

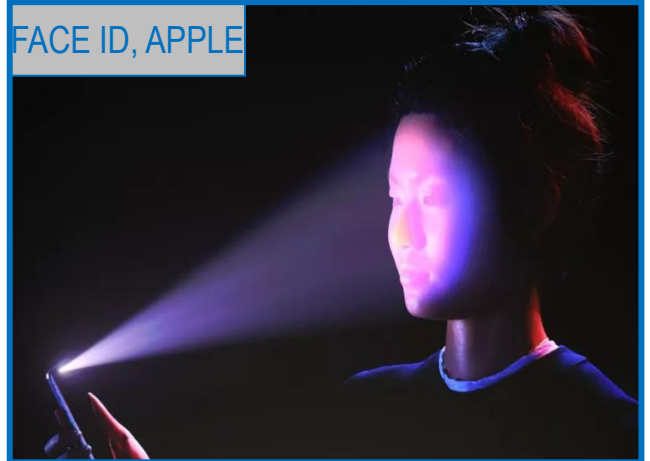
<b>Project proposed by: Supervisor:</b>	Intelligent Sensory Microsystems Laboratory, ECE, U of T Prof. Roman Genov
<b>Project title:</b>	Firmware Development and Computer Vision Applications for the Next-Generation Computational Cameras, Focused on Flux-to-Digital Conversion (FDC) Scheme (2 Positions)
<b>Project description:</b>	<p>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.</p> <p>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.</p> <p>Conventionally, the incident light flux is first converted into an analog voltage within each pixel, which is then digitized by an analog-to-digital converter (ADC). Recently, our team has developed a novel digital conversion scheme that bypasses the analog voltage domain entirely, using CEP. This approach directly converts the incoming light flux into a digital signal, resulting in an increased dynamic range and reduced noise typically introduced during analog-to-digital conversion.</p> <p><b>Related videos:</b></p> <ol style="list-style-type: none"> <li><a href="https://youtu.be/8_WJb06h5E">https://youtu.be/8_WJb06h5E</a></li> <li><a href="https://www.dropbox.com/s/4q60jhp9vfmi4qy/1717-supp.mp4?dl=0">https://www.dropbox.com/s/4q60jhp9vfmi4qy/1717-supp.mp4?dl=0</a></li> </ol> <p><b>Undergraduate and Master Students will actively participate in developing firmware and computer vision applications for our camera, especially focused on FDC scheme.</b> Specifically, you will participate in either 1) FPGA firmware development using Verilog, or 2) neural network model development for the computer vision applications using FDC scheme.</p> <p><b>The ideal candidates are expected to have the following qualifications:</b></p> <ul style="list-style-type: none"> <li>● Concrete understanding in digital system design (preferably taken ECE532H or similar until 2026 Winter) OR neural network model design</li> <li>● Experience in designing your own digital systems using FPGA OR neural network model (not just hyperparameter tuning)</li> <li>● Experience in reading and analyzing papers related to computer vision (only for the applicant for neural network model development)</li> <li>● cGPA higher than 3.5 out of 4.0, with excellence in digital system design OR neural network model design related courses</li> <li>● Self-driven attitude, pre-emptive in finding solutions, and high interest in digital system design OR neural network model design</li> </ul>
<b>Contact persons:</b>	Kindly send your email to Jangwon Suh ( <a href="mailto:j.suh@mail.utoronto.ca">j.suh@mail.utoronto.ca</a> ) and copy to Prof. Roman Genov ( <a href="mailto:roman@eecg.utoronto.ca">roman@eecg.utoronto.ca</a> ). Please include your cGPA, study program, and related accomplished projects in the email along with your attached updated CV and all your official transcripts.

## Computational Imaging Applications

HDR IMAGING



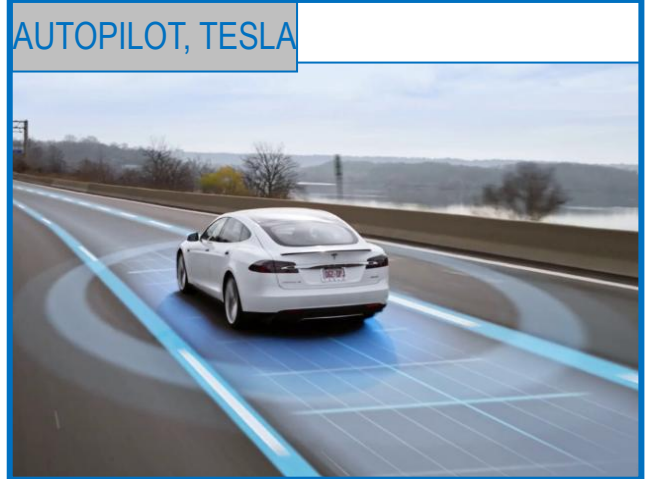
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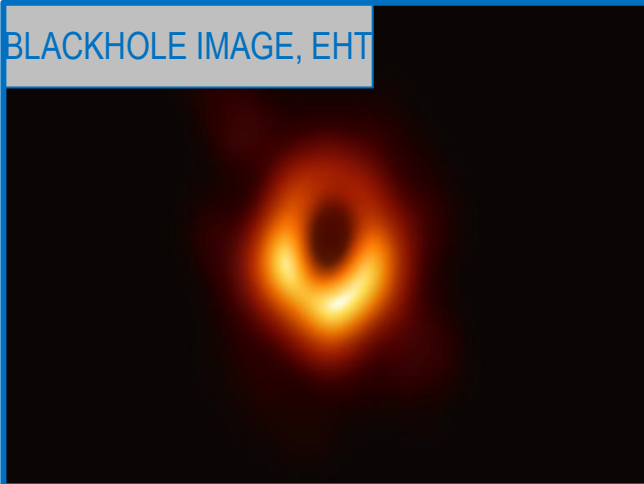
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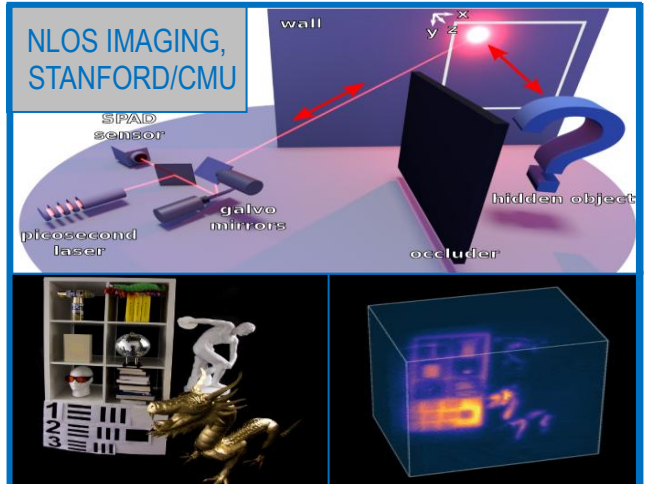
AUTOPILOT, TESLA



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Be part of the groundbreaking revolution in state-of-the-art Computational Imaging applications.