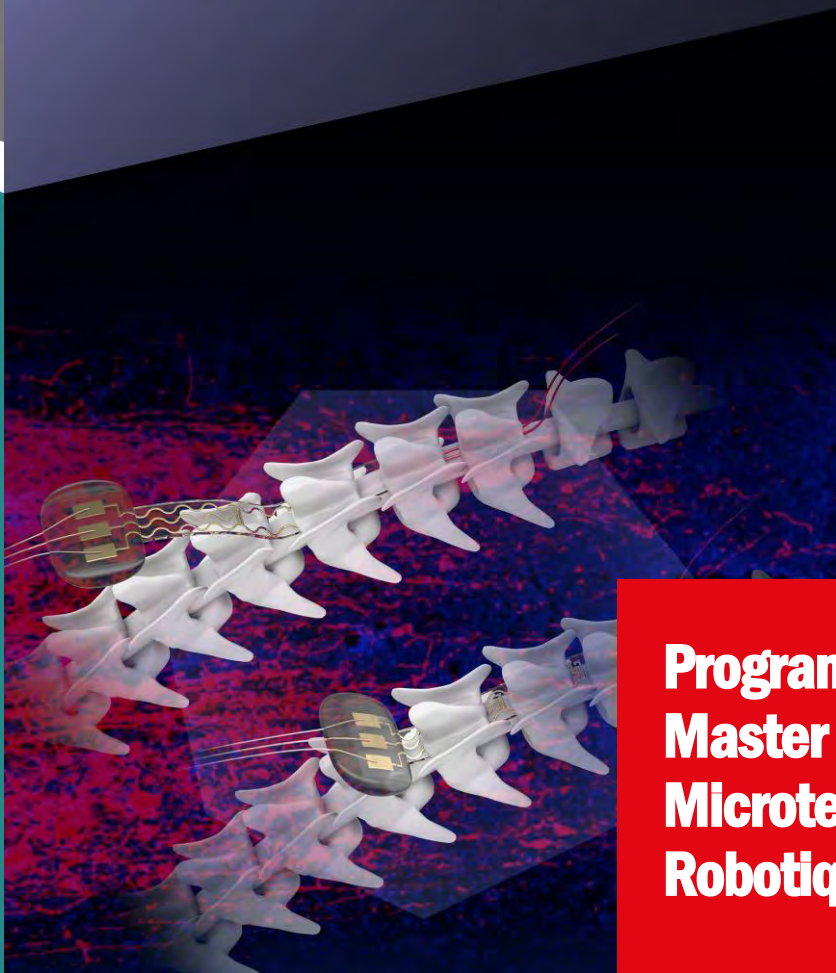


7 mars
2022

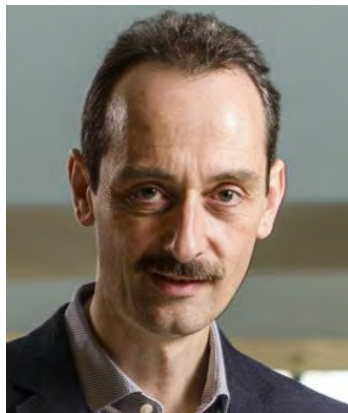
Switchtube
channel of the
section



**Programmes
Master
Microtechnique
Robotique**



Prof. Francesco Mondada
Responsable Master Robotique



Prof. Christophe Moser
Directeur de section



Dr. Sebastian Gautsch²
Adjoint de section



Prof. Olivier Martin
Responsable Mineur Photonique



Prof. Philippe Renaud
Responsable Mineur Technologies biomédicales

Témoignage Alumni



Damien Wittwer · 1st
BU Management | Advisory Board



Mecatronic systems

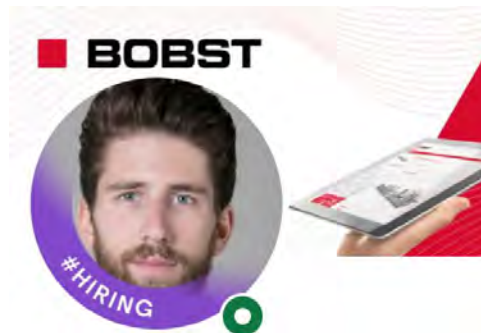


Adrien Briod · 2nd
Co-founder & CTO of Flyability SA



Flyability SA

Mobile robotics



Leonard Badet · 1st
Head of Group Technology at BOBST



Machine emballage
industriel

18h00 Introduction, aspects communs des 2 programmes

18h15 Master Robotique, Q&A

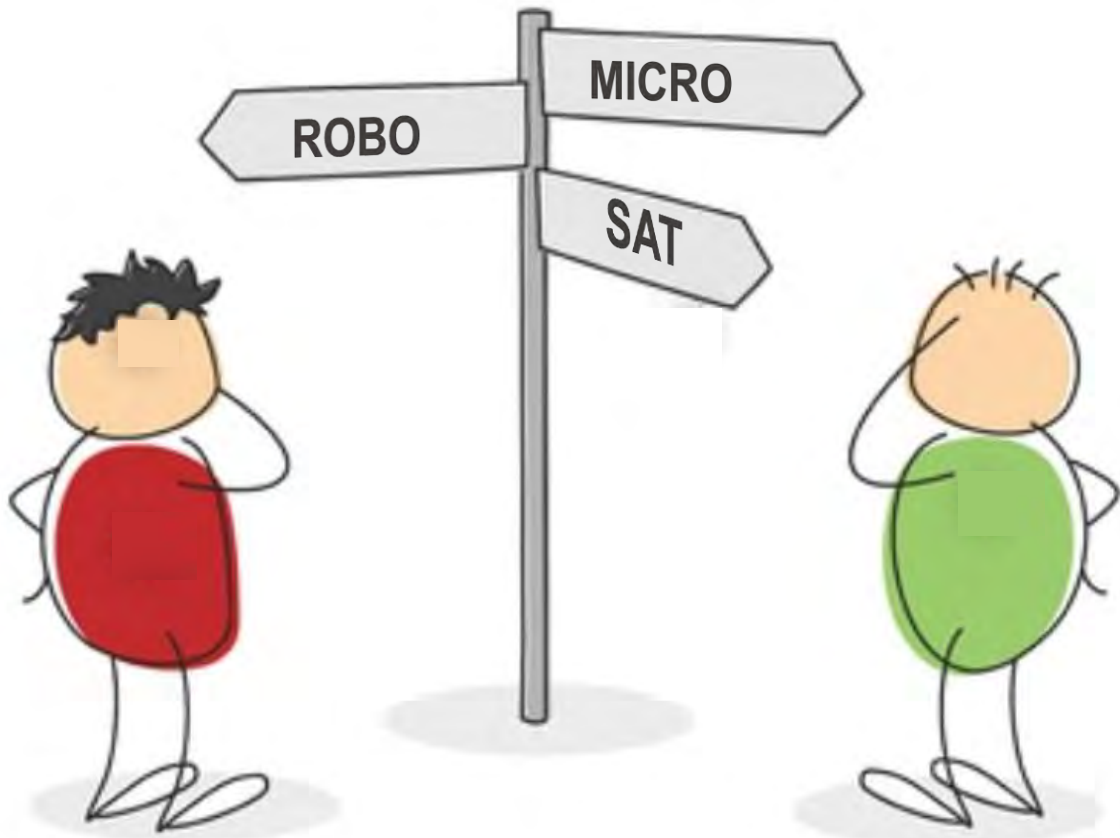
18h30 Master Microtechnique, Q&A

18h45 Mineur Photonique, Q&A

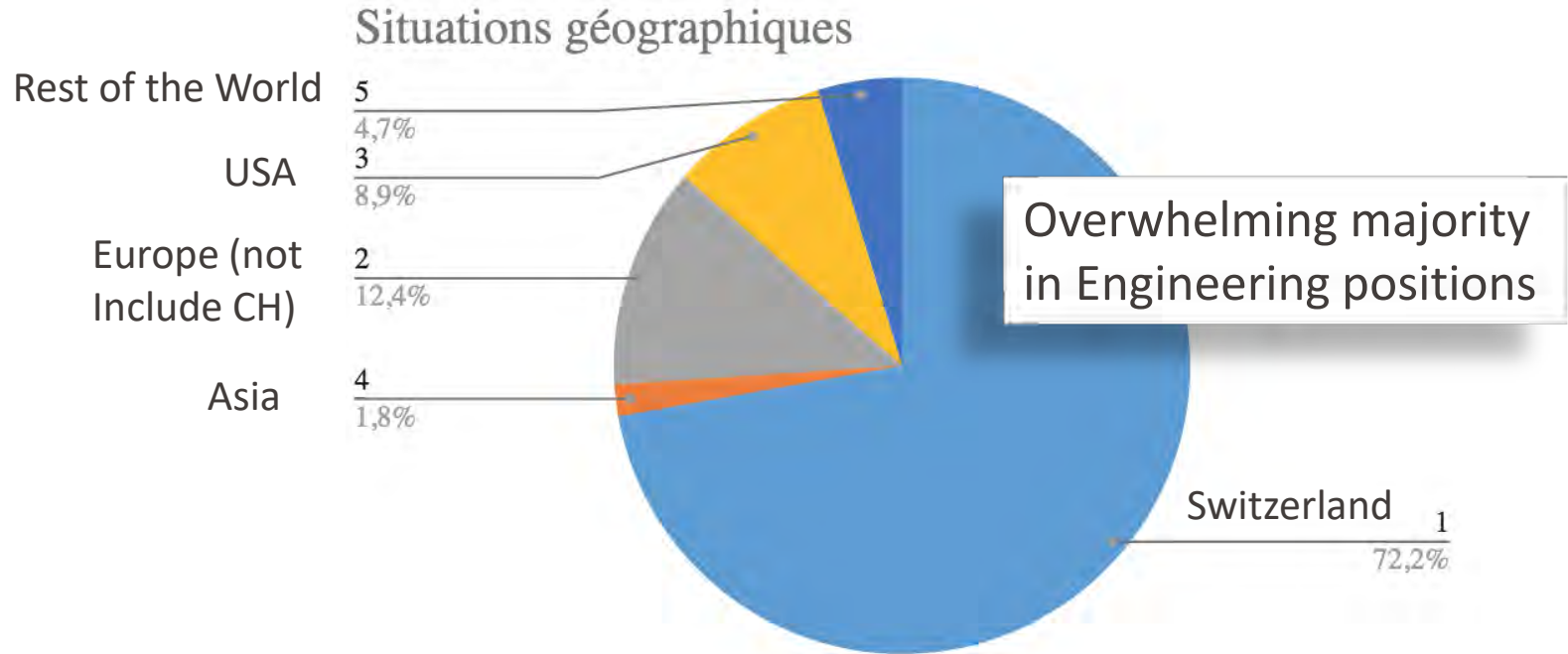
18h55 Mineur Technologies Biomédicales, Q&A

