(MSc/PhD)-FeFET-based in-memory computing for low-power edge artificial intelligence

Record number : OPR-1453

Overview

RESEARCH DIRECTION

Dominique Drouin, Professeur - Department of Electrical and Computer Engineering

INFORMATION

dominique.drouin@usherbrooke.ca

ADMINISTRATIVE UNIT(S)

Faculté de génie
Département de génie électrique et de génie informatique
Institut interdisciplinaire d'innovation technologique (3IT)

LEVEL(S)

2e cycle
3e cycle

LOCATION(S)

3IT - Institut interdisciplinaire d'innovation technologique

Project Description

Context
Edge AI requires low-power architectures that process data locally. Conventional systems are limited by repeated transfers between memory and computing units.

Research project
The project aims to design, model, simulate, and characterize a FeFET-array in-memory computing architecture to accelerate convolutional neural network (CNN) inference for edge-AI applications.
The devices and circuits will be fabricated by a foundry through an MPW program, then experimentally validated and compared with a digital reference.

Proposed activities
• Define the CNN hardware architecture, weight representation, and layer mapping onto FeFET arrays.
• Develop SPICE or Verilog-A FeFET models including analog programming and main non-idealities.
• Design memory cells, MAC arrays, and peripheral circuits for programming, readout, and accumulation.
• Simulate accuracy, energy, latency, throughput, and silicon area while considering variability, noise, retention, and endurance.
• Prepare MPW test blocks, develop the measurement setup, and characterize fabricated circuits.
• Run a CNN using measured data and compare performance with simulations and a digital reference.

Expected outcomes
• FeFET in-memory computing architecture designed, simulated, and validated for CNN execution.
• Device and circuit models calibrated using experimental measurements.
• MPW-fabricated integrated circuit, characterization setup, and CNN inference demonstration.
• Quantitative assessment of accuracy, energy per inference, latency, and robustness.

Supervision and research environment
The project will be supervised by Professor Dominique Drouin at the Université de Sherbrooke, in collaboration with Irréversible, mainly at 3IT.

Candidate profile
• Background in electrical or computer engineering, microelectronics, or applied physics.
• Interest in analog or mixed-signal design, in-memory computing, emerging memories, and AI accelerators.
• Assets: Cadence, SPICE, Verilog-A, VLSI, Python, PyTorch or TensorFlow, electrical characterization.
• Scientific rigor, autonomy, teamwork, and communication in French or English.

Application
Send a motivation letter, CV, transcripts, and two references to inpaqt@usherbrooke.ca. Subject: “FeFET-CNN application - Master’s” or “FeFET-CNN application - PhD”.

Discipline(s) by sector

Sciences naturelles et génie

Génie électrique et génie électronique

Funding offered

To be discussed

Partner(s)

Irréversible Inc.

The last update was on 15 October 2026. The University reserves the right to modify its projects without notice.