Spatio-temporal models for activity analysis of occupants of self-driving cars using RGBD sensors

Job type: Post-doctoral research fellow

Supervision:
- Carlos Crispim-Junior (Associate Professor)
- Laure Tougne (Full professor)

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Keywords: deep learning, action detection and description, self-driving cars

Context: Self-driving cars (SDC) have gained significant attention since the progress of artificial intelligence for visual scene understanding in the 2010s. Technology companies such as Waymo and Tesla now compete with established car manufacturers for the future of autonomous vehicles (AV). However, research on the adoption of such vehicles in our daily life still lags. What will be the typical passenger’s activities during the usage of an SDC? What are the impacts of these activities on the value of time of passengers? In this context, the AURA AutoBehave project (2019-2023), led by Carlos CRISPIM, seeks to automatically analyze the postures and actions of occupants of SDC, and to study how SDCs may change our usage of in-vehicle time.

Objectives: The post-doctoral research fellow will study spatiotemporal architectures of deep neural networks for the automatic detection and description of the actions of occupants of an SDC using multiple sensors. This work will extend the posture analysis of AutoBehave (Figure 1) and the action recognition dataset (publication under review) we are releasing. The outcome of his work is expected to foster new avenues of interdisciplinary research between artificial intelligence, cognitive sciences, and the economy of transport.

Methodology: firstly, the selected candidate will support us in the preparation and release of a large dataset with multi-view and multimodal recordings of people carrying out activities in an SDC for the task of human action detection and description (HADD). Secondly, the candidate will study existing baselines for the given tasks to set up a benchmark in the topic. In summary, the goal here is to study the limitations of existing methods in general and in the context of SDCs, as well as their precision for exploitability by other sciences. Finally, we expect the candidate to help us propose a new method for HADD, capable of overcoming the identified limitations. At the end of the contract, the candidate is expected to share the work carried out with the computer vision community by writing an international paper about the multimodal dataset and the evaluated baseline methods.
Profile of the candidate:

We are looking for a highly motivated candidate with a strong background in computer science or applied mathematics. Experience in image processing, computer vision, and/or machine learning will be a plus.

Required skills:

- Language Python
- Framework PyTorch or TensorFlow
- OpenCV library

The following skills would be counted as a plus:

- Versioning tools (GIT)

Duration: 5-6 months

Starting date: January 2024 (expected)

Salary: according to experience

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Bibliographic references