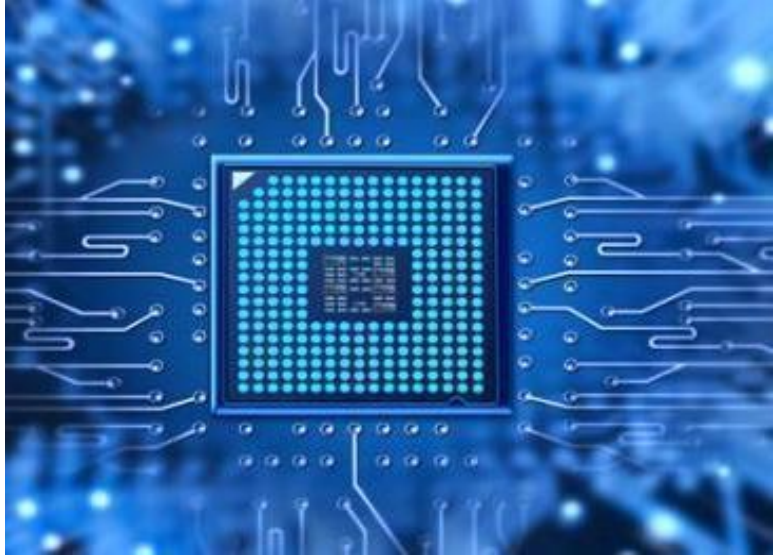
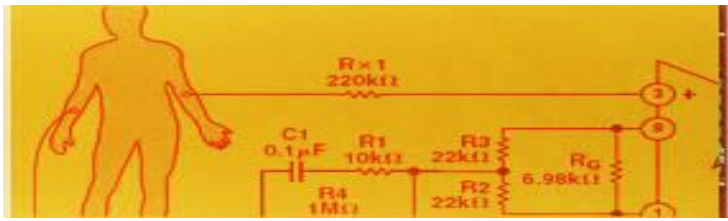
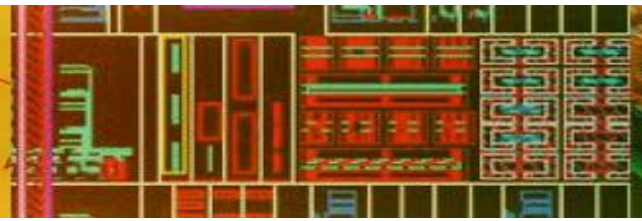




