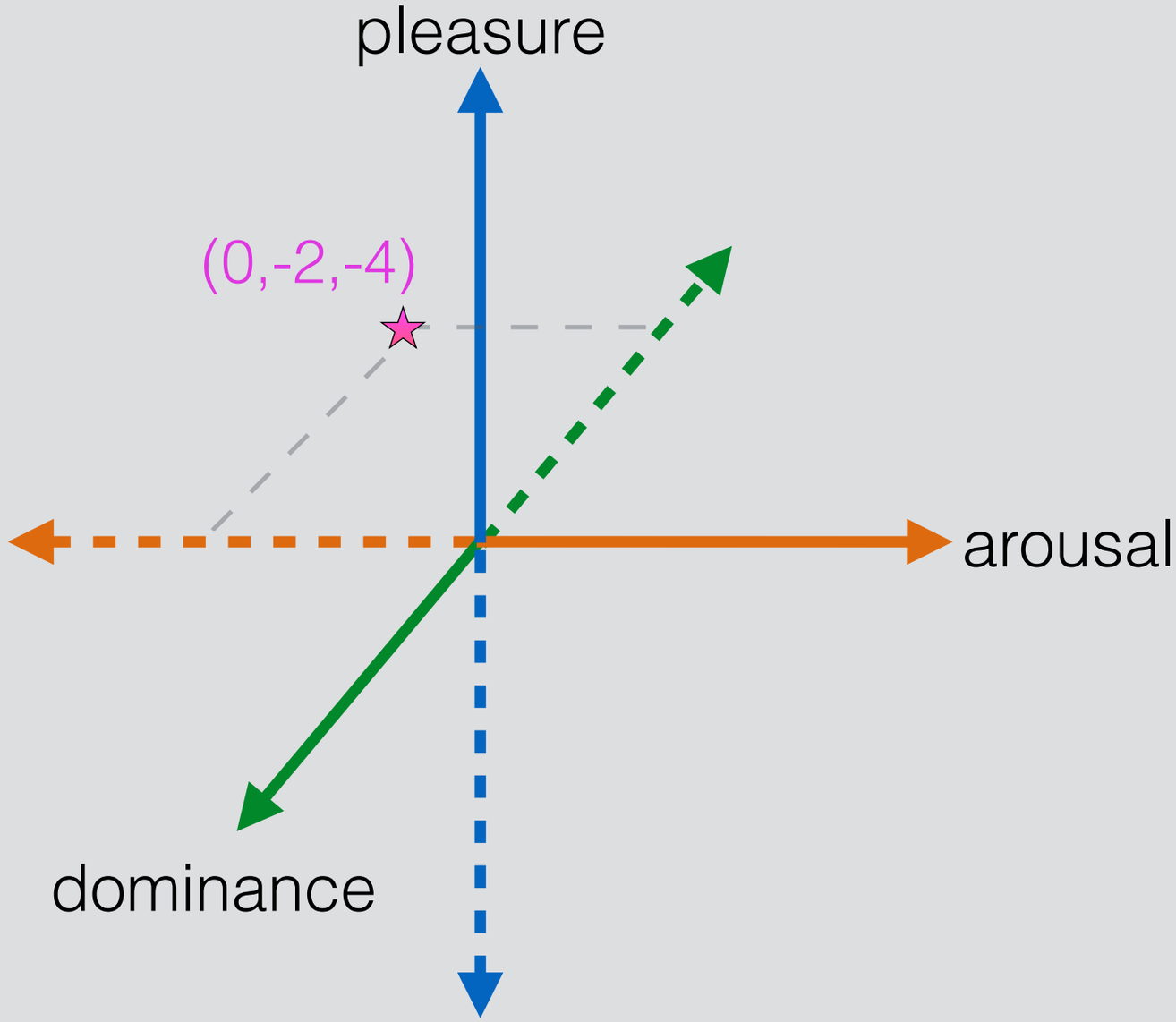
{ AU1, AU4, AU15 }

=



The Dimensional Approach

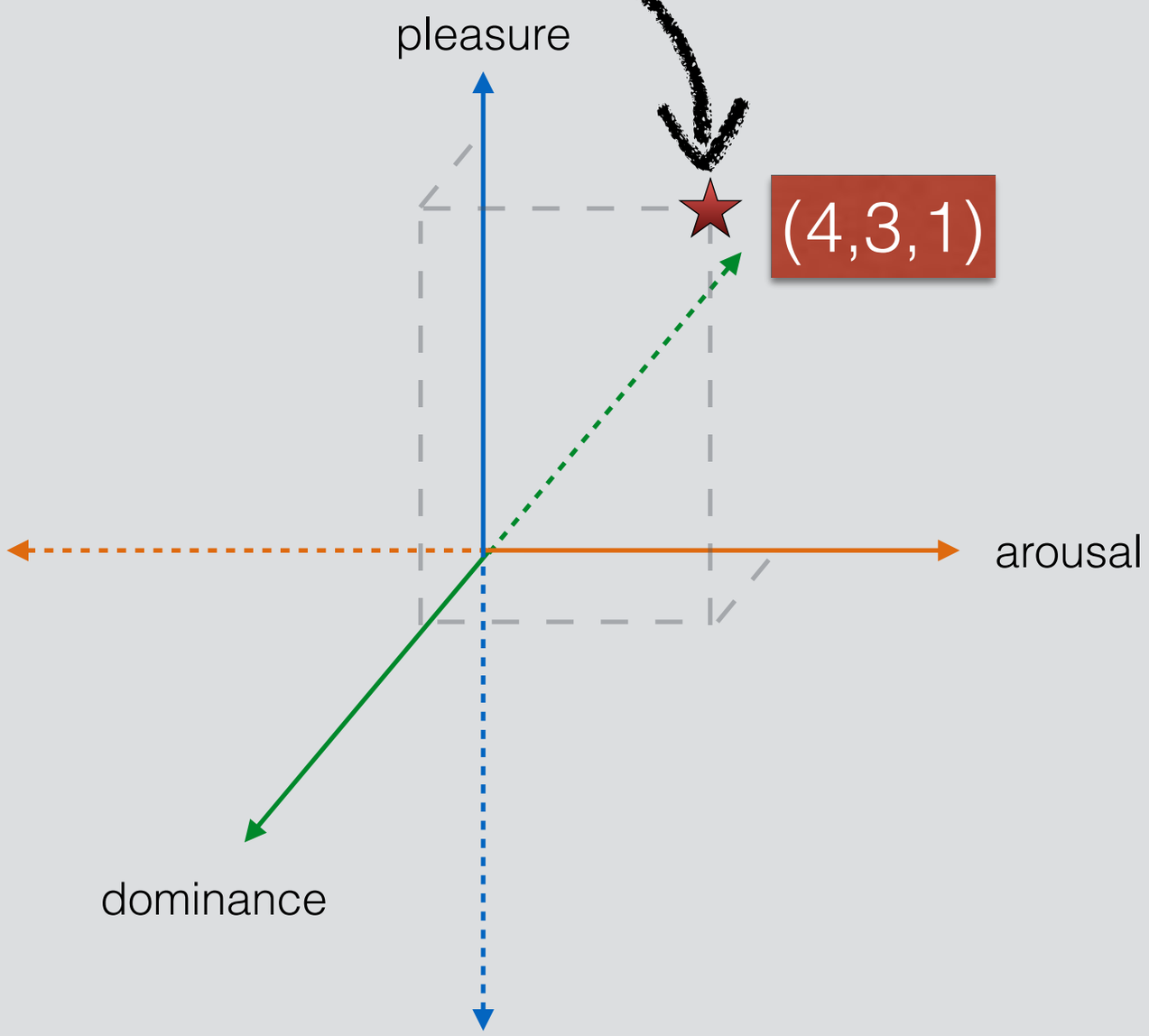
