Synthetic Impressions (II)

Computational Social Intelligence - Lecture 11

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This lecture is based on the following texts (available on Moodle):

- Craenen, Deshmukh, Foster & Vinciarelli, "Do We Really Like Robots that Match our Personality? The Case of Big-Five Traits, Godspeed Scores and Robotic Gestures", Proceedings of the IEEE International Symposium on Robot and Human Interactive Communication, 2018.

This lecture is based on the following texts (available on Moodle):

- Deshmukh, Craenen, Foster & Vinciarelli, "The More I Understand it, the Less I Like it: The Relationship Between Understandability and Godspeed Scores for Robotic Gestures", Proceedings of the IEEE International Symposium on Robot and Human Interactive Communication, 2018.

Outline

- Synthetic Impressions
- Gestures and the Attraction Paradigm
- Gestures and Understandability
- Conclusions

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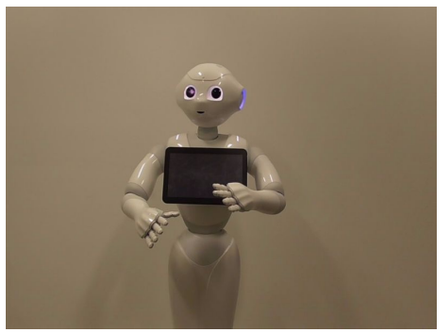
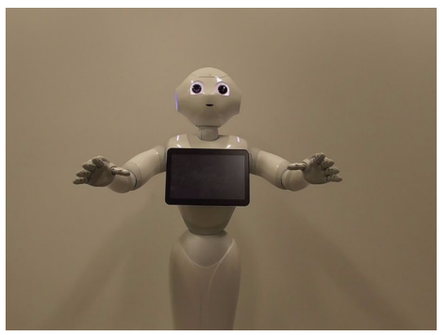
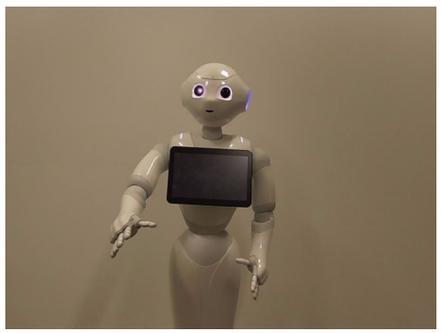
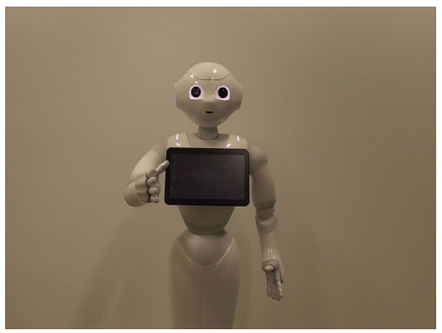
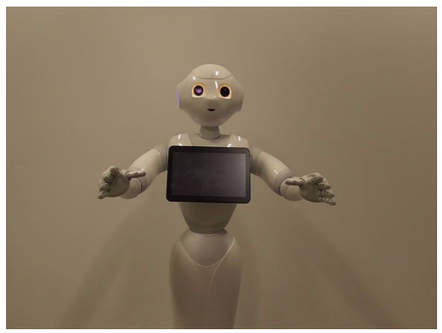
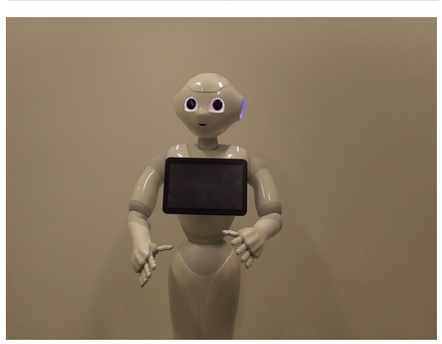
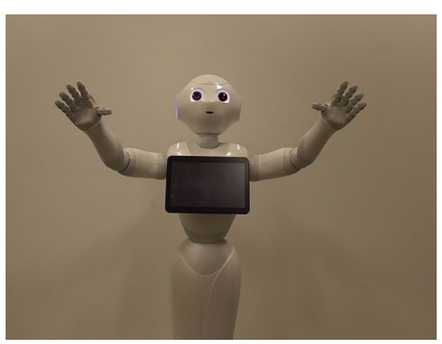
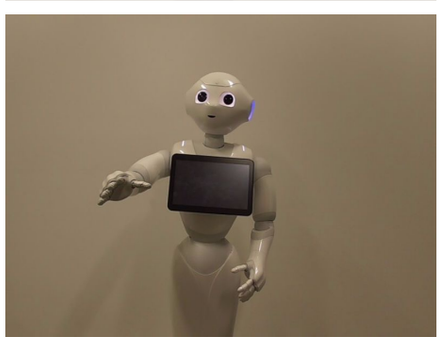
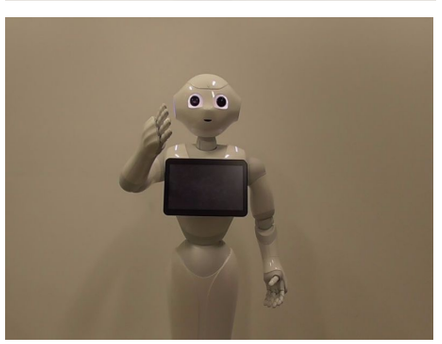
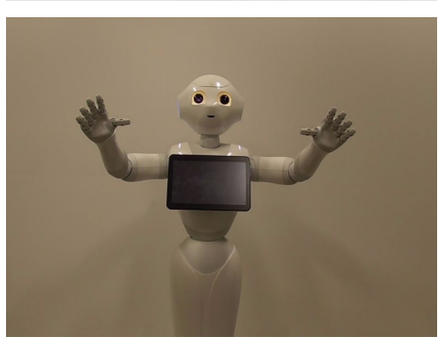
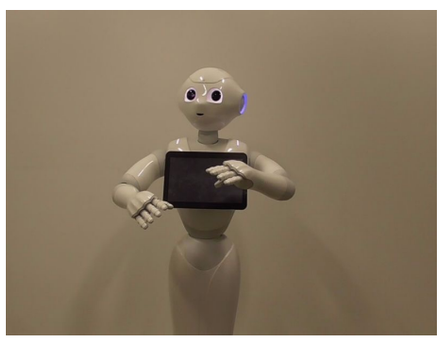
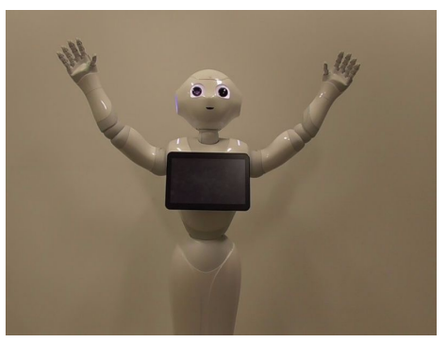
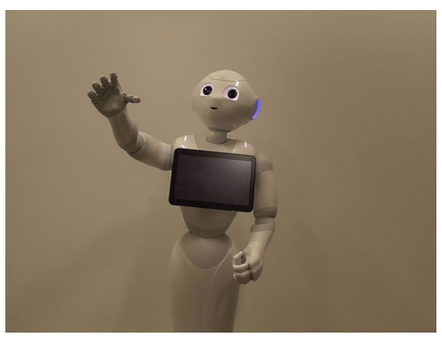
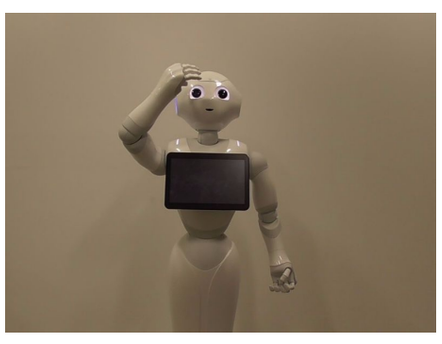
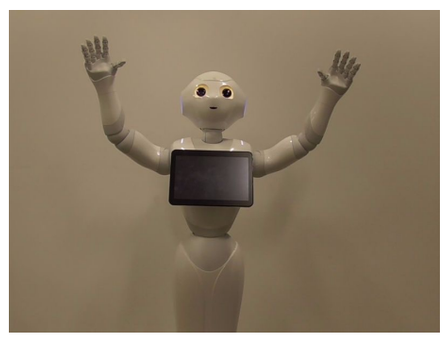
The Gestural Stimuli

