The background of the slide is an aerial photograph of the EPFL campus in Lausanne, Switzerland. The campus is a large complex of modern and traditional buildings, surrounded by green spaces and sports fields. In the background, the city of Lausanne is visible, along with the blue waters of Lake Lemano and the surrounding mountains under a clear sky.

# NX-422 Neural Interfaces

## Project introduction

The TAs and AEs

Fall 2025

Target a  
disease?

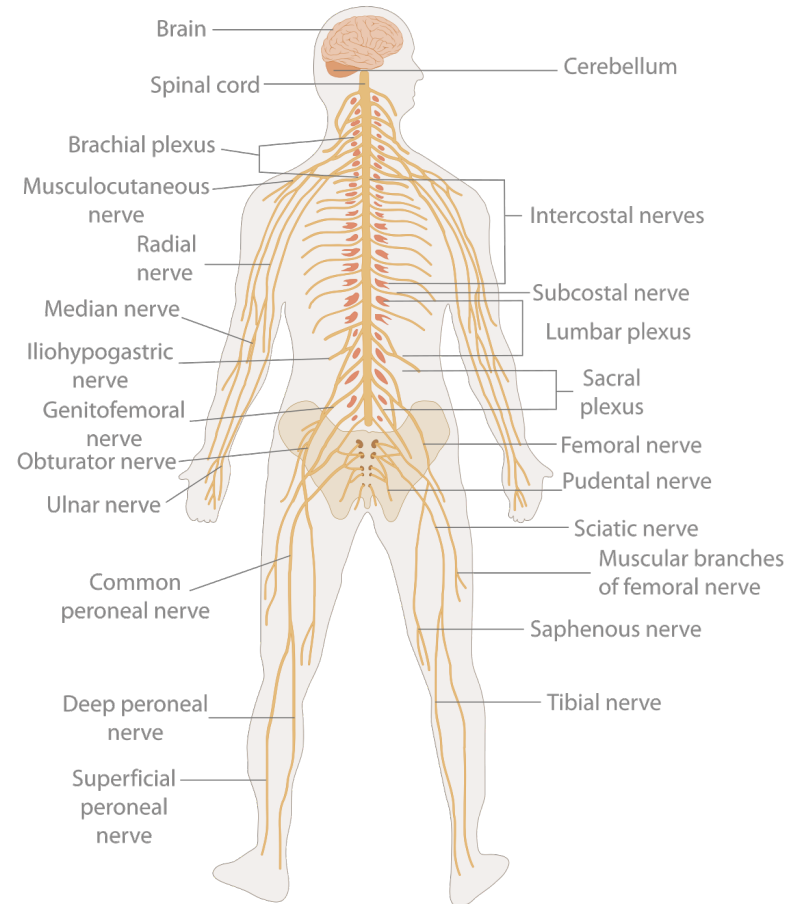


Target a tissue?

