

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 (ICES)

Host: Professor Massimo Alioto

Research Seminar

TOPIC	:	SPAD cameras for picosecond sensing: opportunities and challenges
SPEAKER	:	Edoardo Charbon Professor, Faculty of EPFL
DATE	:	Thursday, 29 May 2025
TIME	:	11.00am – 12:00pm
VENUE	:	E5-03-20, SEMINAR ROOM

ABSTRACT

Solid-state photon-counting image sensors have emerged as useful tool to capture fast phenomena involving light at various wavelengths. Fast photon detection can be achieved with few picosecond resolutions using single-photon avalanche diodes (SPADs). The impact of these detectors on light detection and ranging (LiDAR), fluorescence lifetime imaging microscopy (FLIM), Förster resonance energy transfer (FRET), time-of-flight positron emission tomography (TOF-PET), and many others has been remarkable, and more innovations in quantum imaging are expected. This will be enabled by advances in integrated SPADs along with powerful computational imaging techniques, such as quanta burst photography. New technologies, such as 3D-stacking, Ge, and InP/InGaAs SPAD sensors, will accelerate adoption of SWIR/NIR image sensors. A technological perspective will be given on computationally intensive image sensors, for affordable, yet powerful quantum imaging.

BIOGRAPHY

Edoardo Charbon (SM'00 F'17) received the Diploma from ETH Zurich, the M.S. from the University of California at San Diego, and the Ph.D. from the University of California at Berkeley in 1988, 1991, and 1995, respectively, all in electrical engineering and EECS. He has consulted with numerous organizations, including Bosch, X-Fab, Texas Instruments, Maxim, Sony, Agilent, and the Carlyle Group. He was with Cadence Design Systems from 1995 to 2000, where he was the Architect of the company's initiative on information hiding for intellectual property protection. In 2000, he joined Canesta Inc., as the Chief Architect, where he led the development of wireless 3-D CMOS image sensors. Since 2002 he has been a member of the faculty of EPFL, where he is full professor. From 2008 to 2016 he was with Delft University of Technology's as full professor and Chair of VLSI design. He has been the driving force behind the creation of deep-submicron CMOS SPAD technology, which is mass-produced since 2015 and is present in telemeters, proximity sensors, and medical diagnostics tools. Since 2014, he has pioneered the use of Cryo-CMOS technology for the control of quantum devices, especially qubits, to achieve scalable, fault-tolerant quantum computing. His interests span from 3-D vision, LiDAR, FLIM, FCS, NIROT to super-resolution microscopy, time-resolved Raman spectroscopy, and cryo-CMOS circuits and systems for quantum computing. He has authored or co-authored over 500 papers and two books, and he holds 30 patents. Dr. Charbon is the recipient of the 2023 IISS Pioneering Achievement Award, he is a distinguished visiting scholar of the W. M. Keck Institute for Space at Caltech, a fellow of the Kavli Institute of Nanoscience Delft, a distinguished lecturer of the IEEE Photonics Society, and a fellow of the IEEE.