	Disengage	Engage	Pointing	Head Touching	Cheering
$\alpha = 0.50$					
$\alpha = 0.75$					
$\alpha = 1.00$					

The Setting

30 observers have filled Godspeed questionnaire and Big-Five Inventory 10 (self and attributed) while rating different interpretations for all 45 stimuli.

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The Attraction Paradigm (I)

"[…] evaluations of strangers appear to be affected by degree of similarity, and statistical analysis confirms this impression."

Byrne, "An Overview (and Underview) of Research and Theory Within the Attraction Paradigm", Journal of Social and Personal Relationships, 14(3):417-431, 1997.

The Attraction Paradigm (II)

"[…] perceived similarity predicted attraction in no-interaction, short-interaction, and existing relationship studies."

Montoya, Horton & Kirchner, "Is Actual Similarity Necessary for Attraction? A Meta-Analysis of Actual and Perceived Similarity", Journal of Social and Personal Relationships, 25(6):899-922, 2008.

Distance between self-assessed and attributed traits for stimulus "k"

"T" is the total number of traits

$$d_k = \left[\sum_{j=1}^{T} (t_j^{(s)} - t_{jk}^{(a)})^2 \right]^{\frac{1}{2}}$$

The expression corresponds to one of the observers

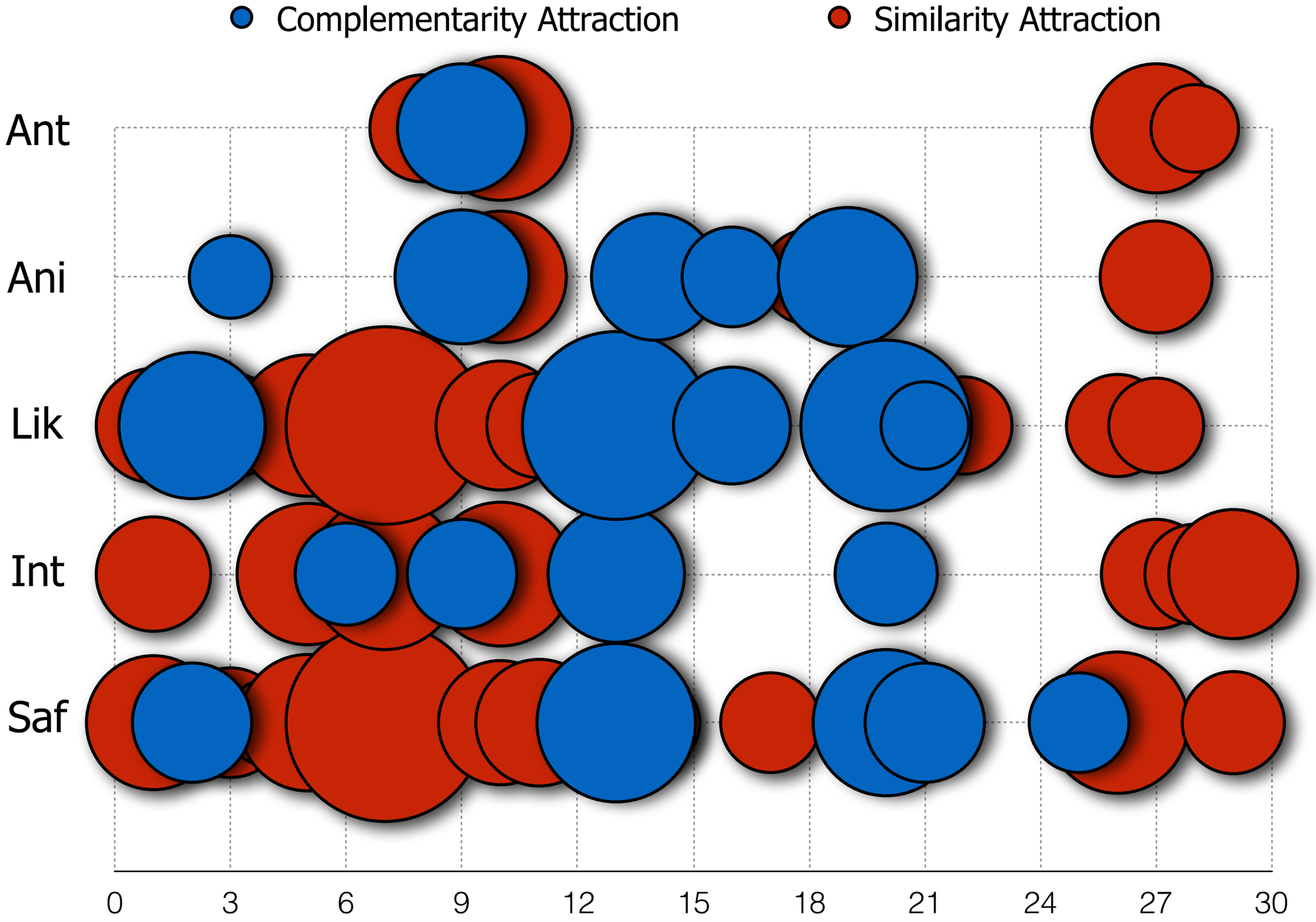
Trait "j" attributed to stimulus "k"

