

Designing and implementing deep learning architectures to predict cohesion's dynamics in small group interactions from multimodal data

Description

An intern position is now available at “Laboratoire Traitement et Communication de l'Information”, Télécom Paris, Institut polytechnique de Paris, France (<https://www.telecom-paris.fr/fr/recherche/laboratoires/laboratoire-traitement-et-communication-de-linformation-ltci>)

Supervisors

Prof Giovanna Varni
PhD Candidate Lucien Maman

Keywords

Social Signal Processing, Information Technology, Multimodal data analysis, Machine learning, Deep learning, Computer vision.

Framework

This work will be conducted in the framework of the 3-years long ANR JCJC French national project GRACE (Groups' Analysis for automated Cohesion Estimation) started on April 2019. For more information on the project, have a look on our website: <https://grace.wp.imt.fr/>

Recently, with the advent of Social Signal Processing aiming at developing socially intelligent machines [1], Computer Science research took interest in investigating and quantifying relational phenomena involving two or more persons. Groups of people are a fascinating interdisciplinary phenomenon. They can be defined as bounded and structured entities that emerge from the purposive, interdependent actions of individuals.

One of the current open challenges on automated groups' analysis is to provide computational models of higher-level concepts called “emergent states”, that is, states emerging as the result of affective, behavioral and cognitive interaction among the members of a group [2]. Cohesion is one of these states considered as a highly valued group property serving crucial roles for group effectiveness and performance.

Scholars proposed theoretical models of cohesion having from one to five dimensions [3]. Among these dimensions, the task and social ones were the most investigated. The task dimension concerns the extent to which group members are united to achieve the group's goals and objectives ; the social dimension refers to the social relationships within the group (e.g. the extent to which group members like each other).

Within the GRACE project, multiple computational models of cohesion has been developed following 4 axes: the integration of temporality, the integration of the Social and Task dimensions' interplay, the integration of the relationships between cohesion and other phenomena (e.g., leadership, group emotion) and finally, the group modeling.

All these models are using handcrafted nonverbal features based on motion capture and audio data and are focusing on predicting cohesion's dynamics from self-assessments of cohesion. In addition, relationships with other phenomena only have been studied independently (i.e., cohesion-leadership and cohesion-group emotion).

In order to face the previously mentioned challenges, the aim of the internship is to develop deep learning architectures exploiting:

- 1) End-to-end deep learning
- 2) Graphs neural networks
- 3) Attention mechanisms

Role

This is an exciting opportunity for you if you are interested in engineering and/or research. We have many directions to explore. Some tasks are more practical than others and we will discuss your interests to find the best fit.

Candidate profile

The ideal candidate should have a strong background on Computer Science, AI, Information Technology, Applied Mathematics or closely related fields. In addition to a passion for science and programming, the candidate should be open to approach and solve the issues linked to Human-Computer Interaction.

The following skills are also expected:

- ▶ Good command of English (written and spoken). French language is not a mandatory requirement
- ▶ Interest in multidisciplinary research at the interface between Computer Science and Sociology/Psychology
- ▶ Proof of Excellent student career
- ▶ Strong programming skills (e.g. C++/Python)
- ▶ Very good communication skills, commitment, independent working style as well as initiative and team spirit.

Offer

Starting date: as soon as possible.

Salary

Full-time intern fellowship according to the Telecom Paris salary scale.

Application deadline

The evaluation of the candidates starts immediately and it will continue until the position is filled.

Application

To apply please send by email to giovanna.varni@telecom-paris.fr and lucien.maman@telecom-paris.fr in a single pdf file:

- ▶ A cover letter stating your research interests and how they could be related to the research topic the internship focuses on.
- ▶ A detailed CV
- ▶ Transcripts of student records of your last year.

For any additional questions about the position, please contact Prof. Giovanna Varni and Lucien Maman. Please quote “Intern_position_DeepLearning_for_SocialSignalProcessing” in the email subject for both asking information and application.

References

- [1] Vinciarelli, A., Pantic, M., and Bourlard, H. 2009. Social signal processing, *Image and Vision Computing*, 27, 12, pp. 1743-1759.
- [2] Nanninga, M. C., Zhang, Y., Lehmann-Willenbrock, N., Szlavik, Z., and Hung, H. 2017. Estimating verbal expressions of task and social cohesion in meetings by quantifying paralinguistic mimicry, in *Proceedings of the 19th ACM International Conference on Multimodal Interaction*, pp. 206-215.
- [3] Salas, E., Grossman, R., Hughes, A. M., and Coultas, C. W., 2015. Measuring team cohesion: Observations from the science. *Human Factors*, 57, 3, pp. 365-374.