MASTER'S THESIS INTERNSHIP OFFER

DESCRIPTION

> **Title :** Deep Learning approach for video analysis in an educational context

> **Hosting organization:** Université de Poitiers

> **Lab:** XLIM

> **Research Team:** Labcom Damialab, collaboration INRIA

> **Scientific pole:** ASALI

> **Starting date (month/date):** 6 mars 2023

> **Short description of the internship offer (up to 5 sentences):**

Eye-tracking, video processing, data analysis, Deep model, semantic segmentation, transfer learning

> **Objectives (up to 5 sentences):**

The objective of this internship is to propose a scene analysis to determine the actions in a scene (by Deep strategy) and the visual attention of a user from an Eyetracker when solving a problem.

> **Description of the internship offer:**

The context of experimentation is that of creative problem solving, modeled in a multidisciplinary way by linking educational sciences, informatic sciences and cognitive neurosciences. We contribute to initiate each and everyone to computer thinking in order to master digital technology and not just consume it. The educational activity consists in assembling 4 small robotic cubes to build a vehicle that goes from one point to another. We observe both the state of the task (the configurations of the chosen cubes, etc...) and what the subject can discover (for example the functioning of such or such object) or his attitudes, in connection with the modeling of this learner in the specific framework of this task.

A first study allowed to set up a Proof Of Concept validating two operational elements:

- Hand detection and segment extraction

- Cube selection, cube color detection, and cube coordinate extraction.

The method, especially for the second point, is based on the integration of the AI Yolox method.

This first development constitutes a fundamental base however there remain various elements that must be deployed. First of all, for various reasons, the cube detector may have difficulty extracting the 4 cubes on certain frame. The treatment is currently done only frame by frame. It is therefore necessary to introduce the temporal dimension either directly into the neural structure or in a post-processing strategy to regularize the extraction of the cubes over time, even in case of occlusion.

Then, depending on the lighting of the scene, it may be difficult for the Deep algorithm to extract the correct color of the cube. It is therefore necessary to deploy a specific functional brick for this discrimination.

Finally, and this is probably the most important milestone, the model for detecting hands and cubes must be adaptable to new experiments. To do so, it will be necessary to propose a "relearning" protocol, to evaluate the best strategy (for example transfer learning or learning from scratch) and finally to provide the user tools allowing a simple reconfiguration.

❯ Description of the research team:

The scientific objectives are complex due to their diverse nature and the vast subjects they underlie: AI for massive data, ecosystem development, reinforcement learning, Active Learning. One of the particularities is to position AI at the interfaces, and thus to confront these model-based or data-based approaches to very diverse scientific contexts (mechanics, photonics, education ...). This approach is possible thanks to the complementarity of the scientific expertise of the researchers in the fields of signal processing, statistics and data analysis, and machine learning, both in experimental and numerical applications. The work and results are valorized by numerous partnerships according to different mechanisms (CIFRE grants, post-doctorates, partnership research agreements, etc.) of knowledge transfer.

SKILLS

❯ Expected skills of the applicant:

Developpement, Analyse de données, Machine Learning

PHD THESIS OPPORTUNITIES

❯ PhD thesis opportunity after the Master course:

☐ Yes   ☒ No

CONTACT & APPLICATION

› Surname and first name and mail of the internship supervisor(s):
François Lecellier (francois.lecellier@univ-poitiers.fr), Philippe Carré (philippe.carre@univ-poitiers.fr)

› The application shall be sent to the email: philippe.carre@univ-poitiers.fr

› Closing date for applications: Cliquez ou appuyez ici pour entrer une date.