

# Danh Nguyen

WIRELESS SYSTEMS PHD CANDIDATE · EMBEDDED SOFTWARE ENGINEER

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## Summary

PhD candidate with 7 years' experience in research and development of hardware, software, and system components for modern wireless communication and networking systems. Fluent in embedded / FPGA development, C, Python, Matlab, and web frameworks (HTML, CSS, JS). Currently seeking full-time opportunities in the general areas of mobile computing and networking.

## Education

### Drexel University

PH.D. IN ELECTRICAL ENGINEERING (ADVISORS: K. R. DANDEKAR, N. KANDASAMY)

Thesis: "Agile Spectrum Sharing Wireless Systems using Software Defined Radios and Reconfigurable Antennas"

Philadelphia, PA

2009–Exp. 6/2017

### Drexel University

M.S. IN COMPUTER ENGINEERING

Hands-on experience in **computer architecture**, **hardware/software co-design**, and **telecommunications**

Philadelphia, PA

2009–2014

### Drexel University

B.S. IN COMPUTER ENGINEERING

Graduated Summa Cum Laude, GPA: 3.96

Philadelphia, PA

2006–2009

## Skills

<b>Programming</b>	C / Python / Matlab ( <i>proficient</i> ), Java / C++ ( <i>intermediate</i> ), HTML / CSS, Javascript
<b>Libraries</b>	NumPy / Matplotlib / Pandas (Python), GNU Radio (C++), lwIP / mac80211 (C), CUDA / OpenCL (GPGPU)
<b>Hardware</b>	Xilinx & Altera FPGA platforms, VHDL, Verilog, Xilinx ISE, Modelsim, JTAG debugging, logic analyzer
<b>Wireless Standards</b>	IEEE 802.11a/g/n/ac/ad (WiFi), 802.15.4 (ZigBee), Bluetooth, LTE-A, MIMO, mmWave
<b>RF Test Equipment</b>	Network analyzer, vector signal generator, channel emulator, anechoic / reverberation chamber
<b>Operating Systems</b>	Unix / Linux, Windows, Mac OS
<b>Web Framework</b>	Node.JS with Express & MongoDB, Parse Server, Python Flask with MySQL, Drupal CMS
<b>Others</b>	Vim, Tmux, shell scripting, Git, Latex, Markdown, Pandoc, Inkscape, GIMP

## Experience

### Drexel Wireless System Laboratory

GRADUATE RESEARCH FELLOW

Philadelphia, PA

9/2009–Present

- Designed and implemented a **synchronous directional wireless architecture** that leverages time synchronization and dynamic antenna directionality to perform autonomous, machine learning-based beamsteering for optimizing network throughput. Built a real-time 802.11-based system prototype on the WARP software-defined radio platform. Three publications [3,4; W1]
- Developed an **FPGA-based software-defined radio testbed** for dynamic spectrum access research in wireless small cells, leveraging a frequency-agile frontend for flexible spectrum access. One publication [8]
- Implemented a **real-time, protocol-aware reactive jammer** using GNU Radio and the low-cost USRP N210 software radio platform. Three publications [9,10,12] and a patent [P1]
- Co-developed a **reconfigurable baseband hardware IP** in Xilinx System Generator for scalable ultra wide-band OFDM signaling at millimeter wave (mmWave) frequencies. Implemented VHDL RTL modules to interface the baseband pipeline with high-speed (1GSPS) ADC and DAC frontends. Verified hardware designs in Modelsim and Xilinx ChipScope. Two publications [11,13]
- Led the development of a **mobile augmented reality framework** based on Unity game engine & Vuforia (frontend), with Parse & Python middleware (backend), to visualize and control wireless transmissions in real time. See [2,5,7] for publications. Demo video: <http://beamviewer.io>
- Gained working knowledge of modern wireless communication systems: OFDM, CDMA, LTE, and WiMAX
- Developed and maintained the lab website at <http://wireless.ece.drexel.edu>

## InterDigital Communications, Inc.

King of Prussia, PA

RESEARCH INTERN - VIDEO OVER WIRELESS

6/2013–6/2014

- Prototyped an experimental WiFi video delivery system using OpenWRT (embedded Linux distribution) with modified Linux 802.11 drivers (**mac80211** and **nl80211** modules), and DASH (Dynamic Adaptive Streaming over HTTP) video clients
- Optimized H.264 video streaming over WiFi networks leveraging IEEE 802.11e QoS support for traffic access categories
- Implemented a control algorithm for network-assisted rebuffering prevention through QoS elevation of distressed video streams

## Department of Electrical and Computer Engineering, Drexel University

Philadelphia, PA

TEACHING ASSISTANT

2009–2014

- Taught lectures and led lab sessions on Matlab, digital logic design, Java programming, and embedded systems

## Freedom Rings Partnership

Philadelphia, PA

WEB DEVELOPER

8/2012–8/2013

- Developed in Drupal CMS key features for the Freedom Rings Partnership's KEYSLOT website (<https://www.phillykeyspots.org>)