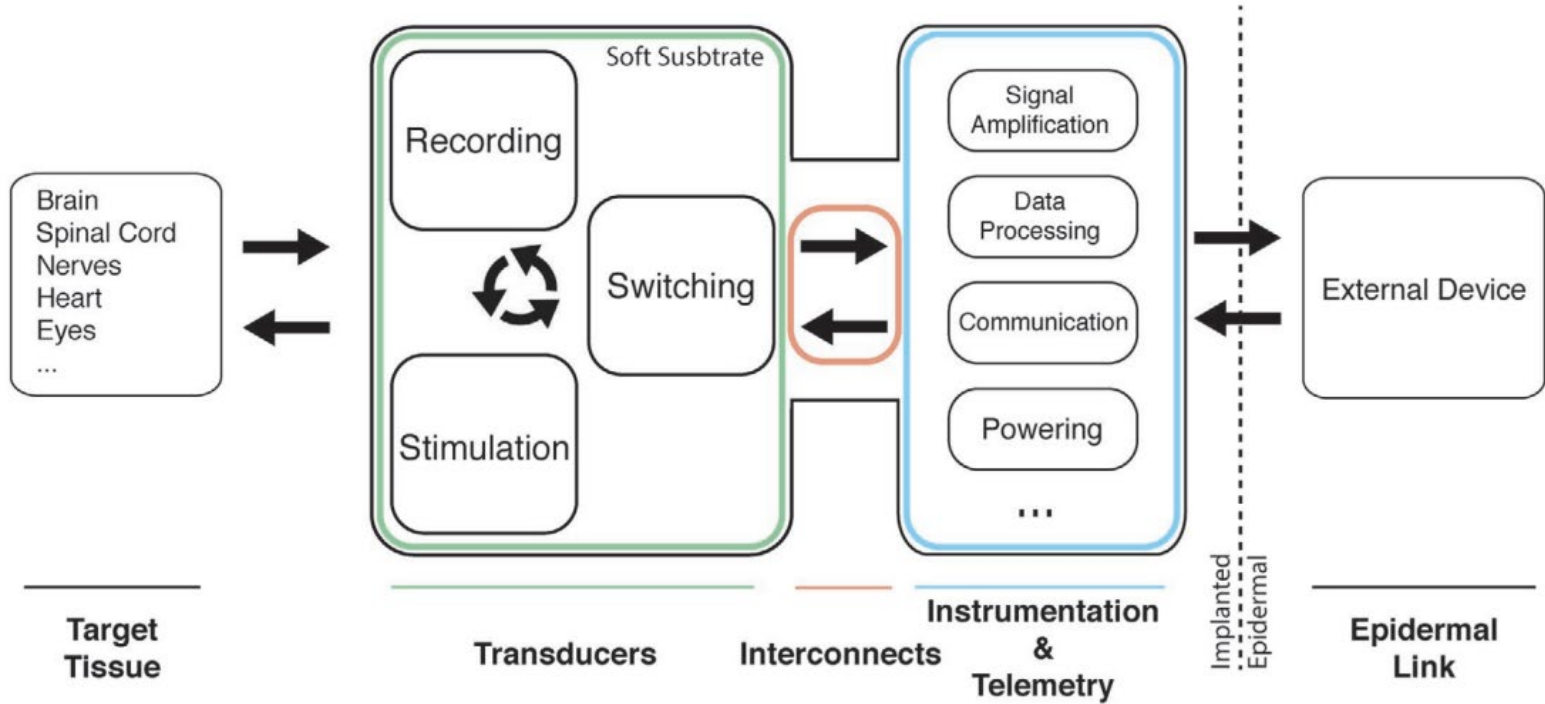
Use a specific  
technology?

# Nervous system: not only the brain!

- Brain (deep vs. cortex)
- Sensory systems (vision, audition, touch, etc)
- Motor system (central system vs. peripheral nerves)
- Etc!



# Consider all aspects of the design



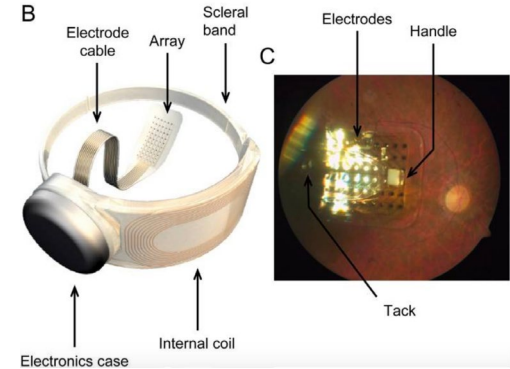
# Innovation can be on one or multiple fronts

- Materials
- Use/application
- Interface electronics
- Miniaturization
- Integration
- Usability
- System power and communication
- Mechanical properties

# Ex. Retinal implant

Stimulation of retinal neurons to restore vision in patients with retinal degeneration

- Stimulation mechanism
- Wireless integration
- Material adhesion/conformability
- Manufacturing



