EE PhD Qualifying Exam Part-2 Presentation Schedule, Spring 2016

Last Name	First Name	Ph.D Advisor	Title & Abstract of Presentation	Day & Time	Location
Ali	Syed Huzaif	Bilal Akin	**Study on parametric variations in insulated gate bipolar transistor characteristics due to degradation triggered by the thermal stress**	March 7 10:00-11:00am	ECSN 4.728
			Abstract: Failure precursor identification for power switches is vital for condition monitoring, fault severity assessment and lifetime estimation, which are fundamental elements of next-generation highly reliable and self-diagnosis capable power converters. Insulated Gate Bipolar Transistors (IGBTs) cover the major portion of the high-power semiconductor market, and thus they are more likely to be subjected to thermo-mechanical stresses and wear-out. In this paper, several IGBT samples are thermally aged on a custom-built modular test-bed and experimental results of most of the parameters present in datasheets are collected at certain thermal cycles through an automated curve tracer and comprehensively analyzed. The experimental results include the noise sensitive measurements, such as gate current, gate charge, leakage current. According to the results, parametric variations in saturation voltage, threshold voltage, transfer capacitances, and gate charge are potential candidate failure precursors, which can be used for diagnosis and prognosis.		
Atique	Sharif	Mohammad Saquib	**LTE Coverage Detection Scheme using Multi-layered Sliding Windows**	March 11 2:00pm	ECSN 4.408
			Abstract: Integration of the cellular network with the fixed network has attracted significant amount of efforts to expand the mobile network. The Long Term Evolution (LTE), one of the most contemporary wireless standards that offers higher spectral efficiency, can support the ever increasing internet traffic. However, white spaces may exist in some of the LTE frequency bands. As a result, dynamic spectrum access (DSA) has gained a lot of attention in the research of LTE environment to improve spectrum utilization. The very first task carried out by any unlicensed user is to detect the presence of network coverage. Synchronization signals are always being transmitted to aid the LTE cell search procedure. Therefore, the existence of LTE coverage may be determined by knowing the occupance of the primary synchronization signal (PSS). In this paper, a novel scheme has been proposed that determines the presence of LTE coverage via collecting the energy of the received PSS by employing multi-layered sliding widows. Extensive theoretical analyses and simulations are performed to demonstrate the performance of the proposed scheme against the other feasible existing techniques. Depending on the channel condition and data transmission rate, the numerical results of the proposed technique show its improved robustness against the frequency selectivity of channels in terms of performance		
Abbasalipour	Amin	Siavash Pourkamali	**Micromachined Frequency-Output Force Probes for Atomic Force Microscopy**	April 12 12:00-1:00pm	ECSN 4.702
			Abstract: This work presents new classes of highly sensitive displacement and force probes with sub-10nm displacement resolution. Two different types of resonators were integrated with displacement probes as frequency output strain gauges. First type utilizes a piezoelectric resonator as its frequency output strain gauge. The device is comprised of a length extensional bulk mode thin film piezoelectric on silicon resonator coupled to a micro-cantilever. In this manner deflection of the cantilever tip is transferred to the resonating plate causing a change in its resonance frequency. Operating at 8.4MHz, fabricated sensors show sensitivities as high as 1.5 Hz/nm with a displacement resolution of 0.5Å. The high sensitivity and fast response time along with a wide range of linearity make such probes suitable for different dynamic measurements in the sub-nm to a few microns range. The second type, in which the force probe is a single layer monolithic crystalline silicon micro-structure, is comprised of a thermal-piezoresistive resonator embedded within a micro-cantilever. Deflection of the cantilever due to the applied force mechanically distorts the resonator, and therefore modulates the resonance frequency of the resonator. A prototype displacement sensor, operating at 7.5MHz, shows a displacement sensitivity of 3.6×10-7 Δf/f/nm with a minimum measurement accuracy of 7.3Hz frequency shift resulting from 2.2nm deflection. Such devices can be used as atomic force microscope (AFM) probes or high resolution surface profilometers with fully electrical operation eliminating the bulky, expensive and complex optical detectors typically used in such systems.		
