

Dr. Sirin Nitinawarat

Lecturer

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Citizenship: Thai

Academic Education

- Ph.D., Electrical Engineering, University of Maryland, College Park* 2010
- Dissertation title: “Information Theoretic Secret Key Generation: Structured Codes and Tree Packing”
 - Ph.D. supervisor: Prof. Prakash Narayan
- M.S., Electrical Engineering, University of Wisconsin, Madison* 2003
- Research project: “Universal Simulation Distributions”
 - Academic advisor: Prof. James A. Bucklew
- B.E., Electrical Engineering, Chulalongkorn University, Bangkok, Thailand* 2001
- First Class Honors
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Professional Trainings

- Self-Driving Car Nanodegree, Udacity* graduated the 2nd term in October 2017
- Designed and tuned a Proportional-Integral-Derivative (PID) controller processing a cross-track error to successfully steer a simulated car along the lap.
 - Designed Extended and Unscented Kalman filters fusing RADAR and LIDAR sensor data to accurately localize a moving vehicle.
 - Devised a computer-vision algorithm for precisely finding lane lines on the road in the video stream from a front-facing camera of the car.
 - Constructed a neural network algorithm trained on the German Traffic Sign Recognition Benchmark to classify German traffic signs with 95% accuracy.
 - Built a convolution neural network that predicts the car steering angle accurately from its front-view image. Successfully generated training data from the Udacity simulator so that the trained neural network can drive the simulated car along the lap without going off the road.
 - Wrote a SW pipeline that can identify other cars in a video from a front-facing camera of the car.
- Deep Learning Nanodegree, Udacity* graduated in June 2017
- Built a neural network trained on a dataset containing the hourly and daily count of rental bikes between 2011 to 2012 in Capital bikeshare system to accurately predict the daily ridership.
 - Built a convolution neural network trained on preprocessed images from the CIFAR-10 dataset consisting of airplanes, dogs, cats and other objects.

- Built a Recurrent Neural Network (RNN) trained on the Simpsons data set that can generate a new TV script for a scene at Moe's Tavern.
- Built a neural machine translator, which is a sequence-to-sequence model trained on a data set of English and French sentence pairs that can translate new English sentences to French.
- Built a generative adversarial network, trained on the MNIST and CelebA data sets, that can generate new images of faces.

Research Interests

Data science, Digital transformations, Information security, Information theory, Public health, Health and wellness, Telemedicine, Machine learning, Deep learning, Neural networks, Telecommunication, Signal processing

Research Experience

Lecturer 2017-present
International School of Engineering (ISE), Chulalongkorn University, Bangkok Thailand

- Co-founder of the Applied Computer Engineering Technology for Medicine and Healthcare (ATM) research group at Chulalongkorn University.
- Collaborate with faculty members and researchers in a digital-transformation project for a system for managing medical volunteers (supported by the Thai Red Cross Society).

Senior Systems Engineer, the Modem Systems Group 2014-2017
Qualcomm Technologies, San Diego, California, USA

- Conducted systems research related to various aspects of modem traffic optimization especially for multi-sim devices and TCP traffic.

Postdoctoral Research Associate, in Prof. Venugopal V. Veeravalli's group 2011-2014
Dept. of ECE and Coordinated Science Laboratory, University of Illinois at Urbana-Champaign

- Designed new *universal* algorithms for outlier hypothesis testing that efficiently discover a few outlier data streams among a large number of data streams. Performance of the algorithms was evaluated on real data sets in a designed experiment that could be relevant to spam detection applications.
- Characterized the fundamental limits and structures of optimal algorithms for *controlled sensing for hypothesis testing* in both the fixed sample size and sequential settings.
- Constructed approximate policies for efficient target tracking using mobile sensors and derived a guarantee on their performance losses relative to that of the optimal policy.

