Phd position, ANR COSS
Trafic flow analysis and modelling

Applications are invited for a Phd in the department of Mathematics, INSA Rouen Normandy. The position is available for 36 months and the successful candidates take up post on or before December 1st 2023. Applications are open from **July 15 to November 15**

Host institution and place of work
The successful candidate will be co-supervised Prof. Nicolas Forcadel (LMI, INSA Rouen Normandie, nicolas.forcadel@insa-rouen.fr) and Prof. Régis Monneau (CEREMADE, Paris Dauphine University and CERMICS, ENPC). He will become a member of the LMI laboratory at INSA Normandy, Rouen. The work will be carried out in a stimulating and international environment involving collaboration and interaction with important experts in the field, in particular within the ANR project COSS (2023-2027).

Scientific program
<u>Context and motivations</u> The modelling and the simulation of traffic flow is a challenging task in particular in order to design infrastructure. During the last years, a lot of work has been done concerning the modeling of traffic flows. At the macroscopic scale, traffic flow can be described using scalar conservation law equations. It consists in describing the collective behavior of the vehicles for example by giving an evolution law on the density. The oldest and most popular macroscopic model is the LWR (Lighthill, Whitham and Richards) model, which dates back to 1955 and is inspired by the laws of fluid dynamics. A lot of models and results have been obtained in this framework, but the case of theses equations posed on networks is not yet fully understood. Using also the well-known link between scalar conservation laws and Hamilton-Jacobi equations, this latter framework has been used for traffic modeling on networks, provided new developments and also new models and so new mathematical difficulties.

<u>Goals</u> In the framework of the ANR project COSS, the goal of this Phd is to study Hamilton-Jacobi (HJ) equations and scalar conservation laws (SCL) on networks and to understand how it is possible to justify more rigorously new macroscopic models. In a first part of the Phd, the candidate will analyse and implement some numerical scheme for a general class of SCL on networks with 3 roads introduced in a recent work of Cardaliaguet, Forcadel and Monneau.

In the sequel of the Phd, the goal will be, using homogenization tools, to understand the case of junctions and networks composed of more than 3 roads.

Required background and skills
The ideal candidate will be an enthusiastic and creative individual with a master in Applied Mathematics (e.g. analysis of PDE's, numerical analysis). Good programming skills will be appreciate but are not mandatory. The candidate should also show, communication skills in English, both written and oral.

All applicants must send a CV to:
nicolas.forcadel@insa-rouen.fr