Bo	Yu	Jonh Fonseka	**Constrained Interleaving of Serially Concatenated Codes with Inner Recursive Codes**	March 04 4:00-4:30pm	ECSN 4.728
			Abstract: A novel constrained interleaving technique is discussed to improve serially concatenated codes (SCCs) with inner recursive convolutional codes (IRCCs). Constrained interleavers are designed to achieve a minimum Hamming distance (MHD) for the SCC, dscc , between do and while simultaneously maximizing the interleaver gain, where do and di are the MHD of the outer and inner codes respectively. Constrained interleavers can be constructed to achieve dscc= dodi while almost maintaining the interleaver gain of uniform interleaving. By imposing additional inter-row constraints, dscc of constrained interleaving is increased beyond dodi up to, however, at the expense of some interleaver gain. Constrained interleaving is an efficient way to construct SCCs with low error floors while achieving interleaver gain at relatively short interleaver sizes.		
Cai	Yongda	Yun Chiu	**A14b 80 MS/s Two-Step SAR ADC with Split-ADC Digital Calibration**	March 11 11:00-11:30am	ECSN 3.804
			Abstract: A 14-bit 80-MS/s split successive-approximation-register (SAR) analog-to-digital converter (ADC) wiil be presented. Redundancy technique, amplifier design, lineary and noise issue will be widely talked in the presentation. The data converter uses split ADC architecture for background calibration. This redundant architecture also enables the converter to work at some strong disturbance environment like radiation.Simulation results and testing results will also be shown and analyzed at the end.		
Choi	Ye	Gil Lee	**Gas sensors using spinnable carbon nanotubes**	April 4 10:00-12:00pm	ECSN 4.728
			Abstract: It is well known that growth of vertically aligned carbon nanotubes (CNTs) are done on nanoparticles of metal, such as Ni or Fe. Many studies showed that vertically aligned CNTs are able to be spun directly from the substrate. The CNTs that can be spun are called "spinnable" CNTs. Spinnable CNTs have many advantages including its conductivity, flexibility, and porous surface. Using these properties spinnable CNTs can be manipulated as a gas sensors. However, despite all the studies that are done over spinnable CNTs, it still is a challenging task to control the parameters of spinnable CNTs. Producing pure single-wall nanotube forest or producing pure multi-wall nanotube forest are still under many studies. Oxidation state of metal nanoparticles also have a significant role in the growth process. Finally, the density of the metal nanoparticles requires more controlled experiment for more stable growth process of CNTs. In this presentation, I will talk about the parameters of spinnable CNTs and methods to improve controls over those parameters. Additionally, applying the vertically aligned CNTs, that are grown with different parameters varying, on gas sensors will be presented and compared. We find that the varying parameters of growth process of spinnable CNTs will affect the quality of the CNTs, and consequently, will affect the sensitivity of gas sensors.		
Dousti	Behnoush	Gil Lee	**Electrode Development of Energy Storage**	April 21 8:00-11:00am	ECSN 4.702
			Abstract: Current lithium ion batteries lack enough power and energy to be used in vehicles and that has confined their use to small electronic devices. To address both energy and power demand, the development of innovative electrodes is imperative for future energy storage devices. Hybrid nanostructures based on carbon nanotubes (CNT), metals/semiconductors, metal oxides and metal sulfides show promising properties for LIBs application such as high surface area, low diffusion distances, high electrical and ionic conductivity. The research focuses on developing a composite structure of carbon nanotubes and MoS2 to serve as the anode of a LIB. MoS2 will be deposited on CNT forests by two electrodeposition methods from an aqueous solution and the results will be modified by changing the process parameters.		

