

# MASTER PROJECT PROPOSAL

**Category:** Digital and modeling

**Title:** Neural network-based hardware decoder design.

**Project for:** 1 M.Sc. diploma student / 1 M.Sc. semester project student.

**Description:** Wireless implantable devices capable of monitoring brain activity are becoming important tools for understanding motor functions and potentially restoring locomotion after spinal cord injury (SCI). We are currently researching innovative machine learning-based approaches to design highly efficient data encoders/decoders on hardware. Use of neural networks is an interesting solution which exploits the signal structure and enhances the real-time performance of the overall system.

This project targets the implementation of such NN-based decoders on hardware to be used in implantable integrated systems. The student will first survey the recent trends and our solutions that will be the basis for the hardware implementation. The main task of the project is the semi-custom design of the digital hardware. The student will gain considerable experience in digital design flow and have the chance to take part in publications upon successful completion of the project.

## **Prerequisites:**

- Solid understanding of digital design fundamentals.
- Experience with Matlab and HDL (Verilog or VHDL).
- Basic experience with semi-custom flow (Modelsim, Synopsys DC, Cadence Encounter/Innovus).

## **Project breakdown:**

20% Literature review.

20% Matlab algorithm study and development.

40% Semi-custom digital design of the decoder.

10% Reporting results.

## **Supervisor:**

Arda Uran (arda.uran@epfl.ch)

## **Responsible professors:**

Prof. Yusuf Leblebici (LSM)

Prof. Volkan Cevher (LIONS)