

**WORK EXPERIENCE**

**Qualcomm, Inc., San Diego, CA**

**June 2015 – Present**

***Staff Embedded Software Engineer***

- Innovate, design and implement embedded drivers for cutting edge RF and modem hardware to support 4G and 5G wireless technologies.
- Currently responsible to design and implement RF drivers and interfaces to support NR5G MMW -
  - DL gain control to support AGC
  - DL frequency compensation
  - UE DL beam switches to support mobility
  - Automatic frequency control (AFC) to support frequency tracking loops
  - Jammer detection and mitigation
  - Maximum permissible exposure (MPE) for user detection and mitigation via cap on UL power
- Prior responsibilities include design and implement RF drivers and interfaces to support 4G LTE –
  - UL carrier aggregation
  - UL power limiting and control
- Work with factory team to provide interfaces to support calibration for above mentioned algorithms.
- Work with protocol, firmware and test teams to drive design, implement interfaces and algorithms and ensure conformance to 3GPP standards.
- Work with customer engineering team to support customer issues.
- Mentor, collaborate and lead a team to participate in product development lifecycle from inception and design to bring-up, optimization, verification and commercialization.
- Responsible to set up team wide periodical training sessions.

**Multimedia Communication Laboratory and Smart Lighting Engineering Research Center,**

**Boston University, Boston, MA**

**September 2011 – June 2015**

***Research Assistant***

- Designing Xilinx FPGA based optical wireless 4x4 MIMO system with an imaging receiver and implementing OFDM variant as modulation at PHY.
- Generating optical MIMO system specifications to develop prototypes in collaboration with partners.
- Developed a wireless, networked color sensor platform (CuSP) to deploy in smart spaces.
- Designed an iOS app and wireless, networked inertial sensors (FAM) for monitoring, detection and real time classification of functional activity.

**Advanced Analytical Technologies, Inc., Ames, IA**

**March 2009 – July 2010**

***Software Engineer***

- Developed GUI data analysis and controller software in C# for analytical laboratory instruments.
- Implemented real time control, digital signal processing, pattern search and match algorithms.

**Enova Systems, Inc. / Hyundai Enova ITC, Torrance, CA**

**August 2007 – March 2009**

***Software Engineer***

- Developed embedded code in C/C++ for hybrid vehicle motor drive control modules.
- Developed an in house UI tool to obtain real time system diagnostic data.

**Lilavati Hospital and Research Center, Mumbai, India**

**June 2005 – December 2005**

***Engineering Intern***

- Serviced and maintained imaging, analytical and diagnostic machines.

**SKILLS**

- Wireless: OFDM, PHY Modulation, MIMO.
- Standards: IEEE 802.15.7 (WPAN-TG7), IEEE 802.11.x (WLAN, WiFi), 3GPP - 5G, LTE.
- Programming: ANSI C, embedded C, C++, assembly, C#, Java, SQL, objective-C.
- Web: HTML, CSS, HTTP.
- Networking: TCP/IP, UDP, Sockets, ANT+, Bluetooth.
- Signal Processing: FFT/IFFT, Wavelets, FIR, IIR, Sampling, Interpolation, Kalman filter, EKF.
- IDEs: Visual Studio, MATLAB, Code Composer Studio, Xcode.
- Version Control: GitHub, SVN.

**EDUCATION**

**Boston University, Boston, MA** **May 2015**

**Doctor of Philosophy, Electrical and Computer Engineering** **GPA: 3.96**

- Ph.D. Thesis: Design, analysis and optimization of optical MIMO communication systems under illumination constraints. Advisor: Prof. Thomas Little.
- Developed low complexity spectrally efficient MIMO OFDM signaling schemes.
- Investigated optical MIMO wireless signaling techniques.

**University of California, Los Angeles, CA** **2007**

**Master of Science, Biomedical Engineering** **GPA: 3.61**

- Designed multi-tap FIR/IIR digital filters.
- Developed java based GUI to parse DICOM images.
- Subjects studied include advanced digital signal processing, statistics and analog circuit design.

**University of Mumbai, Mumbai, India** **2006**

**Bachelor of Engineering, Biomedical Engineering** **GPA: 3.92**

- Senior project: Travelling photometer. Developed prototype for analytical laboratory instrument in R&D phase at Transasia Bio-Medicals Ltd., Mumbai.
- Subjects studied include microprocessors, computer programming, advanced digital signal and image processing, control systems, analog and digital electronic circuits.