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Dubey	Harishchandra	John Hansen	**Noise-Aware Unsupervised Speech Activity Detection**	March 3 10:00-11:00am	ECSN 4.702
			Abstract: This presentation propose a method for noise-aware unsupervised speech activity detection (SAD). Combo-SAD (Sadjadi and Hansen, 2013) is a method for unsupervised SAD based on features that quantifies temporal as well as spectral signatures of voiced speech-segments. This method was tested for audio of duration in order of 10-20 minutes. Combo-SAD assumes the presence of speech and non-speech segment in audio recordings. For long-duration audio recording such as those from NASA Appollo 11, Peer-led Team Learning (PLTL) and digital audio loggers such as LENA device, large number of audio segments contains only noise or in other words probability of speech presence is very low. Prof-Life-Log corpus (Ziaei, Sangwan and Hansen, 2013) contain long duration (8 to 16 hour) audio recordings captured in naturalistic scenarios. The ambient noise is inherently present in most of these recordings under naturalistic settings. The noise possesses signatures of the underlying naturalistic scenarios such as indoor, outdoor, gym. There are instances, where only noise is present for a long segment of audio file (1-2 hours). In such cases, Combo-SAD fails to perform accurate SAD due to its assumption that both non-speech and speech components are present in the audio recording. To eliminate this drawback, threshold-optimized combo-SAD (TO-combo-SAD) was proposed that has memory in threshold (Ziaei, Kaushik, Sangwan, Hansen and Oard, 2014). It used past decision threshold for audio-segments that has low probability of speech presence. We tested TO-combo-SAD on 2 hours of naturalistic data obtained from a female cochlear implant (CI) user and obtained a mean absolute error of 11.0499% on frame-level using 40 ms windows with 10 ms skip rate.		
Gao	Yikai	Babak Fahimi	**High performance LED driver with capability of current balancing**	March 28 10:00-11:00am	ECSN 4.702
			Abstract: LED lamp's brightness is controlled by the DC current that flows through it. So LED drivers are an important part of the lamp. When LED drivers are being designed, many aspects such as lifetime, efficiency, output current ripple and power factor should be considered. And in many cases of high power (>100W) LED application, the LEDs are connected in parallel. Due to their negative temperature coefficient, the brightness of them may be different. In this presentation, conventional issues as well as current balancing problems of LED drivers are discussed. Some cutting edge techniques to address these problems are presented. Based on them, LLC converter and its application in LED drivers are proposed. It achieves zero voltage switching and current balancing to improve efficiency and reliability. Simulation has been done to verify its feasibility.		
He	Dingyi	Babak Fahimi	**Design and Development of Very High Frequency DC-DC Power Converters**	March 28 9:00-10:00am	ECSN 4.702
			Abstract: Power converters are widely used in electronics devices, motor drive systems, power grid, etc. Industry and market are driving demand for power converters with small size, low cost, high integration, and fast transient. Increasing switching frequency is an easy and effective way to satisfy the demand. However, very high frequency (VHF, 30MHz ~ 300MHz) operation will cause some problem. Switching loss and gate drive realization are two of them. In order to avoid switching loss and reduce electromagnetic interfering (EMI), soft-switching technics are used in VHF converters. Because switching frequency is very high, resonant gate drive is introduced to VHF converters.This presentation will introduce two types of VHF converter topologies and analysis their advantages and disadvantages. In additional, two types of gate drive will be introduces as well as their advantages and disadvantages. Finally, outlooks of multiport VHF converters are presented.		
He	Jiacong	Joseph Sloan	**An Energy-Efficient DRAM Cache Design**	March 30 2:00-3:00	ECSN 4.728
			Abstract: Emerging die-stacking technology enables multiple layers of DRAM to be integrated with multicore processors, which provides high bandwidth and low latency to break the memory wall. However, energy becomes a major challenge with the increasing size of die-stacked DRAM caches. It is observed that DRAM caches with longer bitlines consume more energy due to their larger capacitance. To reduce the higher energy of long bitlines, we can divide the DRAM cache into multiple sublevels and schedule energy-efficient data movement among these levels based on reuse distance. We propose an extended MissMap indicating in which sublevel and way that every DRAM cache line is located. Evaluations show that these techniques can efficiently reduce energy consumption and improve performance.		