Experience with real data sets

- **Driver telematics analysis:** Developed an algorithm that achieves 73% accuracy rate to identify false trips from over 50,000 anonymous trips from 2700 drivers. The algorithm applies smoothing filter to increase the signal-to-noise ratio, extracts features characterizing driving risks, and devises a novel clustering algorithm that leveraged boosting and local testing.
- **Spam detection:** Proposed a new paradigm for spam detection where malicious IP addresses are considered anomalies. Developed a new spam detector with linear complexity that outperforms, by a large margin, a kernel-based algorithm with quadratic complexity.

Graduate Research Assistant

2006-2010

Dept. of ECE and Institute for Systems Research, University of Maryland, College Park, MD

- Discovered a new connection between secret key generation for correlated *continuous* observations and *lossy* data compression that led to a characterization of the secret key capacity and an efficient new algorithm for key generation based on structured lattice codes.
- Discovered a new connection between *perfect* secret key generation and communication for *perfect* omniscience for a “pairwise independent network” (PIN) model that led to a characterization of the perfect secret key capacity. An efficient new algorithm was developed for forming a groupwise perfect secret key out of locally generated perfect pairwise keys, based on combinatorial tree packing.
- Characterized the fundamental transmission limit of an arbitrarily varying multiple-access channel under list decoding.

Research Project

2001-2003

Dept. of ECE, University of Wisconsin, Madison, WI

- Devised the Mellin transform to successfully compute the hit rate of universally efficient simulation distributions via for the Gaussian mixture case.

Teaching and Mentoring Experience

Teaching

Information and Communication Engineering (ICE) courses. ISE, Chulalongkorn University

Computer Programming, Computer Programming Laboratory, Introduction to ICE, Principles of Information System, Principles of Telecommunications, ICE Capstone

Graduate Teaching Fellow (Graduate Courses) Dept. of ECE, University of Maryland

Estimation and Detection Theory, Spring 2009; **Information Theory**, Spring 2008;

Digital Communications, Fall 2008, Fall 2007

- Held regular office hours to address student questions.
- Assisted the professor with preparation of problem sets, solutions and exam questions.
- Taught discussion sections for 10-30 graduate students to supplement lecture materials.

Teaching Assistant (Undergraduate Courses)

Dept. of ECE, University of Maryland

Digital Logic Design

- Graded weekly homework assignments.
- Taught weekly discussion sections for explaining homework solutions and supplementing lecture materials.
- Held regular office hours to address student questions.

Fundamental Electric and Digital Circuit Laboratory

- Supervised weekly laboratory work and graded weekly assignments.

Guest Lecturer, **Coding Theory**, Fall 2013

Dept. of ECE, University of Illinois

- Gave a lecture on linear codes.

Mentoring

- Advised and worked with a Ph.D. student, Ms. Yun Li, on the topic of her dissertation: “Universal Outlier Hypothesis Testing.”
- Assisted my Ph.D. supervisor to mentor an undergraduate student on a research project to design Low-Density Parity-Check (LDPC) codes for certain communication channels.

