STUDENT ORAL PRESENTATIONS I
2:15 PM – 3:15 PM

2:15 PM	**Slot A [Room 1130]**	**Victor Wen (Energy Systems)**	*"A Cell-Level Power Management IC for Partial Power Processing in PV Energy Harvesting Applications"*
		Photovoltaic (PV) energy harvesting market has grown at a remarkable rate over the past decade. Much research has been conducted to find methods that can extract the maximum power from PV modules under various weather conditions. These methods are known as Maximum Power Point Tracking (MPPT), and they are usually implemented at string or module level. Recently, there is a growing interest to have Distributed MPPT (DMPPT) at the sub-string or cell level to further maximize the available PV power. In this work, we developed a partial power processing technique, known as the ∆ - Conversion scheme, that can achieve the same power benefit as the DMPPT scheme but with less power conversion losses, and therefore is more cost-effective and compact for cell-level integration. A Power Management Integrated Circuit (PMIC) is designed to realize the ∆ - Conversion scheme for Concentrating-PV (CPV) systems. On average, 10% more PV output power is obtained in a CPV system with this IC design.	
	Slot B [Room 1170]	**Wei Wang (Computer Engineering)**	*"Multi-Resource Fair Allocation in Heterogeneous Cloud Computing Systems"*
		We study the multi-resource allocation problem in cloud computing systems where the resource pool is constructed from a large number of heterogeneous servers, representing different points in the configuration space of resources such as processing, memory, and storage. We design a multi-resource allocation mechanism, called DRFH, that generalizes the notion of Dominant Resource Fairness (DRF) from a single server to multiple heterogeneous servers. DRFH provides a number of highly desirable properties. With DRFH, no user prefers the allocation of another user; no one can improve its allocation without decreasing that of the others; and more importantly, no user has an incentive to form a coalition with others to lie about its resource demand. DRFH also ensures some level of service isolation among the users. As a direct application, we design a simple heuristic that implements DRFH in real-world systems. Large-scale simulations driven by Google cluster traces show that DRFH significantly outperforms the traditional slot-based scheduler, leading to much higher resource utilization with substantially shorter job completion times.	

2:30 PM	**Slot A [Room 1130]**	**Jason Grenier (Photonics)**	*"Ultrafast Laser Inscription of Optical Fiber Sensors and Circuits"*
			Optical fibers form the backbone of the Internet and are also routinely used for biomedical and sensing applications. The fiber core, which guides the light through the optical fiber, represents less than 1 percent of the total volume, leaving room to add much more functionality to this compact and highly utilized platform. Ultrafast laser microstructuring offers new 3D fabrication opportunities for the dense integration of laser-formed optical devices directly inside optical fibers thereby overcoming the many challenges and costs of otherwise connecting and packing optical fibers with discrete bulk optics. This talk will overview the current progress and future opportunities towards fabricating in-fiber temperature-independent bend and torsion sensors, as well as polarization splitters, taps and polarization selective elements of interest for quantum photonics systems. Furthermore, laser-formed microfluidic channels (micron-sized pipes) that allow light guiding structures to probe their contents to make sensitive measurements that underpins the possibility for creating complex laboratory diagnostics on a compact optical fiber are discussed.
	Slot B [Room 1170]	**Nazanin Calagar (Computer Engineering)**	*"Source-Level Debugging for FPGA High-Level Synthesis"*
			High-level synthesis (HLS) raises the level of abstraction for hardware design by allowing software methodologies to be used. Implementing computations in hardware typically provides speed and energy benefits vs. a software implementation, and the value proposition of HLS is to bring such benefits to two types of users: 1) hardware engineers who use HLS to increase engineering productivity, and 2) software engineers with a limited (or no) knowledge of hardware design. Given a bug in the HLS-generated hardware or its integration with a surrounding system, the user is forced into HW-debugging methodologies, logic simulation and manual inspection of waveforms. Thus, debugging HLS hardware is virtually impossible for users without hardware skills. We describe a source-level debugging framework for FPGA high-level synthesis that offers gdb-like step, break, and data inspection functionality for an HLS-generated hardware circuit. With the proposed framework, the user can inspect the values of logic signals in the hardware from the C source code perspective. In addition to the software-like ecosystem for HLS debugging, the framework permits concurrent hardware and software debugging to discover the first point at which at which any logic signal in the hardware mismatches with its corresponding variable in software.