Affect Descriptives



AU ⟷ PAD

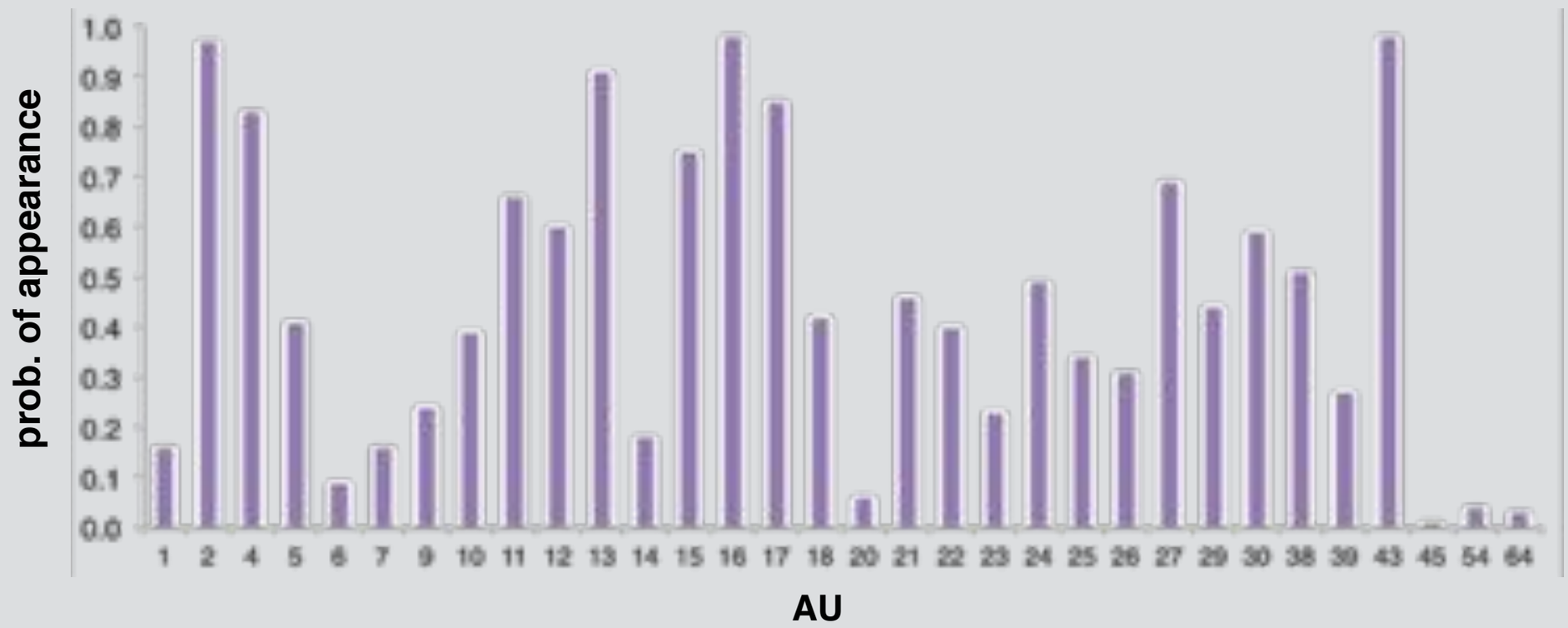
[Hadar, Weinshall, in prep.]