Publications

Journal Papers

In Print

1. J.A. Bucklew, S. Nitinawarat and J. Wierer, “Universal Simulation Distributions,” *IEEE Trans. Inf. Theory*, vol. 50, no.11, pp. 2674-2685, November 2004.
2. S. Nitinawarat, C. Ye, A. Barg, P. Narayan and A. Reznik, “Secret Key Generation for a Pairwise Independent Network Model,” *IEEE Trans. Inf. Theory*, vol. 56, no. 12, pp. 6482-6489, December 2010.
3. S. Nitinawarat and P. Narayan, “Perfect Omniscience, Perfect Secrecy and Steiner Tree Packing,” *IEEE Trans. Inf. Theory*, vol. 56, no. 12, pp. 6490-6500, December 2010.
4. S. Nitinawarat and P. Narayan, “Secret Key Generation for Correlated Gaussian Sources,” *IEEE Trans. Inf. Theory*, vol. 58, no. 6, pp. 3373-3391, June 2012.
5. S. Nitinawarat, “On the Deterministic Code Capacity Region of an Arbitrarily Varying Multiple-Access Channel Under List Decoding,” *IEEE Trans. Inf. Theory*, vol. 59, no. 5, pp. 2683-2693, May 2013.
6. S. Nitinawarat, G. K. Atia and V. V. Veeravalli, “Controlled Sensing for Multihypothesis Testing,” *IEEE Trans. Autom. Control*, vol. 58, no. 10, pp. 2451-2464, October 2013.
7. Y. Li, S. Nitinawarat and V. V. Veeravalli, “Universal Outlier Hypothesis Testing,” *IEEE Trans. Inf. Theory*, vol. 60, no. 7, pp. 4066-4082, July 2014.
8. S. Nitinawarat and V. V. Veeravalli, “Controlled Sensing for Sequential Multihypothesis Testing with Controlled Markovian Observations and Non-Uniform Control Cost,” *Sequential Analysis: Design Methods and Applications*, vol. 34, no. 1, pp. 1-24, January 2015.
9. S. Nitinawarat and V. V. Veeravalli, “Universal Scheme for Optimal Search and Stop,” *Bernoulli*, vol. 23, no. 3, pp. 1759-1784, August, 2017.
10. Y. Li, S. Nitinawarat and V. V. Veeravalli, “Universal Sequential Outlier Hypothesis Testing,” *Sequential Analysis: Design Methods and Applications*, vol. 36, no. 3, pp. 309-344, September 2017.
11. S. Triukose, S. Nitinawarat, *et al.* “Effects of Public Health Interventions on the Epidemiological Spread During the First Wave of the COVID-19 Outbreak in Thailand,” *PLOS ONE*, 16 (2): e0246274. <https://doi.org/10.1371/journal>, February 2021, **corresponding author.**

Conference Papers

1. K. Rashataprucksa, C. Chuangchaichatchavarn, S. Triukose, S. Nitinawarat, M. Pongpruthippan and K. Piromsopa, “Acne Detection with Deep Neural Networks,” to be presented at the 2020 2nd International Conference on Image Processing and Machine Vision on August 5-7, 2020, pp. 53-56.
2. S. Nitinawarat, A. Meylan, and S. Veerepalli, “TCP Mitigation for Concurrent RAT-Capable User Equipments,” QTech, Qualcomm Inc., San Diego, USA, June 28-30, 2016.

