

## Enhancement of Legged Robot Legs through Generative Design and Innovative Manufacturing

### Context:

The EPFL Xplore Research Pole has the objective of building a legged robot. The robot is designed to autonomously navigate through challenging terrain using its on-board sensors.

### Project description:

Building upon the initial prototype of legs designed in the first semester as part of the Legged Robots project, this current initiative aims to significantly enhance leg performance in terms of kinematics, rigidity, lightweight, materials, and manufacturing processes. The project will employ a generative design process, incorporating mechanical constraints, to optimize leg structures. Additionally, the research will be conducted on improving kinematics and dynamics using Jacobian analysis. The project will also explore innovative manufacturing processes, specifically additive manufacturing, to achieve the desired improvements.

Furthermore, the student will be an integral part of the Xplore Legged Robot Team, actively participating in its weekly meetings and working sessions. This collaboration will facilitate close interaction with other team members, and the student is expected to share their findings and progress with the team regularly.

### Tasks:

The project involves a series of tasks, outlined below (note that this list is not exhaustive):

- Generative Design Process
- Kinematics and Dynamic Research
- Innovative Manufacturing Processes
- Prototyping and Manufacturing

### Expected Outcomes:

- Enhanced leg design through generative design, considering kinematics, rigidity, and lightweight properties.
- Improved understanding of leg kinematics and dynamics using Jacobian analysis.
- Exploration and assessment of additive manufacturing feasibility for leg production.
- Fabrication of a functional prototype showcasing the enhancements.

### Contact:

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