AU → PAD

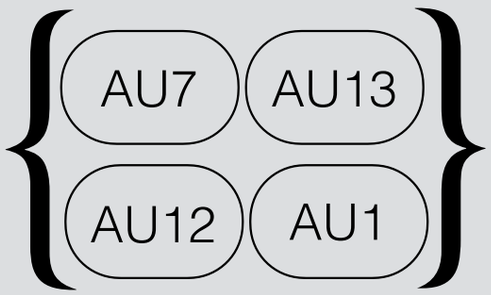


PAD → AU

probability of appearance



How?

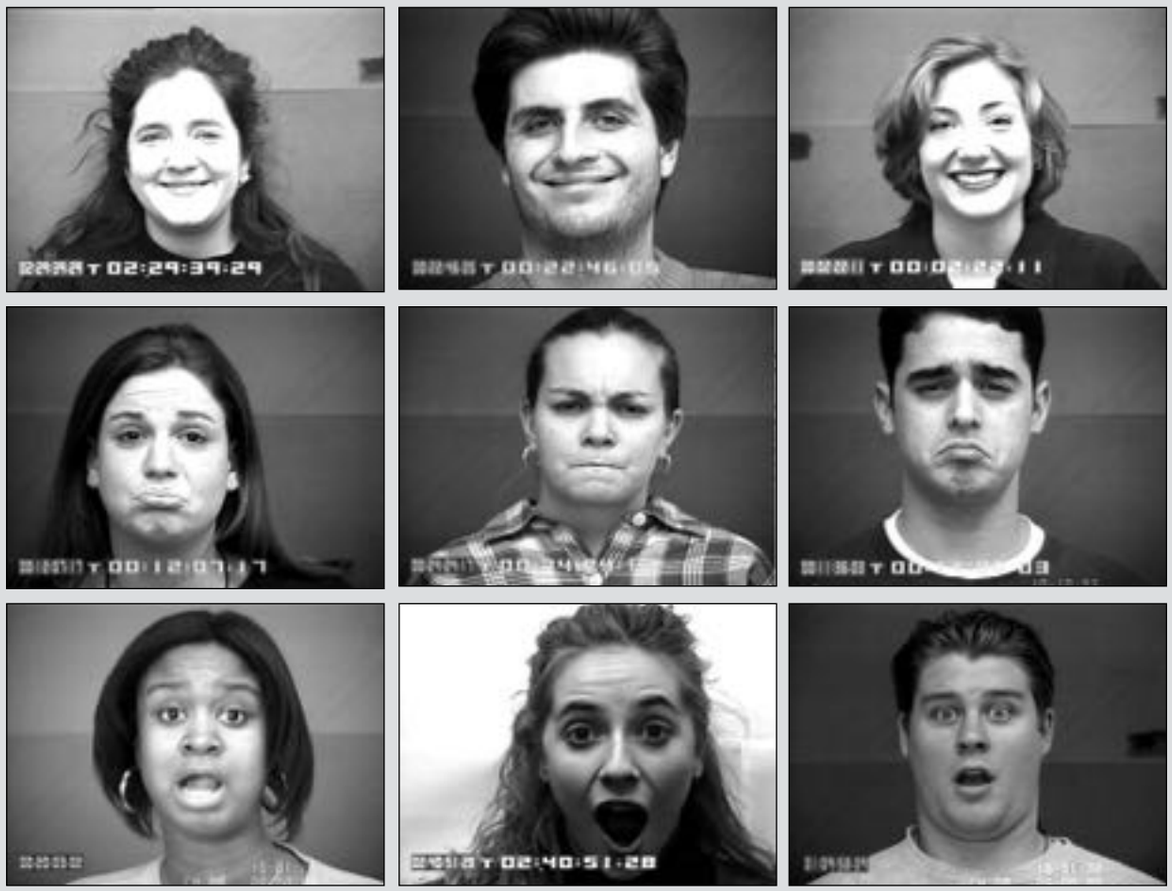


→ Tagged Facial Expressions DB

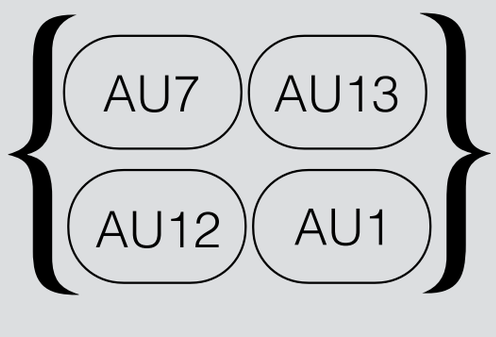
AU ↔ PAD

Cohn-Kanade Database Modification

- 450+ clips of Facial Expressions
  - ✦ Took **175** of them.
- N=20 (13 Female, 7 Male).
- Rated <u>*Expressed Emotion*</u> on scales of **Pleasure**, **Arousal**, **Dominance** [1-9].



