A – lab LFMI
LFMI\textsubscript{1} Wirtz pump

- Hydrostatic spiral pump, able to drive alternating water and air plugs up to great heights (more than 10 metres).
- Amenable to be fully hydropowered (passive).

Objectives:

- Construct and characterise a spiral pump, varying the geometrical parameters.
- Optimise for the output height.
- Understand the limitations and the sources of failure.

LFMI$_2$ Statistics of rain drops

- Project motivated by a proposed mechanism for rillenkarren formation on inclined limestone bedrocks
- The cumulative effect of rain drops running down the path of highest inclination shapes these astonishing patterns
- This requires a proper description of the statistics of rain drops in terms of size and their spatio temporal correlation
Statistics of rain drops

- The objective is to determine the spatio-temporal correlation of the statistics of falling rain drops under different rainfall intensities from the image analysis of rain falling on a inclined plane filmed from below.
- The objective is then to be able to reproduce “synthetic rain” to be fed into our numerical simulations.
- Skills on image analysis and interest for statistics are required.
# LFMI\textsubscript{3} Improved Faraday set-up

<table>
<thead>
<tr>
<th>Container</th>
<th>$R$ [mm]</th>
<th>$h$ [mm]</th>
<th>$b$ [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plexiglas</td>
<td>44</td>
<td>65</td>
<td>7</td>
</tr>
</tbody>
</table>

\[
\frac{b}{2\pi R} = 0.025 \ll 1
\]

<table>
<thead>
<tr>
<th>Liquid</th>
<th>$\mu$ [mPa s]</th>
<th>$\rho$ [kg/m\textsuperscript{3}]</th>
<th>$\gamma$ [N/m]</th>
<th>$M$ [Pa s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ethanol 70.0%</td>
<td>2.159</td>
<td>835</td>
<td>0.0234</td>
<td>0.0485</td>
</tr>
</tbody>
</table>
Our experimental range is too restricted

- The objective is to build an experimental vertical oscillation set-up suitable to reach higher amplitudes of oscillations (2-5mm) of the container at reasonable cost [<1000CHF]
B – lab LA3
Mini Segway challenge

Multi-years challenge

Year 1: initial mechanical setup + stand up control
Year 2: path following/tracking + communication
Year 3: crowd control via camera tracking

Nbr etudiants: 16, 4 x 4 groupes
Responsables: Christophe Salzmann
Assitants: Vaibhav, Mert
Babyfoot fine control

Improve strategy with moving ball
Programmed in LabVIEW!

Nbr etudiants: 2+1
Responsables: Christophe Salzmann
QUBE Extension(s)

- Support for remote experimentation (cameras, usb, power)
- New software modules

Nbr etudiants: 2 x 2
Responsables: Christophe Salzmann
C – lab GFT
Goal: avoid collision between bumper cars!

Scenario:
- Multiple **bumper cars** driven by joystick commands
- Ensure **no collision** with minimum deviation from joystick commands

First step: simulation and miniature
- Racing car platform
- Simulation software is available
How can cars navigate safely?

**Methodology**

- Use Neural Networks (NNs) to plan trajectories for cars
- Encode avoiding obstacles into the training of Neural Networks
- Design a real-time safety filter

**Tasks:**

- Understand the simulator
- Implement a NN for avoiding obstacles in Python
- Link the NN and the simulator to train the NN for completing the goal
- Experiment with different NN architectures

**Supervisor:** Prof. Ferrari Trecate  
**Contact:**  
mahrokh.ghoddousiboroujeni@epfl.ch  
muhammad.zakwan@epfl.ch  
riccardo.cescon@epfl.ch
D – Lab MICROBS
Projects at the MICROBS Laboratory

Mahmut Selman Sakar
Institute of Mechanical Engineering
Robotic microsurgery
Robotic microsurgery

Teleoperation

Visual servoing

10x speed
**Project I: 3D Automated Microsurgery**

- **Task:** Develop a software to automatically register 2D bright-field microscope image with 3D light-sheet microscope images
- **Application:** System for automated robotic microsurgery
- **Tool:** C++/Python with the use of OpenCV
Flow-driven navigation with magnetic steering

- From cylinders to ribbons
- Fluid forces and drag
- Low strength magnetic field