19h05 Comment faire son plan d'études master, Q&A

19h20 Autres sources et infos à télécharger, conclusions

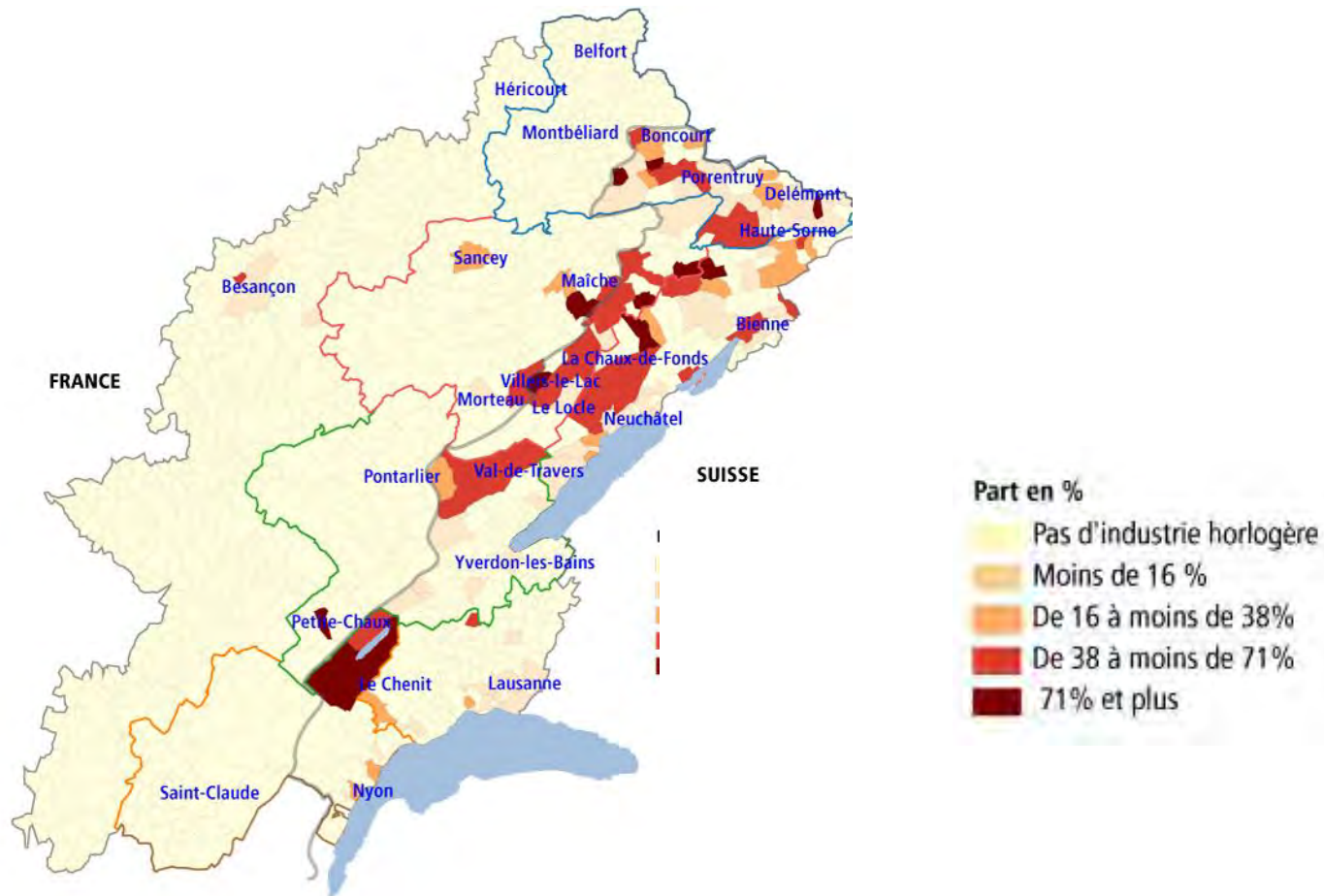


WHERE ARE SMT GRADUATES GOING AFTER THE MASTER ?



Source: SMT alumni list from 2010 to 2019: **200** out of 689 randomly selected – searched via **Linked In**

Industrie horlogère dans l'emploi industriel (2017)



Histoire de la Microtechnique

Les Automates Jaquet-Droz
(*La Chaux-de-Fonds* - 1768 et 1774)



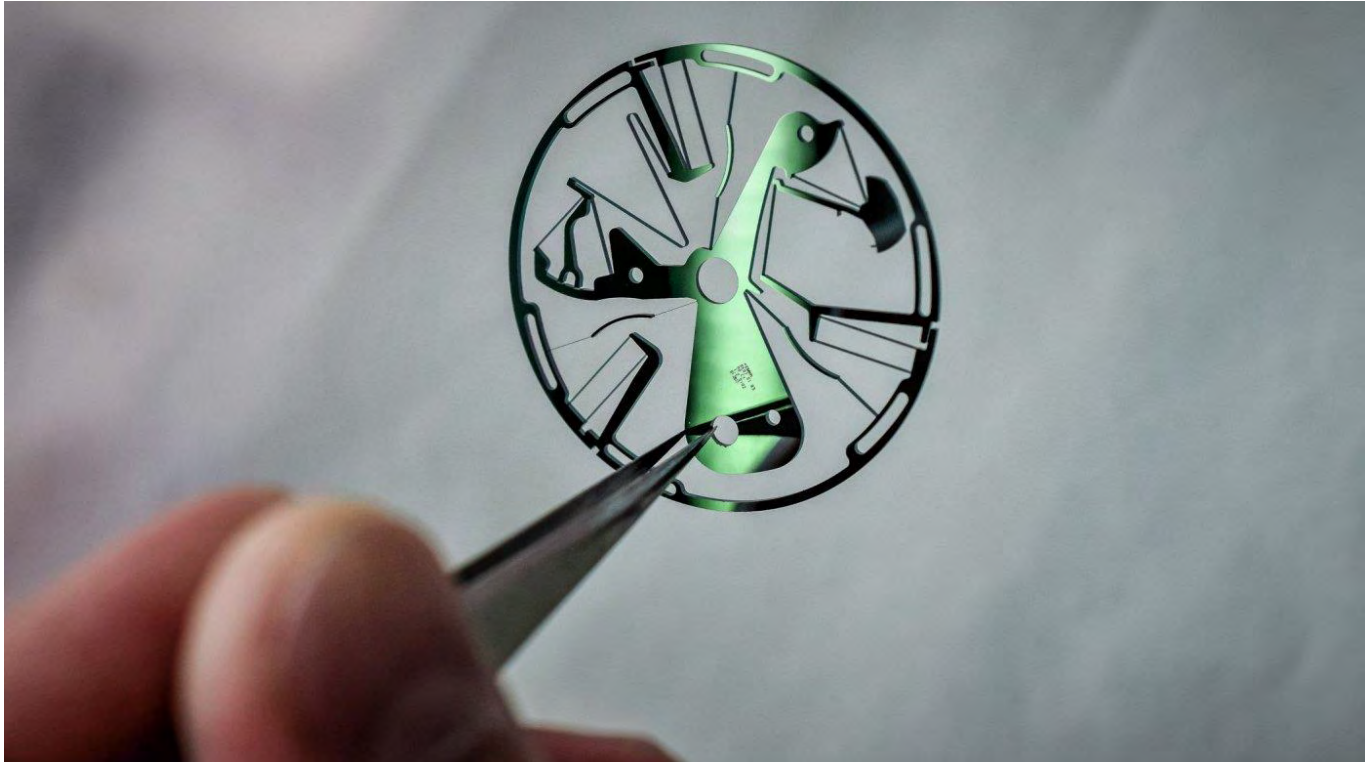
«Ce sont de lointains ancêtres
des robots modernes»

*Le dessinateur
(2000 pièces)*



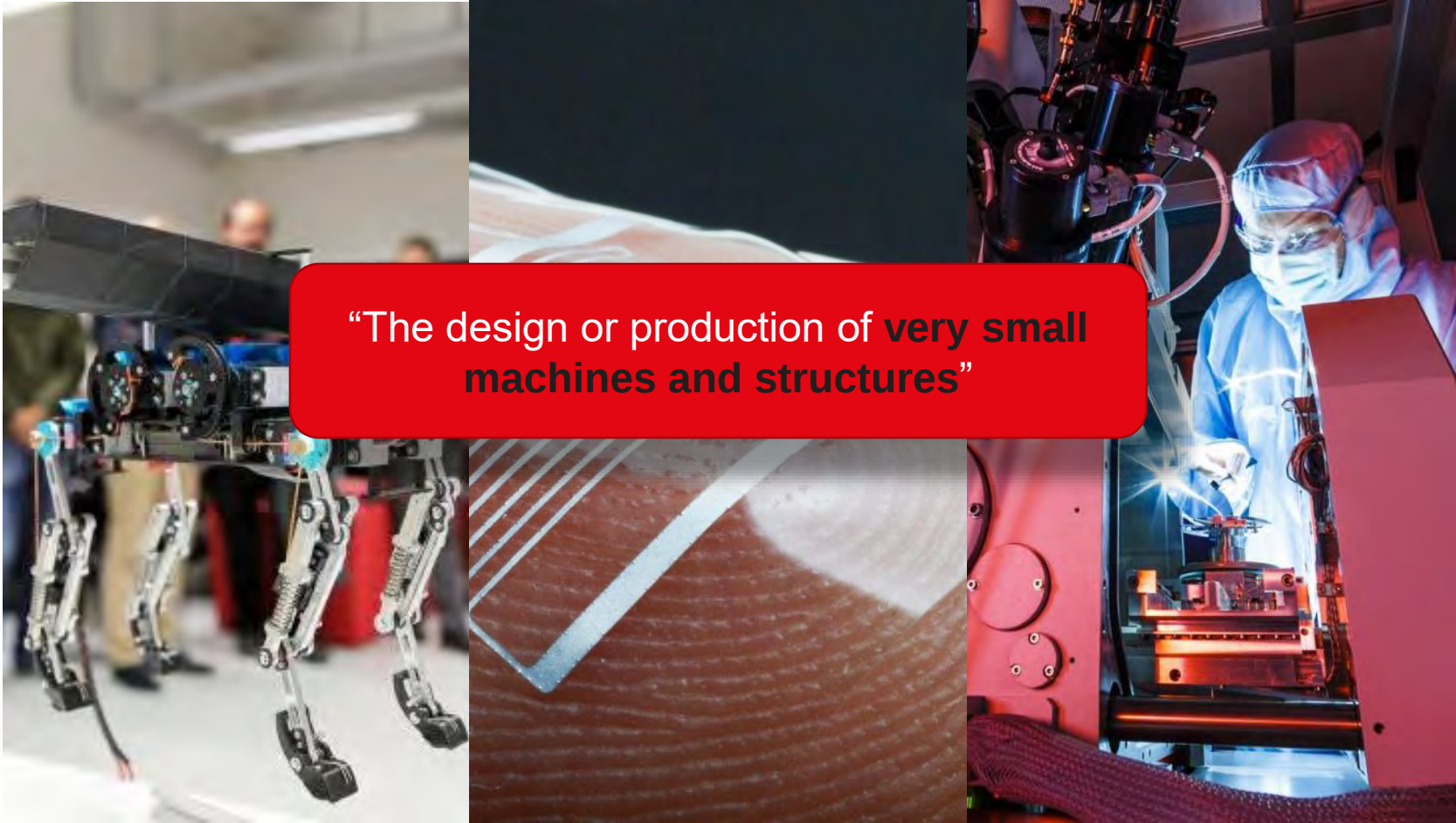
Histoire de la Microtechnique

Généralisation des techniques de Microfabrication et
du silicium dans le monde de l'horlogerie

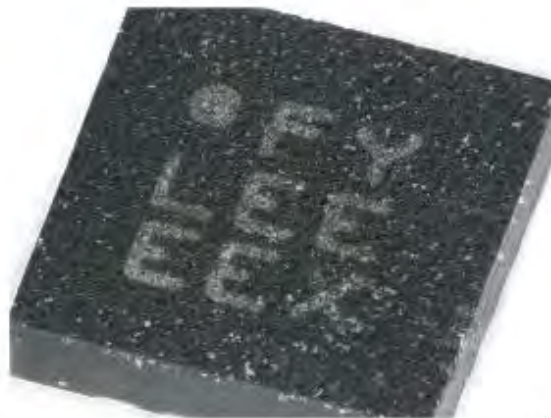
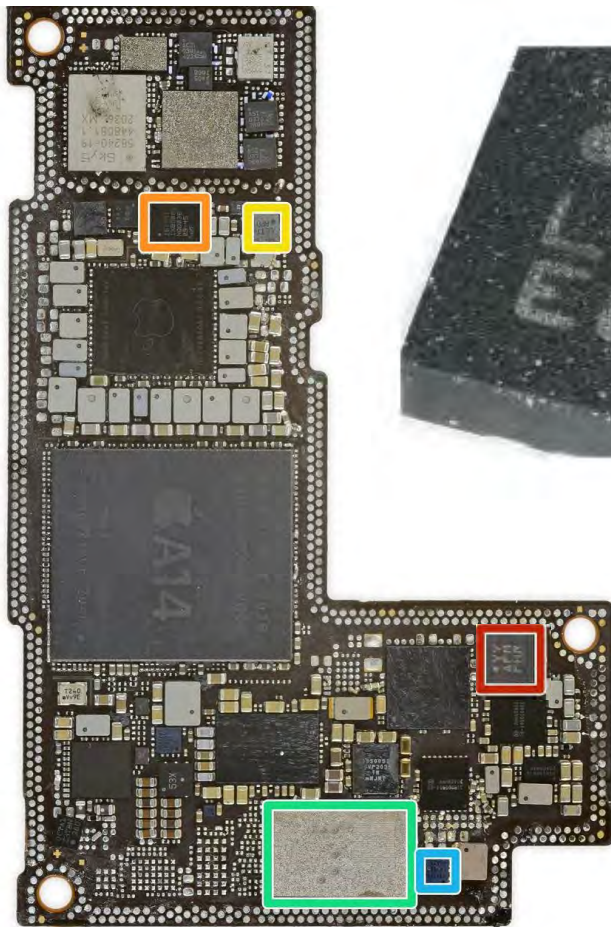