The Spearman Correlation Coefficient

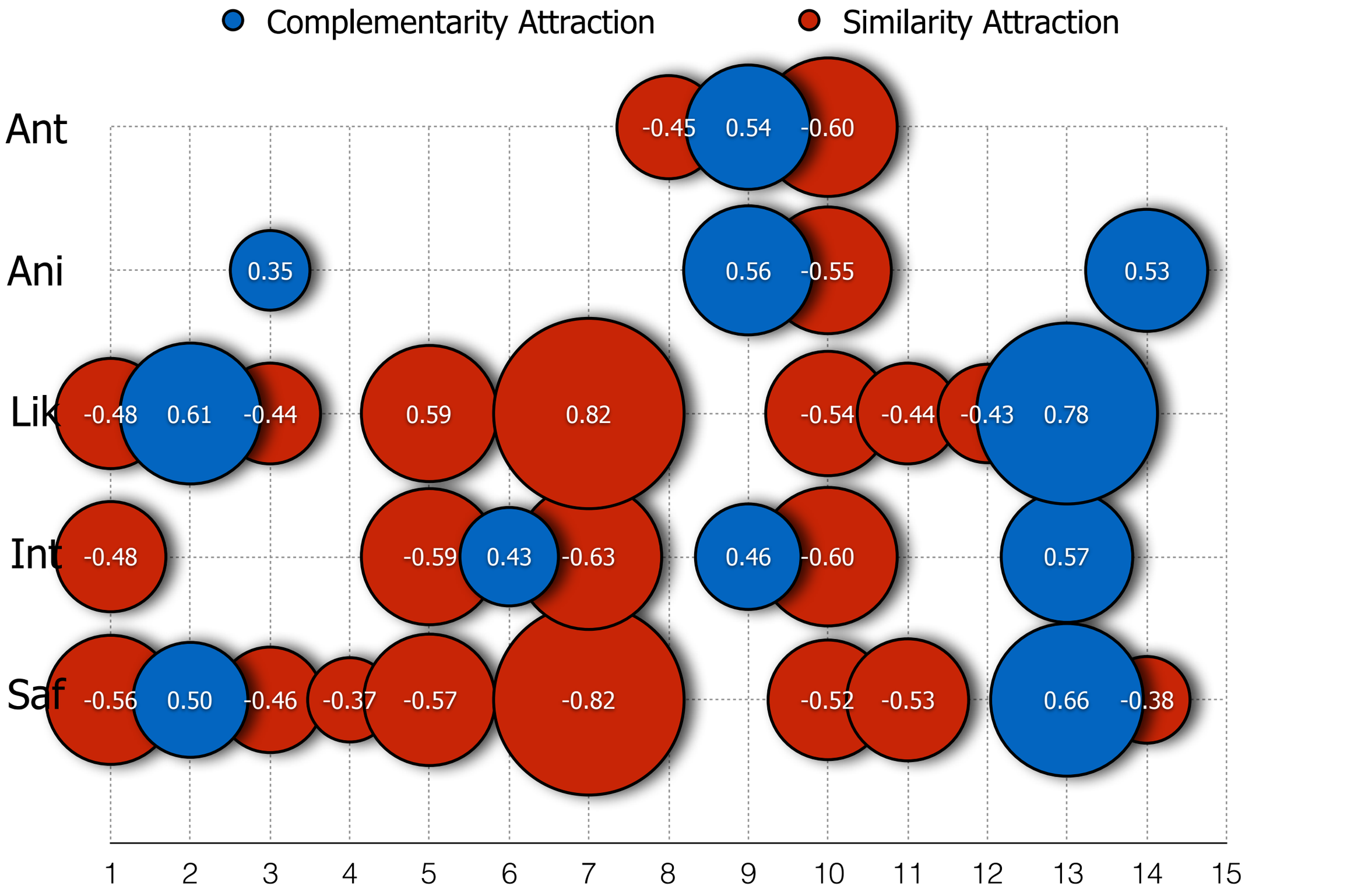
Difference between rank of distance and rank of GS score for the same stimulus