Flow-driven advancement

Magnetic steering

Conventional approach

Flow-driven approach
Navigation in biomimetic phantoms

- Navigation at the speed of the flow
- Accessing capillaries
- Extremely low contact forces
Project II: 3D Automated Navigation

- **Task:** Develop imaging software for accurate tracking of the catheter tip in real-time X-Ray images
- **Application:** System for automated robotic navigation of microcatheters and probing the dynamics of the blood flow
- **Tool:** C++/Python with the use of OpenCV
NEMS Projet 1 – Mécanisme anti-gravité

- Conception et construction du système
- Analyse de la structure

Guillermo.Villanueva@epfl.ch

1-5 Groupes – 3-4 personnes par groupe approx.
NEMS Projet 2 – Mouvement Perpétuel

- Mécanique: Conception et construction du système
- Electronique: Construire l'électronique impliquée pour détecter la balle et activer l'électro-aimant au moment précis.
Propulser une voiture à l'aide d'élastiques
Objectif : parcourir la plus grande distance possible
F – lab EMSI
EMSI Projet – Leaping Latches challenge

- Analyse, Matériaux, Fabrication, TEST!!!!
- Objectif : Sauter à la plus grande hauteur possible
- Unleash elastic energy for the highest hop!

John.Kolinski@epfl.ch

1-3+ Groupes – 3-4 personnes par groupe approx.
G – Lab FLEXLAB
Da Vinci-inspired Design Challenge

Goal: Taking the codices or other art pieces of Leonardo da Vinci as a starting point, you will be ideating, developing, prototyping, analyzing, and studying an innovative technique, process, structure, application, or research/science question.

Up to 4 teams of 5 students. Open-ended project. Lab work will take place at DLL.

Flexible Structures Laboratory – IGM.

Contact: pedro.reis@epfl.ch
Bringing Leonardo da Vinci's designs to life

STUDENT PROJECTS - Fourteen mechanical engineering students spent a semester getting inside the head of Leonardo da Vinci. Using his drawings from the 15th and 16th centuries, the teams built ingenious machines - altering the design in some cases - in order to better understand how they worked.

03/07/23

TAGS:
- GIS
design
electrical engineering
- engineering
- ERC
- mechanics
- rehabilitation
- students
- summer series
The Codex Arundel (CA. 1480s-1518) is a 283-page manuscript by Da Vinci that contains notes on a wide variety of subjects that interested him, including mechanics and geometry. The physical copy is held in The British Library.

The Codex Atlanticus (1478-1519) is the largest single collection of drawings and writings by Da Vinci. It includes content about weaponry, musical instruments, mathematics, botany, and more across 1,119 leaves of paper. The entire codex spans Da Vinci's career through Florence, Milan, Rome, and Paris. The physical copy is held in the Biblioteca Ambrosiana in Milan, Italy.

The Forster Codex (1487-1505) is made up of five pocket notebooks that have been bound into three volumes. Inside, Da Vinci explores geometry, hydraulic engineering, theory of proportions, topology, and more. The physical copy is held in the Victoria and Albert Museum in London.

The Codex on the Flight of Birds (1505) is one of the best-known manuscripts. Relatively short, the codex includes illustrations and notes examining the flight patterns of birds and several inventions for flying machines. The physical copy of the manuscript is held in the Royal Library in Turin, Italy.
The Madrid Codices (1490–1504) are some of the most important manuscripts for the refined quality of their drawings and the number of relevant writing on the science of mechanisms by Da Vinci. The physical copy is held at the Biblioteca Nacional de España.

https://mymodernmet.com/leonardo-da-vinci-notebooks-online/
H – lab UNFOLD
Rencontre entre voiles et chauve-souris
Projects at UNFOLD

Rencontre entre voiles et chauve-souris

Rigidité modulable

Contrôle de la forme

Éléments de raideur
Projet: De meilleures voiles grâce à une rigidité contrôlée

Configurer la soufflerie

Mesurer la performance

Créer des voiles

Mesurer les déformations
I – VPT
Projets d’outils agricoles
Low Tech

Cours
Projet d’ingénierie simultanée

Siroune Der Sarkissian
07.12.2023
Un peu de contexte
Vous cherchez...