Jie	Danfeng	Hoi Lee	**Design of high-frequency high-voltage bus converter**	April 12 3:30pm	ECSN 4.728
			Abstract: This presentation presents a design of high-frequency high-voltage zero-voltage-switched bus converter. Most conventional bus converters can only operate at hundreds of kHz under 400 V input voltage conditions due to the limitations of switch devices and gate driver design. In this presentation, the design considerations of implementing MHz 400 V input voltage converter with GaN devices are analyzed. Operation of the bus converter is also discussed and summarized in details.		
Karadagur Ananda Reddy	Chandan	Issa Panahi	**Independent Vector Analysis: Definition and Algorithms**	April 18 11:00am	ECSN 4.728
			Abstract: A new approach to independent component analysis (ICA) by extending the formulation of univariate source signals to multivariate source signals is presented. The new approach is termed independent vector analysis (IVA). In the model, we assume that linear mixing model exists in each dimension separately, and the latent sources are independent of the others. In contrast to ICA, the sources are random vectors, not just single variables, which means the elements of a random vector are closely related to the others. Thus, we assume the dependency between the elements of a source vector. In this manner, we define dependence between vectors as Kullback-Leibler divergence between the total joint probability of vectors and the product of marginal probabilities of vectors. Then, the model allows independence between multivariate source signals represented as random vectors, and dependence between the source signals within the vector representation. The proposed vector density model can for example capture variance dependencies within a vector source signal. There are several applications of this new formulation. In the separation of acoustic sources, the algorithm mitigates the permutation problem, i.e. the usual ICA algorithms applied in to the frequency domain mixture data suffer from the unknown permutation of the output signals. Although there are several engineering solutions to fix this problem after the ICA stage, the proposed method provides a natural solution to the problem by capturing the inherent dependencies of the acoustic signals. It therefore avoids the permutation problem and allows the separation of sources in very challenging environments for many sound sources.		
Kaushik	Lakshmish	John Hansen	**Keyword Spotting based Automatic Sentiment/Opinion Detection in Naturalistic Audio**	March 3 9:00-10:00am	ECSN 4.728
			Abstract: Most existing methods for audio sentiment/opinion analysis use automatic speech recognition to convert speech to text, and feed the textual input to text-based sentiment classifiers. This study shows that such methods may not be optimal, and proposes an alternate architecture where a single keyword spotting system (KWS) is developed for sentiment detection. In the new architecture, the text-based sentiment classifier is utilized to automatically determine the most powerful sentiment-bearing terms, which is then used as the term list for KWS. In order to obtain a compact yet powerful term list, a new method is proposed to reduce text-based sentiment classifier model complexity while maintaining good classification accuracy. Finally, the term list information is utilized to build a more focused language model for the speech recognition system. The result is a single integrated solution which is focused on vocabulary that directly impacts classification. The proposed solution is evaluated on videos from YouTube.com and UT-Opinion corpus (which contains naturalistic opinionated audio collected in real-world conditions). Our experimental results show that the KWS based system significantly outperforms the traditional architecture in difficult practical tasks		

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Lee	Kunwang	Bilal Akin	**Condition Monitoring of PM Motors through Leakage Flux using Fluxgate Sensors**	April 18 10:00am	ECSN 4.702
			Abstract: Flux spectrums of electric machines contain most critical and direct fault related information to monitor and characterize various faults and their progressions. The detection of magnet defect faults through fluxgate sensors simply by monitoring the leakage flux content around permanent magnet synchronous motors (PMSMs) was investigated. For this purpose, a remote / on case fault monitoring prototype is prepared which includes fluxgate sensor, signal sensing/conditioning circuit, and a microcontroller for leakage flux data streaming. In order to identify magnet defect faults in PMSMs, faults patterns in the leakage flux spectrum are exhaustively analyzed at different torque-speed profiles. Experimental results show that deployment of fluxgate sensor in magnet defect fault detection yields better results than the classical stator current analysis in PMSMs both in time and frequency domains		
Li	Lianjun	Kamran Kiasaleh	**Feedback Equalization for Fading Dispersive Channels**	April 7 1:00-2:00pm	ECSN 4.728
			Abstract: Data transmission through a slowly fading dispersive channel is considered. A receiver that linearly operates on both the received signal and reconstructed data is postulated. Assuming an absence of decision errors, the receiver is optimized for a minimum-mean-square-error criterion. Transfer functions are determined and superiority over nonfeedback receivers is indicated. The feedback receiver can he realized in a slowly varying unknown environment by means of an adaptive technique that requires neither test signals nor statistical estimation. The receiver will eliminate timing jitter and Doppler shifts. In addition, the receiver provides a time-diversity effect, as the receiver probability of error averaged over the fading statistics is lower in the presence of dispersion than in its absence.		