ECE PhD Qualifying Exams (QE) Presentation Schedule Spring 2018






Spring 2018 QE Presentation Schedule

Slide Number	Last Name	First Name	Presentation Title	Date	Time	Venue	PhD Advisor
3	Abdelhamid	Amr	Modeling and Analysis of Passive Mixer-First Receiver	02/28/18	10:00 AM	ECSN 4.728	Won Namgoong
4	Chen	Tianyu	SiC MOSFET Based Inverter and Its Application in Motor Integration	04/06/18	9:00 AM	ECSS 3.503	Babak Fahimi
5	Chen	Jianqi	Thermal Fingerprinting of Behavioral IPs Mapped as Hardware Accelerators on FPGAs	03/09/18	11:00 AM	ECSN 4.728	Benjamin Schaefer
6	Dwobeng	Ebenezer	Capacity Limits and Multiplexing Gain of MIMO channels with transceiver impairments	03/30/18	10:00 AM	ECSN 4.728	Kamran Kiasaleh
7	Eslami Manoochehri	Hafez	Application of Machine Learning in Drug-Target Interaction Prediction	03/29/18	11:00 AM	ECSN 4.728	Mehrdad Nourani
8	Goswami	Pingakshya	Role of FPGAs in Deep Learning	4/16/18	11:30 AM	ECSN 4.728	Dinesh Bhatia
9	Jafarlou	Salar	Event Detection using Neural Networks on Google Dataset	04/25/18	10:00 AM – 12:00 PM	ECSN 4.728	John Hansen
10	Kalimuthu	Pandy	Design and optimization of behavioral circuits for Validation	04/18/18	10.30 AM	ECSN 4.728	Benjamin Schaefer
11	Liu	Jinbo	Nano-FET sensor for DNA detection	03/05/18	11:00 AM	RL 2.744	Wenchuang Hu
12	Patel	Shivam	The Features of GaAs and GaP Semiconductor Cathodes in an Infrared Converter System	04/06/18	9:00 - 11:30 AM	ECSS 3.910	Lawrence Overzet
13	Wan	Heping	Interference Alignment: From Degrees of Freedom to Constant-Gap Capacity Approximations	04/10/18	9:30 - 11:00 AM	ECSN 4.702	Aria Nosratinia
14	Xu	Chi	Investigation of Performance Degradation in Thermally Aged GaN Power Devices	02/28/18	11:30 AM - 1:00 PM	ECSN 4.728	Bilal Akin
15	Yifan	Wang	AI on Biomedical Applications	03/09/18	10:00 AM	ECSN 4.728	Dian Zhou
16	Yousefi	Midia	Co-channel speech processing	04/25/18	10:00 AM	ECSN 4.728	John Hansen
17	Zhang	Tianliang	An Analytical Model of Spectrum Fragmentation in a Two-Service Elastic Optical Link	03/23/18	3:00 - 5:00 PM	ECSN 4.728	Andrea Fumagalli

Modeling and Analysis of Passive Mixer-First Receiver

Amr Abdelhamid

February 28, 2018 * 10:00 AM * ECSN 4.728

Abstract: In this presentation, the transparency property of a passive mixer is used to analyze a passive mixer-first receiver in detail. A linear time-invariant (LTI) system model of the linear time-varying mixer is derived. Using this model, the impedance at the RF port of the mixer can be controlled utilizing the baseband components only to achieve input matching at a given frequency band. Noise figure is analyzed for this type of receiver and is shown to be comparable to the typical LNA-first receiver.

PhD Advisor: Won Namgoong

SiC MOSFET Based Inverter and Its Application in Motor Integration

Tianyu Chen

April 6, 2018 * 9:00am * ECSS 3.503

Abstract: In this presentation, the difference between SiC MOSFET based inverter and traditional IGBT based inverter will be illustrated. The challenges of integrating power inverter into motor will also be illustrated. Some problems like high dv/dt, capacitive current, thermal management, gate driver, and EMI will be investigated in the presentation.

PhD Advisor: Babak Fahimi

Thermal Fingerprinting of Behavioral IPs Mapped as Hardware Accelerators on FPGAs

Jianqi Chen

March 9, 2018 * 11:00 AM * ECSN 4.728

Abstract: The protection of the Intellectual Property (IP) has emerged as one of the most serious areas of concerns in the semiconductor industry. To address this issue, we proposed a method to generate a large number of functional equivalent hardware accelerators, mapped onto an FPGA, each with a unique thermal signature derived automatically from the same behavioral description that we call Behavioral IP (BIP). The main methodology behind this work is to perform a design space exploration for the given behavioral description (e.g. ANSI-C, C++ or SystemC) to obtain a trade-off curve of designs with unique area vs. performance trade-offs as well as a third dimension that consists of the difference in their thermal profile. A power estimator combined with a thermal simulator is used for this. This allows the IP provider to assign different versions of the IP to different IP users and thus, to determine later on, when the product has been deployed in the field, if there is any unauthorized use of the IP by measuring the thermal signature. Experimental results, prototyping different hardware accelerators on an FPGA, and using a high resolution infrared camera, show that our proposed method works well, distinguishing between the different implementations of the BIP and hence serves to detect if an IP is being illegal used.