- Un projet qui soit relié à un besoin venant du terrain ?
- Avec une réflexion low-tech ?
- En lien avec un besoin commun de mieux se nourrir ?
- Avec un aboutissement concret ?
3 projets

1. Epardeur manuel
2. Disposeur de plants
3. Rouleau vélo
**Epandeur manuel**

**Objectif** : Epandre du fumier sur des platebandes de jardins de manière homogène.

Fig 1 : Brouette épandeur  
Fig 2: Epandage sur une platebande

Source : https://mmondialisation.org/lassociation-twende-en-tanzanie-pour-des-machines-qui-reactivent-lhumanite/
Manual manure spreader

- **Explanation**: The wheelbarrow (picture 1) is loaded with manure and pushed to the area where it is to be spread (picture 2). Once in the right place, the pull cord is moved to the open position so that the manure is in contact with the helical screw. The screw will scramble the manure and let it pass through the opening onto the bed.

- **Must have**: It would be interesting to be able to adjust the height of the auger so that you can choose how much manure you want to let through. If you can move the auger further away (closer to the ground) it will open up the hole more and let more manure through. It is important to be able to adjust the amount of manure, as different crops require different amounts of manure. Another possibility would be to have the flow of material controlled by the pull tab.

- **Nice to have**: possibility to spread something else than manure, for example, compost, Biorga (fertilizer in granulated form), green manure seeds.
Disposeur de plants

Objectif : Disposer les plants sur les platebandes aux distances optimales de plantation, sur les lignes et entre les lignes

Fig 2 : Charrette de véloomoteur

Fig 3 : Plants maraîchers
**Explanation:** In vegetable production, most crops are established by planting seedlings (4cm x 4cm x 4cm plugs; Picture 3). In large-scale vegetable production, tractor-mounted implements allow semi-automatic planting of plugs. In micro-cropping, everything is done by hand. It is important to plant the plants in a regular way in order to be able to make follow-ups of culture and weeding with the help of tools. The machine is pushed by two people. It straddles the bed (80 cm wide) and places the plants at the optimal planting distances. These can be adjusted beforehand. The adjustment can be done at the level of the number of rows (1 row, 2 rows, 3 rows, 4 rows) as well as at the level of the distance between the plants on the same row (5cm, 10cm, 15cm, 20cm, 30cm, 40cm, 50cm).

**Idea:** Use a moped carriage for support (Picture 4)

**Must have:** Adjustment between the lines as well as on the lines.

**Nice to have:** Adjustment of the span of the beds (between 75cm and 120cm).
Rouleau vélo

**Objectif** : Rouler les platebandes après avoir fait des semis pour tasser le terrain et casser les petites mottes.

Fig 5 : Rouleau plombeur manuel

Fig 6 : Brise-motte
Bike Roller

- **Explanation**: After broadcasting, a pressure roller is recommended (Picture 5). The roller is relatively heavy and difficult to move. The idea would be to replace the rear wheel of the bicycle with a pressure roller so that it can be passed with less effort and more speed.

- **Nice to have**: Possibility to adapt a lump breaker roller (Picture 6)
Aide et suivi des projets
Support EPFL

Samuel Cotture
Develop your prototype

Siroune Der Sarkissian
Coordination

Alain Prenleloup
Support GM
Support hors EPFL

David Bichsel
Maraîcher, formateur
Initiateur des projets
Pour redéfinir le besoin

Ferme “À la belle courgette” à Bussingy
Pour aller tester vos projets

Atelier Paysan
Pour promouvoir vos résultats
J – lab LBO
Shoulder Project

Pezhman Eghbali

Laboratory of Biomechanical Orthopedics (LBO)
Total Shoulder Arthroplasty (TSA)

Anatomical TSA  Reversed TSA

Shoulder Anatomical Measurements Web App

• Objective
  Develop a web app on top a code to perform and visualise shoulder anatomical measurements

• Skills
  • Python, Django, HTML
Mapping Joint Angles to Joint Forces

• Objective
  Predict joint force from joint angles

• Skills
  • Python, Deep learning
Phantom Detection for Material Assignment of Automatic Finite Element (FE) Modeling of TSA

• Objective
  Detect phantoms in a CT scan image

• Skills
  • Python, Deep learning
Sensitivity Analysis of TSA Automatic FE Modeling

- Objective
  Implement different mechanical metrics to assess bone, cement, and implant stress/strain