Nguyen	Huy	Taylor W Barton	**High efficiency Power Amplifier and linearization technique for wireless applications**	April 7 10:00-11:30am	ECSN 3.8
			Abstract: These days, the proliferation of wireless communication with high data rate and various modulation techniques demand power amplifiers (PAs) with not only high efficiency but also high linearity. However, the exiting PAs tend to trade-off between efficiency and linearity. There are some techniques to deal with this problem based on two main categories: supply voltage-modulation and load modulation. In this presentation, the RF switch-mode PA design in load modulation will be presented and comparison power added efficiency by using Chireix architecture with conventional one (using Wilkinson divider/combiner) will be provided.		
Parthasarathy	Srinivas	Carlos Busso	**Rank Based Emotion Classifiers**	April 13 2:00-3:00pm	ECSN 4.728
			Abstract: Automatic emotion recognition in realistic domains is a challenging task given the subtle expressive behaviors that occur during human interactions. The challenges start with noisy emotional descriptors provided by multiple evaluators, which are characterized by low inter-evaluator agreement. Studies have suggested that evaluators are more consistent in detecting relative expressive trends (i.e., emotional changes), rather than absolutes scores (i.e, the actual emotion). Based on these observations, this study explores the use of relative labels to train machine learning algorithms that can rank expressive behaviors. Instead of deriving relative labels from expensive and time consuming subjective evaluations, the labels are extracted from existing time-continuous evaluations over expressive attributes annotated with FEELTRACE. We rely on the qualitative agreement (QA) analysis to estimate relative labels which are used to train rank- based classifiers. The experimental evaluation on the SEMAINE database demonstrates the benefits of the proposed approach. The classification performance using the QA-based labels compare favorably against preference learning classifiers trained with relative labels obtained by simply aggregating the absolute values of the emotional traces across evaluators.		
Paul	Banaful	Ann Catrina Coleman	**High Frequency Mode Locking of Diode LASERs**	April 11 2:00-4:00pm	ECSS 3.910
			Abstract: Generating short optical pulses along with high repetition rate is becoming more and more important for increasing demand for high speed and data processing rate in optical communication systems. Semiconductor laser diodes can be a very promising source for these optical pulses, considering its compactness, ease of fabrication, stability and also integration into photonic devices. Mode locking, a technique to introduce fixed phase relationship between different longitudinal modes, is usually employed in semiconductor lasers to generate the train of short pulses. To increase the repetition rate of the pulses, one of the simplest idea can be to reduce the cavity length. But that will also reduce the gain and eventually the output power. Harmonic mode locking is a very favorable way of achieving high frequency laser diodes without compromising the output power. This can be done using several methods including sub-harmonic optical injection, Colliding Pulse Mode locking (CPM) and Compound Cavity Mode locking (CCM). Among these methods, it has been reported that CCM provides the highest achievable repetition rate. This presentation will demonstrate different methods of obtaining high frequency optical pulses from mode locked diode lasers along with drawbacks of individual methods.		