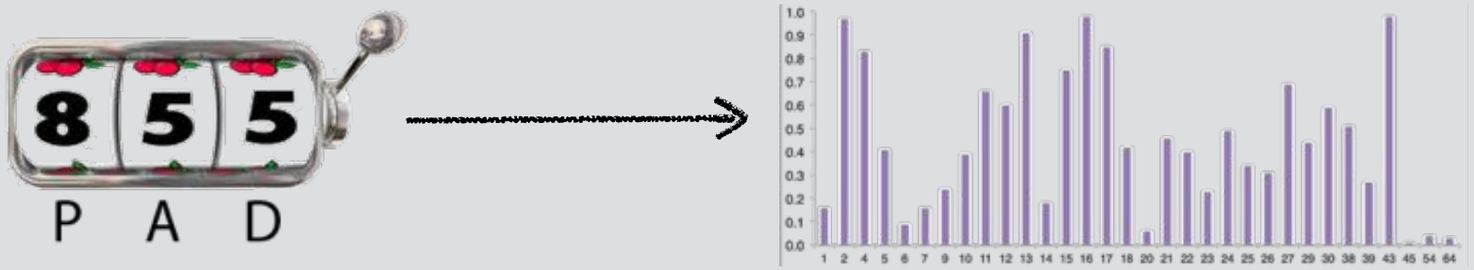
- High Internal Consistency ($\alpha \geq .95$).



<u>Images taken from</u>: Kanade, T., Cohn, J. F., & Tian, Y. (2000). Comprehensive database for facial expression analysis. In Automatic Face and Gesture Recognition, 2000. Proceedings. Fourth IEEE International Conference on (pp. 46-53). IEEE.

PAD → AU

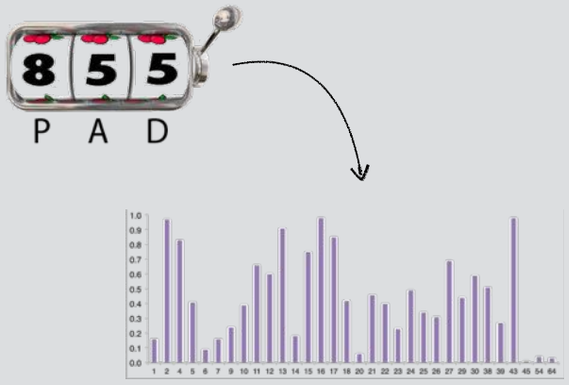
Results



- A model was computed for each AU separately, using a linear classifier (SVM).

- Results: *average* ***ρ=0.14*** [-1 to +1], not much better than chance.
- Taking a closer look: For 20% AUs, *ρ>0.33*, while 44% of them received *ρ=0*.

- Conclusion: Some AUs are *more accurately predicted* than others.



PAD → AU

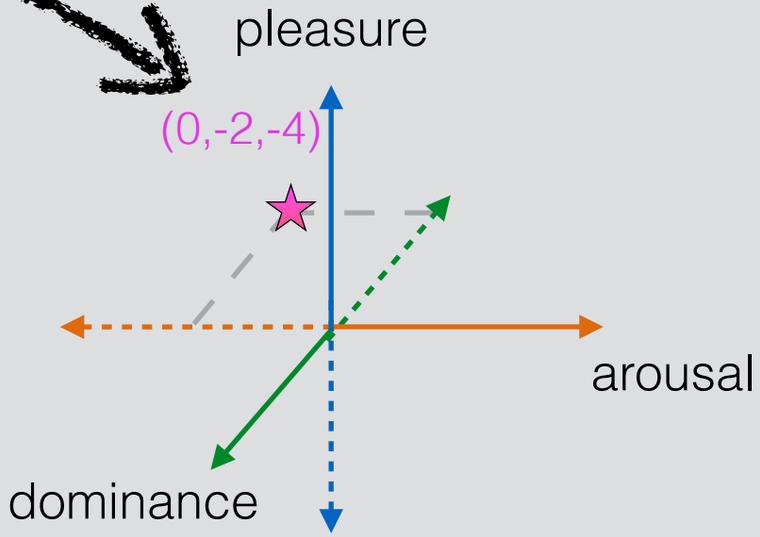
Accurately Predicted AUs

- **AU-12** (Zygomaticus Major): *MCC=.54*

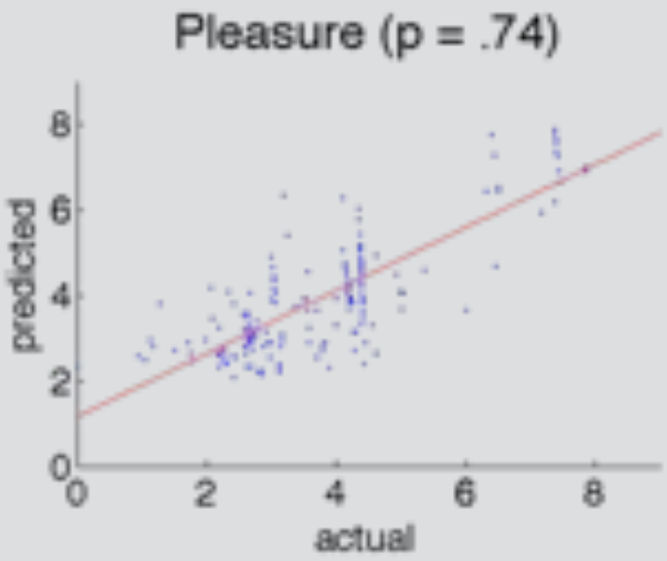
- **AU-5** (Levator Palpebrae Superioris): *MCC=.35*