- Skills
  - Abaqus, Python
K – lab Sycamore
Deep reinforcement learning for Pacman

Bachelor student project
Learning to play Pacman

Goal

• Learn to play Pacman by trial and error

• Apply policy gradient methods to learn neural network policy $\pi_{\theta} : \mathcal{S} \rightarrow \Delta_{\mathcal{A}}$
Learning to play Pacman

Timeline

- Week 1
  - Learn about policy gradient
- Week 14
  - Implement environment
  - Learn to navigate through the environment
  - Learn to play Pacman

Requirements

- Strong coding abilities in python (ideally experience with PyTorch)
- Solid math background (analysis and probability theory)
- Teamwork
L – lab CREATE
Can we leverage LLMs to accelerate the design process?

Accelerating the design of gripping solutions

One way to build a gripper for handling crops would be to use silicone or rubber, which are both soft and flexible, helping to reduce the risk of crushing the crops.

Overall, a Dynamixel motor is suitable for actuating a gripper for picking tomatoes.

Here is an example of how you might use Python to control a Dynamixel motor:

```python
import pyDynamixel

pyDynamixel.Dynamixel(port='COM3')
dynamixel.set_torque_limit(1.5)
dynamixel.set_goal_position(0.3)
```

One possible shape for a gripper that is designed to grasp tomatoes could be a round or oval shape that is slightly larger than the tomato.

One way to connect the oval shape of a gripper to a motor would be to use a gear or pulley system. This could involve attaching a pulley to the output shaft of the motor, and then connecting the gripper to the pulley using a linkage such as a belt, chain, or cable.

How can we use LLMs/Large AI for design?

• ‘Soft simulation’ – prediction of interactions
• Fabrication (online with 3D printing)
• Closed-loop control with CV
• Auto generation of design?
• Design inspiration?
• Education?

• What are the limitations/ethical considerations?

→ 3 Groups → select which area to work on
M – lab LNET
Laboratory of Nanoscience for Energy Technologies

- Head: Prof. Giulia Tagliabue
Photo-ThermoElectroChemical (P)TEC arrays

**Background:**
- Goal: harvest low-grade wasted heat (≈ 150 °C) which is abundant and ubiquitous.
- Thermoelectric thermopower in conventional technologies lies: tens of μV/K;
- Thermo-Electrochemical (TEC) thermopower: tens of mV/K;
- Use of Quasi-solid (Hydrogel) TEC are a promising alternative to liquid:
  - Lower heat transfer;
  - Easier packaging;
  - Tunable mechanical and chemical properties.

**Current Status:**
- TEC hydrogel available and fully characterized;
- (P)TEC are the next step to exploit also solar radiation;
- (P)TEC prototype available;
- Strategy of enhancement by photocatalytic processes.

**AIM of the project:**
- Design and analyze an experimental setup to encapsulates an array of TEC quasi-solid cells.
- Achieve an output voltage of approximately 1V and a current around 1mA.
- Analyse performances using (P)TEC and photocatalitically enhanced TEC;

Reference contact: matteo.bevione@epfl.ch  Professor: giulia.tagliabue@epfl.ch  Laboratory of Nanoscience for Energy Technologies
Plasmonic Hydrogels for Evaporation in Hydrovoltaic Devices

Background:
- ≈ 10% of the global population live in countries with high or medium critical water stress;
- ≈ 2 billion people worldwide lacking access to clean drinking water due to overexploitation and environmental factors.

How to address the issue:
- Plasmonic materials have improved light absorption and photo-thermal capabilities;
- Hydrogels have emerged as a promising tool for achieving efficient water evaporation;
- Hydrogels present an interesting platform for incorporating nanoparticles;

AIM of the project:
- Design and build an experimental setup to precisely measure photothermal effects on evaporation;
- Evaluate the effectiveness of various hydrogel materials and applicability to hydrovoltaic devices for electricity generation;
- Examine and analyze factors influencing evaporation: e.g hydrogen composition, geometry, environmental conditions and plasmonic materials hybrids;

Reference contact: matteo.bevione@epfl.ch, tarique.anwar@epfl.ch - Professor: giulia.tagliabue@epfl.ch - Laboratory of Nanoscience for Energy Technologies
Accurate temperature measurement at the nanoscale level is crucial for various applications, including photo-thermal therapies, sub-cellular biology, micro-fluidics, and artificial photosynthesis.