Press	Alex	Lawrence Overzet	**Fabrication of a MEMS device to measure secondary electron emission in a strong electric field**	April 11 2:00pm	ECSS 3.504
			Abstract: Secondary electron emission (SEE) is an important factor in DC microdischarges, plasma processing and MEMS design. Theory says that the main factor effecting the prevalence of electron emission, is the total number of electrons in the material. Since valence electrons greatly outnumber conduction band electrons, varying the number of conduction band electrons is not expected to noticeably change the overall yield. However in a plasma, it has been shown that biasing a surface pn junction can turn on and off a plasma. A major difference between a surface, and a surface interacting with a plasma is the plasma sheath. The sheath will form a boundary between the plasma bulk and the surface. The sheath is a strong electric field spanning a short distance into the plasma. To study SEE under these conditions, a MEMS device is fabricated, allowing the controlled creation and detection of SEE with an applied electric field on the order of both the distance and strength of a plasma sheath.		
Pyne	Moinak	Stephen Yurkovich	**BATTERY MANAGEMANT SYSTEMS**	MARCH 3 3-4 pm	ECSS 3.910
			Abstract: Improving battery efficiency has always been an important topic of research for automotive and grid power related industries and has led to the introduction of several new technologies to better monitor and operate individual batteries and battery packs in the last few decades. In our research, in order to control battery performance and safety it is necessary to understand what needs to be controlled and why it needs controlling. This requires in-depth understanding of the fundamental cell chemistries, performance characteristics and battery failure modes. The key objectives defining the working of a battery management system are: • Protect the batteries from damage • Extend the life of the battery • Maintain the battery in precise states to maximize its performance in specific applications In order to achieve these goals, we are considering factors: • Temperature Dependence: Ambient temperature tends to have an effect on the internal resistance of a battery. • SOC Estimation: Many applications require an accurate State of Charge of the batteries to enable effective control of changing and discharging. • SOH Estimation: The State of Health helps in determining the battery's capability to deliver its specified output at any point in its life cycle. • Form Factor vs Weight: In order to have maximum capacity at minimum weight, a trade-off is needed with an ultimate aim of maximizing performance. • Reconfigurable Packs: In multi-cell battery systems, small differences between cells can affect the functioning of an entire pack, hence a flexible approach is needed which a controller changes the combinations of batteries to eliminate these changes thus extending battery life.		
Qi	Yuan	Bilal Akin	**A Diagnosis Procedure in Standalone Mode for Inter Turn Short Circuit Fault of PMSMs through Modified Self-Commissioning**	April 1 10:00-12:00pm	ECSS 3.504

Last Name	First Name	Ph.D Advisor	Title & Abstract of Presentation	Day & Time	Location
			Abstract: Fault diagnosis for inter turn short circuit fault in permanent magnet synchronous machines (PMSMs) is critical for system performance, efficiency and reliability. The traditional motor current signature analyses provides reasonable results yet some has practical limitations due to computational complexity and topology dependencies. On the other hand, the self-commissioning procedures are not explored in detail for inter turn short circuit fault PMSMs which has significant potential for diagnostics and performance improvement. In this paper, a modified self-commissioning is proposed to detect inter turn short circuit fault in PMSMs at start-up when the rotor is stationary. Compared to counterparts, it requires significantly low computational load and (less than 5% CPU bandwidth), and provides topology independent results. The procedure is implemented at start-up during standalone mode, that's why agnostic to well-known issues caused by transients and load/speed level. In order to distinguish the inter turn shorts from the eccentricity fault which can exhibit similar behavior, a classification algorithm is introduced. Moreover, the effect of stator iron core saturation on the electric parameters analyzed in depth. Both 2-D FEA simulation and experimental test results are given in this paper to show the efficacy of this method.		