**PATENT APPLICATION**

- Sensory lighting system and method for characterizing an illumination space. **2013**  
Inventors: R. Karlicek, R. Radke, T. Little, *P. Butala*, and L. Jia  
Publication date: 2013/4/19  
Patent office: US  
Application number: 14/394,888

**LIST OF PUBLICATIONS**

- Trace-orthogonal PPM – Space time block coding under rate constraints for visible light communication. **2015**  
M. Biagi, A.M. Vegni, S. Pergoloni, *P. Butala*, and T. Little, *Journal of Lightwave Technology*.
- Multi-wavelength visible light communication system design. **2014**  
*P. Butala*, H. Elgala, P. Z.-Ha, and T. Little, *OWC, IEEE Globecom*, Austin, TX.
- Sample indexed spatial orthogonal frequency division multiplexing. **2014**  
*P. Butala*, H. Elgala, and T. Little, *Chinese Optics Letters*.

# PANKIL M BUTALA

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- Performance of optical spatial modulation and spatial multiplexing with imaging receiver. 2014  
*P. Butala, H. Elgala, and T. Little, IEEE Wireless Communications and Networking, PHY and Fundamentals, Istanbul, Turkey.*
- SVD-VLC: A novel capacity maximizing VLC MIMO system architecture under illumination constraints. 2013  
*P. Butala, H. Elgala, and T. Little, OWC, IEEE Globecom, Atlanta, GA.*
- Metameric modulation for diffuse visible light communications with constant ambient lighting. 2012  
*P. Butala, J. Chau, and T. Little, IEEE IWOW, Pisa, Italy.*
- Monitoring walking and cycling of middle-aged to older community dwellers using wireless wearable accelerometers. 2012  
*Y. Zhang, K. Beenakker, P. Butala, C. Lin, T. Little, A. Maier, M. Stijntjes, R. Vartanian and R. Wagenaar, IEEE EMBC, San Diego, CA.*
- Wireless system for monitoring and real time classification of functional activity. 2012  
*P. Butala, Y. Zhang, T. Little and R. Wagenaar, COMSNETS, Bangalore, India.*

## CONFERENCE ORAL PRESENTATIONS

- Multi-wavelength visible light communication system design. 2014  
*OWC, IEEE Globecom, Austin, TX.*
- Performance of optical spatial modulation and spatial multiplexing with imaging receiver. 2014  
*IEEE Wireless Communications and Networking, PHY and Fundamentals, Istanbul, Turkey.*
- SVD-VLC: A novel capacity maximizing VLC MIMO system architecture under illumination constraints. 2013  
*OWC, IEEE Globecom, Atlanta, GA.*
- Metameric modulation for diffuse visible light communications with constant ambient lighting. 2012  
*IEEE IWOW, Pisa, Italy.*
- Wireless system for monitoring and real time classification of functional activity. 2012  
*COMSNETS, Bangalore, India.*

## POSTER PRESENTATIONS

- Impact of color space non-linearity on performance of color shift keying. 2015  
*NSF Site Review, Smart lighting ERC, Troy, NY.*
- Designing a dual purpose indoor illumination and optical communication system. 2015  
*Industry Academia Day, Smart lighting ERC, Troy, NY.*
- Designing a dual purpose indoor illumination and optical communication system. 2014  
*New England Networking and Systems Day, Boston, MA.*
- Performance of Optical Spatial Modulation and Spatial Multiplexing with Imaging Receiver. 2014  
*NSF Site Review, Smart lighting ERC, Troy, NY.*
- SVD-VLC: MIMO VLC architecture under illumination constraints. 2014  
*Industry Academia Day, Smart lighting ERC, Troy, NY.*
- Indoor Diffuse Optical MIMO Communication System. 2013  
*NSF Site Review, Smart lighting ERC, Troy, NY.*
- Metameric Modulation for Diffuse Visible Light Communications with Constant Ambient Lighting. 2013  
*Industry Academia Day, Smart lighting ERC, Troy, NY.*

## AWARDS AND LEADERSHIP

- President Student leadership council, Smart lighting ERC. 2014-2015
- Chair Engineering students' workshop, Boston University. 2014
- Representative Smart lighting ERC at national level inter-ERC perfect pitch competition. 2014
- Won Perfect pitch competition, Smart lighting industry-academia event. 2014

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|---------------------|--|-----------|
| • Vice President    | Student leadership council, Smart lighting ERC.                  | 2013-2014 |
| • Captain           | Soccer team, Student association of graduate engineers, BU.      | 2012-2013 |
| • University Chair  | Student leadership council, Smart lighting ERC.                  | 2012-2013 |
| • Secretary         | Student association of graduate engineers, BU.                   | 2012-2013 |
| • Representative    | For ECE students, Student association of graduate engineers, BU. | 2011-2012 |
| • Dean's fellowship | Awarded at BU.   | 2010-2011 |
| • Student Member    | IEEE.  | 2010-2015 |