	Slot A [Room 1130]	**Juan Gonzalez (Biomedical)**	*"A Feedback System to Improve Gait in Lower-Body Amputees"* The current research of sensory-feedback systems in amputees tries to improve sensory-motor coordination. Several technologies have been developed to help the users acquire information from the environment in order to improve the use of prosthesis. In this project, a non-invasive technique using cutaneous mechanical stimulation is been investigated as a channel to provide feedback to the user. One aspect of mobility and prosthetic function that is a common part of real-world mobility where sensory feedback has not been investigated is in obstacle crossing and avoidance. There is evidence that individuals with lower-limb amputations have increased failure rates in obstacle avoidance. Studies have also shown that one of the main indicators of successful obstacle avoidance is foot clearance. The proposed development aims to study the ability to control foot clearance via vibrotactile sensory feedback. The experiment will require a subject to walk wearing a sensory device. Vibrotactile feedback based on foot clearance will be provided to the subject, who will interpret it and try to maintain the foot clearance within a certain limit. Measurements will be taken to determine the feasibility of foot clearance control based on vibrotactile feedback.
2:45 PM	**Slot B [Room 1170]**	**Narges Norouzi (Computer Engineering)**	*"Assessment of Alcohol Withdrawal Tremor in the Emergency Department"* Alcohol withdrawal (AW) syndrome is commonly encountered in the Emergency Department (ED) and can be life-threatening in most severe form. Despite its prominence, it is poorly managed in ED. Emergency physicians are often reluctant to treat patients in AW because Benzodiazepines can cause excessive sedation and they have high abuse potential (patients present to the ED complaining of AW but are actually drug-seeking). We propose a signal processing method of assessing the severity tremors caused by AW syndrome. We have developed an iOS application to calculate the Clinical Institute Withdrawal Assessment (CIWA) score which captures iPod movements using the built-in accelerometer in order to reliably estimate the tremor severity component of the score. We report on the characteristics of AW tremor, the accuracy of electronic assessment of tremor compared to expert clinician assessment, and the potential for using signal processing assessment to differentiate factitious from real tremor in patients seen in ED. Our preliminary result based on 38 subjects shows linear relationship between energy measured by the accelerometer (in the 6.5-10.5 Hz range) and the expert rating of tremor severity. Additionally, we find out that the tremor above 7 Hz could be a potential discriminator of real versus fictitious tremors.

3:00 PM	**Slot A [Room 1130]**	**Heng Xu (Computer Engineering)**	*"Efficient Strong Consistent Communication in Distributed Control Plane of Software Defined Networks"*
			Traditional networks employ a distributed mechanism for controlling the network, thus making it resilient to network fragmentation, among many of its original goals. However, many of these original design goals are no long valid in today's operating environments. Software Defined Networking (SDN) is a new computer networking paradigm, where thousands of switches are managed by a centralized controller. The switches are basically just forwarding elements controlled by central controller. In this way, the forwarding plane (the switch) and the control plane can evolve independently of each other, which could lead to a diverse range of new innovations. Applying SDN to Wide Area Networks (WANs) is a recent discovery. The main challenges of applying the SDN paradigm to WANs is that the characteristics of links of WANs differ significantly from that of the Local Area Networks. The major innovations in the work is the investigation of use multiple controllers to partition the WAN topology, thus creating a logically centralized physically distributed control plane. SDN paradigm leads itself easily to interdisciplinary collaboration, for instance, we can have different optical wired or wireless links connecting the switches, and the controller would not have to be changed regardless of the change in the underlying link properties.
	Slot B [Room 1170]	**He Xu (Photonics)**	*"Characterization of Superconducting Single Photon Detectors (SSPD)"*
			Among many other Single Photon Detectors (SPD), Superconducting nanowire or Superconducting SPD- SSPD present distinct advantages of high detection efficiency and low dark counts. With such superior SPD, the main effort of the research community is geared towards completely characterizing the SSPD to understand its performance. Our work filled the niche by presenting an experimental procedure to predict the response of the SSPD. While many phenomena of the SSPD are of interest, the SSPD 'afterpulse' phenomenon is of particular importance. Not only does the afterpulse behaviour reveal internal details about the SSPD, but it also provides clues on how to better tune the SSPD to reduce afterpulse. A recent publication of ours postulated the after pulse is a result of the combination of finite bandwidth and spurious reflection. This hypothesis is confirmed by experimentally varying the bandwidth of the SSPD. The results of characterization will enable research to probe quantum effects more efficiently.