THESIS/INTERNSHIP PROPOSAL

Subject:	**Analyzing social interactions in commensal setting**
Supervisors and Co-supervisors:	**Radoslaw Niewiadomski**
Field of research:	**Human Behavior Understanding**
Motivations and general objectives:	Gathering around a table, conversing, and sharing food are some of the most common, widespread, and universal social experiences. The 2-years project *COmputational Models of COmmensality for artificial Agents (COCOA)* aims to investigate human-human interactions in a commensal setting using state-of-the art machine learning techniques and develop artificial commensal companions (e.g., social robots) capable of engaging with human commensals. The aim of this thesis is to investigate nonverbal interactions among human commensal partners during social dinners. These events are characterized by rich social interactions, where the act of consuming food serves as an opportunity to exchange ideas, strengthen social bonds (e.g., friendship), or finalize business matters. The main goal of this study is to **perform an analysis of nonverbal behaviors of the commensal partners at the group level.** First, the student will process the existing synchronized video recordings [1] of eating dyads. For this purpose, they will use existing Python libraries, such as MediaPipe and PyFeat, to extract information about nonverbal behaviors from the videos (e.g., smiles, gaze, and hand movements). Subsequently, the student will develop **models of interaction dynamics.** Such models typically consider sequences of nonverbal behaviors exhibited by each interaction partner, such as gaze movements, start/end of utterance, interruptions, hand gestures, etc., and their regularities (repetitions, patterns) in the behavior of others. One example is measuring the degree of synchronization of nonverbal behaviors between the interaction partners. The nonverbal behavior synchronization can be an indicator of social relations between the two interaction partners. Various methods exist for measuring interpersonal synchronization, such as Event Synchronization [2] and MECS [3]. In the final step, the student will develop a model that connects features extracted from the synchronized videos (e.g., degree of synchronization) with self-reported high-level information on social bonds (e.g., the degree of relationship between interaction partners), satisfaction with the meeting, etc. Please check [4] for preliminary results.

	The expected outcome of the thesis is a computational model able to estimate commensal partners' social bonds (e.g., degree of relationship) from the automatic analysis of their nonverbal behaviors. The student will have the opportunity to develop innovative solutions and contribute to scientific publications.
Required skills:	• Basic skills in Programming and video processing
Work Plan:	The student is expected to carry out the following tasks: • extract nonverbal features from the videos • perform the analysis of inter-personal synchronization or apply other models to study interaction dynamics • compare the results of the analysis with participants' self-reports • write thesis report
References:	[1] R. Niewiadomski, G. De Lucia, G. Grazzi, M. Mancini, Towards Commensal Activities Recognition. In Proceedings of the 2022 International Conference on Multimodal Interaction (ICMI '22). Association for Computing Machinery, New York, NY, USA, 549–557. 2022. https://doi.org/10.1145/3536221.3556566 [2] R. Quian Quiroga, T. Kreuz, and P. Grassberger, Event synchronization: A simple and fast method to measure synchronicity and time delay patterns, Phys. Rev. E 66, 041904. 2002 [3] P. Alborno, G. Volpe, M. Mancini, R. Niewiadomski, S. Piana, A. Camurri, The Multi-Event-Class Synchronization (MECS) Algorithm. https://arxiv.org/abs/1903.09530 [4] Radoslaw Niewiadomski and Cigdem Beyan. 2025. Toward Modeling Commensal Interactions in Human Dyads. Companion Publication of the 2025 ACM Designing Interactive Systems Conference. Association for Computing Machinery, New York, NY, USA, 403–408. https://doi.org/10.1145/3715668.3736334
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