

Electro-Optics and Photonics Seminar
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Integrated Photonics for Computation, Interconnects and Sensing

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Abstract

Silicon photonics is poised to revolutionize inter- and intra-data center communications since internet traffic continues to increase exponentially making it difficult and costly for existing switching and interconnects in data centers to cope with the fast-growing bandwidth requirement. Silicon photonics is able to contribute data centers in terms of the lower cost, higher bandwidth, and lower power consumption. As many fundamental components including the power-efficient modulators mature, silicon photonics is believed to have reached the tipping point with a surging global market. Besides the optical interconnects, silicon photonics also shows the promise in abundant applications, ranging from high performance optical computing and autonomous cars, to biomedical sensing and even aerospace applications.

In this seminar, an overview of the silicon photonics as well as a potential trend for 2020 and beyond will be provided. First, the recent development of optical components including passive and active modules as well as optical circuits in silicon photonics will be presented. Second, as Moore's law has been approaching the physical limitation, photonics-based high-performance computing is envisioned as a potential answer to the continuation of Moore's law. We propose and experimentally demonstrate a new photonics-assisted full adder which is capable of operating at a higher frequency than electrical counterparts while consuming less power. This paves the way to the future integrated high-speed and power-efficient optical computing. Sensing related applications will also be addressed in the presentation. Finally, silicon photonics for bio- and chemical sensing applications such as CWAs (chemical warfare agents) will also be presented.



Ray T. Chen is Professor at UT Austin. Dr. Chen is a Fellow of IEEE, OSA, and SPIE. He was the recipient of the 1987 UC Regent's Dissertation Fellowship, the 1999 UT Engineering Foundation Faculty Award, the 2008 IEEE Teaching Award and the 2013 NASA Certified Technical Achievement Award. To date, he has over 930 publications, including over 100 invited papers, and holds 74 patents. He has chaired or been a program-committee member for more than 120 domestic and international conferences organized by IEEE, SPIE, OSA, and PSC. He has served as an editor, co-editor or coauthor for over twenty books. Dr. Chen served as the CTO, Founder and Chairman of the Board of Radiant Research, Inc. from 2000 to 2001, and serves as the founder and Chairman of the Board of Omega Optics Inc. since its initiation in 2001. Dr. Chen has supervised and graduated 51 PhD students and 30 postdocs from his research group at UT Austin. Many of them are currently professors in the major research universities in USA and abroad.