$$r = 1 - \frac{6\sum_{k=1}^{M} d(d_k, g_k)}{M(M^2 - 1)}$$

The Spearman Correlation Coefficient is more robust to outliers than the most common Pearson Correlation



Relationship between Godspeed scores and Big Five traits (effects observed after application of the False Discovery Rate Correction)



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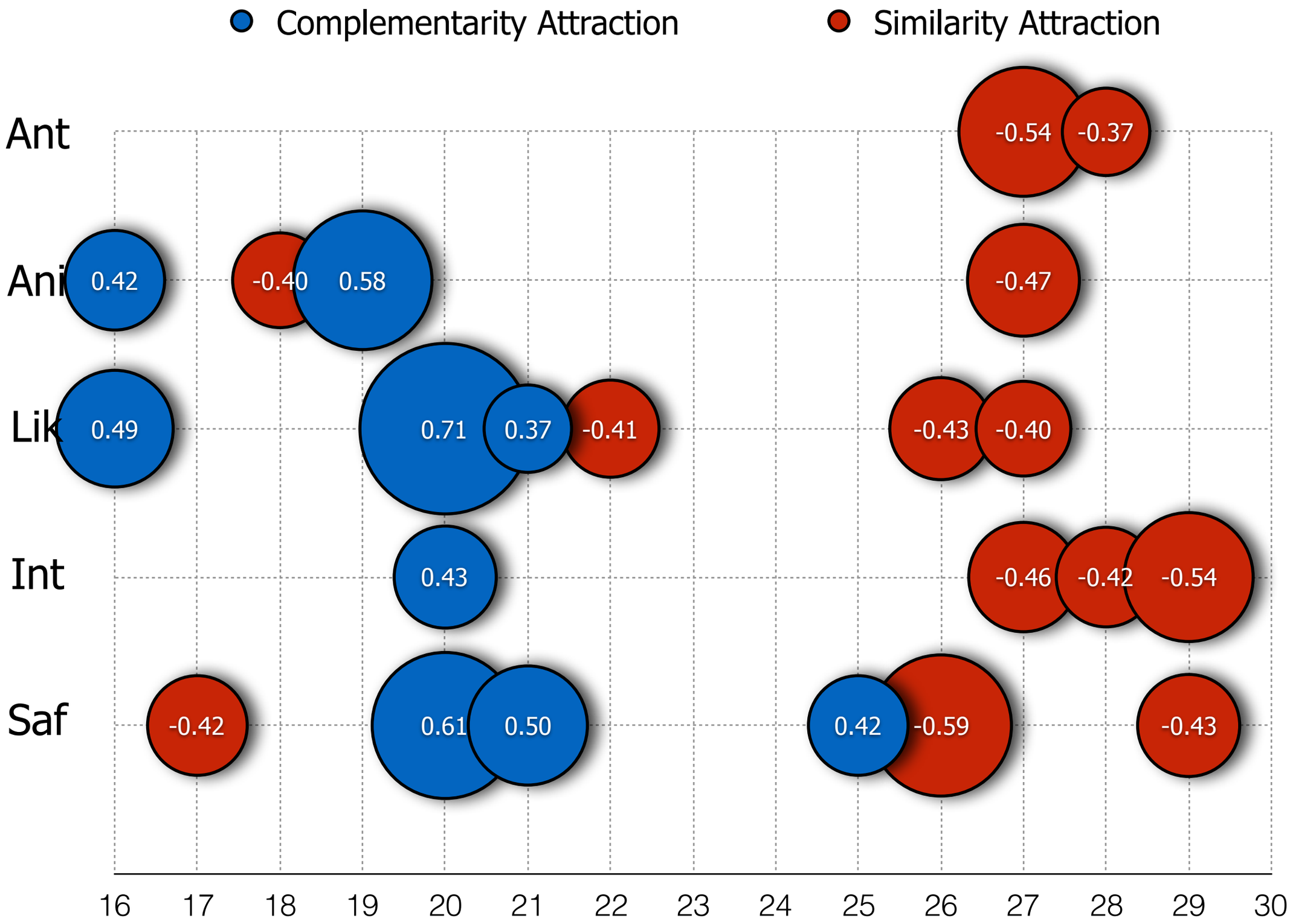