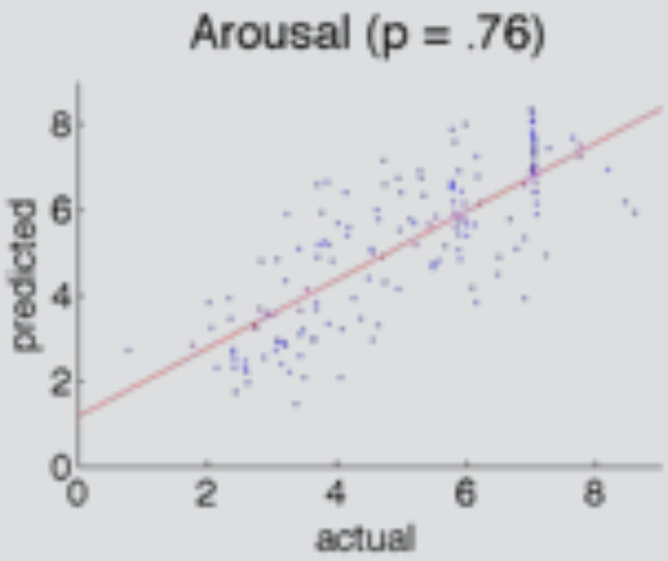
AU → PAD

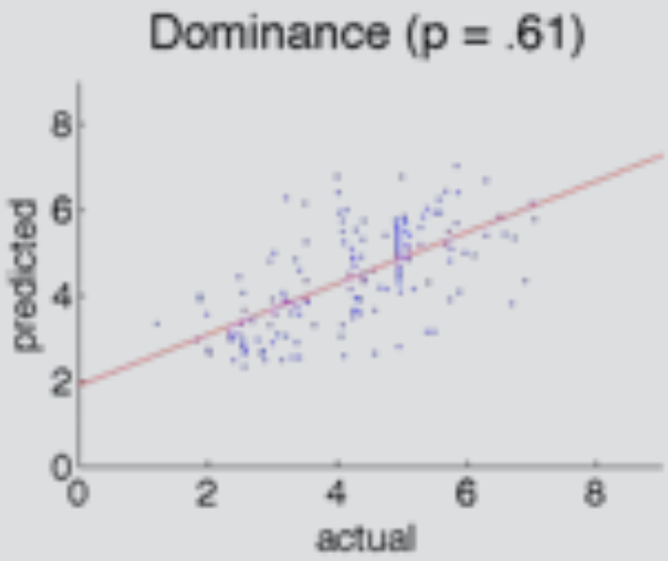
Results



A model was computed for **each axis separately**, using linear regression.







AU ↔ PAD

Interim Summary

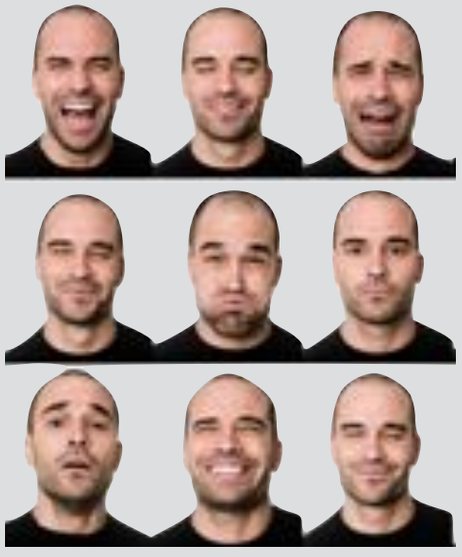
- Thus, we learned a model from AU to PAD, and vice versa.
- The results and correlations were moderately nice.

- *But…*
  - Only **posed** facial expressions.
  - **Laboratory** AU ratings (Manual FACS Raters).
  - **Perceived** emotion.
  - **Dominance** is relatively weak.

