Thesis Proposal

Title	**Commensal Activities Recognition for Social Robot**
Supervisors	**Radoslaw Niewiadomski (DIBRIS, UNIGE)**
Team/Company	**DIBRIS**
Research field	Affective Computing / HCI
Motivations and general objectives:	The 2-year project Computational Models of Commensality for Artificial Agents (COCOA) aims to develop artificial commensal companions (e.g., social robots) [1] capable of engaging with humans during meals. To build successful interactions, it is essential that social robots are able to recognize human actions during meals and generate appropriate reactions. Some of these activities are related to the food consumption (e.g., chewing, drinking, etc.) while others are social signals displayed by the commensal partner (e.g., gaze, smiling,…) Thus, the aim of this thesis is to develop computational models for commensal activities recognition that will be integrated into the existing robot architecture (NAO) and used in experiments on human-robot interaction. The thesis is composed of two stages. The first step includes extending the existing multimodal dataset [1] containing the videos of dyads and small groups sharing meals. The student will actively participate in the data collections, the data pre-processing and manual annotation the data. Next the student will investigate state-of-the-art techniques for the activity recognition in the previously annotated videos (e.g. chewing, speaking, smiling, food intaking…) and develop multimodal (i.e., using the data of facial expressions, upper body movements and eventually audio) models working in real-time. The thesis is a part collaborative project that involves several researchers in Italy. The student will have the opportunity to develop innovative solutions and consequently be involved in scientific publications. <u>Required skills</u> • Programming skills (Python, C++) • Notions of machine/deep learning

Proposed work plan and expected results

The student is expected to carry out the following tasks:

- participate actively in data collection
- develop multimodal classifiers of commensal activities
- participate in model's tests during the human-robot experiments

The expected outcome of the thesis is a model capable of classifying various commensal activities. Ideally the model should improve the baseline results [2] and be suitable to be used in human-robot interaction experiments.

Place of activity

The primary location of activity is the DIBRIS (via Opera Pia). Some activities will be realized in collaboration with University, La Sapienza.

References

[1] Niewiadomski, R., Bruijnes, M., Huisman, G., Gallagher, C.P., Mancini, M. Social robots as eating companions, Frontiers in Computer Science, 4, 2022.
doi: 10.3389/fcomp.2022.909844

[2] Niewiadomski, R., De Lucia, G., Grazzi, G., Mancini, R., Towards Commensal Activities Recognition, In Proceedings of the 2022 International Conference on Multimodal Interaction (ICMI '22), November 7–11, 2022, Bengaluru, India, Association for Computing Machinery, New York, NY, USA, 549–557, 2022. *doi: 10.1145/3536221.3556566*

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