At LNET, we have developed nanoscale electrochemical probes tailored for scanning probe microscopies.

We are seeking a team to contribute to the design, fabrication, testing, and calibration of these nano-probes for thermal measurements. Successful participation in this project could lead to the opportunity for a research paper publication.
Accurate temperature measurement at the nanoscale level is crucial for various applications, including photo-thermal therapies, sub-cellular biology, micro-fluidics, and artificial photosynthesis.

At LNET, we have developed nanoscale electrochemical probes tailored for scanning probe microscopies.

We are looking a team to firstly work on the simple design of a polymer coating set-up, and to secondly do some automatization in terms of temperature control and automatic movement of the electrode during the coating process.
Constructing micro-fluidic chamber for solar redox flow cells

- Solar redox flow battery can realize harvest and storage of solar energy in one device. Its performance is dependent on various factors including cell geometry, dimensions of the flow field channels, flow rate, redox couples concentration, PH value, charge/discharge rate, etc.

The main task of the project is:
- Construction of a flow mode solar redox cell with microfluidic chamber to further improve mass transport within electrolyte/electrode interface. We already have the solar redox flow cell and micro-chamber prototype, this project is aiming to improve the prototype and perform basic test.

Contact: jiaming.ma@epfl.ch
ziyan.pan@epfl.ch
giulia.tagliabue@epfl.ch
N – SGM-GE
Apprendre avec ses mains (1/2)

- **Etude du fonctionnement de machines anciennes**

  - **Objectifs**
    - Analyse des fonctions, en mode « boîte-noire »
    - Brainstorming & concepts de solutions techniques
    - Démontage & analyse des solutions de conception, nettoyage et remontage
    - Modélisation des lois de comportements, etc. (TBD)

  - **Nombre d’étudiants**
    - 2 par machine
Apprendre avec ses mains (2/2)

- **Etude de moteurs thermiques**

  - **Objectifs**
    - Analyse du fonctionnement et des spécificités fonctionnelles de chaque moteur étudié
    - Mesure / métrologie + modélisation CATIA du micromoteur (3D + 2D d’assemblage)
    - Analyses théoriques & confrontation à la TDS

  - **Nombre d’étudiants**
    - 3 (en tout)
Cadre de travail

• **Moyens à disposition pour les 2 projets « AASM »**
  – Machines d’étude
  – Une salle avec outillage (pour monter / démonter)

• **Mode d’encadrement**
  – Séance kickoff en semaine 1
  – 3 revues techniques en cours de semestre (sem. 4-5 + 9-10 + 14)
    + Séances ponctuelles à la demande (vous ou moi !)

• **Mode d’évaluation**
  – Évaluation continue durant le semestre
  – Capacité à maintenir les fonctionnalités des machines après remontage / remise en état de certaines machines
  – Rapport & soutenance (à préciser)
O – Swiss Solar Boat
The association

+ 70 Students

12 Sections from EPFL represented

9 Partner laboratories
New horizons 2025-2026

The REF:

- Renewable Energy Foiler
- Powered by hydrogen and solar energy
- 3 passengers
- Autonomy: 160 km
- Cruising speed: 25kts
- Top speed: 35kts
Design of the REF (Renewable Energy Foiler)
Design and production of the trailer

Project’s description:

Design and production of a trailer for the REF allowing road transport and put the boat on the water.
Preparation of the floats’ production

Project’s description:

Preparation for float production, assembly method with the main hull, and manufacturing.
Design and mock-up of the cockpit

Project’s description:

Production of a life-sized mock-up of the cockpit, optimization of its components and its ergonomics, and preparation for production (seat, dashboard, windshield).
Boat’s drag analysis

Project’s description:

Fluid simulation analysis of the gantry, rear assembly, and platform for various scenarios and behaviors (slamming, takeoff, steady flight, slalom etc).
Actuation system design

Project’s description:

Designing the actuation systems for the flaps, gantry, and rear assembly, and providing support for the mechanical actuation project.
Bachelor projects (Spring 2024):

- Design and production of the trailer
- Preparation of the floats’ production
- Design and mock-up of the cockpit
- Boat’s drag analysis
- Actuation system design
Thank you!
presidence@solar-boat.ch
www.swisssolarboat.ch
+41 76 602 29 01
P – MAKE SP80
SP80 c’est …