La réponse de Google search «Microtechnique»

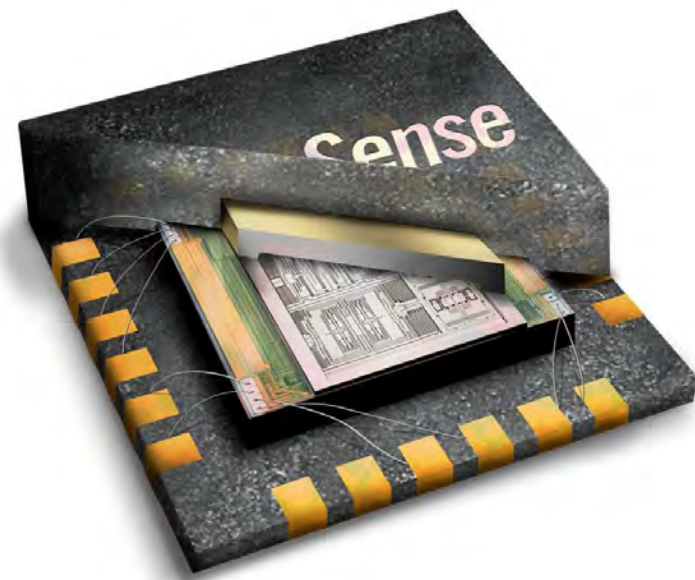
“The design or production of very small machines and structures”



Capteurs de mouvements - Microsystèmes



Accéléromètres: X, Y, Z
Gyroscope: Roll, Pitch, Yaw
Magnétomètre: X, Y, Z
GPS



Drone stabilisé, caméra stabilisée, ...



SHOT ON
MAVIC 2 PRO



Portrait de la Microtechnique en 10min

28



ROBOTICS

Robotique industrielle

Robotique mobile

Robotique médicale



Mineurs

Technologies
Biomédicales

Photonique

Ingénierie pour
la durabilité

Machine learning

spatiales

Intelligence artificielle

la technologie

Energie

Internet of Things

Sciences et
Ingénierie
computationnelles

Neuroprothétiques

Stage en entreprise

MICROENGINEERING

Micro/Nanosystems

Photonics

Production and Advanced
Manufacturing



Interdisciplinary Minor	Section	Director	Microengineering	Robotics
Data and Internet of Things	EL	Atienza D.	R	
Ingénierie pour la durabilité	SIE	Gilliéron P.-Y./Leterrier Y.	R	R
Énergie	GM	Maréchal F.	R	
Management de la technologie et entrepreneuriat	MTE	de Rassenfosse G.	R	
Neuroprothétiques	SV	Blanke O.		R
Science et ingénierie computationnelles	MA	Pouchon O.	R	
Photonique	MT	Martin O.	R	R
Technologies biomédicales	MT	Renaud Ph.	R	R
Technologies spatiales	EL	Kneib J.-P.	R	R
Disciplinary Minor	Section	Director	Microengineering	Robotics
Computer science	IN	Eileen Hazboun		R
R: Recommended in study plan				

Moyens d'apprentissage



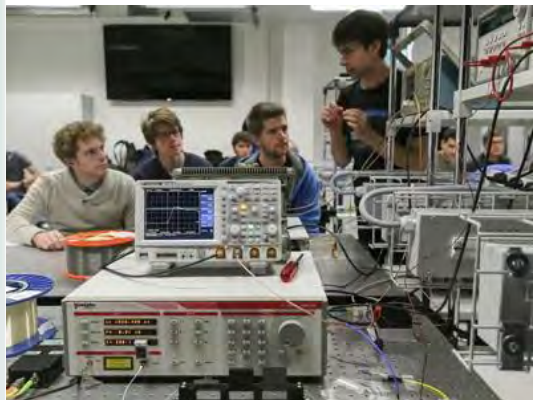
Cours ex cathedra



Exercices



Travail individuel



Travaux pratiques

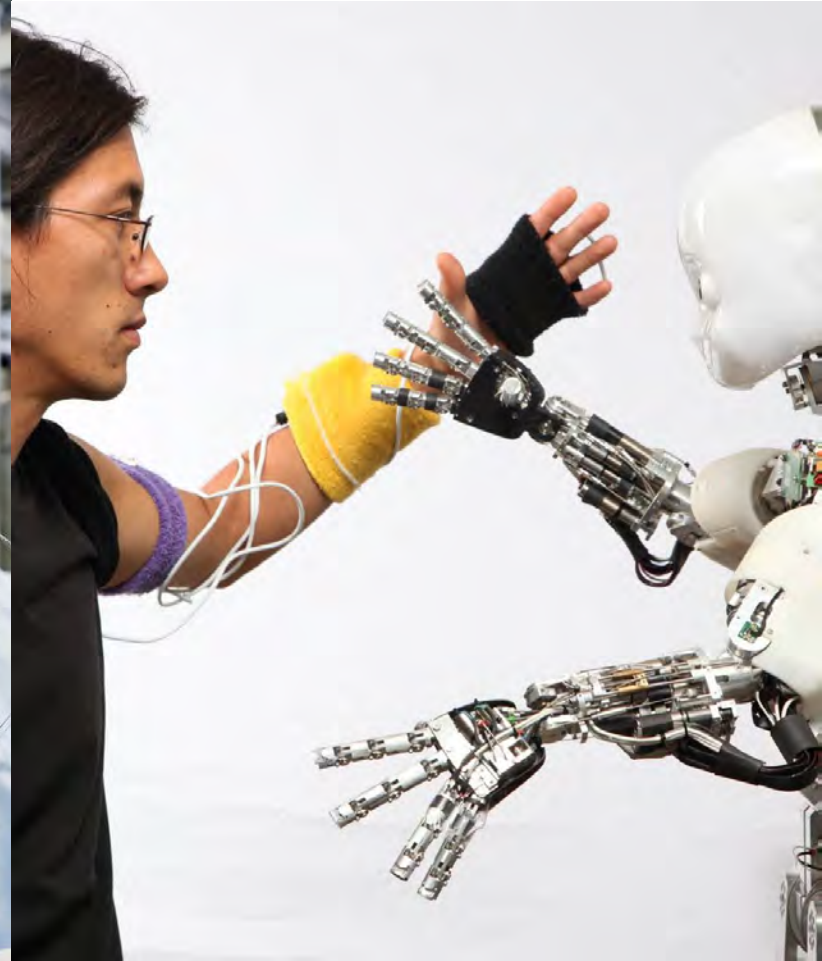


Projets multidisciplinaires



Projets de recherche

2 Projets de semestre



Lignes directrices PDS

Semester project guidelines

- [Find a project](#)
- [Registration](#)
- [Project description](#)
- [Dates](#)
- [Evaluation method](#)

[Find a project](#)

We recommend to look for your project at the end of the previous semester. Browse through the following pages

- **lab webpages dedicated to projects**
- **Extraction list from the IS-A project portal**

These project lists are non-exhaustive and other projects can be found by contacting directly the labs of interest.

Reserve your project as early as possible. Meet with the Professor in charge and define the objectives and work to be accomplished.

IMPORTANT : If the Professor proposing the project is not affiliated with Microengineering section, the project has to be submitted for validation to **sebastian.gautsch@epfl.ch**





MAKE: Les projets d'étudiants – X'PLORE



MAKE: Les projets d'étudiants – EPFL Rocket team



Quoi de microtechnique à bord d'un Rover?

Electronique

Electrotechnique I+II: BA1-2
Electronique I+II: BA3-4
Systèmes logiques: BA3
Microcontrôleurs: BA4

Software

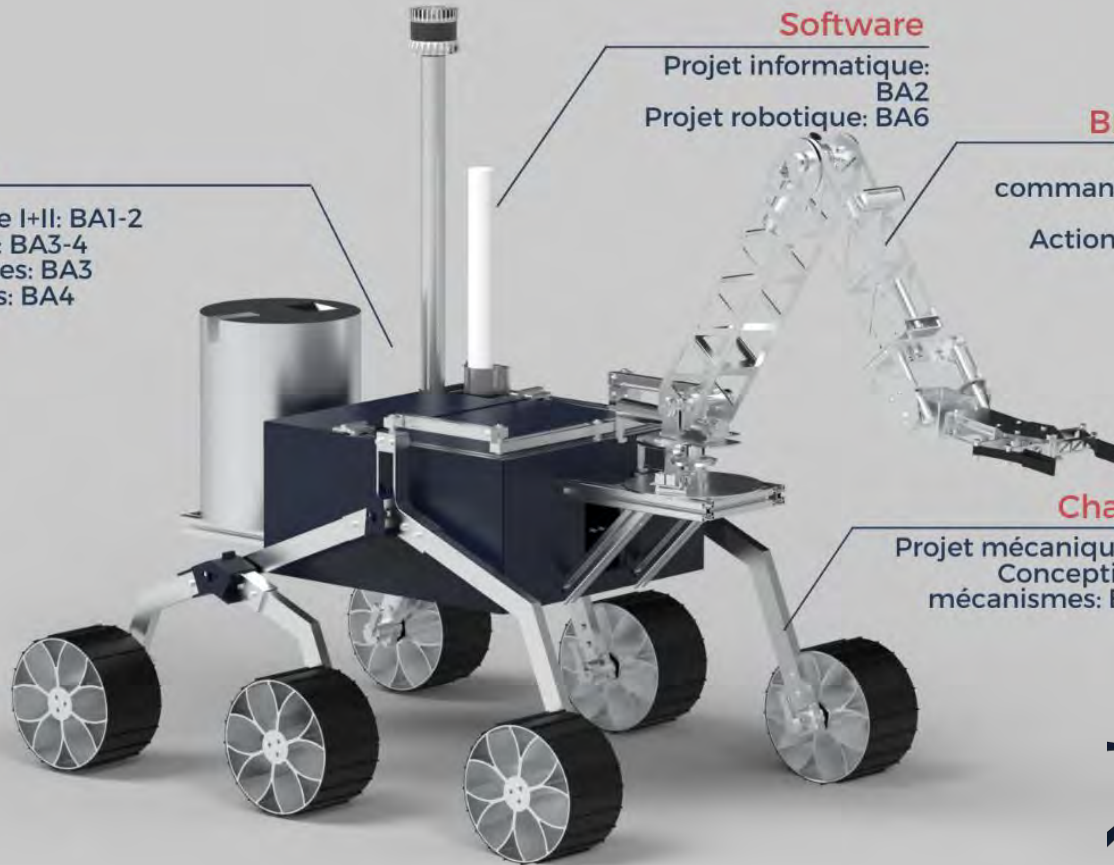
Projet informatique: BA2
Projet robotique: BA6

Bras robotique

Automatique et
commandes numériques: BA5
Actionneurs I+II: BA5-6

Chassis

Projet mécanique: BA1
Conception de
mécanismes: BA3-4.