Argus II

Power

Integration

Wireless

Electronics

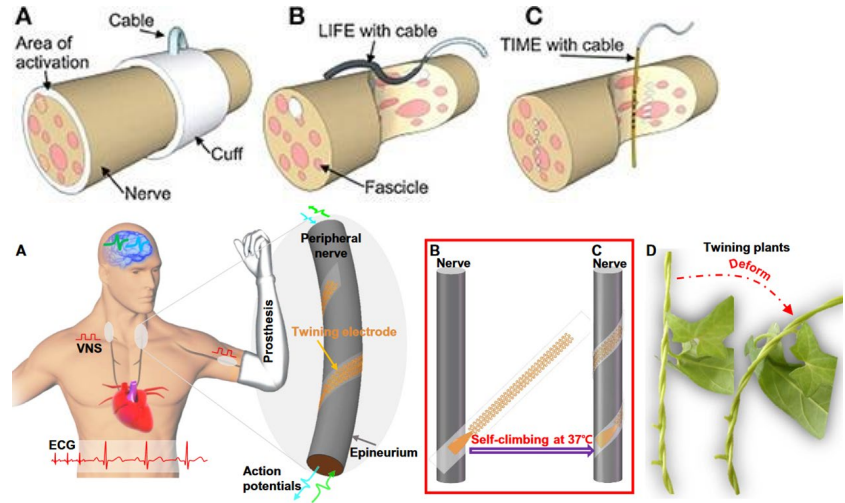
Materials

Biocomp.

Application

Implants for sensing or actuation

- Interface type (cuff, intraneural)
- Wireless integration
- Material
- Manufacturing
- Implantation technique



Zhang 2019

Power

Integration

Wireless

Electronics

Materials

Biocomp.

Mechanics

# Expectations

1. State of the art
2. Innovation
3. **Implementation**
  - Fabrication (materials, processes)
  - Connections (electrical components)
  - Power
  - Etc
4. Feasibility assessment
5. Discussion/Conclusion

# Start forming teams and brainstorm!

- Teams of 4
- Mandatory **mix of backgrounds** (2-3 different sections represented)
- Start to discuss a possible **application/part of the nervous system** you want to interface
- **Sign up sheet** available on Moodle to register your team with a tentative project title
  - **deadline for registration: 19 September @23:59**
- Summary of project guidelines available on Moodle

# Main project deadlines

- Project registration (Moodle→Google doc): **Friday, September 19th, 23:59**
- 2-page summary (one per team): **Friday, October 10th, 23:59**
  - Ungraded, but mandatory
- Project presentations: **December 11-12**
  - 20% final grade
- Project report (one per team): **Friday, December 19th, 12:00pm noon**
  - 40% final grade

**AEs are present after lectures** (11:15am-12:00pm, Thu/Fri)

- Course content
- General project advice

Each group is assigned **a 1° and 2° TA**

- Regular mtg with 1° TA (~30 mins/wk)
- TA communicates availability (after lectures, by zoom)

Special TA sessions (after some lectures)

- **4x exercise sessions** (see schedule)
- Occasional review sessions (communicated via Moodle)

Use **Ed Discussion for Q&A** about the course or projects

- We will communicate course info via Moodle

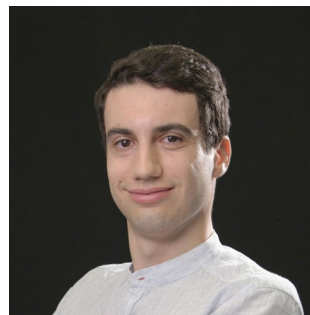
- **Come to class**
  - Recordings can fail
  - Slides do not contain everything
- **Start the project early (~now)**
  - Choose something interesting to you
  - Balance novelty with realism
  - There are many challenges you can't foresee until you progress
- Talk regularly to your 1° and 2° TAs and the AEs
  - Come to your TA meetings with specific questions

**Scott**

Microelectrode arrays  
for cell culture, tissue  
engineering

**Desirée**

Microfabrication, TFTs,  
acoustic restoration

**Luca**

LED arrays, neural  
circuits

**Pietro**

Microfabrication &  
Electronics

**Yasemin**

Analog IC Design,  
Wireless Power Transmission

**Daney**

Digital IC Design,  
Signal Processing

**Amitabh**

On-Chip Machine Learning,  
Electronic Integration

**Houman**

Microfab, Electronics, Signal  
Processing



Tim

BSc., Materials Science &  
Neuroengineering



Federico

BSc., Computer Science



Paola

MSc., Neuro-X



Baptiste

BSc., Microengineering



Wenxin

■ BSc., NeuroX, Signal  
Processing



Ameer

BSc., Microengineering

# Questions?