PhD Advisor: Benjamin Carrion-Schaefer

Capacity Limits and Multiplexing Gain of MIMO channels with transceiver impairments

Ebenezer P Dwobeng

March 30, 2018 * 10:00 AM * ECSN 4.728

Abstract: When analyzing the channel capacity of ideal communication systems using more than one antenna, theoretical results have shown that the capacity increases linearly with the minimum of the number of transmit and receive antennas. However, the achievable capacities of practical multi antenna systems are limited by a number of factors including analog impairments in the transceiver. To understand the impact of analog impairments in MIMO, a model of the MIMO channel is first presented. The model is then used to analyze the non-ideal MIMO channel and derive the capacity bounds. Finally, the multiplexing gain of MIMO in the presence of analog impairments is also presented.

PhD Advisor: Kamran Kiasaleh

Application of Machine Learning in Drug-Target Interaction Prediction

Hafez Eslami Manoochehri

March 29, 2018 * 11:00 AM * ECSN 4.728

Abstract: In recent years, machine learning techniques have been used in outcome prediction in many engineering and bio-science applications. Determining drug-target interaction is a critical part of drug development in pharmaceutical industry. However, this process is extremely time consuming and expensive. In this presentation, we explain how computational biology and machine learning have helped to speed up the process of predicting unknown interactions between drug compounds and target proteins.

PhD Advisor: Mehrdad Nourani

Role of FPGAs in Deep Learning

Pingakshya Goswami

April 16, 2018 * 11:30 AM * ECSN 4.728

Abstract: Deep Learning has played an important role in classification of images, speech recognition and natural language processing. Traditionally, these learning algorithms are implemented in clusters of CPUs and GPUs. Increasing data sizes, demand for higher performance and energy efficiency makes use of CPUs and GPUs difficult for scaling computation. FPGAs promise and provide hardware model for implementing energy efficient, high performance deep learning networks. This presentation will focus on recent advances in FPGA based deep learning network implementations. We will discuss architectures and CAD frameworks for building energy efficient deep learning networks. Our focus is primarily towards fast energy efficient inferencing engines.

PhD Advisor: Mehrdad Nourani

Event Detection using Neural Networks on Google Dataset

Salar Jafarlou

February 28, 2018 * 10:00 AM-12:00 pm * ECSN 4.728

Abstract: In domains of self-driving car, smart cities, and related ones automatic event detection plays a significant role. However, training models for these purposes always come with many difficulties. The most challenging one is gathering strongly annotated data. Many types of research have been conducted to train models using weakly annotated data. Google has been releasing sets of the audio corpus of YouTube videos with weakly event annotations called AudioSet, consisting 17 classes of sound events divided into two high-level categories of Warning and Vehicle. Our task in this research is to compare different approaches to this challenge, consisting using different features from Mel-frequency cepstral coefficients (MFCC) and log-Mel spectrograms and pre-trained embeddings extracted from a deep convolutional network to raw waveform, and different architectures from feedforward neural networks and Convolutional Neural Networks and Recurrent Neural Networks to task-specific architectures like RCNN.

PhD Advisor: John Hansen

Design and optimization of behavioral circuits for Validation

Pandy Kalimuthu

April 18, 2018 * 10:30 AM * ECSN 4.728

Abstract: Complex ASIC designs require to prototype these on FPGAs as it allows to develop the software before the silicon is available, thus, reducing the turn-around-time (TAT) considerably. When using traditional RT-level based VLSI design methodologies, this often requires to manually re-optimize the design to fit the emulation platform or rapid prototyping system. In contrast, raising the level of VLSI design abstraction using behavioral languages, such as C or C++ has many advantages. One advantage that this work aims at exploiting is the ability to generate multiple micro-architectures with unique area, performance and power without the need to re-write the input descriptions. Although C-based VLSI design facilitates its re-use and re-targeting to different technologies ,it still requires manual optimizations, as FPGAs have different underlying architectures. Thus, designs optimized for ASICs often lead to unoptimized FPGA implementations. This work studies methods to re-optimize behavioral systems intended for ASIC design to FPGAs automatically.