Stage en entreprise

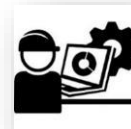


<https://sti.epfl.ch/wp-content/uploads/2021/11/SMT-Internships-student-2021.pdf>

Mandatory Internship or Master Project in Industry

□ Internship

- Minimum duration of 2 month, up to 6 months
- Immersion into industry
- Familiarize with company processes
- Acquire specific competences
- Apply transversal skills
- Evaluation report by student and industry supervisor

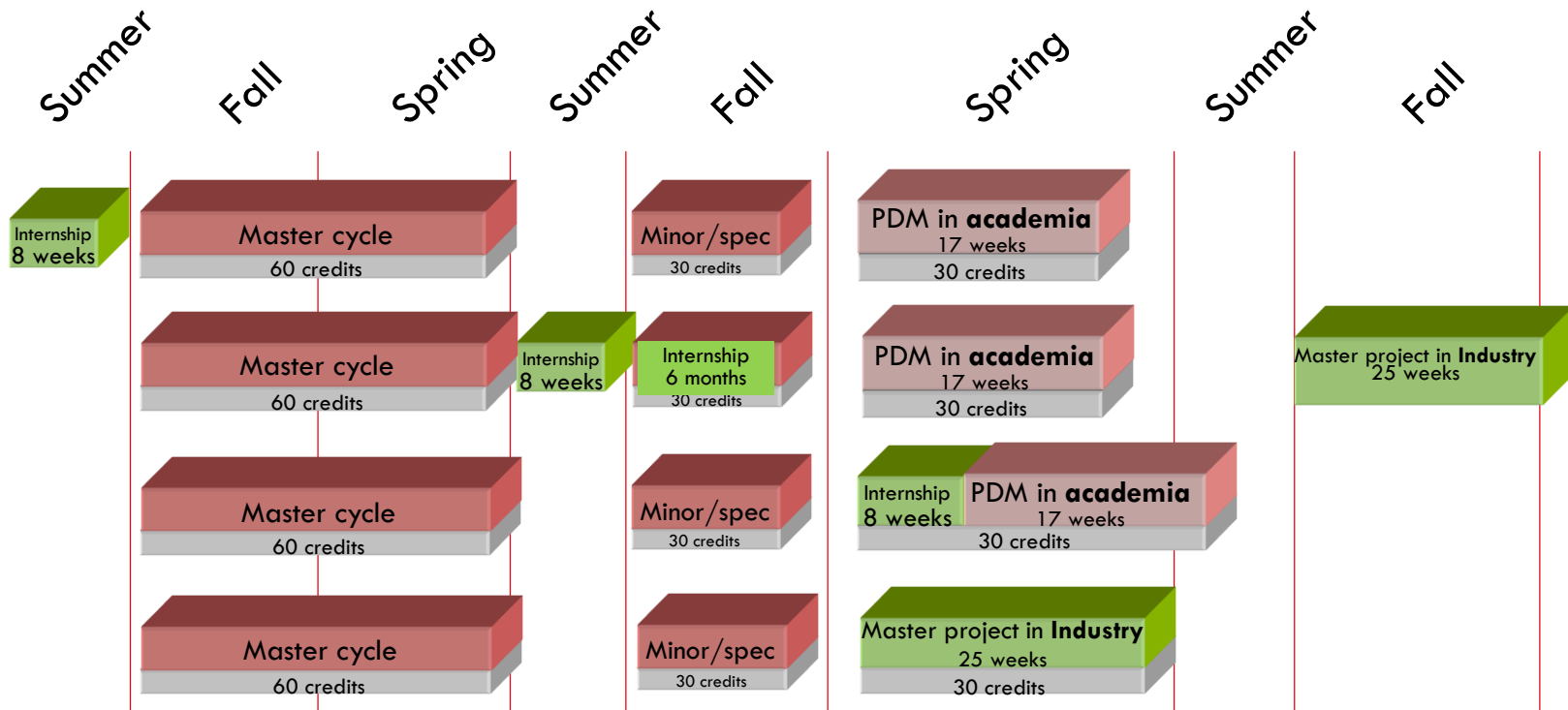


□ Master project in industry

- A research project in the company
- Student applies the competences acquired during his master
- Supervised by a Professor **from his section**
- Written report and oral defense
- **Monthly feedback to Professor**
- 25 week duration (+1 week vacation)



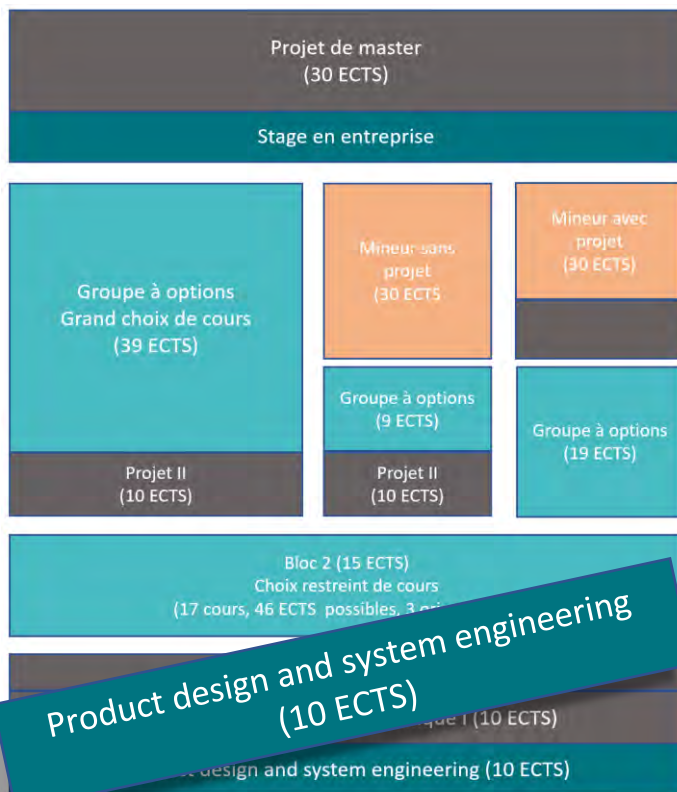
When to place your internship / Master thesis?



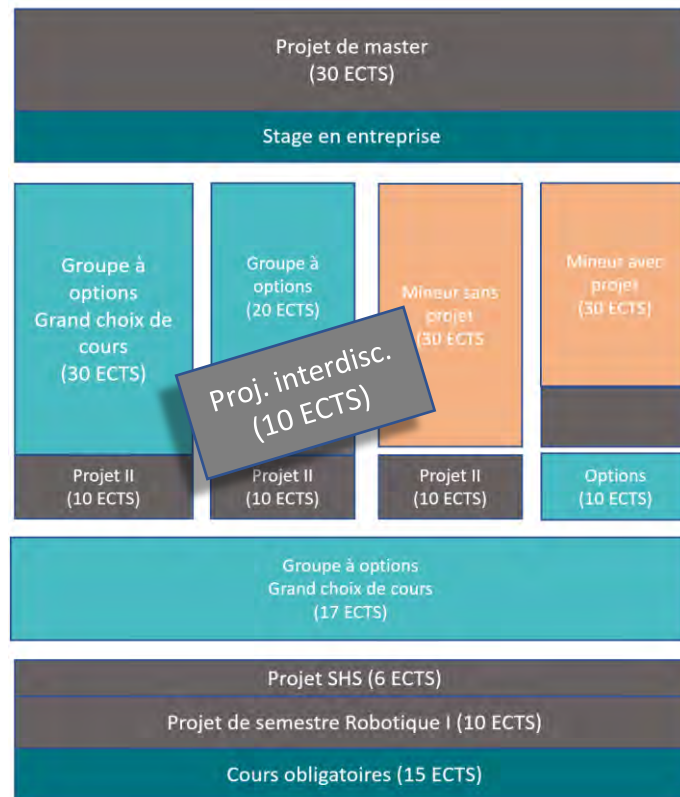
PDM in academia in foreign Universities: 25 weeks