Ranjbar-Mojaveri	Zohre	Andras Farago	**Routing Metrics of Cognitive Radio Networks**	April 5 4:00-6:00pm	ECSN 4.728
			Abstract: Previously, most of the research in cognitive radio networks has focused on single-hop networks, mainly considering challenges at the physical and Medium Access Control layers. Recently, however, multi-hop networks have gained attention as a promising design to leverage the full potential of cognitive radio. One of the main features of routing protocols in multi-hop networks is the routing metric that is used to select the best route for forwarding packets. We survey the state-of-the-art routing metrics for cognitive radio networks. As a starting point, we list the challenges that have to be addressed in designing a good routing metric for cognitive radio networks. We then provide a taxonomy of the different metrics, as well as a survey of how they are being used in different routing protocols.		
Rezaei	Elahe	John Fonseka	**New approach to find the probability density function of a sum of independent exponential random variables**	March 4 3:00pm	ECSN 4.728
			Abstract: In recent years, the spatial diversity has gained a great attention as an efficient solution to deal with non-ideality characteristics of channels. In this paper, a simple approach to extract the probability density function (pdf) of a sum of independent exponential random variables is proposed. Then these pdf's are used to formulate the BER of MIMO systems where the number of TX transmitter is two. In addition, it is shown that how these formulation facilitate finding probability of outage of repetition coding. Index Terms_ outage probability, spatial diversity, MIMO, probability density function.		
Sehgal	Abhishek	Nasser Kehtarnavaz	**A Literature Review of Voice Activity Detector Approaches**	April 6 10:30-11:30am	ECSN 4.728
			Abstract: Voice Activity Detectors (VADs) have been used in many signal processing pipelines to separate the presence of speech from situations when no speech is present. An example pipeline of an application of VAD is performing noise adaptive speech enhancement where noise classification is applied in the absence of speech and speech enhancement is applied in the presence of speech. A literature review of various statistical and machine learning VAD solutions will be conducted in this assignment. The pros and cons associated with various solutions will be examined, in particular with the viewpoint of real-time implementation on smartphone and mobile platforms		
Shakeri Asadi	Mohammad Ali	Andrea Fumagalli	**An Analytical Model of Spectrum Fragmentation in a Two-Service Elastic Optical Link**	March 25 12:00-1:00pm	ECSN 4.702
			Abstract: Elastic Optical Networks (EONs) enable optical circuits to be assigned distinct numbers of spectrum slices. Individual circuits can then be assigned an optimal number of slices to best match their target transmission rates. A well-known drawback of EONs is spectrum fragmentation and its resulting uneven blocking probability, which circuit requests experience when the available spectrum slices in the fiber are insufficient or not contiguous. Capturing this spectrum fragmentation problem analytically is a challenging problem. Not surprisingly, most of the existing studies at this time mainly use simulation based techniques to quantify blocking probability in EONs. In this paper, the authors present a Markov Chain (MC) model that attempts to characterize the fragmentation problem in a simplified scenario, i.e., only two types of circuit services are allowed over a single fiber link. Despite its limited scope, this initial analytical effort is able to accurately capture the non-monotonic behavior of the blocking probability in EONs for the first time.		
Ugur	Enes	Bilal Akin	**Investigation on Power Switch Lifetime Extension Strategies through Switching Frequency and Modulation Adjustment**	March 15 1:00-3:00pm	ECSN 4.278
			Abstract: The recent advances and reports on failure precursors of power switches have led to estimation of lifetime as well as developing secondary control schemes to increase the lifetime of the converters. In this presentation, a secondary control scheme to extend the lifetime of the converter based on the identified failure precursors such as the on-state resistance variation for power MOSFETs and collector emitter voltage variation for IGBTs is proposed for three-phase converters. The controller switches the modulation scheme from SVPWM to discontinuous PWM, and adjusts the switching frequency, once the tracked failure precursor reaches to the defined threshold value. The tradeoff between the total harmonic distortion and lifetime extension at different modulation techniques and switching frequencies are addressed.		
