Université Gustave Eiffel

PHD OFFER "INTELLIGENT AND LOW-COST LABELING FOR MULTISENSORY NAVIGATION DATA WITH REINFORCEMENT LEARNING"

Data-driven approaches are becoming increasingly popular in the localization and navigation domain due to their ability to address complex challenges that traditional methods struggle to model accurately. The labels required for supervised learning, particularly high-quality labels, are often costly to obtain due to factors such as the need for human labor, expensive equipment, or access to detailed map data. For example, labeling GNSS Line-of-Sight (LOS) and NLOS data typically relies on cumbersome devices like fish-eye cameras or 3D map-aided systems, which can introduce errors such as image segmentation inaccuracies, camera calibration errors, and map discrepancies. The main research question and objective of this PhD thesis is to propose a generalizable data labeling methodology that uses reinforcement learning (RL) to automatically generate high-quality labels. By utilizing only the reference trajectory, this approach aims to label intermediate quantities in particular sensor data quality and filtering parameters in a cost-effective and scalable way.

Reinforcement learning is particularly suited for this task because it enables an adaptive, autonomous learning process where the system can continuously refine its labeling strategy based on feedback from the environment. The main tasks in this PhD thesis include: 1) A thorough state-of-the-art on reinforcement learning focusing on its applications in localization and navigation systems, as well as its potential to address challenges in data labeling. 2) Modeling the navigation data labeling problem within the framework of reinforcement learning by carefully defining the core elements of the problem, including the state, actions, environments, and rewards. This leads to an appropriate methodology that allows reinforcement learning algorithms to autonomously optimize the labeling process, relying only on the reference trajectory, which is anyway needed for performance evaluation. In this way, the cost and efficiency of data labeling will be significantly reduced. 3) Two particular study will be conducted to demonstrate the effectiveness of the proposed methodology: a) sensor quality labeling, eg., GNSS and Inertial Navigation System (INS) data; b) filtering parameter labeling, e.g., EKF and/or FGO, ensuring that the filter remains robust and accurate under varying conditions.

An exciting collaboration with Data Scientist from the campany Datategy: Let's showcase the power of AI to tackle the challenges of navigation!

To apply, please send your CV, master note transcripts to the contact email address on the right side.

Affiliation
AME-GEOLOC (campus Nantes)

Supervision mission
No

Monthly gross salary
2878 € -3200€

Contract
Fixed-term contract of 36 months

Starting date
October 2025

Contact
ni.zhu@univ-eiffel.fr

Knowledge

- Data Science
- Signal/image processing
- AI (time series analysis)
- English: fluent

Skills / Know-how

- Coding in Python, matlab coding
- Scientific writing

Soft skills

- Communication
- Teamwork
- Organization and rigor
- Capacity of proposal