Structure des 2 Masters

Microtechnique



Robotique



7 mars
2022



Programme Master Robotique



Robotics



Robotics



Prof. Aude Billard



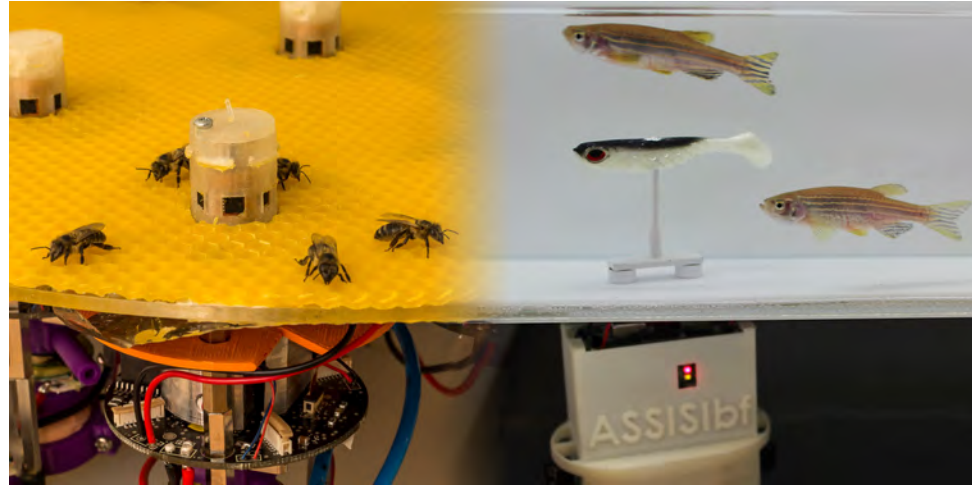
Prof. Dario Floreano



Prof. Auke Ijspeert

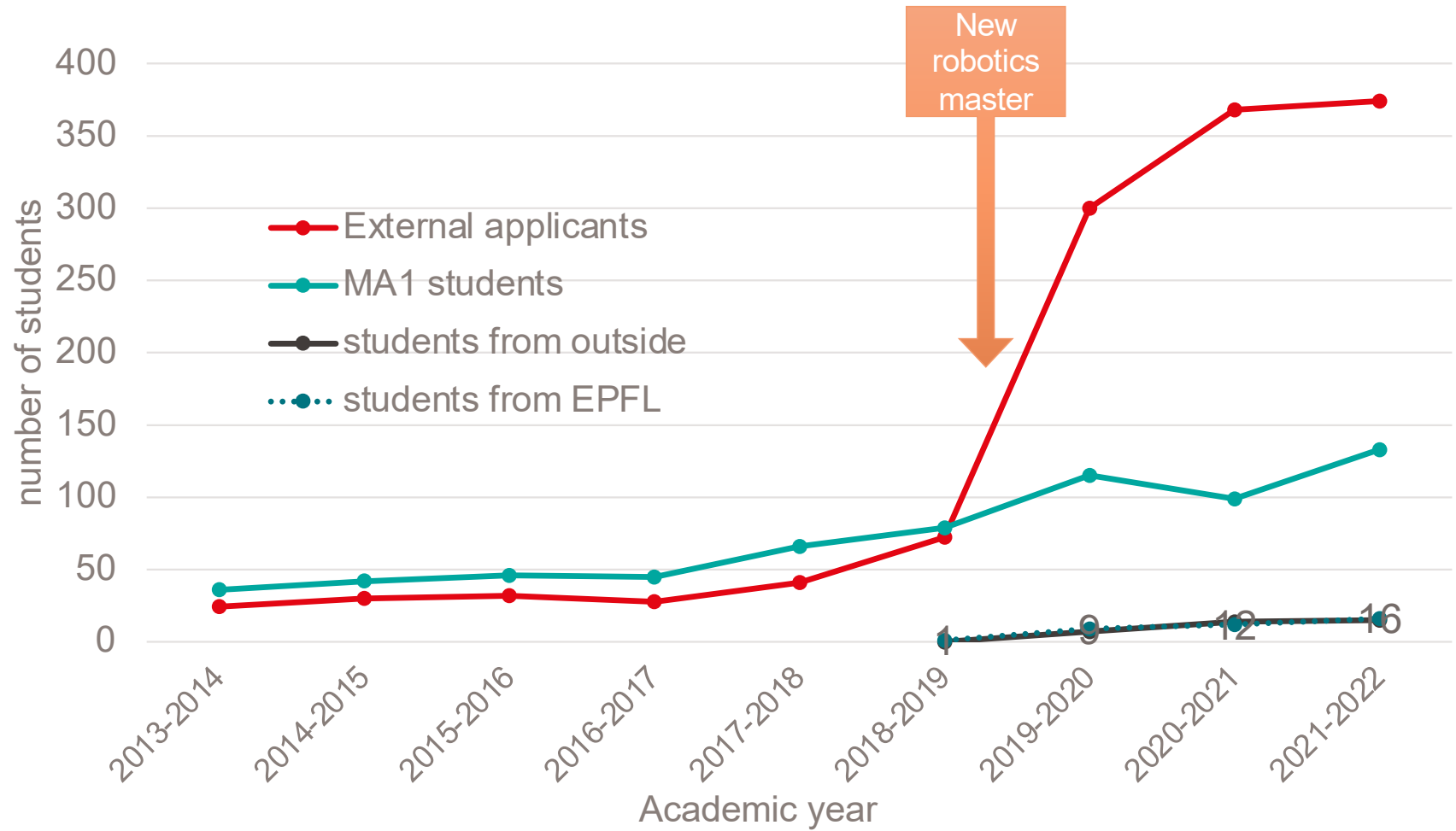


Prof. Silvestro Micera

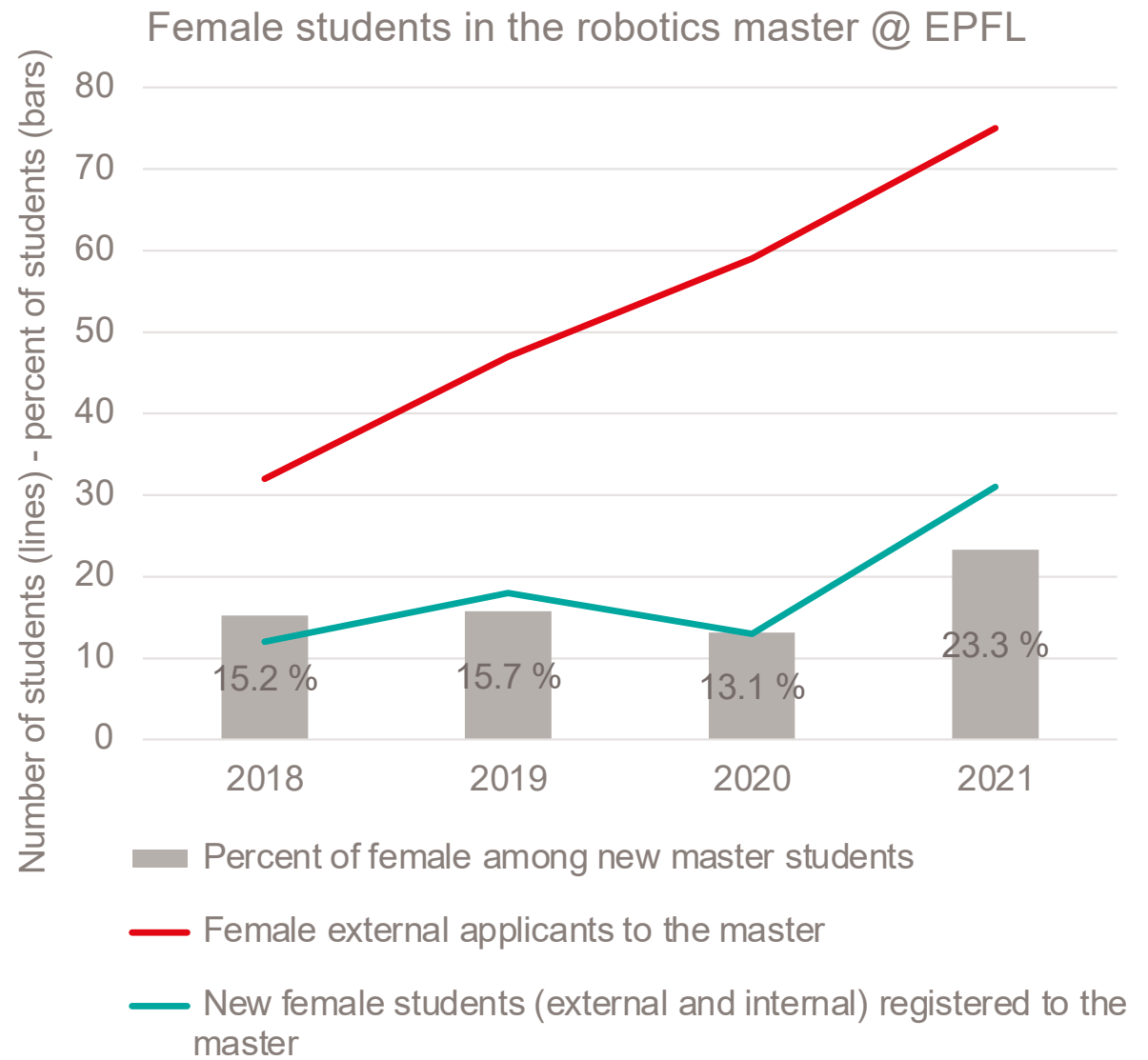


Prof. Francesco Mondada

Robotics master numbers



Diversité





Diversité (écoles de provenance de nos candidats externes)

Technische Universität München	Allemagne
Technische Universität Wien	Autriche
Université Catholique de Louvain	Belgique
McGill University, Montreal	Canada
University of British Columbia, Vancouver	Canada
University of Toronto	Canada
University of Waterloo	Canada
Shanghai Jiao Tong University	Chine
The Hong Kong University of Science and Technology	Chine
Tsinghua University, Beijing	Chine
Universitat Politècnica de Catalunya, Barcelona	Espagne
Cornell University, Ithaca	Etats-Unis
Harvard University, Cambridge	Etats-Unis
University of California, Santa Barbara	Etats-Unis
University of Illinois at Urbana-Champaign	Etats-Unis
Ecole Polytechnique, Palaiseau	France
National Technical University of Athens	Grèce
Indian Institute of Technology Delhi	Inde
Indian Institute of Technology Kanpur	Inde
Indian Institute of Technology Madras	Inde
Politecnico di Milano	Italie
Politecnico di Torino	Italie
Università degli Studi di Roma "La Sapienza"	Italie
Delft University of Technology	Pays-Bas
Imperial College London	Royaume-Uni
University of Edinburgh	Royaume-Uni
Nanyang Technological University	Singapour
National University of Singapore	Singapour
Bogazici University, Istanbul	Turquie

Quality

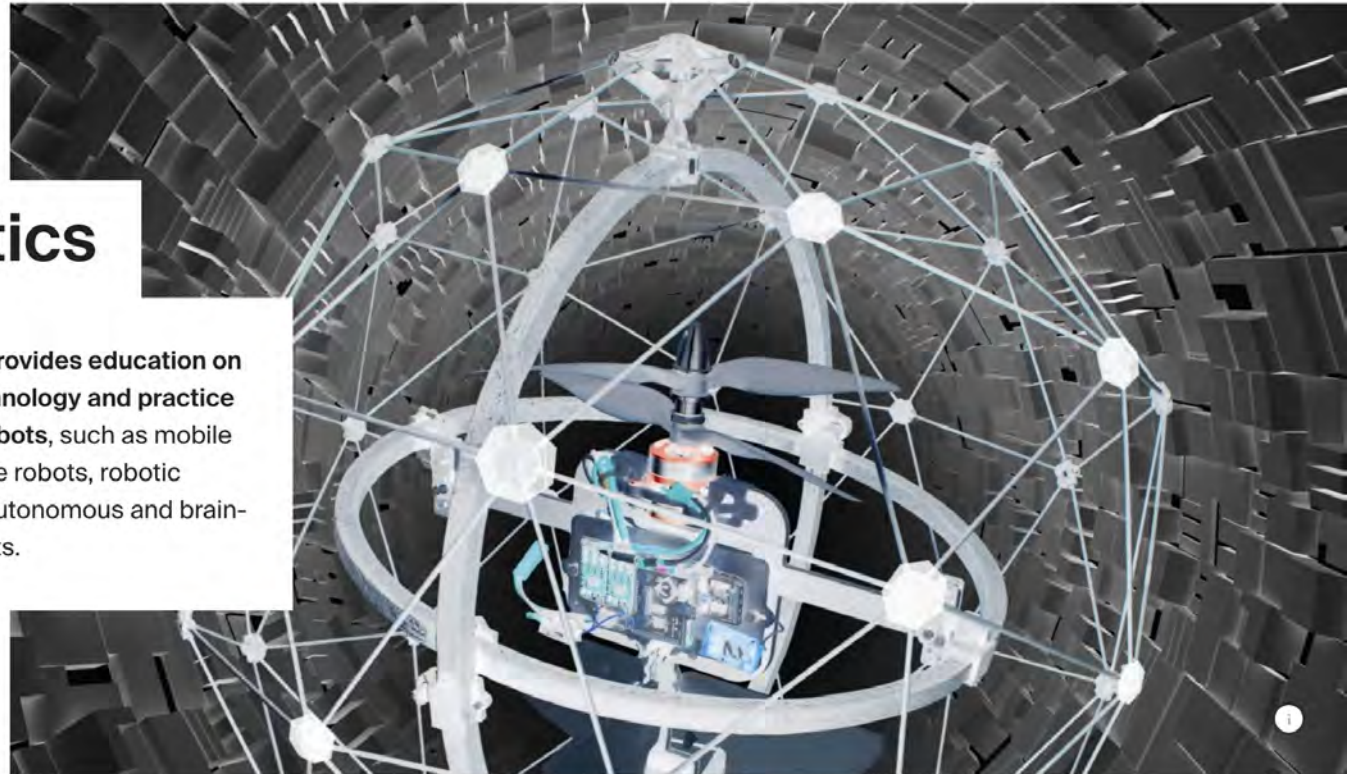
8. Please give your general appreciation and comments on the Robotics Master

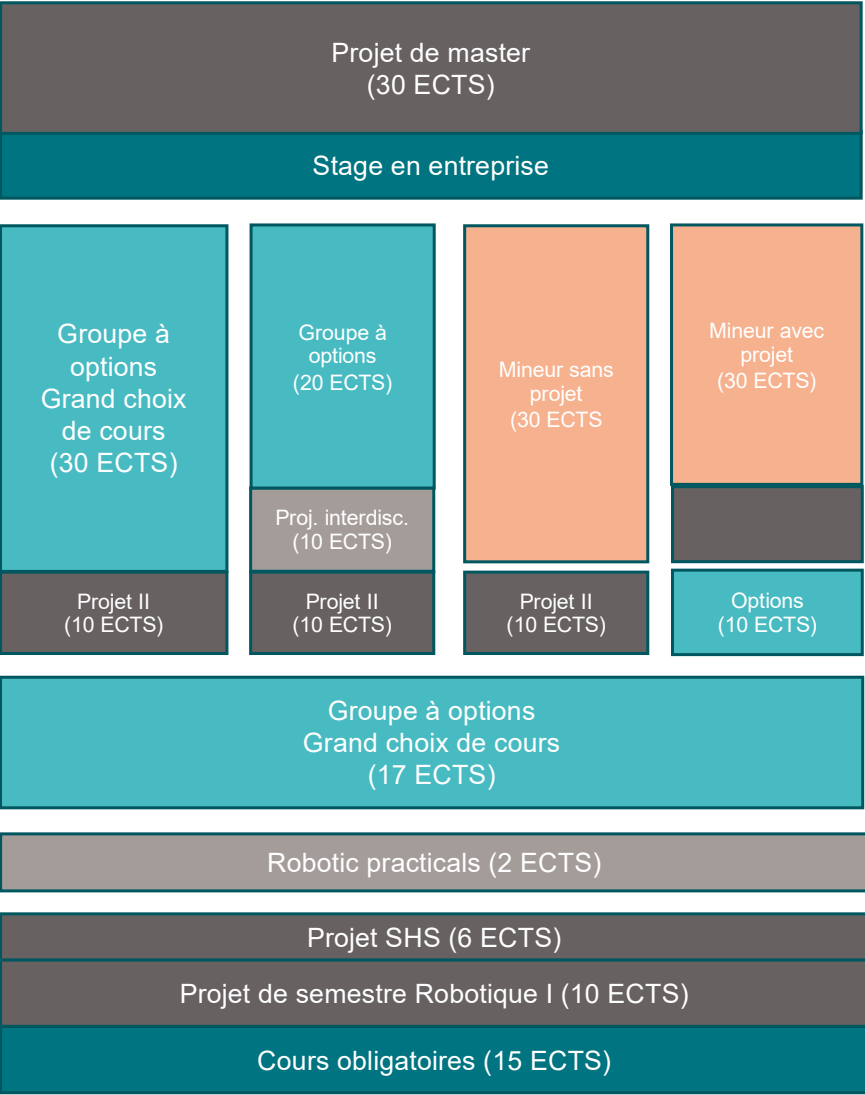
8.1) Overall, I find the Robotics Master of high quality



