

SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING

Website: <https://cde.nus.edu.sg/ece>

Area: Integrated Circuits & Embedded Systems

Host: Assoc Prof. Jerald Yoo

TOPIC	:	Spiking Cochlea With System-Level Local Automatic Gain Control
SPEAKER	:	Prof. Shih-Chii Liu Institute of Neuroinformatics, University of Zurich and ETH Zurich
DATE	:	Monday, 13 June 2022
TIME	:	10.30AM to 11.30AM
VENUE	:	E5-03-20 SEMINAR ROOM

ABSTRACT

Neuromorphic spike-event-based auditory sensors (Dynamic Audio Sensor) capture the basic functionality of the biological cochlea. They respond to input sounds by producing asynchronous event outputs from a bank of frequency channels. Combined with event-driven deep neural networks they can enable "always-on" low-latency low-power system-level responses for edge audio tasks such as voice activity detection (VAD) and keyword spotting (KWS). Including local automatic gain control (AGC) circuits will allow the system to handle the large input dynamic range of natural sounds. We present a system-level algorithm that implements channel-specific AGC in a silicon spiking cochlea by measuring the output spike activity of individual channels. The bandpass filter gain of a channel is adapted dynamically to the input amplitude so that the average output spike rate stays within a defined range. Because this AGC mechanism only needs counting and adding operations, it can be implemented at low hardware cost. We evaluate the impact of the local AGC algorithm on a speech versus noise classification task over 32dB test amplitude. Both the logistic regression and deep neural network classifiers achieve an average of 40% relative improvement in accuracy when the AGC is enabled.

BIOGRAPHY



Shih-Chii Liu is a professor in the Faculty of Science at UZH. She co-directs the Sensors group (<http://sensors.ini.uzh.ch>) at the Institute of Neuroinformatics, University of Zurich and ETH Zurich. Her group works on sensor integrated circuit designs such as bio-inspired event-driven auditory sensors; and real-time energy-efficient hardware systems that combine both sensor and event-driven low-compute network algorithms, targeting always-on edge AI and wearable applications. Prof. Liu is the current IEEE Swiss CAS/ED Chair and an IEEE fellow.

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