3. S. Nitinawarat and V. V. Veeravalli, "Universal Quickest Outlier Detection and Isolation," presented at *IEEE Int. Symp. Inf. Theory*, Hong Kong, China, June 14-June 19, 2015.
4. Y. Li, S. Nitinawarat, and V. V. Veeravalli, "Universal Outlier Hypothesis Testing: Application to Anomaly Detection," presented at *IEEE Int. Conf. Acoust., Speech, and Signal Process.*, Brisbane, Australia, April 19-24, 2015, **invited paper**.
5. S. Nitinawarat and V. V. Veeravalli, "Universal Scheme for Optimal Search and Stop," *Proc. Inf. Theory and Applicat. Workshop*, San Diego, CA, February 1-6, 2015, pp. 1-5, **invited paper**.
6. Y. Li, S. Nitinawarat and V. V. Veeravalli, "Universal Sequential Outlier Hypothesis Testing," *Proc. 48th Annu. Asilomar Conf. Signals, Syst. and Comput.*, Pacific Grove, CA, USA, November 2-5, 2014, pp. 281-285, **invited paper**.
7. Y. Li, S. Nitinawarat and V. V. Veeravalli, "Universal Sequential Outlier Hypothesis Testing," *Proc. IEEE Int. Symp. Inf. Theory*, Honolulu, HI, USA, June 29-July 4, 2014, pp. 3205-3209 (same title as **3**; the former has additional results).
8. Y. Li, S. Nitinawarat and V. V. Veeravalli, "Universal Multiple Outlier Hypothesis Testing," *Proc. 5th IEEE Int. Workshop Computational Advances in Multi-Sensor Adaptive Process.*, Saint Martin, December 15-18, 2013, pp. 177-180.
9. S. Nitinawarat and V. V. Veeravalli, "Controlled Sensing for Sequential Hypothesis Testing with Non-Uniform Sensing Cost," *Proc. 47th Annu. Asilomar Conf. Signals, Syst. and Comput.*, Pacific Grove, CA, USA, November 3-6, 2013, pp. 1095-1099.
10. S. Nitinawarat and V. V. Veeravalli, "Controlled Sensing for Multihypothesis Testing Based on Markovian Observations," *Proc. IEEE Int. Symp. Inf. Theory*, Istanbul, Turkey, July 7-12, 2013, pp. 2199-2203.
11. Y. Li, S. Nitinawarat and V. V. Veeravalli, "Universal Outlier Hypothesis Testing," *Proc. IEEE Int. Symp. Inf. Theory*, Istanbul, Turkey, July 7-12, 2013, pp. 2666-2670.
12. Y. Li, S. Nitinawarat and V. V. Veeravalli, "Universal Outlier Detection," *Proc. Inf. Theory and Applicat. Workshop*, San Diego, CA, February 10-15, 2013, pp. 1-5, **invited paper**.
13. S. Nitinawarat, G. K. Atia and V. V. Veeravalli, "Controlled Sensing for Hypothesis Testing," *Proc. IEEE Int. Conf. Acoust., Speech, and Signal Process.*, Kyoto, Japan, March 25-30, 2012, pp. 5287-5280.
14. S. Nitinawarat, G. K. Atia and V. V. Veeravalli, "Efficient Target Tracking using Mobile Sensors," *Proc. 4th IEEE Int. Workshop Computational Advances in Multi-Sensor Adaptive Process.*, San Juan, Puerto Rico, December 13-16, 2011, pp. 405-408.
15. S. Nitinawarat, "On Maximal Error Capacity Regions of Symmetric Gaussian Multiple-Access Channels," *Proc. IEEE Int. Symp. Inf. Theory*, Saint Petersburg, Russia, July 31-August 5, 2011, pp. 2269-2273.
16. S. Nitinawarat, "On the Deterministic Code Capacity Region of an Arbitrarily Varying Multiple-Access Channel Under List Decoding," *Proc. IEEE Int. Symp. Inf. Theory*, Austin, TX, USA, June 13-18, 2010, pp. 290-294, **finalist for best student paper award**.

17. S. Nitinawarat and P. Narayan, "Perfect Secrecy and Combinatorial Tree Packing," *Proc. IEEE Int. Symp. Inf. Theory*, Austin, TX, USA, June 13-18, 2010, pp. 2622-2626.
18. S. Nitinawarat, C. Ye, A. Barg, P. Narayan and A. Reznik, "Perfect Secrecy, Perfect Omniscience and Steiner Tree Packing," *Proc. IEEE Int. Symp. Inf. Theory*, Seoul, Korea, June 28-July 3, 2009, pp. 1288-1292.
19. S. Nitinawarat, C. Ye, A. Barg, P. Narayan and A. Reznik, "Common Randomness, Multiuser Secrecy and Tree Packing," *Proc. 46th Annu. Allerton Conf. Commun., Control, and Computing*, Monticello, IL, USA, September 23-26, 2008, pp. 217-220, **invited paper**.
20. S. Nitinawarat, "Secret Key Generation for Correlated Gaussian Sources," *Proc. IEEE Int. Symp. Inf. Theory*, Toronto, Ontario, Canada, July 6-11, 2008, pp. 702-706, **invited paper**.
21. S. Nitinawarat, C. Ye, A. Barg, P. Narayan and A. Reznik, "Secret Key Generation for a Pairwise Independent Network Model," *Proc. IEEE Int. Symp. Inf. Theory*, Toronto, Ontario, Canada, July 6-11, 2008, pp. 1015-1019.
22. S. Nitinawarat, "Secret Key Generation for Correlated Gaussian Sources," *Proc. 45th Annu. Allerton Conf. Commun., Control, and Computing*, Monticello, IL, USA, September 26-28, 2007, pp. 1054-1058 (same title as **17**; the former has additional results).
23. S. Nitinawarat and N. Boston, "A Complete Analysis of Space-time Group Codes," *Proc. 43th Annu. Allerton Conf. Commun., Control, and Computing*, Monticello, IL, USA, September 28-30, 2005.

