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 systems. Fluent in embedded / FPGA development, digital signal processing, C, Python, and Matlab. Currently seeking full-time opportunities in the general areas of mobile computing and wireless PHY/MAC development.

Education

Drexel University — *Philadelphia, PA*

Ph.D. in Electrical Engineering (Advisors: K. R. Dandekar, N. Kandasamy) — *2009–Exp. 6/2017*

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

Drexel University — *Philadelphia, PA*

M.S. in Computer Engineering — *2009–2014*

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

Drexel University — *Philadelphia, PA*

B.S. in Computer Engineering — *2006–2009*

Graduated Summa Cum Laude, GPA: 3.96

Skills

Programming	C / Python / Matlab (*proficient*), Java / C++ (*intermediate*), HTML / CSS, Javascript
Libraries	NumPy / Pandas (Python), GNU Radio / Intel IPP (C++), lwIP / liquid-dsp (C), CUDA / OpenCL (GPGPU)
Hardware	Xilinx & Altera FPGA platforms, VHDL, Verilog, Xilinx ISE, Modelsim, JTAG debugging
Architectures	x86, x86-64, ARM, Xilinx Microblaze, Atmel AVR microcontrollers
Operating Systems	Unix / Linux, OpenWRT / FreeRTOS (embedded), TinyOS / Contiki (wireless sensors)
Wireless Standards	IEEE 802.11n/ac/ad (WiFi), 802.15.4 (ZigBee), Bluetooth, GSM, UMTS/W-CDMA, LTE, MIMO, mmWave
RF Test Equipment	Network analyzer, vector signal generator, channel emulator, anechoic / reverberation chamber
Others	Vim, Tmux, shell scripting, Git, Latex, Markdown, Pandoc, Inkscape

Experience

Drexel Wireless Systems Laboratory — *Philadelphia, PA*

Graduate Research Fellow — *9/2009–Present*

- Designed and implemented a **synchronous directional wireless architecture** that uses **reinforcement learning**, time synchronization, and pattern-reconfigurable antennas to perform autonomous beamsteering for optimizing network throughput. Built a real-time 802.11 system prototype on the WARP software-defined radios. Three publications [3,4; W1]
- Developed **wideband spectrum sensing algorithms** in Matlab and FPGA hardware for **cognitive radio operations** in wireless small cells, leveraging a frequency-agile transceiver frontend for flexible spectrum access. One publication [8]
- Implemented a **real-time, protocol-aware reactive jammer** using GNU Radio and the low-cost Ettus USRP N210 software-defined radio. Devised a hardware/software co-processing scheme to meet real-time deadlines while maintaining platform programmability. Three publications [9,10,12] and a patent [P1]
- Co-developed a **reconfigurable baseband hardware IP** 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]
- Investigated **automatic generation of software components** for physical layer processing. Extended SPIRAL—a code generator for DSP transforms (http://spiral.net)—to handle baseband processing kernels. Developed algorithmic break-down rules to enable Spiral to generate optimized C implementations of the baseband pipeline on x86 platforms
- Handled backend development (cloud-controlled radios, gateway, and server software) of a **mobile augmented reality** framework to visualize and control RF transmissions in wireless networks in real time. See [2,5,7] for publications. Demo video: http://beamviewer.io

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 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 KEYSPOT 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

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), 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

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

Academic Projects

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

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