## MediaTech, Inc. (Vietnam)

Hanoi, Vietnam

TECHNICAL CONSULTANT

1–5/2012

- Designed and implemented a proof-of-concept PBX phone system for live-broadcast TV interactive games based on Asterisk
- Performed system latency tests using landline, cellular, and SIP-based soft phones

## Drexel High Performance Computing Laboratory

Philadelphia, PA

RESEARCH ASSISTANT (ADVISOR: J. JOHNSON)

6–12/2009

- Investigated performance bottlenecks of static auto-tuning software for sparse matrix-vector multiplication on x86 CPU platforms
- Analyzed and tested a lab-built Multiply-Accumulate (MAC) hardware design on FPGA using Xilinx ISE Suite

## Motorola Inc. - Home & Network Mobility Division (now ARRIS Group, Inc.)

Horsham, PA

SOFTWARE ENGINEER CO-OP

3/2008–6/2009

- Developed C++ features for the thin client software layer of set-top boxes to enhance digital video recording (DVR). Debugged and improved device drivers for external mass storage devices (eMSD) to handle DVR's external hard drive configuration process
- Implemented the System Test Program (STP) framework for automation of all design validation tests in the group

## SAP America, Inc.

Newtown Square, PA

R/3 SYSTEM ADMINISTRATOR CO-OP

3–9/2007

- Provided R/3 basis technical support for SAP systems used for demo, training, and consulting purposes

## Publications

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### CONFERENCE PROCEEDINGS

- [1] **Enhancing Blind Interference Alignment with Reinforcement Learning**  
S. Begashaw, D. H. Nguyen, K. R. Dandekar  
*Proc. of IEEE Global Communications Conf. (GLOBECOM '16 - to appear)*, 2016
- [2] **Demo: WiART - Visualize and Interact with Wireless Networks using Augmented Reality**  
D. H. Nguyen, J. Chacko, L. Henderson, A. Paatelma, H. Saarnisaari, N. Kandasamy, K. R. Dandekar  
*Proc. of 22nd Annu. Intl. Conf. on Mobile Computing and Networking (ACM MobiCom '16)*, 2016
- [3] **Enabling Synchronous Directional Channel Access on SDRs for Spectrum Sharing Applications**  
D. H. Nguyen, A. Paatelma, H. Saarnisaari, N. Kandasamy, K. R. Dandekar  
*Proc. of ACM Intl. Workshop on Wireless Network Testbeds, Experimental Eval., and Characterization (WiNTECH '16)*, 2016
- [4] **Demo: Enhancing Indoor Spatial Reuse through Adaptive Antenna Beamsteering (WinCool Best Demo Award)**  
D. H. Nguyen, A. Paatelma, H. Saarnisaari, N. Kandasamy, K. R. Dandekar  
*Proc. of ACM Intl. Workshop on Wireless Network Testbeds, Experimental Eval., and Characterization (WiNTECH '16)*, 2016
- [5] **BeamViewer: Visualization of Dynamic Antenna Radiation Patterns using Augmented Reality**  
D. H. Nguyen, L. Henderson, J. Chacko, C. Sahin, A. Paatelma, H. Saarnisaari, N. Kandasamy, K. R. Dandekar  
*Proc. of IEEE Conf. on Computer Communications Workshops (INFOCOM WKSHPS '16)*, 2016
- [6] **Experimental Evaluation of a Reconfigurable Antenna System for Blind Interference Alignment**  
S. Begashaw, J. Chacko, N. Gulati, D. H. Nguyen, N. Kandasamy, K. R. Dandekar  
*Proc. of IEEE Wireless and Microwave Technology Conf. (WAMICON '16)*, 2016

- [7] **Wireless Communications Engineering and Cybersecurity Education via Augmented Reality**  
C. Sahin, D. H. Nguyen, S. Begashaw, B. Katz, J. Chacko, L. Henderson, J. Stanford, K. R. Dandekar  
*Proc. of IEEE Frontiers in Education Conf. (FIE '16)*, 2016
- [8] **Leveraging an Agile RF Transceiver for Rapid Prototyping of Small-Cell Systems**  
D. H. Nguyen, M. Rauhanummi, H. Saarnisaari, N. Kandasamy, K. R. Dandekar  
*Proc. of IEEE Vehicular Technology Conf. (VTC-Fall '15)*, 2015
- [9] **Wireless Cybersecurity Education via a Software Defined Radio Laboratory**  
C. Sahin, D. Nguyen, J. Chacko, K. R. Dandekar  
*Proc. of IEEE Frontiers in Education Conf. (FIE '15)*, 2015
- [10] **A Real-Time and Protocol-Aware Reactive Jamming Framework Built on Software-Defined Radios**  
D. Nguyen, C. Sahin, B. Shishkin, N. Kandasamy, K. R. Dandekar  
*Proc. of ACM Workshop on Software Radio Implementation Forum (SRIF '14)*, 2014
- [11] **FPGA-Based Latency-Insensitive OFDM Pipeline for Wireless Research**  
J. Chacko, C. Sahin, D. Nguyen, D. Pfeil, N. Kandasamy, K. R. Dandekar  
*Proc. of IEEE High Performance Extreme Computing Conf. (HPEC '14)*, 2014
- [12] **Real-Time , Channel-Aware Reactive Jamming in 802 . 11 Networks**  
D. Nguyen, B. Shishkin, C. Sahin, D. Dorsey, N. Kandasamy, K. Dandekar  
*Proc. of 2013 Wireless @ Virginia Tech Annu. Symp.* 2013
- [13] **SDC Testbed: Software Defined Communications Testbed for Wireless Radio and Optical Networking**  
B. Shishkin, D. Pfeil, D. Nguyen, K. Wanuga, J. Chacko, J. Johnson, N. Kandasamy, T. P. Kurzweg, K. R. Dandekar  
*Proc. of Intl. Symp. on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOPT '11)*, 2011

