Projects for Industrial Innovation (Pi²)

These Projects concerns students from the 10 majors of ESILV:

- Data & Artificial Intelligence
- IoT & Security
- Cybersecurity & Cloud Computing
- Financial engineering & Quantitative finance
- Fintech
- Actuarial science
- Modeling & computational mechanics
- Industry 4.0
- Energy and sustainable cities
- Health Engineering & Biotechnology

Operation and organisation :

- *The subjects are deposited by the partners on a platform at the beginning of September at the latest. The submission consists of a short description of the topic and the partner.*
- *The partners are invited to pitch their topic in early September.*
- *Each student positions himself on several subjects, then we constitute the teams by respecting as well as possible the wishes of the students and the needs of the partner.*
- *An Esilv project team is made up of 5 students at first. But if the volume of work on the project requires it, a team can be made up of more than 5 students.*
- *A project topic can address competences of several majors.*
  In this case, the team will include students from the different majors involved.
- *The amount of work required of students is 10 hours per week per student, or 50 hours per week for a standard team.*
- *The partner commits to do the kick off, then to follow the team until the end of the project. The follow-up is planned for one hour every 15 days (face-to-face, remote, email, ...) to be adapted according to the needs. The closing will take place at the end of the project at the school.*
- *The partner undertakes to provide the material and elements necessary for the successful completion of the project. The partner keeps the product at the end of the project.*
- *The school undertakes to provide the necessary scientific and technical support if necessary.*
- *The partner undertakes to answer the regular questionnaires of the school (approximately one per month) in order to allow us to follow the evolution of the project and to intervene if necessary.*
- *The partner agrees to participate in the closing meeting at the end of the project at the school (time slot fixed at the beginning of the project).*

- *The deliverables of the project are fixed during the kick off by the partner.*
- *A partner can have several teams working together on the same project if each team has enough time to work 50 hours per week.*
- *A partner may have several teams " in competition " on the same project.*
- *Projects start in mid-September and run until the end of January for A5 projects, and start in the end of September and run until the end of March for A4 projects.*
- *The call for projects takes place in July.*

The A4 go on an internship from April to September at the end of the project, which gives ***the opportunity to propose in the subject of the project an extension in internship****. Same in A5, but their internship is often a pre-employment internship (departure early February, for 6 months).*

The topics are offered to all students (A4 and A5) when the projects are presented, but the A5 students choose first. So if you prefer a team of A5 students, but are still willing to have a team of A4 students, you have to submit your project to A5 AND A4. Teams cannot mix Year 4 and Year 5 students BUT you can have Year 4 AND Year 5 teams on the same project if you want multiple teams.

The goal of the Pi² is to push the students to appropriate a new subject in a very professional context through the relationship with the industrial partner. They must acquire new skills, both in Hard Skills and Soft Skills.

The Pi² remains a pedagogical project whose partner must be able to obtain a real benefit. The internship then makes it possible to push the work further (ex: putting into production).

Main tasks that can be requested in Pi²:

1. Realization of a state of the art.
2. Comparative study of technical solutions to a given problem (feasibility, cost, etc ...).
3. Study of a given problem and proposition of an argumentative solution.
4. Realization of a Proof Of Concept.
5. Realization of technical tasks in a major project of the Partner.

The students of each major develop in A4, A5 specific technical skills. A project may be transverse to several majors, i.e. the team may consist of different major students.

The purpose of the projects is to enable them to use these skills as well as to encourage them to acquire new ones. The discovery and the autonomous implementation of new technical fields is an integral part of the skills they must acquire.

Depending on the majors, here are some technical areas to focus on:

- Data & Artificial Intelligence
  - Cloud Computing
  - Machine Learning/Deep Learning
  - Data Mining
  - Devops
  - AR/VR

- Data visualisation
- Web development (node/angular)
- Big Data

- IoT & Security
  - IoT-IIoT (networks, WSN, M2M, etc…)
  - Edge computing
  - Intelligence of things
  - Embedded DevSec
  - Cybersecurity
  - Cyber resiliency
  - Security by design

- Cybersecurity & Cloud Computing
  - DevSecOps/DevOps
  - DevSec
  - Cloud Computing
  - OWASP 10
  - Pentesting Web
  - Virtualisation et déploiement sécurisé
  - Cybersécurité
  - Cyber résilience
- Financial engineering & Quantitative finance
  - Pricing of financial instruments : technical design and implementation
  - Quantitative analysis or statistical methods of data
  - Time series analysis
  - Asset management, analysis and portfolio management
  - Development of innovative financial products
  - Big data, ML and IA for finance
  - Robotrading, roboadvisory, design / trading platform development

- Actuarial science
  - Cyber Insurance
  - Insurance fraud
  - Insurtech

- Fintech
  - Cryptocurrencies (Bitcoin, Ethereum, …)
  - Blockchain
  - DLT and applications

- Modeling & computational mechanics
  - Numerical modeling of structures

- Modeling complex systems
- Fluid mechanics and simulations
- Multidisciplinary optimization and reliability

- Industry 4.0
  - Mechatronics, robotics, cobotics
  - Sensors & metrology
  - Real time embedded software and systems
  - Avionics and control systems
  - Industrial Systems Engineering
  - Multidisciplinary optimization and reliability

- Energy and sustainable cities
  - Study, sizing of renewable installations
  - Energy efficiency study
  - Sensors / IoT
  - Embedded systems
  - Sustainable development
  - Machine Learning
  - Systems modeling
  - Smart buildings
  - Smart cities

- Health Engineering & Biotechnology
  - Physiological sensors, instrumentation and metrology
  - Modeling of physiological phenomena
  - Modeling of complex systems
  - Machine Learning
  - E-health
  - Biomaterials
  - Bionics
  - Neurological interfaces
  - Signal processing and image processing
  - Wearable connected objects