PhD Advisor: Benjamin Carrion-Schaefer

Nano-FET sensor for DNA detection

Jinbo Liu

March 5, 2018 * 11:00 am * RL 2.744

Abstract: Ion sensitive field effect transistors (ISFETs) are widely used in biosensing due to fast response to charge variation. The surface potential is modulated by the charges at surface and electrolyte interface. In corporation of nano-texture on the gate is responsible for high pH sensitivity compared with conventional planer ISFET. Two masks are considered to transfer nano-structure on SiO2. The dimension of the nano-pore or nano-pillar is sub-20nm. The sensitivity is going to be enhanced about 10 times which makes ISFET suitable for immobilization-free sensing of DNA molecules such as semiconductor real-time polymerase chain reaction (PCR) or semiconductor DNA sequencing based on released H+ ion.

PhD Advisor: Wenchuang Hu

The Features of GaAs and GaP Semiconductor Cathodes in an Infrared Converter System

Shivam Patel

April 6, 2018 * 9:00 - 11:30 AM ***** ECSS 3.910

Abstract:

H. HILAL KURT 1,3 and EVRIM TANRIVERDI2

1Department of Physics, Faculty of Science, Gazi University, 06500 Teknikokullar, Ankara, Turkey. 2.â€”Division of Physics, Institute of Science, Gazi University, 06500 Teknikokullar, Ankara, Turkey. 3.â€”e-mail: hkurt@gazi.edu.tr

The aim of this study is to examine the electrical and optical comparative analysis of semi-insulating GaAs and GaP photoconductive electrodes in an infrared converter system with a resistivity of >107 X cm for the same interelectrode distance d and gas pressure p experimentally and theoretically, when the discharge cell has been filled by argon. To provide the stability of the semiconductor electrode in Ar media, the experiments were carried out in Townsend and glow discharge regimes for various parameter sets of pressure, interelectrode gap and discharge voltage. When the discharge exceeds a crit- ical voltage value, some N-shape CVCs, which stem from both semiconductors and Ar gas, have been observed. To compare the features of the GaAs and GaP cathodes, the COMSOL multiphysics programme is used under the Ar media. The mean electron energy, thermal velocity, surface charge density, space charge and initial electron densities, and electron mobilities have been cal- culated for both semiconductor materials. It has been found that the electron mobility le, electron thermal velocity, surface charge density r and mean electron energy of GaAs is higher than those of GaP; hence, GaAs has better opto-electronic features compared to GaP. In addition, the experiments on the optical explorations prove that GaAs exhibit better optical response in the infrared region. The explored transport characteristics of the semiconductor electrodes are of importance, and they have to be taken into account when studying plasma cells.

PhD Advisor: Lawrence Overzet

Interference Alignment: From Degrees of Freedom to Constant-Gap Capacity Approximations

Heping Wan

April 10, 2018 * 9:30am-11:00am ***** ECSN 4.702

Abstract: Interference alignment is a key technique for communication scenarios with multiple interfering links. In several such scenarios, interference alignment was used to characterize the degrees of freedom of the channel. However, these degree-of-freedom capacity approximations are often too weak to make accurate predictions about the behavior of channel capacity at finite signal-to-noise ratios (SNRs). The aim of this paper is to significantly strengthen these results by showing that interference alignment can be used to characterize capacity to within a constant gap. We focus on real, time-invariant, frequency-flat X-channels. The only known solutions achieving the degrees of freedom of this channel are either based on real interference alignment or on layer-selection schemes. Neither of these solutions seems sufficient for a constant-gap capacity approximation. In this paper, we propose a new communication scheme and show that it achieves the capacity of the Gaussian X-channel to within a constant gap. To aid in this process, we develop a novel deterministic channel model. This deterministic model depends on the 1/2 log (SNR) most-significant bits of the channel coefficients rather than only the single most-significant bit used in conventional deterministic models. The proposed deterministic model admits a wider range of achievable schemes that can be translated to the Gaussian channel. For this deterministic model, we find an approximately optimal communication scheme. We then translate this scheme for the deterministic channel to the original Gaussian X-channel and show that it achieves capacity to within a constant gap. This is the first constant-gap result for a general, fully-connected network requiring interference alignment.

