

## Urbanloop pods control

M.Sc. project

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### Supervisors

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### Place

This internship will take place at CRAN, UMR CNRS 7039: 2 avenue de la forêt de Haye, 54516 Vandœuvre-lès-Nancy, France.

### Duration

5 to 6 months, starting between February 1 and March 31, 2024

### Funding

Gratuity of approximately €600/month

### Keywords

Control engineering, autonomous vehicle, modelling, Urbanloop, Matlab-Simulink

### Topic

[Urbanloop SAS](#) is developing an individual on-demand rail transport system that allows users to move from one point to another without waiting, connecting, or even stopping in between. It consists of numerous pods (see figure below) running autonomously on interconnected loops.



While work has just begun on the implementation of an initial 2.2 km loop to run 10 pods for the Paris 2024 Olympic Games, Urbanloop is facing new challenges for a city-scale installation. This change of scale requires improving the performance of the pods and therefore their controllers in order to offer better flexibility for the overall system.



In this context, this project aims to improve the control law that regulates the speed of a pod to adapt it to the parameters that may change during its use (slope of the track, weight of the vehicle, etc.).

The study plan is described below.

- **Modelling.** A model based on the physics of pods dynamics will first be developed, then simplified to facilitate the synthesis of a control law. The model obtained will be validated using available experimental data.
- **Specifications.** The second step will involve deriving the specifications imposed by Urbanloop into control specifications.
- **Control design.** The aim here is to build a controller that meets the specifications from the simplified model obtained previously. Various control laws will be considered, from the simplest (proportional-integral regulator) to the most advanced (predictive control). We will also consider the possibility of designing a control law directly from the available data sets, in this case referred to as data-based control.
- **Validations.** The control law(s) selected will first be validated using numerical simulations and then, if possible, implemented experimentally on a pod.

This internship will be funded by the French national project ANR COMMITS. It should be noticed that this internship could lead to a Ph.D. thesis afterwards.

### Desired profile

This is a M.Sc. internship for students in mechanical, control or electrical engineering. Matlab skills are desirable.

Do not hesitate to contact Jérémie Kreiss ([jeremie.kreiss@univ-lorraine.fr](mailto:jeremie.kreiss@univ-lorraine.fr)), Romain Postoyan ([romain.postoyan@univ-lorraine.fr](mailto:romain.postoyan@univ-lorraine.fr)) and Quentin Hélaïne ([q.helaine@urbanloop.fr](mailto:q.helaine@urbanloop.fr)) for further information.