- *So…*

Current Work

2nd Experiment

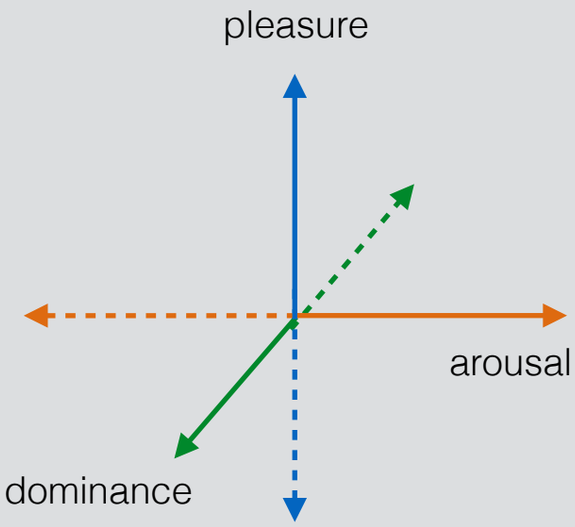


Spontaneous Facial Expression

Emotion Prediction

Implicit Media Tagging

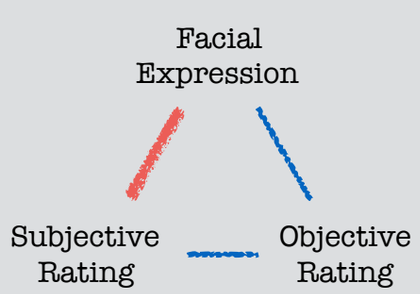
Emotion



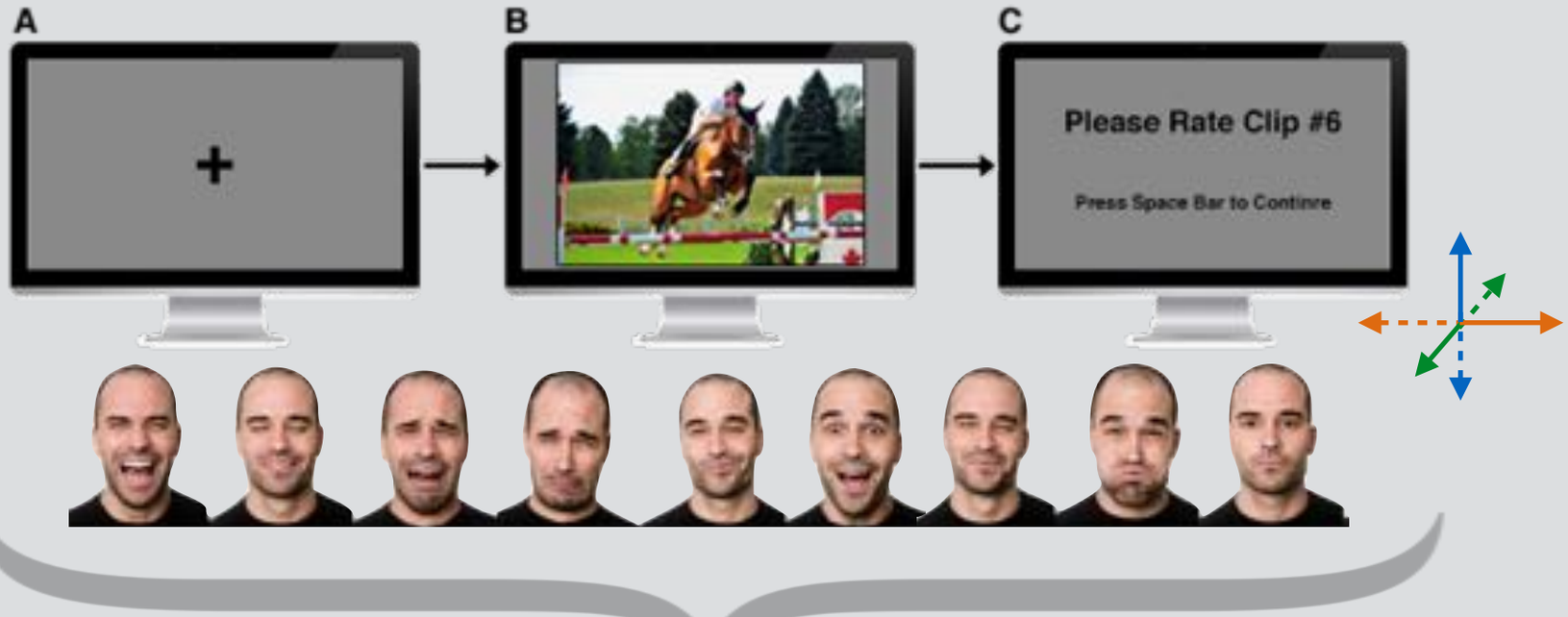
Subjective Rating

Objective Rating

Current Work

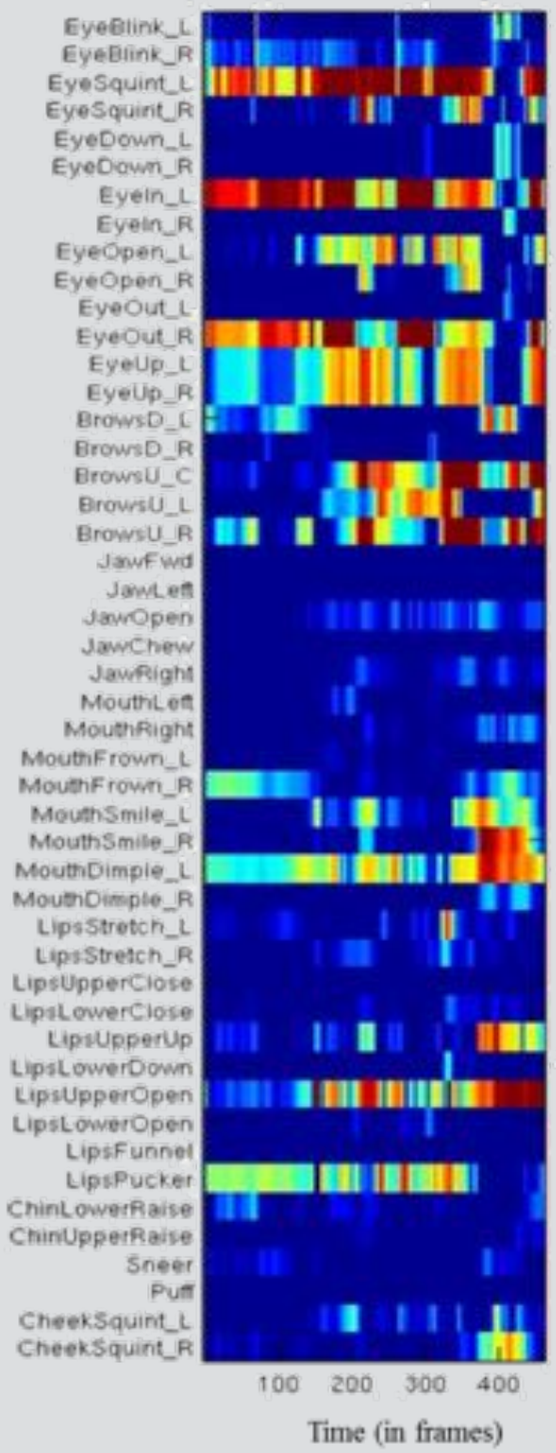


Emotion Prediction



Record
Facial Activity
[3D + Depth Data]

