COMP 6002 NEUROMORPHIC SENSING

Credit Points 10

Legacy Code 800233

Coordinator Gregory Cohen (https://directory.westernsydney.edu.au/search/name/Gregory Cohen/)

Description Neuromorphic sensors offer a new way to electronically sense and process data that have a unique structure based on principles found in biology. Understanding how they operate is integral to their effective use in practical situations, to the development of algorithms, process their data, and to the optimisation of their electronic designs. This subject focuses primarily on neuromorphic vision sensors, which are rapidly being adopted by multiple industries, including exciting applications in automotive and space. Students will develop an in-depth understanding of neuromorphic sensors and the skills to operate a neuromorphic sensor for acquiring data and solving real-world problems. This practical experience is in high demand from both research labs and the industry.

School Graduate Research School

Discipline Algorithms

Student Contribution Band HECS Band 2 10cp

Check your HECS Band contribution amount via the Fees (https://www.westernsydney.edu.au/currentstudents/current_students/fees/) page.

Level Postgraduate Coursework Level 6 subject

Restrictions Students must be enrolled in 8124 Master of Applied Neuromorphic Engineering

Assumed Knowledge

Basic knowledge of:

- the physical nature of light
- analogue and digital electrical circuits (filtering, transistor logic)
- computer architectures (Van Neuman architectures, microcontrollers, buses, peripherals (USB, DAC, GPIO), communication protocols)

Learning Outcomes

On successful completion of this subject, students should be able to:

1. Synthesize the characteristics of a scene using data captured by an event-based vision sensor
2. Evaluate the differences between frame and event-based sensors
3. Design an experimental setup to gather valuable data from a neuromorphic sensor with a deep appreciation of different neuromorphic sensor characteristics
4. Assess the suitability of visio-tactile neuromorphic sensing for a real-world application
5. Critically appraise legal, ethical and cultural issues and considerations in the context of the emerging field of Neuromorphic research
6. Report data and analysis in accordance with professional standards

Subject Content

1. Physics of vision sensors
2. The different architectures of vision sensors
3. Biological sensors
- Retina: organization, key experiments, optic nerve, 6 control muscle
- Retina: organization, key experiments, optic nerve, 6 control muscle
- Tactile
- Olfactory
4. Neuromorphic vision sensors
- The event-based pixel: architecture, characteristics
- Sensors?f evolutions: ATIS, DAVIS, Celex.
5. Neuromorphic auditory sensors
- Artificial cochlea: filters, analogue vs digital implementation
- Auditory nerve: spike generation
- Brainstem: Auditory feature extraction and analysis
6. Research methods
7. Sensing technology and emerging legal, ethical and cultural considerations
8. Data collection and analysis
9. Guidelines for journal paper writing

Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are regularly updated, where there is a difference your Learning Guide takes precedence.

Type	Length	Percent	Threshold	Individual/ Group Task
Viva Voce	3000 words or equivalent	20	N	Group
Report	1000 words or equivalent	30	N	Individual
Practical	4000 words or equivalent	50	N	Individual

Teaching Periods

Spring (2022)

Parramatta City - Macquarie St

Day

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View timetable (https://classregistration.westernsydney.edu.au/even/timetable/?subject_code=COMP6002_22-SPR_PC_D#subjects)

Spring (2023)

Parramatta City - Macquarie St

On-site

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View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=COMP6002_23-SPR_PC_1#subjects)