Un projet de record du monde de vitesse à la voile à 80 nœuds (150 km/h)

Plus de 80 projets d’étudiants à l’EPFL
Structure du projet

L'association SP80
- Gestion des étudiants en lien avec le projet
- Projet MAKE
- Nouveau projet

L'entreprise SP80
- Gestion de la continuité du projet de record
- Relation avec les partenaires
Et maintenant?
Conception et prototypage d'un module autonome de traction par kite
Projet 1
Châssis et actuateur

- 4-6 personnes

- Design du système de contrôle
- Envoi/récupération autonome du kite
- Dimensionnement/choix des composants mécaniques
Projet 2
Capteurs et contrôle

2-4 personnes

Algorithme de contrôle du kite
Identification des données nécessaires
Implémentation des capteurs adaptés
Q – Racing Team
The Formula Student is a competition during which teams of engineering students compete from all around the world. The objective is to design and build a single seater from A to Z with respect to a special set of rules given by the organizer.

- **Worldwide engineering competition**
- **120 Teams**
- **3 categories**
- **30 countries**
- **Most innovative motorsport category**
SAISON 2022/23 : ARIANE
EBS: Emergency Braking System for Autonomous Vehicles

Nécessaire à la validation des inspections avant le roulage aux compétitions: arrêt à distance avec décélération d’au moins 10m.s⁻²

Compétences et acquis de formation:

- Design Mécanique de Précision
- CAD
- Etanchéité
- Implémentation d’un mécanisme sur une voiture de compétition.
- Analyse de manufacturabilité.
- Optimisation de masse et fiabilité
Chassis : *Test bench torsional rigidity of a composite monocoque*

- La rigidité en torsion du châssis est importante pour savoir si les suspensions sont immobiles et qu’elles puissent travailler optimalement.

- **Objectif du projet** : Designer, produire et tester la rigidité de LRT5

- **Compétences acquise** :
  - CAD Design et dessin 2D
  - Analyse FEM
  - Production des pièces
  - Composite manufacture

Exemple de test bench LRT5
Aerodynamics : Front wing & Rear wing design (2 projects)

Compétences et acquis de formation:

- Design Aérodynamique
- CAD
- Implémentation et analyse de simulations CFD.
- Analyse de manufacturabilité
Merci pour votre attention
R – Rocket Team
Role Description

Context: ERT is aiming to build a bi-liquid rocket which goes to space before the end of the decade. In order to prepare for such a feat, the Team will prove its technology through intermediate rockets that fly at lower altitude. These rockets will be fueled using liquid oxygen and ethanol. There is currently a semester-project dedicated to the design of tanks which will contain the propellant of the next class of rockets. This class consists of a first version of rocket that will compete in the 9km bi-liquid category at EuRoc for 2025 and the second version that will fly at 30km for 2026. Once the design is approved, the next step is to manufacture the tanks. This step itself is quite complex, requiring a project on its own. At the end, tests on the produced tanks shall be done.

Project overview: The current design features tanks that fulfills thermal and mechanical requirements, i.e.: keeping the LOx temperature at -183°C for 8min using external thermal isolation and able to sustain a maximum operating pressure of 60 bars (FoS 2). So, the aim of this project is to continue the work that has been done to produce tanks for liquid oxygen and ethanol. The main focus is to adapt, if possible, or re-design the tanks for a viable production, within the limit of the team’s means. In other words, the tanks must be capable of being produced using conventional production methods at reasonable cost.
What the student will do:
- Literature review
- Finish the conception of the current end caps
- Conception of the external isolation layer
- Selection of the manufacturing steps (sheet metal rolling, welding, machining)
- Pressure tests (isobaric and cyclic with varying temperature)

Student gain: The student will learn how
- to respect the strict requirements of the aerospace industry
- to produce parts that respect cost and resource constraints
- to plan and follow real parts manufacturing with professional workshops
- to perform certification tests for rocketry

A general idea of the tasks unfolding:
- [5 weeks]: Conception
- [5 weeks]: Manufacturing
- [4 weeks]: Test

Skills involved:
- General mechanical knowledge
- CAD
- Material selection
- Mechanical simulation
- Thermal simulation
S – Xplore
EPFL Xplore - Pôle de Recherche (XRE)

Section Génie Mécanique  07.12.2023

DELINEAU Loïc
loic.delineau@epfl-xplore.ch
Qui suis-je?