Patents

1. A. Venkatesh, A. Mitra, S. R. Mudireddy, G. S. Chhabra, A. Meylan, S. Nitinawarat, V. Kumar, S. Nair and N. Somani, "Transport Protocol Communications Reduction," U. S. Granted, 9876613, January 23, 2018.

Invited Presentations

- "Mobile Evolution," at Chulalongkorn University, July 2016.
- "Duality in Combinatorial Optimization and Information Theoretic Secrecy," in Nexus of Information and Computation Theories Workshop, Secrecy and Privacy session, Institut Henri Poincaré, March 2016.
- "Universal Scheme for Optimal Search and Stop," at *Inf. Theory and Applicat. Workshop*, San Diego, CA, February 2015.
- "Universal Outlier Hypothesis Testing," Dept. of ECE, National University of Singapore, Singapore, December 2014.
- "Universal Sequential Outlier Hypothesis Testing," at *48th Annu. Asilomar Conf. Signals, Syst. and Comput.*, Pacific Grove, CA, November 2014.
- "Universal Outlier Hypothesis Testing Based on Markovian Observations," at *Inf. Theory and Applicat. Workshop*, San Diego, CA, February 2014.
- "Controlled Sensing for Sequential Multihypothesis Testing with Non-Uniform Sensing Cost," at *47th Annu. Asilomar Conf. Signals, Syst. and Comput.*, Pacific Grove, CA, November 2013.
- "Controlled Sensing for Sequential Multihypothesis Testing," Networking, Communications, and DSP Seminar, Dept. of EECS, University of California, Berkeley,

- CA, November 2013.
- “Controlled Sensing for Sequential Multihypothesis Testing,” ISE Seminar, Dept. of ISE, University of Illinois at Urbana-Champaign, IL, September 2013.
 - “Controlled Sensing for Sequential Multihypothesis Testing,” Communications, Control and Signal Processing Seminar, Dept. of ECE, University of Maryland, College Park, MD, September 2013.
 - “Universal Outlier Hypothesis Testing,” Institute of Network Coding, Chinese University of Hong Kong, Shaitin, N.T., Hong Kong, May 2013.
 - “Controlled Sensing for Sequential Multihypothesis Testing,” Wireless Networking and Communications Seminar, Dept. of ECE, University of Texas, Austin, TX, May 2013.
 - “Universal Outlier Hypothesis Testing,” Telecommunications, Control and Signal Processing Seminar, Dept. ECE, Texas A&M University, College Station, TX, April 2013.
 - “Universal Outlier Detection,” at *Inf. Theory and Applicat. Workshop*, San Diego, CA, February 2013.
 - “Multihypothesis Testing with Controlled Observations,” CSPL Seminar, Dept. of EECS, University of Michigan, Ann Arbor, MI, May 2012.
 - “Controlled Sensing for Hypothesis Testing,” Grad. of Inform. Systems, University of Electro-communications, Tokyo, Japan, March 2012.
 - “Controlled Sensing for Hypothesis Testing,” Special Session on Controlled Sensing for Inference at *IEEE Int. Conf. Acoust., Speech, and Signal Process.*, Kyoto, Japan, March 2012.
 - “Controlled Sensing for Hypothesis Testing,” at *Inf. Theory and Applicat. Workshop*, San Diego, CA, February 2012.
 - “Secrecy Generation, Source Coding and Tree Packing,” Information Processing Seminar Series, School of Computer and Communication Sciences, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland, September 2010.
 - “Perfect Omniscience, Perfect Secrecy and Steiner Tree Packing,” on the Graduate Day at *Inf. Theory and Applicat. Workshop*, San Diego, CA, February 2010.
 - “Zero-Error Information and Graph Theory,” ECE Graduate Student Association Seminar Series, University of Maryland, College Park, MD, November 2008.
 - “Secret Key Generation for Correlated Gaussian Sources,” Special Session in Memory of Professor Sergio Servetto at *IEEE Int. Symp. Inf. Theory*, Toronto, Ontario, Canada, July 2008.

