

# Zhao Tian

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## Research Statement

I am eager to devise novel wireless/mobile systems. Specifically, my interests focus on emerging wireless technologies, e.g., visible light communication, and their applications on human sensing. I am also motivated by spectrum monitoring, which assists to use the existing wireless spectrum resources, such as TV white space, more efficiently.

## Academic Background

- **Dartmouth College** Hanover, New Hampshire, United States  
*Ph.D. in Computer Science* Sept. 2014 – Jun. 2019 (expected)
  - supervised by Prof. Xia Zhou at DartNets (Dartmouth Networking and Ubiquitous Systems) Laboratory
  - wireless networking and mobile system, specifically in visible light communication and spectrum monitoring
  - courses: Machine learning, DSP (Digital Signal Processing)
- **Peking University** Beijing, China  
*Bachelor of Science in Computer Science* Sept. 2009 – Jul. 2013
  - core courses: Compiler, Operating system, Architecture, Computer network; Linear algebra, Calculus, Graph theory, Probability and statistics, Stochastic process; Data structure, Algorithm design & analysis; Digital logic
  - worked with Prof. Tao Wang and Prof. Guojie Luo at the Center for Energy-Efficient Computing and Applications (CECA) of Peking University since sophomore, on reconfigurable computing, specifically FPGA architecture and tool chain
  - Bachelor of Arts (minor) in Economics (National School of Development)
- **UCLA (University of California, Los Angeles)** Los Angeles, California, United States  
*Research-Exchange Student in Department of Computer Science* Sept. 2012 – Jan. 2013
  - sponsored by the Joint Research Institute in Science and Engineering of Peking University and UCLA
  - worked with Prof. Jason Cong and Dr. Kalliopi Tsota at UCLA VLSI CAD Laboratory (now VLSI Architecture, Synthesis, and Technology (VAST) Laboratory)

## Appointment

- **University of Cambridge** Cambridge, United Kingdom  
*Visiting Researcher in Computer Laboratory* Oct. 2016 – Dec. 2016
  - worked with Prof. Cecilia Mascolo at Networks and Operating Systems Group

## Honors & Awards

- **HotMobile Travel Grant** NSF, 2016
- **Second Place in ACM Student Research Competition** ACM MobiCom, 2015
- **Neukom Travel Grant** Neukom Institute, 2015
- **International Scholarship for Outstanding Undergraduates** China Scholarship Council, 2012
  - sponsored by Ministry of Education, China to do research overseas: stipend, travel expense, and insurance
  - the only winner from School of EECS; 13 from Peking University; 289 nationwide (all disciplines included)
- **May Fourth Scholarship** Peking University, 2012

## Publication

- **The DarkLight Rises: Visible Light Communication in the Dark** Best Video Award  
*Z. Tian, K. Wright, and X. Zhou*  
Proceedings of 22nd Annual International Conference on Mobile Computing and Networking (MobiCom'16)
- **Lighting Up the Internet of Things with DarkVLC**  
*Z. Tian, K. Wright, and X. Zhou*  
Proceedings of 17th International Workshop on Mobile Computing Systems and Applications (HotMobile'16)

- **Human Sensing Using Visible Light Communication** Best Video Award  
*T. Li, C. An, Z. Tian, A. Campbell, and X. Zhou*  
 Proceedings of 21st Annual International Conference on Mobile Computing and Networking (MobiCom'15)
- **Visible Light Knows Who You Are**  
*C. An, T. Li, Z. Tian, A. Campbell, and X. Zhou*  
 Proceedings of 2nd ACM Workshop on Visible Light Communication systems (VLCS'15)

## Research Experience

- **Visible Light Communication in the Dark** DartNets  
*supervised by Prof. Xia Zhou* Mar. 2015 – Mar. 2016
  - We devise a new visible light communication (VLC) primitive: DarkLight, where the communication sustains even when the LED light appears dark
  - The key idea is to encode data into ultra-short light pulses imperceptible to human eyes yet detectable by devices equipped with photodiodes.
  - We build a preliminary prototype to demonstrate its feasibility. Our current single link achieves 1.77 kbps data rate with 46.8  $\mu$ W power consumption at the LED
- **Human Sensing Using Visible Light Communication** DartNets  
*supervised by Prof. Xia Zhou* Dec. 2014 – Mar. 2015
  - A device-free 3D posture reconstruction system leveraging visible light communication
  - We embedded 324 photodiodes on the floor to capture the shadows of the user cast by the LED lights mounted on the ceiling and used an optimization algorithm to compute the vectors of body segments
  - Our system achieved 10° mean angular error
- **Novel FPGA Architecture and its Tool Chain** CECA  
*Supervised by Prof. Tao Wang and Prof. Guojie Luo* Jul. 2011 – Mar. 2014
  - Our project aims to facilitate time-multiplexing dedicated logic blocks in FPGA. We incorporate SPFUs (Sequential Programmable Functional Units), a DSP-like component with built-in dedicated control logic, into FPGA. We are using wireless applications to show its advantage.
  - I contributed to design the prototype of SPFU, which is comprised of ALU, register file and a sequencer.
  - I was in charge of the tool-chain for our heterogeneous FPGA. In order to support SPFU, I tailored VPR, an academic FPGA flow from the University of Toronto and also developed a Verilog-to-BLIF logic elaborator to replace the the old one in VPR.
  - I conducted the experiments using my flow to evaluate our new FPGA, which achieved a higher area efficiency than DSP-based FPGA.

## Teaching Assistant Experience

- **COSC50: Software Design and Implementation** Winter and Spring 2015, Dartmouth  
 – held office hours, led lab sessions, graded labs and course projects, and shepherded course projects
- **COSC 30: Discrete Mathematics in Computer Science** Fall 2014, Dartmouth  
 – held office hours, graded and wrote solutions for assignments and exams, and explained the exams

## Technical Skills

- **Programming Language** **Proficient:** C/C++, Java, Python, MATLAB, Shell script;
- **Hardware Design** Verilog, Analog circuit design
- **System & Tools** GNU/Linux, GNU Radio
- **FPGA Platform** Xilinx Vivado, Xilinx Vivado HLS

## Extracurricular Activities

- **Vice President**, Dartmouth Chinese Students and Scholars Association (CSSA), 2015–2016