#### WORKING PAPERS (Unpublished)

- [W1] **LinkPursuit: An Adaptive Pursuit Learning Method to Mitigate Small-Cell Interference through Directionality**  
D. H. Nguyen, A. Paatelma, H. Saarnisaari, N. Kandasamy, K. R. Dandekar  
*Submitted (unsuccessfully) to ACM MobiCom '16. Under revision*, 2016

#### PATENT / PATENT APPLICATIONS

- [P1] **Real-Time, Channel-Aware Reactive Jamming in Wireless Networks**  
B. Shishkin, D. H. Nguyen, C. Sahin, K. R. Dandekar, N. Kandasamy, D. J. Dorsey  
*US Patent No. 9,531,497. Issued December 27, 2016*
- [P2] **Beam Visualization and STEM Education using Augmented Reality**  
K. R. Dandekar, C. Sahin, L. J. Henderson, D. H. Nguyen, J. J. Chacko, X. R. Rey  
*US Provisional Patent Application No. 62/403,415. Filed October 3, 2016*
- [P3] **An Adaptive Pursuit Learning Method to Mitigate Small-Cell Interference through Directionality**  
D. H. Nguyen, A. Paatelma, H. Saarnisaari, N. Kandasamy, K. R. Dandekar  
*US Provisional Patent Application No. 62/402,671. Filed September 30, 2016*

## Honors & Awards

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2016	<b>WinCool Best Demo</b> , ACM WiTECH '16 (judged by a panel from industry and academia)
2009–Present	<b>Graduate Research Fellow</b> , Drexel University
2008–2009	<b>Milton Rosenberg Scholar</b> , Drexel University (recognizing outstanding engineering students)
2009	<b>Senior Design Competition Winner</b> , Drexel ECE (for a real-time RFID-based product locating system)
2006–2009	<b>Dean's Scholarship Recipient</b> , Drexel University
2008	<b>Inductee</b> , Eta Kappa Nu National ECE Honor Society

## Academic Projects

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#### NACHOS EDUCATIONAL OPERATING SYSTEM IMPLEMENTATION

Fall 2011

- Implemented in Java various features of a modern operating system: paging, virtual memory, locks and semaphores, conditional variables, and multi-threaded operations

#### FAST FOURIER TRANSFORM (FFT) PERFORMANCE BENCHMARKING ON CPU AND GPU

Winter 2011

- Implemented and measured runtime performance of various FFT implementation in C and CUDA

## MULTI-THREADED MATRIX OPERATIONS USING BLAS AND LAPACK

Winter 2011

- Wrote C programs to perform LU decomposition on large matrices, then parallelized the implementations using Pthreads, OpenMP, and Cilk

## COMPILER CONSTRUCTION FOR SPL (SIGNAL PROCESSING LANGUAGE)

Spring 2010

- Constructed a scanner, parser, and interpreter for a Lisp-style language targeted for describing signal processing kernels called SPL, using Java Lex and Yacc

## IMPLEMENTATION OF A 5-STAGE PIPELINED CPU ON FPGA

Winter 2010

- Implemented a 5-stage pipelined CPU supporting Load/Store, R-type instructions, branching, and context switches in VHDL. Performed FPGA synthesis and verification on the Xilinx Spartan 3E board

## Other Activities

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### Journal and Conference Peer-Review

Philadelphia, PA

#### EXTERNAL REVIEWER

2012–Present

- Performed peer-review and provided publication recommendations for submitted manuscripts

### National Science Foundation (NSF) Research Grant Proposals

Drexel University

#### CONTRIBUTOR

2011–Present

- Performed literature survey, formulated research thrusts, and assisted the Principal Investigators (PIs) in writing grant proposals

### Local Political Convention (Democratic National Convention)

Philadelphia, PA

#### RADIO FREQUENCY (RF) COORDINATION VOLUNTEER

7/2016

- Handled the RF coordination procedure: static allocation of available spectrum to media organizations, device inspection and tagging, floor sweep to monitor spectrum usage, troubleshoot interference incidents

### IEEE Student Branch

Drexel University

#### LOGISTICS CHAIR

2010

- Handled logistics operations in the organization: organize membership drives, book event venues, prepare refreshments and meeting materials, contact and schedule event speakers

### GSA Education, Inc.

Hanoi, Vietnam

#### FOUNDING MEMBER

2008

- Co-founded a professional education service company in Vietnam. Services include tutoring and college application consulting
- Led the development of the company's web portal for customer relationship management