Honors and Awards

- Finalist for best student paper award at *IEEE International Symposium on Information Theory*, Austin, Texas, June 13-18, 2010.
- Graduate Teaching Fellowship, U. of Maryland, Spring 2009, Spring 2008 and Fall 2007.
- First Class Honors, Chulalongkorn University, Thailand, 4th in EE major, 2001.
- First Prize, Sumo Robot Contest, Department of Electrical Engineering, Chulalongkorn University, Thailand, 1999.
- President Tab Best Engineering Student Award, Chulalongkorn University, Thailand, 1997-1998.
- Best 30 students in National Olympiad in Informatics, Thailand, 1995.

Funding Agency and Industry Contacts

National Broadcasting and Telecommunications Commission of Thailand

- Principle investigator for a 1,031,160 Bahts grant on “Detecting the Weather Condition Amenable to Air-Pollutant Trapping with Wireless Signals in Cellular Networks”

National Science Foundation

- Contributed to the successful NSF grant proposal on “Information Theoretic Multi-Core Processor Thermal Profile Estimation” (in a problem area different from that of my dissertation) that was awarded a three-year grant in August 2009 (award number 0917057) for \$450,000. The PIs for the proposal were Profs. A. Srivastava and P. Narayan.
- Contributed to the successful NSF grant proposal on “Common Randomness, Multiuser Secrecy and Tree Packing” that was awarded a four-year grant in September 2008 (award number 0830697) for \$400,000. The PI for the proposal was Prof. P. Narayan.
- Assisted the PIs regularly with preparation of progress reports and presentations at review meetings for the project on “Information Theoretic Secret Key Generation in a Network: Principles and Constructions.”

Air Force Office of Scientific Research

- Assisted a University of Illinois PI, Prof. Veeravalli, in the initial phase of preparation for the pending proposal on “Dynamic Data Driven Information Fusion for Situation Awareness.” The proposal was later finished in collaboration with Profs. Biao Chen and Pramod Varshney at Syracuse University.
- Assisted the PIs (Prof. Veeravalli *et al.*) regularly with preparation of progress reports and presentations at review meetings for the project on “Dynamic Information Collection and Fusion.”

InterDigital, King of Prussia, PA

- Made visits to present and discuss research problems on our joint project on “Common Randomness, Multiuser Secrecy and Tree Packing.”
- Led discussions via telephone conferences.
- The collaboration led to papers in a journal and conference proceedings.

Graduate Courses

Information Theory, Multiuser Information theory, Information Geometry, Probability Theory and Stochastic Processes, Estimation and Detection Theory, Signal Processing, Error Correcting Codes, Advanced Topics in Coding Theory, Digital Communications, Multiuser Communications, Data Communications, Stochastic Control, Optimal Control, Optimization, Nonlinear Control, Game Theory, Real Analysis, Abstract Algebra

Professional Service

Co-Organizer

- Special Session on Controlled Sensing for Inference at *IEEE Int. Conf. Acoust., Speech, and Signal Process.*, Kyoto, Japan, March 25-30, 2012.