Relationship between Godspeed scores and Big Five traits (effects observed after application of the False Discovery Rate Correction)

Recap

- The attraction paradigm appears to apply, to a large extent, to Human-Robot Interaction;
- Out of 30 observers, 16 show similarity-attraction, 9 show complementarity-attraction, and 2 show mixed effects;
- The attraction paradigm can be exploited effectively only if it is possible to understand which of the effects is taking place.

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Emblems

"[gestures] steadily linked to a meaning, so that the two make a signal-meaning pair [...] like it happens, for instance, with the lexical items of a verbal lexicon"

Poggi, "Mind, hands, face and body. A goal and belief view of multimodal communication", Weidler 2007

Interpretation

The observers have been asked to rate 10 possible interpretations of every gesture:

Getting Distracted; Aggressing; Flirting; Pointing; Complaining; Cheering; Reflecting; Teasing; Rejecting; and Welcoming.

A matrix for a specific stimulus (speed and amplitude)

An element is the score of observer "i" for interpretation "k"

$$M^{(\alpha,\lambda)} = \{m_{ik}^{(\alpha,\lambda)}\}$$

$$u_j^{(\alpha,\lambda)} = \sum_{i=1}^{N} m_{ij}^{(\alpha,\lambda)}$$

Total number of points for interpretation "j" for one stimulus

Sum over the elements of column "j" of the matrix

Probability of one interpretation being voted

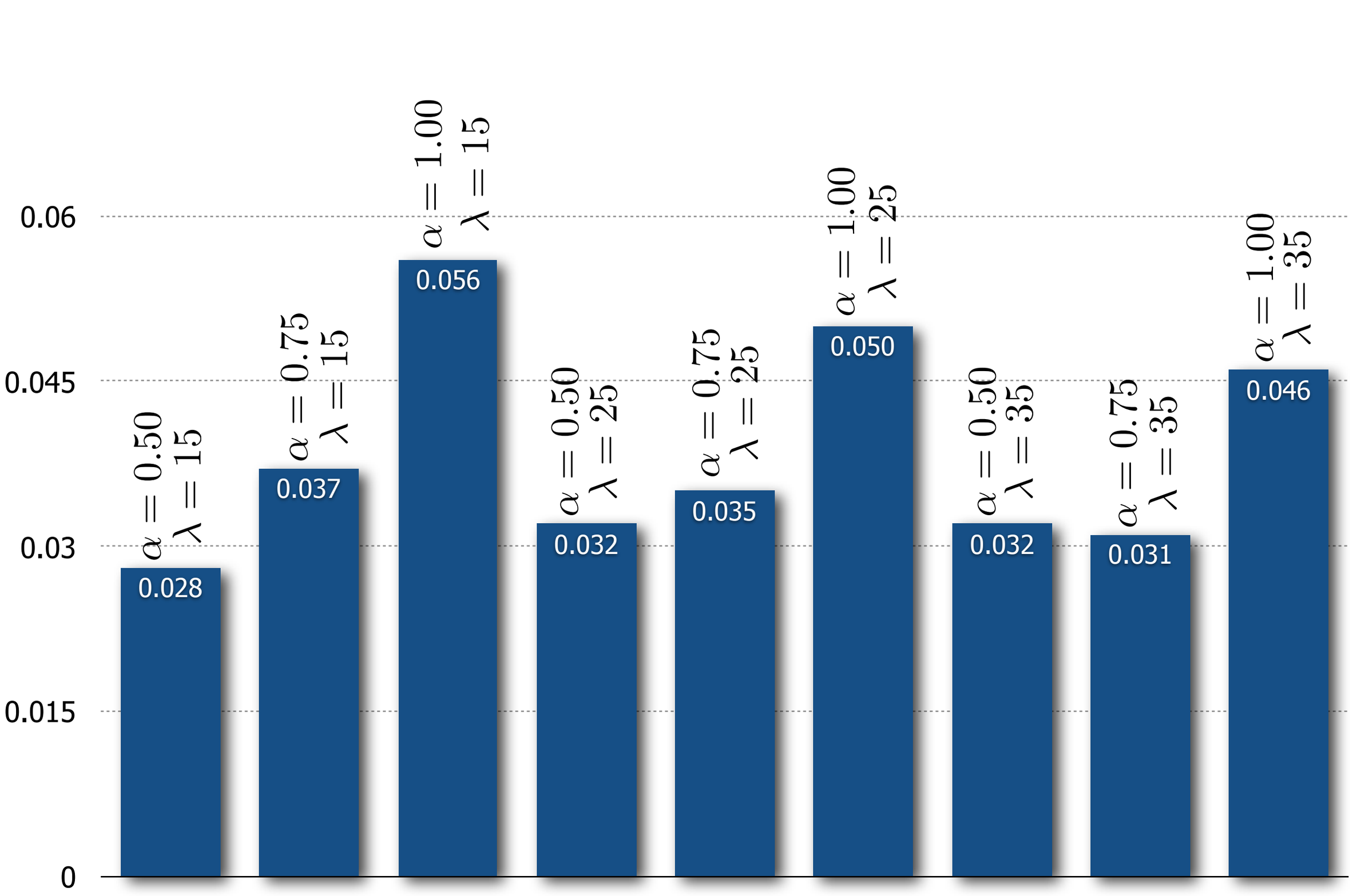
Sum over all elements of matrix "M"