Wang	Jun	John Hansen	**Context-dependent Hardware Speech Processing for Cochlear Implant Subject**	April 4 1:00-2:00pm	ECSN: 4.728
			Abstract: A general hardware speech processing research platform with extension usage for cochlear implant (CI) subject is presented. The highly portable and versatile research platform supports both real-time operation mode as well as offline operation mode. The real-time operation is achieved by combining the research platform with Android based smartphone App aiming at giving CI users convenient ways to adapt to the devices. While offline mode is added to enable researchers to have great flexibility to implement signal processing algorithm and conduct experiments in laboratory. The research platform supports unilateral, synchronized bilateral electrical stimulation and electric plus acoustic stimulation (EAS). The hardware implementation, software realization as well as feathers are discussed		
Wang	Zhengyang	Lawrence Overzet	**Subsurface Control of Secondary Electron Emission in the Presence of a Strong E-field**	April 18 2:00-4:00pm	ECSN 4.728
			Abstract: This presentation focuses on ion induced electron emission (IIEE) from semiconductors. The first part will be a brief review of dissertation [1], the content includes, in order, motivation and background of the research, basic theory, experimental setup, experimental result and discussion, future work. The second part will be a discussion of IIEE in the presence of a strong E-field, which is part of the "future work" mentioned in dissertation [1]. The content includes, in order, device design and experimental setup, basic theory, and the corresponding COMSOL simulation result report and discussion. Reference: [1] David Urrabazo Jr., Ion Induced Electron Emission from Semiconductors: The Effects of Conduction Band Electrons and Surface Density of States.		
Xu	Rupei	Andras Farago	**Fine-Grained Complexity and Algorithm Design for Graph and Network Problems**	April 21 3:00-4:00pm	ECSS 4.910

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			Abstract: Traditionally, the main dividing line for the complexity of algorithmic problems is whether they are NP-complete or solvable in polynomial time. In many cases, however, this qualitative distinction is a too rough subdivision of the complexity landscape. On the one hand, NP-complete problems are not always universally hard, they may often benefit from the use of parametrization, allowing more efficient algorithms for certain parameter ranges. On the other hand, if an algorithm runs in polynomial time, it may still be very slow for big data, leading to the practical experience that polynomial time solvability does not always mean easiness. This situation calls for a finer distinction among the running time bounds of various algorithms. The central goal of the theory of fine-grained complexity is to refine the qualitative distinction of NP-completeness vs. polynomial time solvability into a quantitative analysis of more precise bounds on running times. An example of such a fine-grained analysis is the distinction between problems that necessarily require cubic time in the worst case (under some plausible assumptions), and those that are solvable in quadratic time. Fine-grained complexity theory has the potential to become a fine-tuned guide for algorithm design, identifying precisely what algorithmic performance is obtainable. In graph theory, classic and new open problems and conjectures are almost everywhere, despite the desperately searching for mathematical or operations research techniques, can the fine-grained complexity theory help? In network problems, with the new developing trends, traditional complexity theory cannot fit very well, can the fine-grained complexity theory meet the new demanding computing challenges? This presentation is a survey and summary of research discoveries of fine-grained complexity theory, as well as its application to graph and network problems.		
Zhang	Fan	Aria Nosratinia	**Coherent Product Superposition for Downlink Multiuser MIMO**	March 9 1:30-2:30pm	ECSN 4.728
			Abstract: In a two-user broadcast channel where one user has full CSIR and the other has none, a recent result showed that TDMA is strictly suboptimal and a product superposition requiring non-coherent signaling achieves DoF gains under many antenna configurations. This work introduces product superposition in the domain of coherent signaling with pilots, demonstrates the advantages of product superposition in low-SNR as well as high-SNR, and established DoF gains in a wider set of receiver antenna configuration. Two classes of decoders, with and without interference cancellation, are studied. Achievable rates are established by analysis and illustrated by simulations		