EPFL

MICRO-608	**Optical Computing**

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Cursus	Sem.	Type
Photonics		Opt.

Language of teaching	English
Credits	1
Session	
Exam	Term paper
Workload	30h
Hours	**22**
Lecture	2
Project	20
Number of positions	**10**

Frequency

Every 2 years

Remark

Spring semester 2024

Summary

In this course we will start with a brief history of optical computing, describe methods for implementing optical interconnection and logic and then spend most of our time on learning about the recent efforts in optical computing machines for machine learning.

Content

The course will explore the use of optics in computation. The inherent advantage of light over electronic for communicating information has been realised in fibre optics networks for telecommunications. Optical interconnections are also used in some computing systems replacing wires. A complete optical computer requires also the equivalent of transistors to carry out the nonlinearity essential for logic or decision making and therefore an optical computer needs to include nonlinear devices, either of optical or electronic origin. Optical computing has received a lot of attention recently because of the explosion of machine learning and neural networks which require dense connectivity, making these systems well matched to optics. In this course we will start with a brief history of optical computing, describe methods for implementing optical interconnection and logic and then spend most of our time on learning about the recent efforts in optical computing machines for machine learning.

Keywords

Optical computing
Neural networks
Neuromorphic computing

Learning Outcomes

By the end of the course, the student must be able to:
- Explain the advantages that optics bring to computing
- Formulate the type of architectures that use optics to compute

Teaching methods

2 courses by the instructors followed by student presentations who will explain recent works on optical computing. It is mandatory for each student to make a presentation.

Assessment methods

A quizz will be given at the end of the course with question drawn from the student presentations.

Resources

Moodle Link

- https://go.epfl.ch/MICRO-608