SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
Faculty of Engineering
Website: https://www.eng.nus.edu.sg/ece/

Area: Integrated Circuits & Embedded Systems

Host: Dr Lin Longyang

TOPIC	**:**	**Low-Energy Voice Activity Detection via Energy-Quality Scaling from Data Conversion to Machine Learning**
SPEAKER	**:**	**Mr Teo Jinq Horng** **Graduate student, ECE Dept, NUS**
DATE	**:**	**19 September 2019, Thursday**
TIME	**:**	**1pm to 2pm**
VENUE	**:**	**E5-02-32, Engineering Block E5, Faculty of Engineering, NUS**

ABSTRACT

In this work, voice activity detection (VAD) systems with system-level energy-quality (EQ) scaling are investigated. Compared to prior single-knob EQ scaling, multiple EQ knobs are selectively inserted into the entire signal chain from end to end (including analog bias current, data conversion resolution, feature extraction, and machine learning-based classification). EQ knobs are dynamically co-optimized to minimize energy for a given quality target. The analysis shows that system-level EQ optimization provides several benefits and has interesting implications on the performance of machine learning-based classification. First, it can make quality degradation more graceful than single knob, allowing for more aggressive energy reduction under a given quality target, while retaining the ability to operate at full quality. Also, proper system-level EQ optimization enhances fitting in machine learning-based systems, suppressing both underfitting and overfitting. The analysis also shows that context-specific retraining significantly improves quality and resolves fitting issues, especially at low input SNR. Measurements on a 28nm testchip show that system-level EQ scaling can reduce energy by up to 3.5X at 2% accuracy degradation in 10-dB noise, compared to full quality. Iso-technology comparison shows that the minimum energy of 51.9 nJ/frame is lower than prior art by 1.9-74.4X at comparable speech/non-speech hit rates.

BIOGRAPHY

Teo Jinq Horng is currently pursuing a Ph.D. degree from the National University of Singapore. His research interests include systems with scalable energy-quality and on-chip self-learning.