

# Dhruv Patel

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## EDUCATION

### University of Toronto

Master of Applied Science - Electrical Engineering

Sept 2016 - Present | Toronto, ON

Supervisor: Prof. Tony Chan Carusone

- Research Area: CMOS Optical Receiver Circuits

### University of Waterloo

Bachelor of Applied Science Honours Electrical Engineering, Co-op Program - With Distinction

Sept 2011 - April 2016 | Waterloo, ON

- [Final Year Project](#): PowerSmart - Enabling IoT with AC power-line communication

## PUBLICATIONS

### Refereed Journal Papers:

- [J1] **D. Patel** and M. Sachdev, "0.23-V Sample-Boost-Latch-Based Offset Tolerant Sense Amplifier," in **IEEE Solid-State Circuits Letters**, vol. 1, no. 1, pp. 6-9, Jan. 2018.

### Refereed Conference Papers:

- [C1] **D. Patel**, D. Wright and M. Sachdev, "Sense amplifier offset characterisation and test implications for low-voltage SRAMs in 65 nm," in 2018 IEEE 23rd **European Test Symposium (ETS)**, Bremen, 2018, pp. 1-6.

### Refereed Posters & Presentations:

- [P1] **Dhruv Patel** and Manoj Sachdev, "Sample-Boost-Latch Based Offset Tolerant Sense Amplifier for Sub-threshold SRAMs" **IEEE 2018 International Solid-State Circuits Conference (ISSCC) Student Research Preview**, San Francisco, California.

## RESEARCH EXPERIENCE

### CMOS Optical Receiver Circuits | MASc. Graduate Research Assistantship

Sept 2016 - Present | Toronto, ON

Supervisors: Prof. Tony Chan Carusone

- Designing Optical Receiver Front-end for PAM-4 fiber-optic communications
- Second order system optimization with Gain-BW-noise trade-offs and peak-distortion analysis

### SRAM Circuits - VLSI | BASc. Undergraduate Research Assistantship

1 yr | Sept 2015 - Aug 2016 | Waterloo, ON

Supervisors: Prof. Manoj Sachdev, Dr. Adam Neale, Dr. Derek Wright

- Taped-out low-voltage and offset reducing Sense-amplifiers in 65 nm

- Schematics, layout and simulations of 65 nm SRAM cells and Sense Amplifiers in Cadence Virtuoso
  - Characterizing Sense Amplifier ICs in CMOS design and reliability laboratory
  - 4-layer PCB Design for Sense Amplifier IC for characterization purposes
  - Took graduate level CMOS digital design course; Project: 16-bit 1GHz adder design in cadence
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### **Power-Line Transceiver Design** | BAsC. Undergraduate Research Assistantship

8 months | Jan 2015 - Aug 2015 | Waterloo, ON

Supervisors: Prof. Vincent Gaudet

- Assisted in automotive DC power-line communication (PLC) research
- Schematics and PCB designs of transmitter and receiver analog-front-end (AFE) boards
- Prototyped and characterized AFE transceivers in microelectronic laboratory
- Performed substantial circuit simulations and component selections for the AFE circuitry

## WORK EXPERIENCE

### **Apple Inc.** | Sensing Systems Hardware Intern

5 months | Aug 2014 - Dec 2014 | Cupertino, CA

- Optical Characterizations of CMOS SPAD arrays and VCSELs in optoelectronics laboratory
  - Executed extensive statistical analysis of sensor test data for modelling purposes with python
  - Architected Robotic control software for automating sensor characterizations with python and Java
  - Involved in System level and PCB level designs of Optical sensor prototypes
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### **Arista Networks** | Hardware Design Engineering Intern

4 months | Jan 2014 - April 2014 | Santa Clara, CA

- Contributed in PCB designs for 40Gb/s Network Switches
  - Designed and simulated matched 156 MHz clock fanout interfaces with HSpice and ADS
  - Simulated power planes and optimized component placements for efficient power delivery
  - Performed spectrum analysis for selecting Crystal Oscillators with lowest EMI
  - Eye characterizations and tuning for Jitter and Power reduction
  - Developed JTAG boundary scan test on Network Switches
  - Characterized Airflow and Pressure inside the Network Switch chassis for better fan selection
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### **Blackberry** | Hardware Verification Engineering Intern