Session Chair

- Session on Sequential Learning at *Inf. Theory and Applicat. Workshop*, San Diego, CA, February 1-6, 2015.
- Session on Outlier Detection and Bandit Problems at *IEEE Int. Symp. Inf. Theory*, Honolulu, HI, June 29-July 4, 2014.
- Session on Source Coding II at *Inf. Theory and Applicat. Workshop*, San Diego, CA, February 9-14, 2014.
- Session on Covariance Estimation and Matrix Completion at *IEEE Int. Symp. Inf. Theory*, Istanbul, Turkey, July 7-12, 2013.
- Session on Distributed Inference in Sensor Networks at *49th Annu. Allerton Conf. Commun., Control, and Computing*, Monticello, IL, September 28-30, 2011.

Reviewer

- *Advances in Mathematics of Communications*
- *IEEE Journal of Selected Areas in Communications*
- *IEEE Journal of Selected Topics in Signal Processing*
- *IEEE Signal Processing Letters*
- *IEEE Transactions on Automatic Control*
- *IEEE Transactions on Communications*
- *IEEE Transactions on Information Theory*
- *IEEE Transactions on Information Forensics & Security*
- *IEEE Transactions on Signal Processing*
- *IEEE Transactions on Wireless Communications*
- *IEEE International Conference on Acoustics, Speech, and Signal Processing*
- *IEEE International Conference on Communications*
- *IEEE International Symposium on Information Theory*
- *IEEE International Symposium on Information Theory and Its Applications*
- *IEEE International Symposium on Spread Spectrum Techniques and Applications*
- *IEEE Information Theory Workshop*
- *IEEE Global Communications Conference*
- *Iran Workshop on Communication and Information Theory*

Work Experience

Senior Systems Engineer, Qualcomm Technologies Inc., San Diego, California 2014-2017
Work descriptions may not be given in full details, and not all works are listed here due to their proprietary nature

- Lead a team of engineers that design and implement the Ultra-Reliable Low Latency Communications (URLLC) feature in the Qualcomm pre-5G and 5G modem roadmap.
- Lead a team of engineers that design and implement a low-complexity adaptive algorithms in the Qualcomm Connectivity Engine to handle fast mobility between cellular and Wi-Fi connections.

- Lead a team of engineers that develop and implement a novel modem feature for multi-sim handsets supporting concurrent radio access technology. This feature leverages on how TCP estimates the Round-Trip Time (RTT) using timestamps in TCP packet to boost performance.
- Led a team of engineers that developed and implemented a novel modem feature to boost the peak modem data throughput by reducing the computational burden required to process TCP ACK packets.
- Led a team of engineers that designed and evaluated performance of scheduling algorithms for the TransReceiverManager arbitrating between Multimedia Broadcast/Multicast Service and competing voice services in dual-SIM-dual-standby mobile devices.

Summer Intern, Qualcomm Flarion Technologies, Bedminster, New Jersey 2006
Host: **Dr. Thomas J. Richardson**

- Investigated the performance of turbo-equalization in the context of noncoherent Space Division Multiple Access (SDMA) in Flash OFDM system.
- Developed a new channel estimation algorithm based on message passing decoding that offers a significant performance improvement from an existing algorithm.

Project Assistant, University of Wisconsin, Madison, Wisconsin 2002-2005

- Developed software for a microarray genesynthesizer. The software controls specific devices exercising a process of genesynthesis which requires precise timing constraints and feedback. The software comprises the core module, written in C++, interconnected with several MATLAB scripts. The Graphic User Interface (GUI) was developed in the Visual C++ framework.

Summer Intern, Mandli Communications, Oregon, Wisconsin 2002

- Developed a GUI for an automated road patterning system that interpreted data collected from a GPS instrument. The company commercialized the product.

Summer Intern, Telecom Asia Corporation, Bangkok, Thailand 2000

- Worked with a team of engineers and technicians to maintain the telephone network for one of the most active business areas in the country.

Coding and Computer Skills

C++, Python, Tensorflow, Keras, Ns-3 network simulator, Amazon Web Services (AWS), MATLAB, R, GitHub, SVN, Slack