Loïc Delineau
Vice-President of Research & Education
Structure de l’association

Management

XRC (Xplore Rover Challenge)
- Pôle d’éducation
- 33 étudiants BA
- 8 équipes, 8 rovers

ERC (European Rover Challenge)
- Pôle de compétition
- 50 étudiants BA & MA
- 3 années, 3 rovers

XRE (Xplore Research)
- Pôle de R&D
- 22 étudiants MA
- 3 projets
Xplore Rover Challenge (XRC)

XRC
(Xplore Rover Challenge)

Pôle d’éducation

33 étudiants BA
8 équipes, 8 rovers

Microver - 2023

loic.delineau@epfl-xplore.ch
Xplore Rover Challenge (XRC)
Xplore Rover Challenge (XRC)

8 Teams
8 Rovers
33 Students

loic.delineau@epfl-xplore.ch
European Rover Challenge (ERC)

ERC
(European Rover Challenge)

Pôle de compétition

50 étudiants BA & MA
3 années, 3 rovers

Argos - 2021
Astra - 2022
Kerby - 2023

loic.delineau@epfl-xplore.ch
European Rover Challenge (ERC)

ERC 2023

3rd Place out of 60 Teams

Best Prize in Manipulation

loic.delineau@epfl-xplore.ch
Xplore Research (XRE)

XRE
(Xplore Research)

Pôle de R&D

22 étudiants MA
3 projets

Chienpanzé
(Legged Robot)

Wall-E
(Recyclage Impressions 3D FDM)

Xplore AI
(AI Solutions to Xplore Problematics)

loic.delineau@epfl-xplore.ch
Xplore Research (XRE) - Chienpanzé

loic.delineau@epfl-xplore.ch
Xplore Research (XRE) - Wall-E

Wall-E
(Recyclage Impressions 3D FDM)
Xplore Research (XRE) - Xplore AI

Xplore AI
(AI Solutions to Xplore Problematics)
Xplore Research (XRE) - Xplore AI

Recognition of Uncommon Objects

Pipeline:

1. Build the model:
   - Data Generation with Isaac Sim
   - Data Formatting for YOLOV8
   - Train and test the model locally

2. To do:
   - Frame recording mechanism for the uncommon objects during the videos
   - Test the model on the rover

3. Done
Semester Projects List

25 Semester Projects
Spring 2024

Xplore Research (XRE)

10 ECTS & 6 ECTS in groups

https://go.epfl.ch/xplore-semester-projects
Semester Projects Candidature

25 Semester Projects
Spring 2024

Xplore Research (XRE)

Postulation sur Google Forms

https://go.epfl.ch/xplore-semester-projects-candidature
Xplore Research (XRE) - Xplore AI

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Semester Projects Candidature Form

https://go.epfl.ch/xplore-semester-projects-candidature
EPFL CARBON TEAM
Lausanne, Switzerland

STATUS
Registered Team

PROJECT SOLUTION
Air Solution
Rocks Solution

TOP ACHIEVEMENT
PHASE 2 ACTIVE TEAM

OTHER ACHIEVEMENTS
TOP 60
QUALIFIED COMPETITOR

We are a team of students from EPFL (École Polytechnique Fédérale de Lausanne) who will be developing a solution for Direct Air Capture (DAC). We will create an air flow then filter out

Link to the competition web site Xprize Carbon Removal
Project 1: Air flow optimization for adsorbent bed (max 5 students)

Link to a more detailed description of the project
Project 2: Heat transfer optimization for adsorbent bed (max 5 students)

Link to a more detailed description of the project
Project 3: Improve the design of a spiral wound graphene membrane module (max 5 students)

Link to a more detailed description of the project
Project 4: Build a point source carbon capture unit  
(max 5 students)

Link to a more detailed description of the project
Adsorbent process

410 ppm CO₂
78% N₂, 21% O₂, 0.93% Ar and H₂O, He, CH₄

Adsorption
1 bar, 25 °C

Desorption
1 bar, 80-100 °C

Membrane process

1 bar, 25 °C

Storage tank
0.5-1 % CO₂

CO₂ > 95%