4 months | May 2013 - Aug 2013 | Waterloo, ON

- Verified high-speed interfaces across baseband and application processors in GBit/sec class
  - Analyzed signal eye diagrams and jitter measurements for signal integrity verification purposes
  - Automated oscilloscopes, temperature chambers and frequency counters for chip testing in python
  - Performed current drive optimization and noise analysis on baseband ICs
  - Developed software in C for throughput measurements on USB and  $\mu$ SD interfaces
  - Performed USB 2.0 electrical compliance tests according to USB protocol specifications
  - Tested functionalities of Blackberry handheld devices using NI LabVIEW
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### **Christie Digital** | Electrical Engineering - Intern

4 months | Sept 2012 - Dec 2012 | Kitchener, ON

- Contributed to flight-simulator Projector's PCB designs
- Lead projector's harness designs: component selections, prototype building and finalizing designs

- Involved in Electro-Optical/Mechanical algorithm development and validation
- Performed net list checks, signal integrity and brought-up PCBs according to test plans
- Optimized Light Sensor sampling time by modifying existing amplification circuitry

## **TDA Inc. | Programmer - Intern**

4 months | Jan 2012 - April 2012 | Burlington, ON

- Developed scantron scanning software from scratch to a release product in C# and VB.net
- Designed Call Information System for VOIP to search call records from the database in VB.Net

## **VOLUNTEERING ACTIVITIES & SOCIETY MEMBERSHIPS**

2018 Engineer in Residence (EIR) volunteer at Briarcrest Junior School  
 2018 IEEE International Solid-State Circuit Conference (ISSCC) Volunteering Team  
 2013-2014 UofW Application Specific Integrated Circuit (ASIC) group  
 2013-2014 UofW Badminton Club  
 2012-Present IEEE Student Membership:  
 (2016-Present): SSCS, CAS, Photonics, Nanotechnology, Sensors

## **SCHOLARSHIPS & AWARDS**

2018 Edward S. Rogers Sr. Graduate Scholarships (UofT: MASc.)  
 2017 Queen Elizabeth Graduate Scholarship in Science and Technology (UofT: MASc.)  
 2016 NSERC Undergraduate Student Research Award (SRAM: VLSI)  
 2016 Distinguished Final Year Capstone Design Project Award (PowerSmart)  
 2016 Undergraduate Research Assistantship Award (SRAM: VLSI)  
 2015 NSERC Undergraduate Student Research Award (SRAM: VLSI)  
 2015 Undergraduate Research Assistantship Award (Power-Line Tx/Rx Design) x2  
 2011 University of Waterloo Merit Scholarship  
 2011 Queen Elizabeth II Aiming for the Top Scholarship

## **MAJOR COURSEWORKS**

### **Undergraduate**

Integrated Digital Circuits	Microelectronic Circuits I and II
Electronic Devices	Analog and Digital Communication
EM Fields and Waves	RF and Microwave Circuits
Analog Control Systems	Power Electronic Converters
Embedded Microprocessor Systems	Probability Theory and Random Access
Integrated Analog Electronics	Photonics Devices and Systems
Geometric and Physical Optics	

### **Graduate**

Digital Integrated Circuits	Analog Circuit Design I
VLSI Design Methodology	High Frequency Integrated Circuits
Integrated Circuits for Wireless Communications	Integrated Circuits for Digital Communications

## **TEACHING ASSISTANTSHIP**

ECE 334-Digital Electronics: Lab sessions for 3rd Yr. undergrad students (2016, 2017)  
 ECE 231-Introductory Electronics: Lab sessions for 2nd Yr. undergrad students (2018)

## **EXPERTISE**

## Hardware tools

- Electronics Instruments: High-end Oscilloscopes, Spectrum Analyzers, VNA, Current Probes, Power Supplies, Pattern Generators, Frequency Counters, Logic Analyzers
  - Optical Instruments: Spectrometers, Solar simulators, Lasers and precision stages/apertures
  - Communication Protocols: I2C, USB, SPI, JTAG, GPIB
  - Solid PCB design and soldering skills
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## Software tools

- EE tools: Cadence Virtuoso (Schematics/Layout), Cadence Allegro/Orcad, Ltspice, HSpice, Advanced Design System, Labview, Altium, Eagle, Qurtus, Hyperlynx Power-Integrity
- Programming: Java, C, C#, C++, Matlab, Python, VHDL, Verilog, Assembly, .NET, Html, CSS
- Publishing Presentation tools: Latex, MS office suit