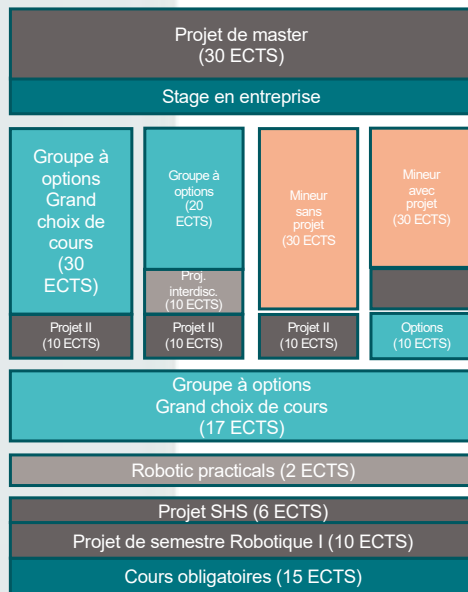
Robotics

This program provides education on the theory, technology and practice of intelligent robots, such as mobile robots, wearable robots, robotic manipulators, autonomous and brain-interfaced robots.

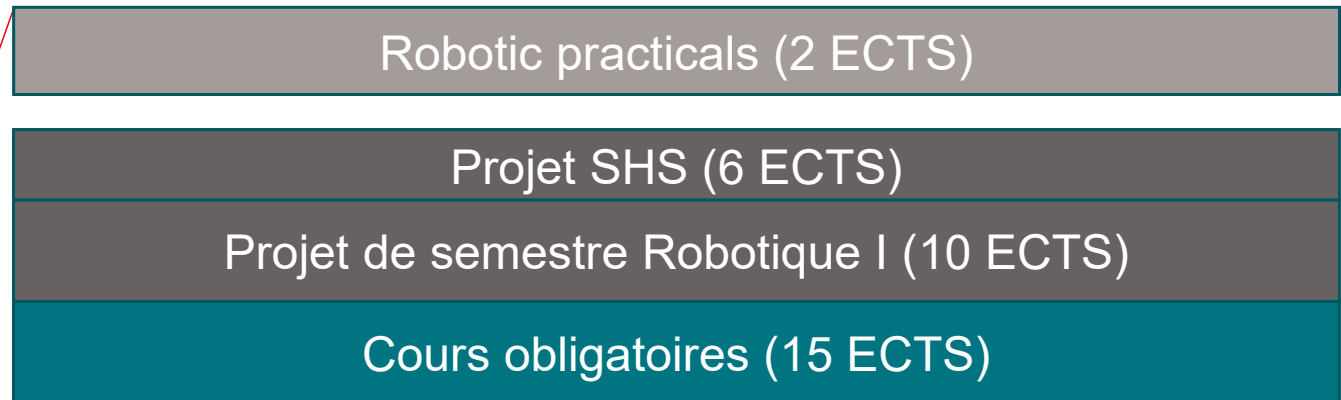
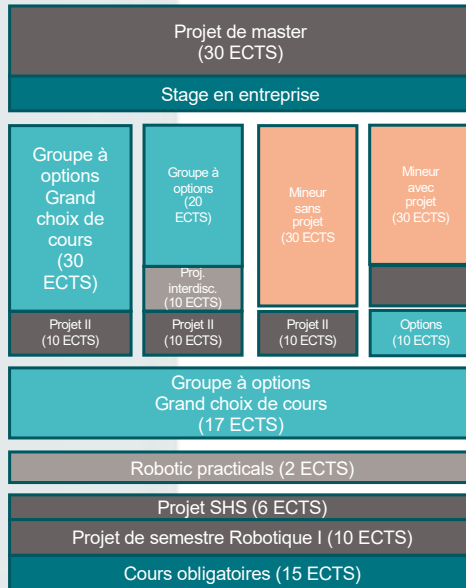




Structure



Structure



Compulsory courses

- **Foundations :**
 - Basics of Mobile Robotics (4 ECTS; Mondada) – fall
 - Basics of robotics for manipulation (3 ECTS; Bouri) – fall

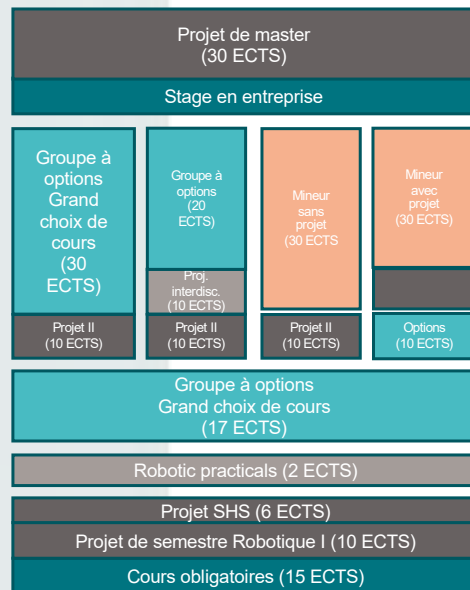
- **Algorithms and Methods for Robotics :**
 - Applied machine learning (4 ECTS; Billard) – fall
 - Model Predictive Control (4 ECTS; Jones) – fall

- **Practicals:**
 - Robotics Practicals (2 ECTS; Mondada + all) - spring

Orientations

Students must choose 17 ECTS of optional courses in one of these three orientations:

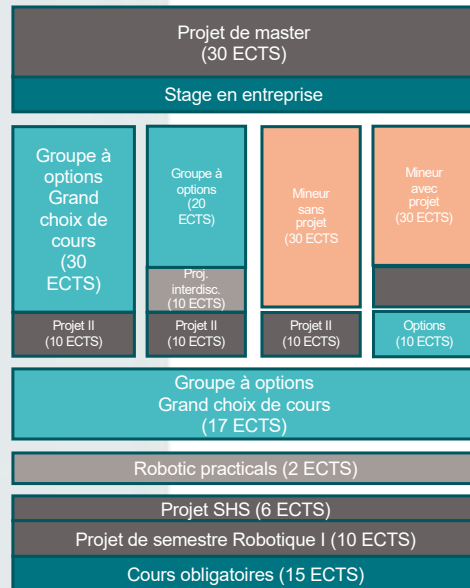
- A Industrial robotics
- B Medical robotics
- C Mobile robotics



Groupe à options
Grand choix de cours
(17 ECTS)

Optional courses and orientation	A	B	C	60
Advanced control systems	A	B	C	3
Advanced machine learning	A	B	C	4
Advanced MEMS & microsystems			C	3
Advanced satellite positioning			C	4
Analyse de produits et systèmes	A			2
Analysis and modeling of locomotion		B	C	4
Biomaterials		B		4
Commande embarquée de moteurs	A			2
Computational motor control		B	C	4
Computer vision	A	B	C	4
Conception mécanique intégrée	A			3
Continuous improvement of manufacturing systems	A			4
Controlling behavior in animal and robots		B	C	4
Deep learning	A	B	C	4
Distributed intelligent systems			C	5
Embedded systems	A	B	C	4
Evolutionary robotics			C	3
Flexible bioelectronics		B		4
Flying robots			C	4
Fundamentals of computer aided manufacturing	A			5
Fundamentals of neuroengineering			C	4
Haptic human robot interfaces	A			3
How technology shapes the workplace of the future	A	B	C	3
Image analysis and pattern recognition		B	C	4
Image processing I		B		3
Image processing II		B		3
Industrial automation	A			3
Industry dynamics, models & trends	A			4
Intelligent agents	A		C	6
Interdisciplinary project				10
				4
				3
				2
				5
				3
				5
				3
				3
				4
				2
				5
Production management	A			4
Real-time embedded systems	A	B	C	4
Robotique industrielle et appliquée	A			2
Sensorimotor neuroprosthetics		B		4
Sensor orientation			C	4
Sensors in medical instrumentation		B		3
Signal processing for functional brain imaging		B		3
System identification	A	B	C	3
Systèmes mécatroniques	A	B	C	5

Orientation courses examples



2021-2022 ROBOTICS - Options			
Code	Matières	Enseignants	Crédits
MICRO-502	Aerial robotics	Floreano	3
MICRO-515	Evolutionary robotics	Floreano	3
MICRO-570	Advanced machine learning	Billard	4
EE-559	Deep learning	Fleuret	4
MICRO-514	Flexible bioelectronics	Lacour S.	4
EE-451	Image analysis and pattern recognition	Thiran J.-P.	4
MICRO-462	Learning and adaptative control for robots	Billard	4
MICRO-455	Applied machine learning	Billard	4
MICRO-553	Haptic human robot interfaces	Bouri	3
MICRO-401	Machine learning programming	Billard	2
BIOENG-404	Analysis and modelling of locomotion	Aminian/Ijspeert/Courtine	4
BIOENG-456	Controlling behavior in animals and robots	Ramdya	4
CIVIL-459	Deep learning for autonomous vehicles	Alexandre Alahi	6
ENG-466	Distributed intelligent systems	Martinoli	5
CS-487	Industrial automation	Tournier/Sommer	3
MICRO-507	Legged robots	Ijspeert	3
ENV-548	Sensor orientation	Skaloud	4

Orientations

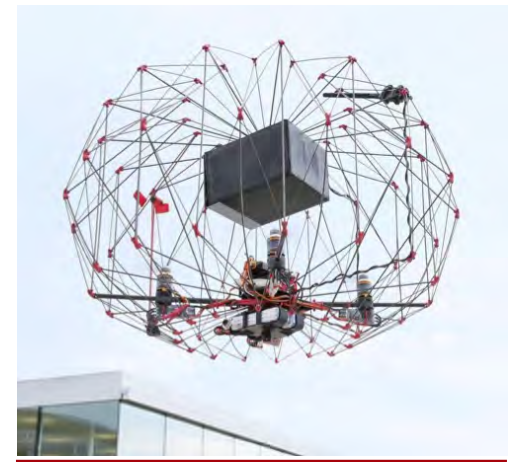
17 optional credits chosen among the optional courses of the chosen orientation, then free choice in robotics options.



Industrial Robotics

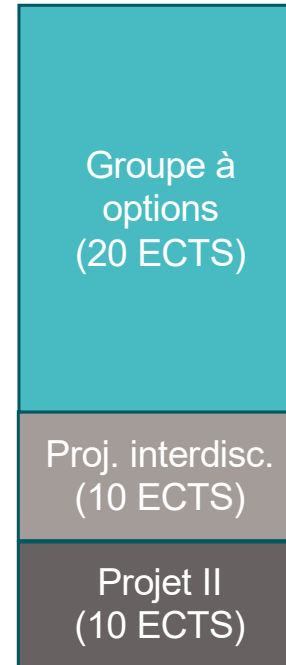
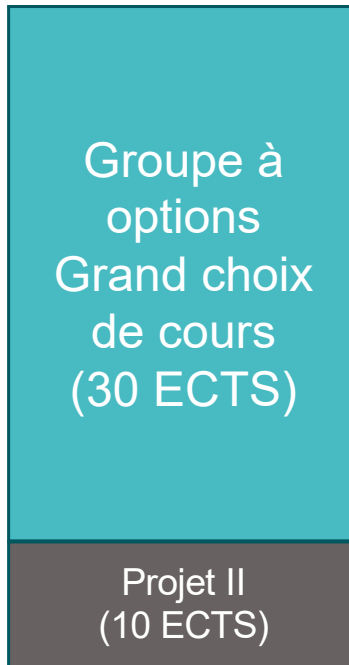
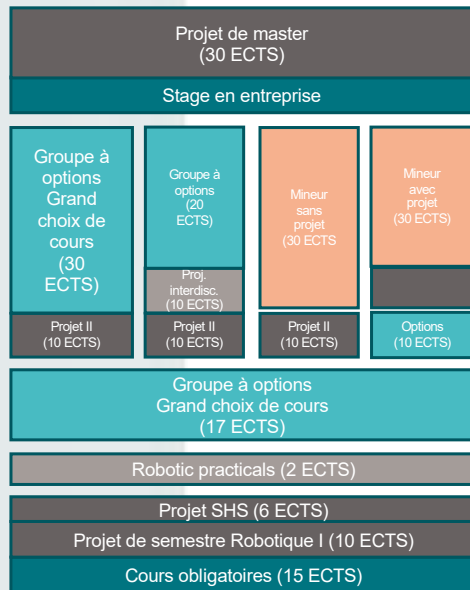


Medical Robotics



Mobile robotics

Free options



MINORS

2.6) I find that the information provided by EPFL concerning the choice of minors was sufficient.