faceshift

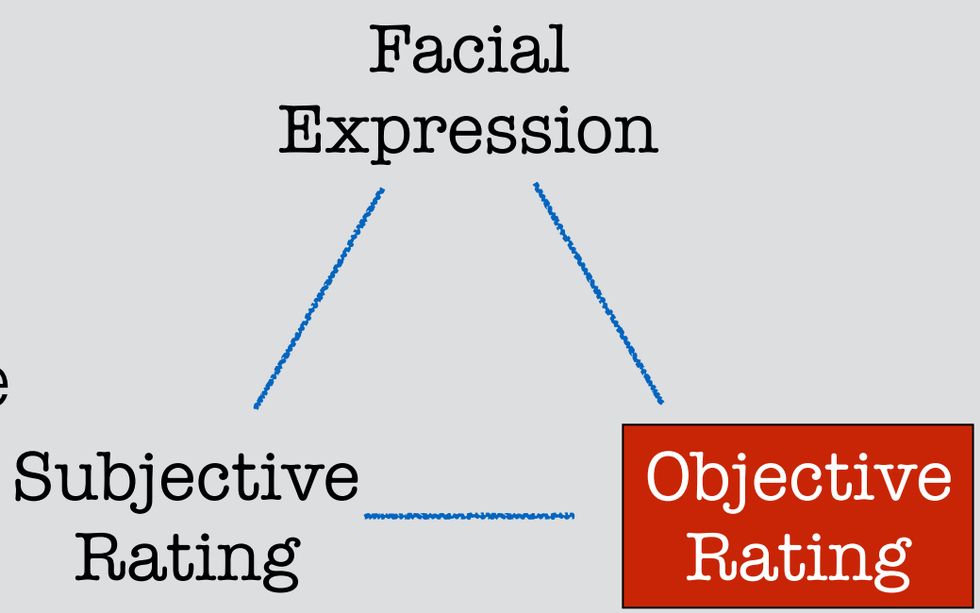


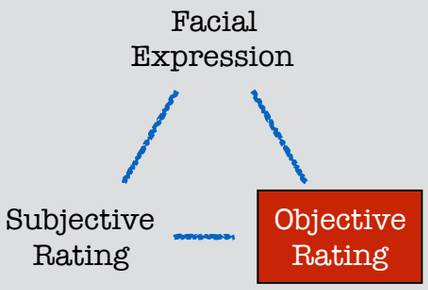
Current Work

EEVDB

Emotion Elicit Video DataBase

1. Familiarity
2. Duration
3. Publicly Available
4. Globally Germane
5. …





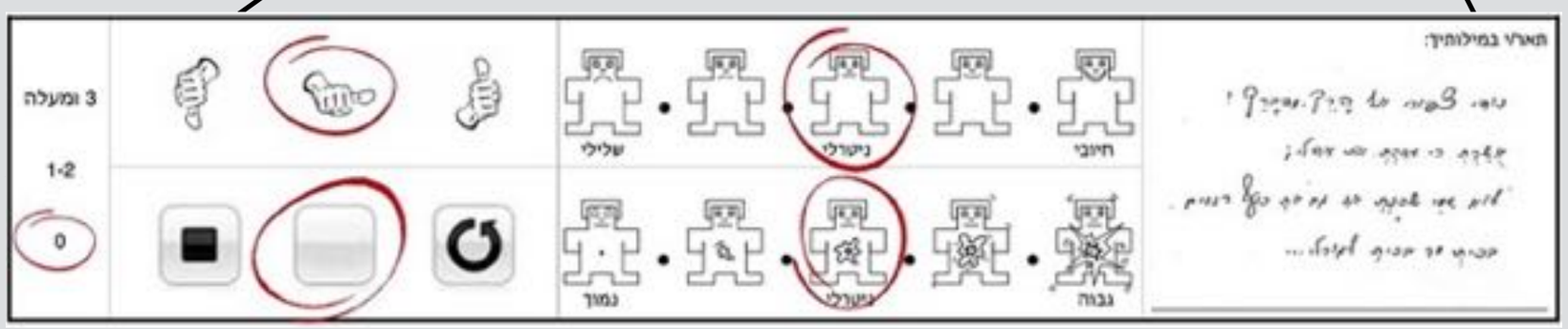
Current Work

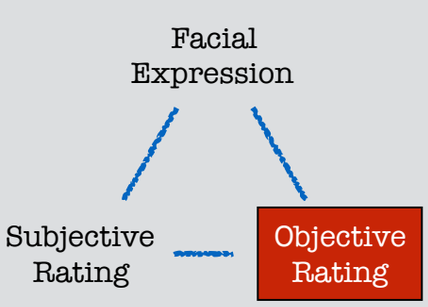
EEVDB

Method

- 26 Participants (13 Females, 13 Males)