$$p_k = \frac{u_k}{\sum_{i=1}^{N} \sum_{j=1}^{T} m_{ij}}$$

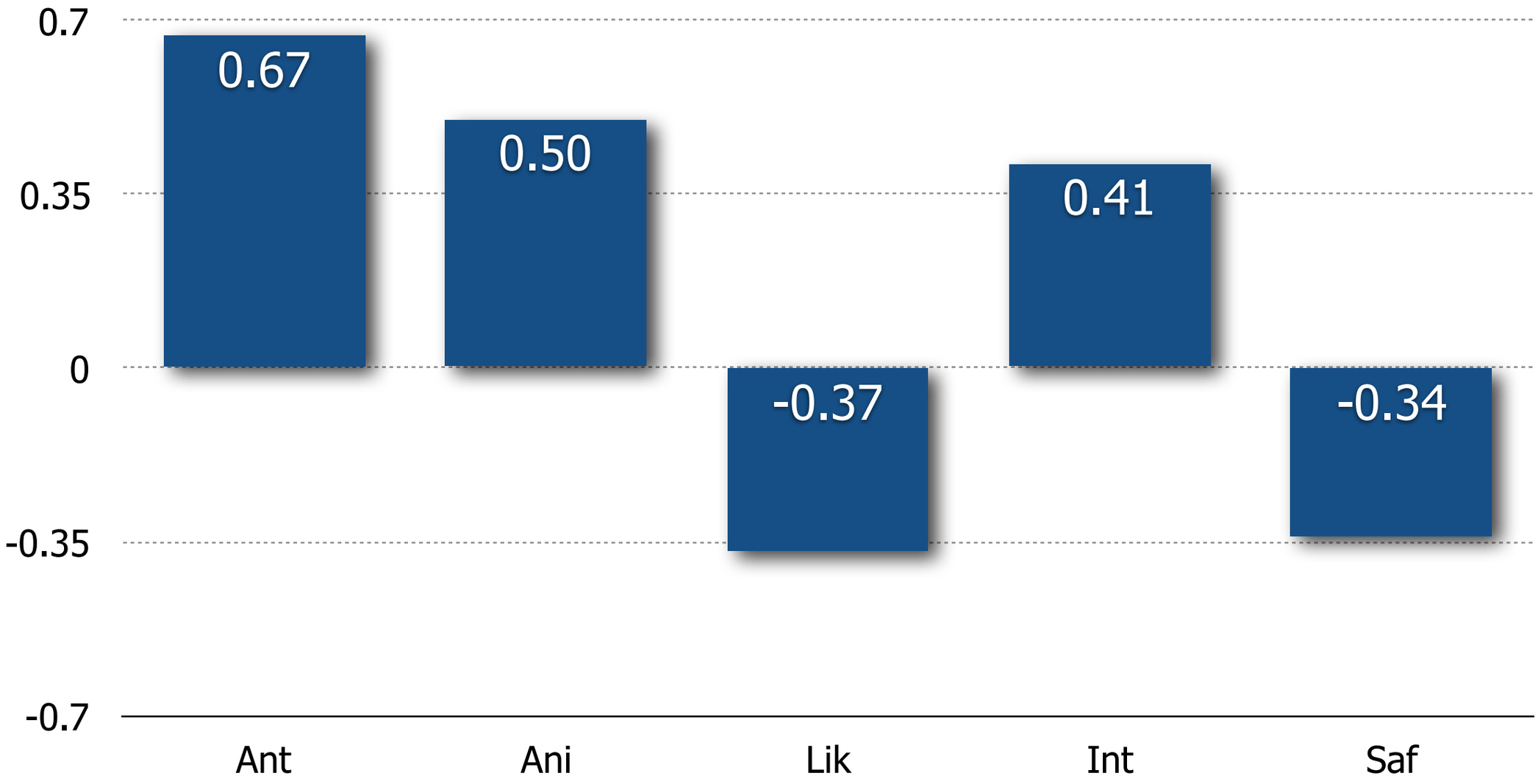
$$U = 1 - \frac{-\sum_{j=1}^{T} p_j \log p_j}{\log T}$$

Understandability (high when interpretation only attracts many votes)

Entropy (measuring how uniform the distribution is)



The Understandability is higher when there is no dampening.



Correlations between Understandability and Godspeed Scores (all values are statistically significant)

Recap

- There is an association between changes in amplitude and changes in understandability;
- There is a statistically significant correlation between understandability and Godspeed scores;
- The interplay appears to reproduce the incompatibility between social and task skills.

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Conclusions

- However simple, gestures give rise to a wide spectrum of synthetic impressions;
- Overall, the impressions appear to follow principles and laws observed in human-human interactions;
- The next step is the collection of data in real-world settings.

Thank You!

Special thanks to:

- Bart Craenen
- Amol Deshmukh
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