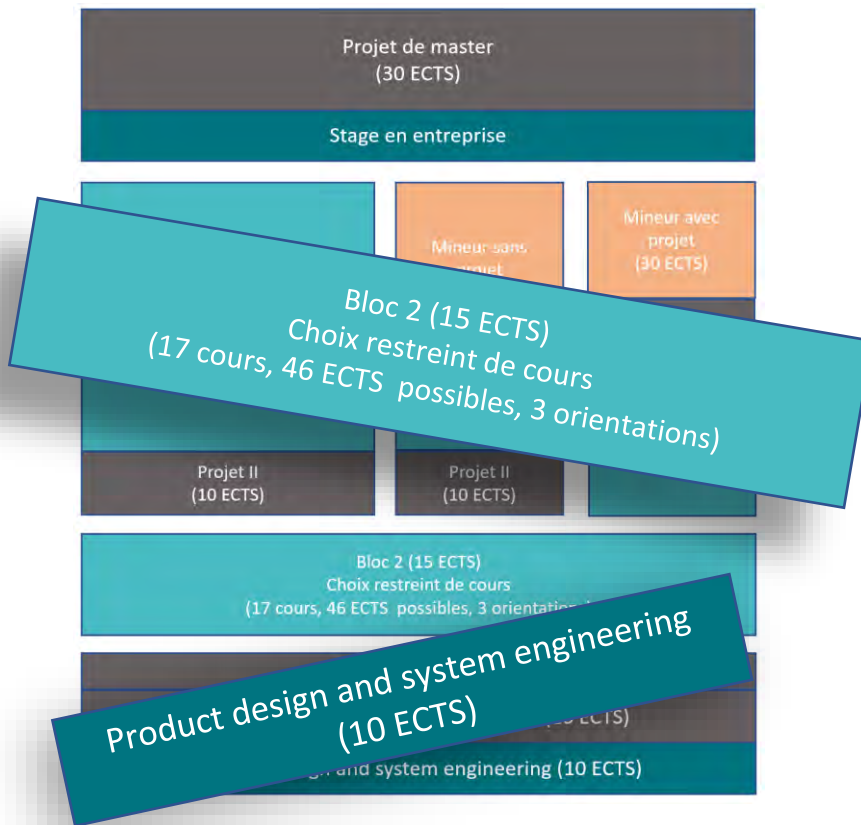
<https://www.epfl.ch/education/master/index-fr-html/minors-and-specializations/>

- **Basic elements:**
 - Some do not have a project included
 - The minors are totally autonomous
- **Goal**
 - Complement your major! Choose a minor only for this and for having the title on your diploma
- **Alternative, always possible**
 - Courses in the options

7 mars
2022

**Programme
Master
Microtechnique**

Cours phare et orientations



Products Design and Systems Engineering

Cours fondateur donnant l'occasion de créer un produit de la conception jusqu'au prototype et à l'ébauche de marketing
 Avec des intervenants académiques et industriels



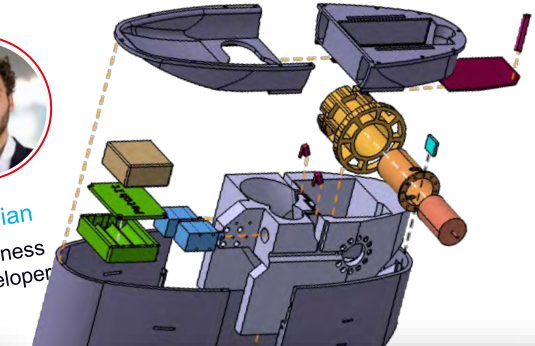
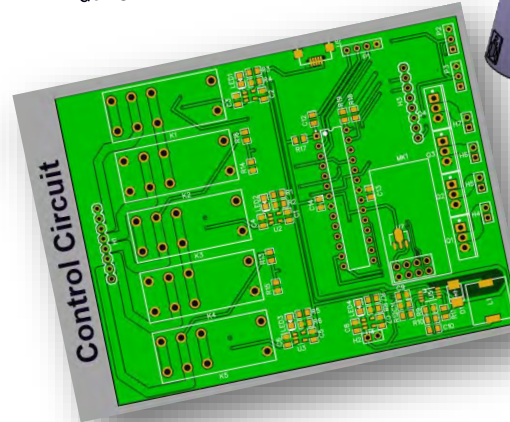
Pablo
 Propulsion
 Designer

Andrea
 Propulsion
 Designer

Charlotte
 CAD
 designer

Hugo
 Programmer

Florian
 Business
 developer



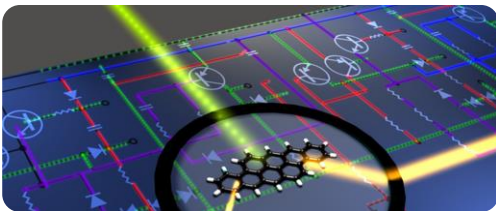
Products Design and Systems Engineering

Cours fondateur donnant l'occasion de créer un produit, de la conception jusqu'au prototype et à l'ébauche de marketing

Avec des intervenants académiques et industriels

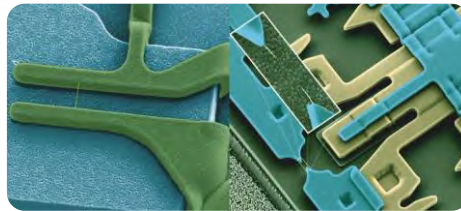
Exemple de projet Pill'It:





Optique et Photonique (12 ECTS)

- Imaging optics (3)
- Optical detectors (3)
- Selected topics in advanced optics (3)
- Laser fundamentals and applications for engineers (3)



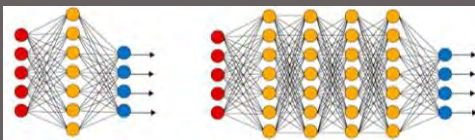
Micro et nanosystèmes (19 ECTS)

- Advanced MEMS & microsystems (3)
- Scaling laws and simulation methods in micro- and nanosystems (4)
- Nanotechnology (3)
- Materials and technology of microfabrication (3)
- Low-power radio design for IOT (3)
- Smart sensors for IOT (3)



Techniques de production et de fabrication avancées (14 ECTS)

- Introduction to additive manufacturing (3)
- Manufacturing systems and supply chain dynamics (3)
- Material processing with intelligent systems (3)
- Robotique industrielle et appliquée (2)
- Metrology (3)



Applied machine learning (4) Apprentissage et intelligence artificielle (4)

Optique et Photonique

Optical detectors
Besse

Selected topics in advanced optics
Martin

Optics laboratories I
Psaltis, Pu

Nonlinear optics
Roke

Biomicroscopy I
Seitz

Biomedical optics
Wagnières

Quantum and nanocomputing
Charbon, Graziano

Lasers: theory and modern applications
Moser, Kip

Laser fundamentals and applications for quantum systems
Moser

Imaging optics
Psaltis

Optics laboratories II
Psaltis, Pu

Optical communications
Gauthier

Physics of photonic semiconductor devices
Butté

Photonic systems and technology
Brès

Fundamentals of Biophotonics
Radenovic

Deep learning for optical imaging
Psaltis / Borhani

Biomicroscopy II
Altug / Seitz

Micro et nanosystèmes

Materials and technology of Microfabrication
Gijs, Lehnert

Scaling laws & simulations in micro & nanosystems
Shea, Renaud

Low power radio design for IOT
Enz

MEMS practicals I
Renaud, Boero, Brugger

Flexible Bioelectronics
Lacour

Micro/ nanomechanical devices
Villanueva

BioMEMS
Renaud

Techniques de production et de fabrication avancées

Intro to additive manufacturing
Boillat, Brugger, Moser

Materials processing with intelligent systems
Hoffmann / Wasmer

Robotique industrielle et appliquée
Hoffmann / Wasmer

Fundamentals of computer aided manufacturing
Kiritzis

Management de projet et analyse du risque
Wieser

And many other optional courses

Manufacturing and supply chain dynamics
Gallay / Filler

Metrology
Charbon / Fantner

Metrology practicals
Charbon / Fantner

Industrial automation
Tournier / Sommer

Techniques d'assemblage
Chautemps

Laser microprocessing
Hoffmann

Analyse de produits et systèmes
Kejik

Advanced additive manufacturing technologies
Moser, Brugger

Continuous improvement of manufacturing systems
Kaboli

Fundamentals and processes of PV devices
Ballif, Haug

Applied machine learning

Machine learning programming
Distributed intelligent systems
Model predictive control

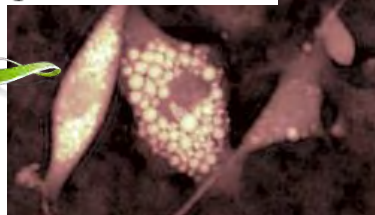
Apprentissage et intelligence artificielle

Quantum and nanocomputing
Embedded systems
Haptic human robot interfaces

Signal processing for functional brain imaging
Lab on app development for tablets and smartphones
System identification



