Dhruv Patel

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EDUCATION

University of Toronto
Ph.D. - Electrical Engineering
Sept 2019 - Present | Toronto, ON, Canada
Advisors: Prof. Tony Chan Carusone

University of Toronto
Master of Applied Science (Thesis) - Electrical Engineering
Sept 2016 - Jan 2020 | Toronto, ON, Canada
Advisors: 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, Canada

- Final Year Project (Distinguished): PowerSmart - Enabling IoT with AC Power-Line Communication

PUBLICATIONS

Refereed Journal Papers:

[J2] **D. Patel**, A. Neale, D. Wright and M. Sachdev, "Hybrid Latch-Type Offset Tolerant Sense Amplifier for Low-Voltage SRAMs," in **IEEE Transactions on Circuits and Systems I: Regular Papers (TCAS-I)**, vol. 66, no. 7, pp. 2519-2532, July 2019.

[J1] **D. Patel** and M. Sachdev, "0.23-V Sample-Boost-Latch-Based Offset Tolerant Sense Amplifier," in **IEEE Solid-State Circuits Letters (L-SSC)**, 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] **D. Patel** and M. 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
+2 yr | Sept 2016 - Present | Toronto, ON, Canada
Advisors: Prof. Tony Chan Carusone

- Designing Optical Receiver Front-end for +100 Gb/s PAM-4 fiber-optic communications in 16 nm FinFet CMOS
- Providing compact package level integration solution of CMOS optical receiver with state-of-the-art photodetectors
- High-frequency–Low-noise layout optimization and analysis in 16 nm FinFet CMOS
- Second order system optimization with Gain-BW-Noise trade-offs and peak-distortion analysis
- Planning of office-space/laboratory for university-industry collaboration
- Assisting in paper reviews

SRAM Circuits - VLSI | BASc. Undergraduate Research Assistantship
2 yrs | Sept 2015 - Aug 2017 | Waterloo, ON, Canada
Advisors: Prof. Manoj Sachdev, Dr. Adam Neale, Dr. Derek Wright

- Schematics, layout and simulations of deep-subthreshold SRAM sensing schemes in 22 nm FDSOI CMOS
- Taped-out low-voltage and offset reducing Sense-amplifiers test chip in 65 nm CMOS
- Sense Amplifier Offset Characterization and Test Implications for Low-Voltage SRAMs
- Lab equipment automatization with LabView for characterizing taped-out test chips
- 4-layer PCB Design for Sense Amplifier IC for characterization purposes

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Power-Line Transceiver Design | BASc. Undergraduate Research Assistantship
8 months | Jan 2015 - Aug 2015 | Waterloo, ON, Canada
Advisors: Prof. Vincent Gaudet

- Assisted in In-Vehicular 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 microelectronics 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, USA

- Optical Characterizations of CMOS SPAD arrays and VCSELs in optoelectronics laboratory
- Executed statistical analysis of sensor test data for modelling purposes with python
- Goniometric robotic automation of optical components with Python and Java
- Architected robotic control software for automating Apple products' characterizations
- Involved in System level designs for Optical sensor prototypes

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Arista Networks | Hardware Design Engineering Intern
4 months | Jan 2014 - April 2014 | Santa Clara, CA, USA

- 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 on PCB to optimize component placement and Power Delivery
- Performed spectrum analysis for selecting Crystal Oscillators with lowest EMI
- Signal Characterization: Eye measurements and tuning for Jitter and Power reduction

- Developed JTAG boundary scan test on Network Switches
- Characterized Airflow and Pressure inside the Switch chassis with various cooling fans

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Blackberry | Hardware Verification Engineering Intern
4 months | May 2013 - Aug 2013 | Waterloo, ON, Canada

- Verified high-speed interfaces in baseband and application processors in GBit/s class
- Captured and analyzed signal eye diagrams and jitter measurements
- Automated oscilloscopes, temperature chambers and frequency counters in python
- Performed current drivers optimization and noise analysis on baseband ICs
- Developed C program for accurate throughput measurements on USB and µSD interfaces
- Performed USB 2.0 compliance tests according protocol specifications
- Tested functionalities of various sensors on Blackberry devices using LabVIEW

Christie Digital | Electrical Engineering - Intern
4 months | Sept 2012 - Dec 2012 | Kitchener, ON, Canada

- Contributed to flight-simulator Projector's PCB designs
- Lead projector's harness designs: component selection and prototype building
- Involved in projector's Electro-Optical/Mechanical algorithm development and simulations
- Performed net list checks, signal integrity and brought-up PCBs according to test plans
- Created Visio drawings, BOMs and ECOs for cable harness documents
- Optimized Light Sensor sampling time by making changes to amplification stage circuitry

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TDA Inc. | Programmer - Intern
4 months | Jan 2012 - April 2012 | Burlington, ON, Canada

- Developed scantron scanning software from scratch to a release product in C# and VB.net
- Integrated credit/debit processing system into the student online application system
- Developed Call Information System in VB.net for voice-over-IP to search records from database

VOLUNTEERING ACTIVITIES & SOCIETY MEMBERSHIPS

2018, 2020, 2021	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 & FELLOWSHIPS

2020	Natural Science & Engineering Research Council Post-Graduate Scholarship (NSERC PGS-D)
2020	Ontario Graduate Scholarship (UofT: PhD) - offer declined
2019	Ontario Graduate Scholarship (UofT: PhD)
2017	Edward S. Rogers Sr. Graduate Scholarships (UofT: MASc.)
2016	Queen Elizabeth Graduate Scholarship in Science and Technology (UofT: MASc.)
2016	University of Toronto Research Fellowship [2016-2019] (UofT: MASc.)
2016	NSERC Undergraduate Student Research Award (SRAM Circuits)
2016	Distinguished Final Year Capstone Design Project Award (PowerSmart Capstone Design Project)
2016	Undergraduate Research Assistantship Award (SRAM Circuits)
2015	NSERC Undergraduate Student Research Award (SRAM Circuits)
2015	Undergraduate Research Assistantship Award (Power-Line Tx/Rx Design) *during spring term
2015	Undergraduate Research Assistantship Award (Power-Line Tx/Rx Design) *during fall term
2011	University of Waterloo Merit Scholarship
2011	Queen Elizabeth II Aiming for the Top Scholarship

MAJOR COURSEWORKS

Undergraduate

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

Graduate

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

TEACHING ASSISTANTSHIP

ECE 212 - Circuit Analysis	Lab sessions for 2nd Yr. undergrad students (2020)
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)
MIE 366 - Electronics for Robotics:	Lab sessions for 3rd Yr. undergrad students (2019)
MIE 346 - Analog and Digital Electronics:	Tutorials and Lab sessions for 3rd Yr. undergrad students (2020, 2021)

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

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