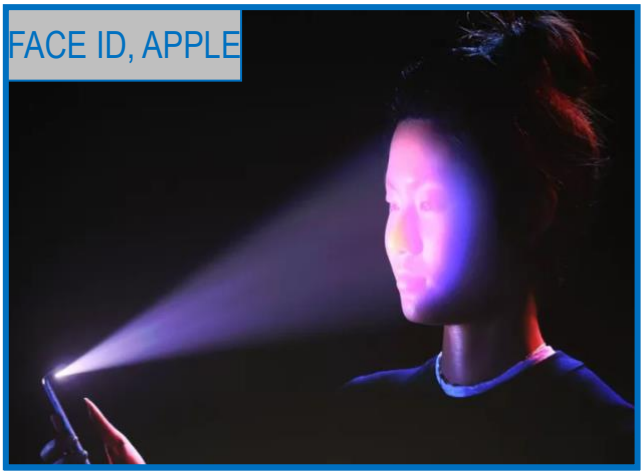
Project proposed by: **Supervisor:**	Intelligent Sensory Microsystems Laboratory, ECE, U of T Prof. Roman Genov
Project title:	**System Development for Next-Generation Cameras for 3D Imaging with Time-of-Flight Sensors** (2 Positions)
Project description:	At Intelligent Sensory Microsystems Lab, our team is leading the development of a new family of coded-pixel cameras with never-before-seen capabilities, like the ability to sort incoming photons based on their properties. These cameras target the explosively growing space of new computer vision applications such as 3D imaging for robotic navigation of drones and self-driving cars in harsh environments; and next-generation information-rich user interfaces through face / gesture analysis. Such applications often require programmability, or coding, of the camera exposure at the individual-pixel level. Unlike conventional cameras, which record all light incident onto a pixel, our coded-exposure-pixel (CEP) cameras can be programmed to selectively sort the light based on its path or time of travel. In conjunction with a concurrently coded illumination, this enables a wide range of previously unattainable video capabilities such as seeing against the sun, seeing through the skin, or seeing behind an object/around the corner. This interdisciplinary project spans across many fields such as the design of analog and digital integrated circuits for custom-fabricated CMOS image sensors, embedded systems with high-performance FPGA/DRAM/ASIC co-design, design of semiconductor devices such as novel 3D photodetectors, design, and experimental deployment of computational-imaging algorithms, as well as various aspects of optics and photonics. **Related videos:** 1. https://youtu.be/8__WJb06h5E 2. https://www.dropbox.com/s/4q60jhp9vfmi4qy/1717-supp.mp4?dl=0 **Undergraduate and Master Students** will actively participate in the development of various hardware prototypes and software applications for computational imaging systems/cameras. Especially, FPGA firmware development and software programming. The ideal candidates are expected to have the following qualifications: • Good experience with printed circuit boards (PCB), development for FPGA boards, and software/hardware debugging. • Proficiency in Python and HDL language like Verilog. • Experience with digital design verification is desirable. • Self-driven attitude, preemptive in finding solutions, and interested in both hardware and software.
Contact person:	Kindly send your email to Ayandev Barman (ayandev.barman@mail.utoronto.ca) and Roberto Silva (r.silva@mail.utoronto.ca), and copy to Prof. Roman Genov (roman@eecg.utoronto.ca). Please include your GPA, study program, and related accomplished projects in the email along with your attached updated CV and all your transcripts (official or unofficial).

Computational Imaging Applications

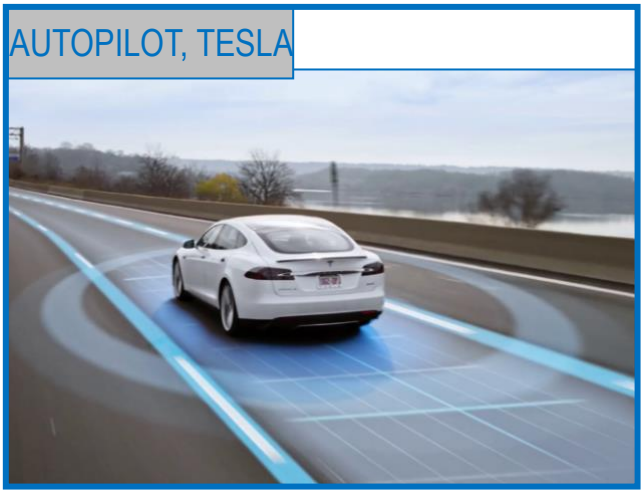
HDR IMAGING

FACE ID, APPLE

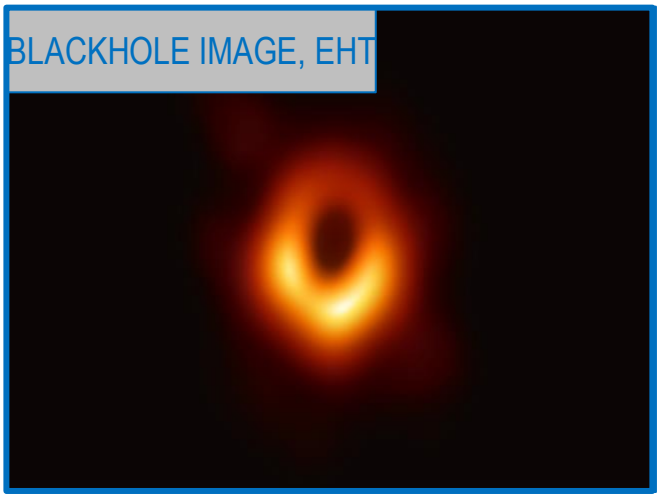


ASTRO-PHOTOGRAPHY,

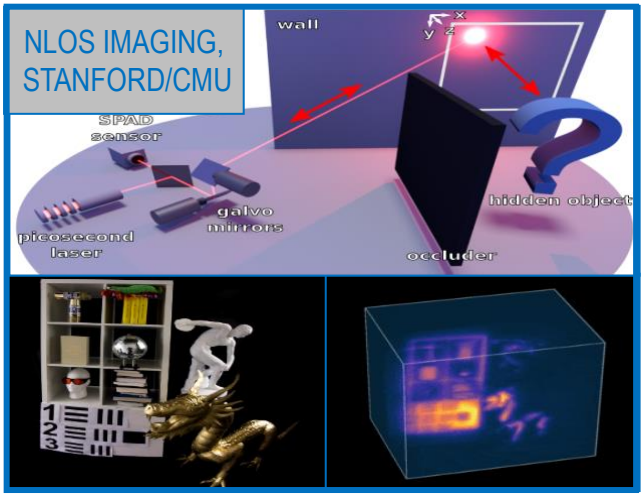
AUTOPILOT, TESLA



BLACKHOLE IMAGE, EHT



NLOS IMAGING, STANFORD/CMU



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