PhD Advisor: Aria Nosratinia

Investigation of Performance Degradation in Thermally Aged GaN Power Devices

Chi Xu

February 28, 2018 * 11:30 AM - 1:00 PM * ECSN 4.728

Abstract: The wide band gap power semiconductor technology has been gaining more attention due to its promising merits in high frequency, high efficiency, and high power density power conversion. In order to fully apply the new devices, the reliability needs to be studied to reduce the potential uncertainties and problems in power conversion applications. Accelerated aging tests through power cycling trigger various failure mechanisms due to junction temperature swings and allow identification of aging precursors. In this presentation, a brief review of the power cycling test setup is reviewed. An AC accelerated aging setup is designed which operates within the safe operating area (SOA) to mimic the power cycling in real applications as much as possible. The overall structure, design criteria, and basic function are given. Besides, the physical inspections are provided to investigate the causes. Finally, the lifetime extension strategies are investigated.

PhD Advisor: Bilal Akin

AI on Biomedical Applications

Yifan Wang

March 9, 2018 * 10:00AM * ECSN 4.728

Abstract: Recent years have witnessed the growing of a new trend in machine learning and artificial intelligence (AI). By exploiting the computational power, deep learning models like convolutional neural network (CNN), while is very hard to train in the past, shows significant impact on data analysis, image and speech processing. In the domain of biomedical and health informatics, heterogeneous data and implicit features require large amount human intervention. According to the success it gained in other fields, deep learning seems to be a promising method to overcome this difficulty. More and more researchers focus on applying deep learning methods on biomedical domain. They tried to establish and training a deep model to generate features from health informatics automatically. Furthermore, once models are well tuned, predictions and diagnosis can be made. While challenges remain, outcome of some researches are proven to be encouraging. In this presentation, I will give a up-to-date review of some most common used deep learning methods employed in biomedical field. Also I will talk about their pros and cons based on recent researches.

PhD Advisor: Dian Zhou

Co-channel speech processing

Midia Yousefi

April 25, 2018 * 10:00 AM * ECSN 4.728

Abstract: Conference meetings and telephone conversations can be referred to as co-channel speech, in which speech utterances of multiple talkers are recorded on a single communication channel. Detecting/separating segments of overlap in co-channel speech recordings is a challenging task and active research area. In multi-talker recordings, a significant percentage of the remaining error in the state-of-art automatic speech applications such as speech/speaker recognition, speaker diarization and identification can be attributed to interfering speaker. Traditional approaches consider the interfering speaker as a non stationary noise source and they tend to enhance the target speech, while suppressing the interfering speech. However, recent techniques try to identify usable segments in co-channel speech. The term â€œUsabilityâ€•is context dependent and it refers to any speech segments that contain enough information for identifying the talker or recognizing what he/she has said. In our study, we are investigating energy and spectral related features which are well-suited for detecting overlapped speech. Most of the existing features are vulnerable to noise, hence in adverse environmental conditions they cause a drop in overlap detection performance. We have also been looking into techniques including Difference of Gaussian (DoG) filtering in order to enhance formant structure. This can lead to robust formant tracking which can be used for improved overlap detection.

PhD Advisor: John Hansen

An Analytical Model of Spectrum Fragmentation in a Two-Service Elastic Optical Link

Tianliang Zhang

March 23, 2018 * 3:00pm-5:00pm * ECSN 4.728

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 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.

PhD Advisor: Andrea Fumagalli

Thank You!