

Engineering/master's 2 internship

Data analysis and processing for estimating road network evolution or survival laws

Evolution and/or survival laws have been used for many years to manage and maintain the road network. They are based on the use of statistical models to predict a probability of performance level; a maintenance/repair operation is scheduled below a certain performance threshold. These laws are modelled using observable elements (usually manually/visually picked up) characterizing the condition of the road surface and specific measurements of the mechanical strength of the road structure.

Existing high-performance monitoring tools produce images of the road surface, the quality of which is conducive to automated segmentation of the damage. In this internship, we propose to explore the estimation of a road network evolution or survival law based on elements of interest recorded on images selected from a time series of images of a road network over several years.

This internship focuses on extracting these elements of interest from the pavement surface in order to use them as components of an evolution law. In particular, the aim is to study machine learning techniques for detecting defects in images of road surface, to implement and evaluate them on a set of data. At the same time, the trainee will explore the possibility of integrating traffic, weather and road network topography data.

The internship is part of a collaboration between the joint Inria/UGE I4S project team and Cerema. It is a prerequisite for a ph.thesis due to start in autumn 2024.

Tasks :

- State of the art :
 - o Evolution or survival laws: understanding the implementation of current methods, features used and their selection methods, choice of parameters, limits;
 - o Possible equivalences between mechanical measurements and surface defects;
 - o Automatic detection of features in images.
- Implementation
 - o Image data (quality, format, repetition, etc.)
 - o Development of a defect detection method using machine learning
 - o Evaluation and performance analysis
 - o Use of additional data (traffic, weather, topography, etc.) on the network: availability, formatting, cross-referencing of data --> investigative approach.

Profile : Master's (M2) or 3rd year engineering student (applied mathematics, computer science, images, computer vision), with skills in statistics, pattern recognition/classification and scientific computing (Python, Matlab, C/C++).

Internship duration : 6 months, from march 2024

Location: The student will be located at Cerema Strasbourg, 11 rue Jean Mentelin, BP9, 67035 STRASBOURG cedex.

Compensation: according to legal basis (approx. 600 €/month)

Contacts: Philippe Foucher, Researcher ENDSUM (philippe.foucher@cerema.fr, 03.88.77.46.34), Alain Hebting, ITPE (alain.hebting@cerema.fr, 03.88.77.46.18), Vincent Baltazart, Researcher I4S (vincent.baltazart@univ-eiffel.fr).