NANO LIVE
 Looking Inside life

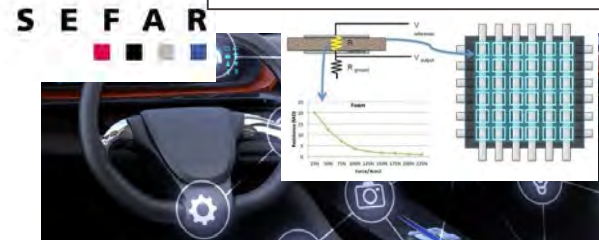


Imaging

REGENT
 LIGHTING



Smart fabric printing



photon focus



Laser marking



PHOTONICS

Laser cutting



TRUMPF

SCHNYDER
 GEAR CUTTING SOLUTIONS

COHERENT

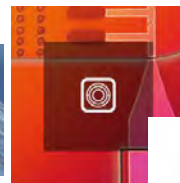
LUMENTUM



Microfab, MEMS, Sensors and Packaging



MicroOptics



ASML



Systems Engineering



TESA
TECHNOLOGY



life.augmented



csem

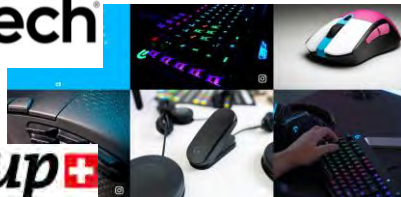
NEUROTHERAPEUTICS
aleva

**Precision
Systems**



Sensors, Wireless and IOT

logitech



Gaitup

GEOSATIS
securing people



Watchmaking



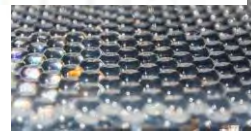
BVLGARI



ROLEX



insolight



Advanced manufacturing

BUHLER



csem

Advanced
Manufacturing

Supply chain



ROLEX



Cartier



ABB



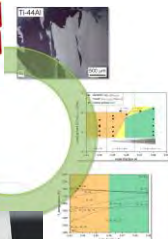
PHILIP MORRIS
INTERNATIONAL

Industrial robotics

BOBST

Materials processing

EMPA



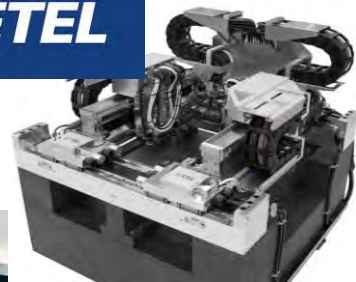
ROLEX



ETEL

ABB

asyril



18h00 Introduction, aspects communs des 2 programmes

18h15 Master Robotique, Q&A

18h30 Master Microtechnique, Q&A

18h45 Mineur Photonique, Q&A

18h55 Mineur Technologies Biomédicales, Q&A

19h05 Comment faire son plan d'études master, Q&A

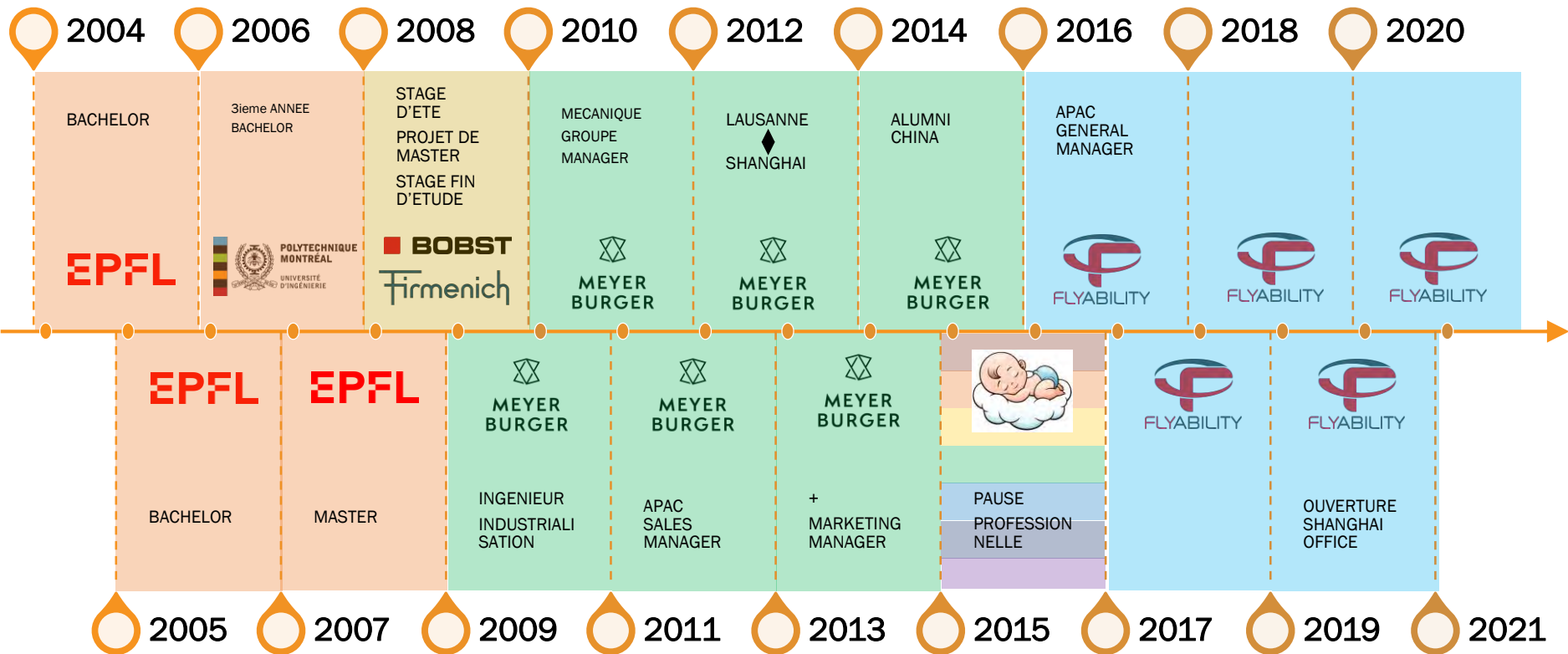
19h20 Autres sources et infos à télécharger, conclusions

La réponse de nos alumni



SAFE DRONES
FOR INACCESSIBLE
PLACES

Xiaolin Briod
General Manager – Flyability
Master Microtechnique terminé en 2009



La réponse de nos alumni



<https://www.youtube.com/watch?v=XmYgre-eUsQ>
29min57



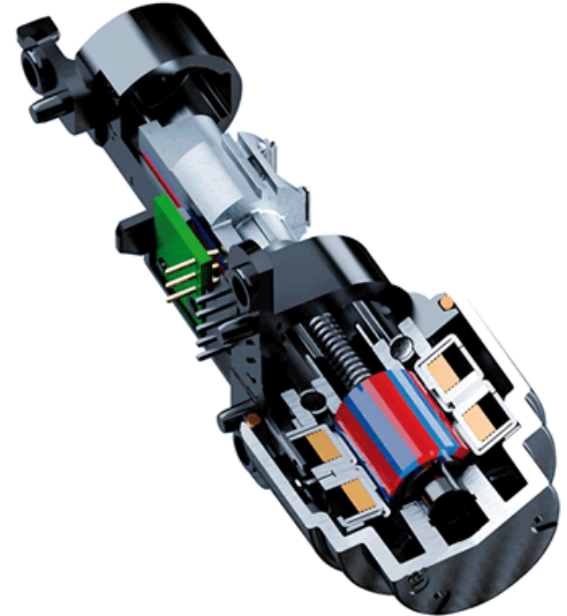
Léonard Badet
Head of Group Technology – Bobst
Master Microtechnique terminé en 2017



La réponse de nos alumni



Damien Wittwer
Business Unit Manager Associate
Master Microtechnique terminé en 2010



<https://tube.switch.ch/videos/J6tEwLlxYr>

La réponse de nos alumni

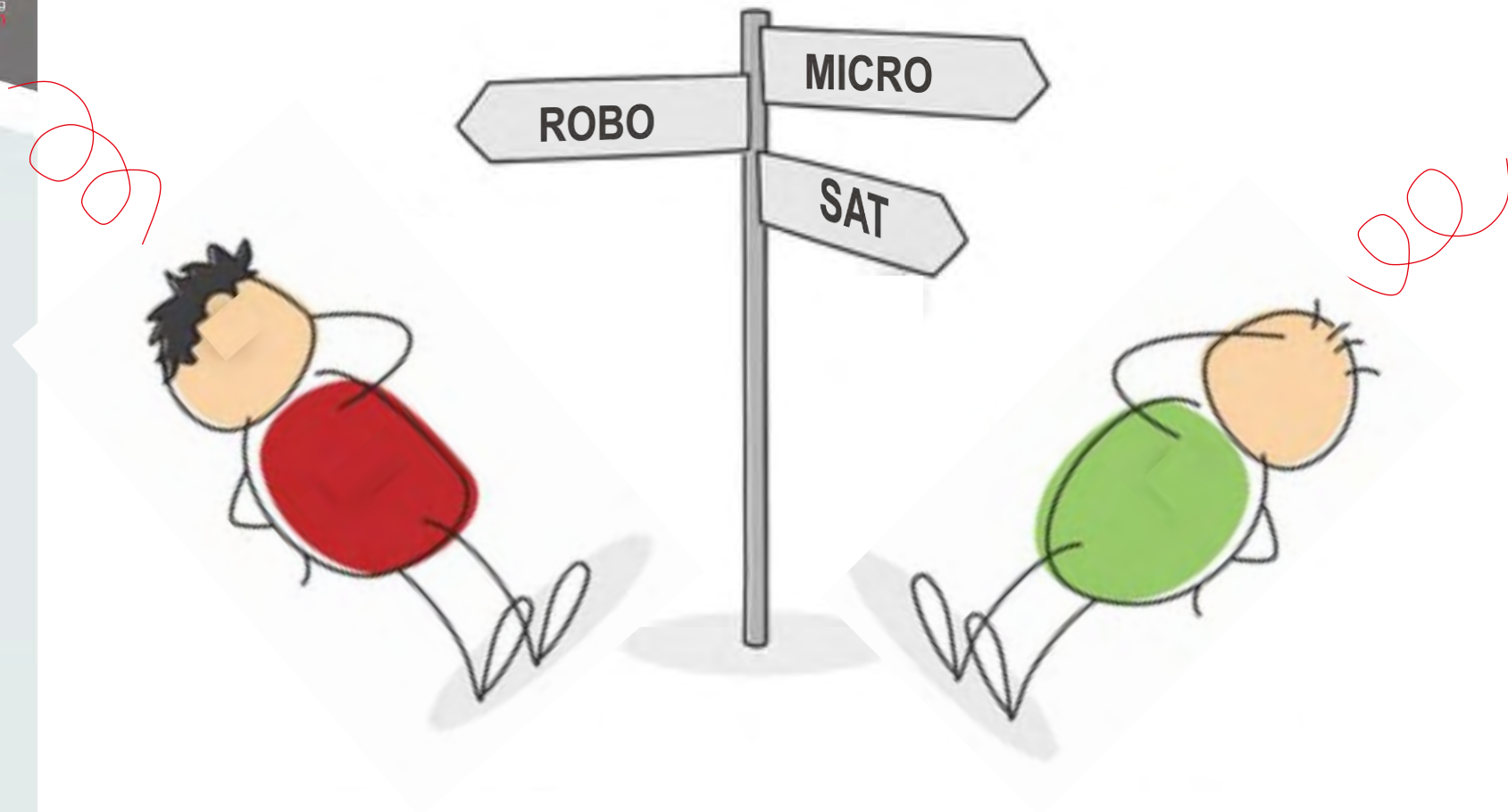
<https://tube.switch.ch/videos/g2TVAzW6sa>



Adrien Briod
Founder and CTO
Master Microtechnique terminé en 2009
Thès doctorat EPFL 2013



Conclusions



Nous ferons de vous des ingénieurs ...

...responsables



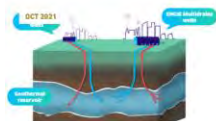
Changer le monde grâce à la technologie ...

1313 Solutions



Power-to-X modular chemical plants
Fournir des applications Power-to-X et Gas-to-Liquid pour produire des e-carburants et des e-produits durables.

Énergie



MultiDrain geothermal wells
Puits géothermique Multi-Drain pour la décarbonisation des réseaux de chauffage urbain

Énergie



Storage
Stockage de l'air comprimé et de l'énergie thermique à un prix abordable, deux fois moins cher que le lithium-ion.



CitiG Car Bike
Un vélo électrique avec des capacités de chargement pour passer du trafic automobile au cyclisme tout au long de l'année.

Mobilité Frost



Transform Cities Together
Un logiciel pour permettre aux opérateurs d'exploiter avec succès un service de micro-mobilité partagée

Mobilité



O2oPus
Une nouvelle génération de serveurs innovants, performants et respectueux de l'environnement



MyEasyCarbon
Une plateforme pour les acteurs de l'alimentation pour réduire les émissions de CO2 / augmenter le stockage du carbone dans...

Alimentation/Agr



FIS V Zero
Un mortier d'injection sans peroxyde pour les ancrages dans la maçonnerie, le béton fissuré et non fissuré.

Bâtiements Industrie/Marchandises



Propair Toilet System
Des toilettes à faible consommation d'eau et d'énergie conçues pour une utilisation en dehors du domicile.

Nouvelle labellisation: 34 résultats par page



Jifit
Un lubrifiant qui remplace les huiles minérales actuellement utilisées dans l'industrie du formage des métaux.

Industrie/Marchandises



Daccon
Une technologie de collecte et d'analyse des données pour faciliter l'inspection des biens sous-marins.

Alimentation/Agr Infrastructures



ACC Gold Water Shield Cement
Ciment aux propriétés imperméabilisantes durables protégeant de l'humidité et des infiltrations.

Bertrand Piccard
« Grâce aux technologies,
la lutte contre le
réchauffement
n'est plus une
contrainte »



Merci pour votre écoute