1. Valence
2. Arousal
3. Likeability
4. Desire To Rewatch
5. Familiarity
6. Free Text



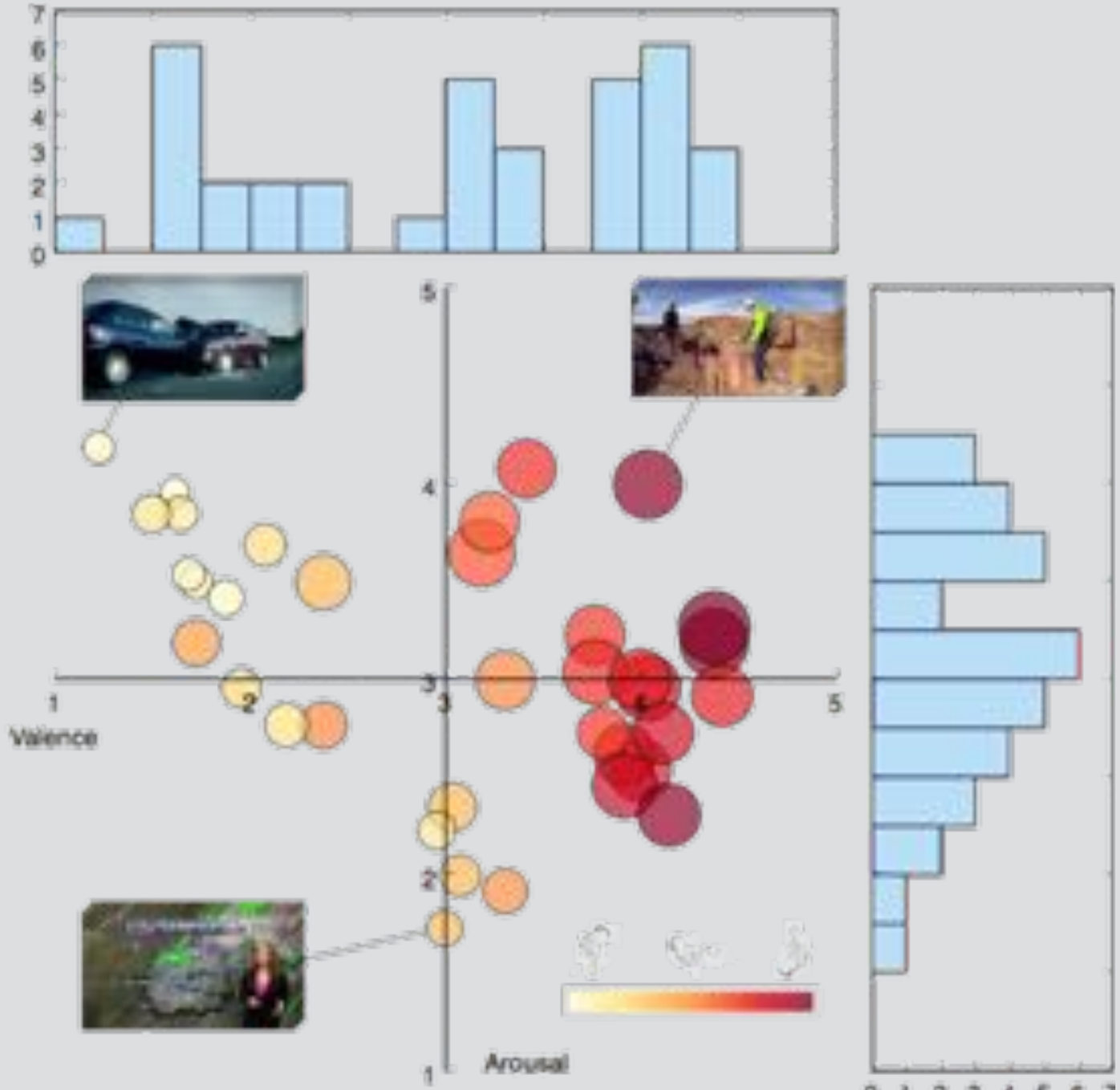


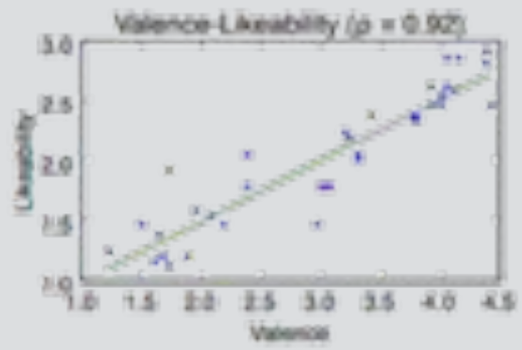
Current Work

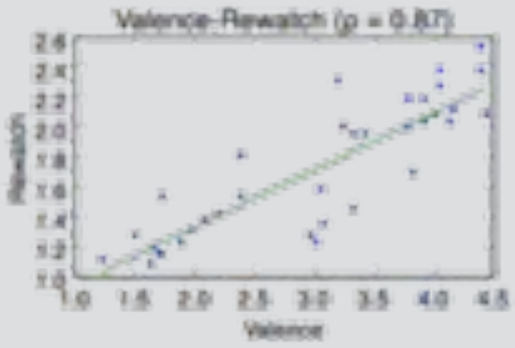
EEVDB

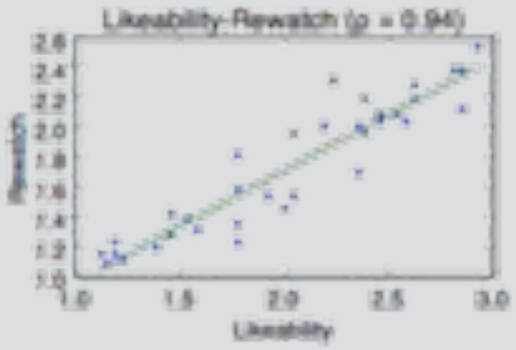
Results

- 36 Publicly available DB of clips.
- Significantly unfamiliar (p<.0001).
- High Raters Agreement (ICC ≥ .92).









[Hadar, Weinshall, in prep.]

Summary

- Developed a model from Action Units (AU) to Affect Descriptives (PAD), to answer the question(s) —

- Given a **Facial Expression**,
  - Can we automatically predict **Subjective Emotion**? **Yes.**
  - Can we **implicitly tag the media** being watched? In work .

- **E**motion **E**licit **V**ideo **D**ata**B**ase.

(Now Publicly Available!)

Thank You.

Prof. Daphna Weinshall

Talia Tron, Ph.D

Questions

1. Model: **AU** $\leftrightarrow$ **PAD**
2. Framework: **Triangle of Emotion**
3. Database: **EEVDB** (Emotion Elicit Video DB)

(Now Publicly Available!)