Candice J. X. Ip

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Education

University of British Columbia
Vancouver, Canada

Engineering Physics (BASc) & Minor in Commerce — *Sep 2013 - May 2018*

- A physics and applied mathematics program enriched by design fundamentals in electrical and mechanical engineering.
- One of 25 engineering students admitted to Pre-Med Alternative Path.

Eidgenössische Technische Hochschule Zürich (ETHZ)
Zürich, Switzerland

International Exchange – Department of Mechanical and Process Engineering — *Sep 2016 - Dec 2016*

- Studied in the Department of Mechanical and Process Engineering with a focus in Physics, Data Visualization, and Energy Sciences.
- Courses: Plasmonics, Quantitative Flow Visualization, Heat Transfer, Wind Energy, Solar Cells, and Nuclear Energy Systems.

St. Michaels University School
Victoria, Canada

High School Diploma — *Sep 2005 - Jun 2013*

Research & Work Experience

Embrace Orthopaedics
Vancouver, Canada

Engineer — *Oct 2018 – Present*

- Implemented image pattern matching and 3D spatial-temporal mesh reconstruction as well as other advanced computer vision techniques in MATLAB to support the development of a proprietary orthopaedic brace.
- Reduced reconstructed iamge calibration error x8 by implementing a simulated annealing optimizer on intrinsic and extrinsic camera parameters.
- Increased the efficiency of graphics rendering by speeding up the calculation x200 by developing a heuristic recursive algorithm.
- Supervised engineering interns and collaborated in designing and developing an automated test jig to determine and confirm the mechanical efficacy of the brace.

Dynamic Optics
Port Coquitlam, Canada

Project Coordinator & Mechanical Engineer — *Jun 2018 – Oct 2018*

- Designed an automated slurry recovery system for a proprietary hydrodynamic robotic mirror polishing system (HyDRA).
- Developed preliminary designs for an optical metrology system using both commercial and experimental interferometry systems.
- Supervised mechanical engineering co-op students on the design of HyDRA force plates and safety systems surrounding a KUKA robot.
- Coordinated project timelines, budgets, and development for employees of Dynamic Optics and held monthly board meetings to update all stakeholders.

Nanoplasmonics Laboratory, University of Victoria
Victoria, Canada

Research Intern with Dr. Reuven Gordon — *May 2017 – Aug 2017*

- Studied the use of double-nanohole (DNH) apertures in an optical tweezing experiment to analyze protein composition of a heterogeneous egg white solution [1].
- Conducted autocorrelation and standard deviation analyses on Brownian motion signals of trapped proteins to calculate molecular mass for protein identification (MATLAB).
- Assisted in the design of focus ion beam fabricated DNHs and measured the degredation of DNHs using a scanning electron microscope.

Human Interaction Robotics Laboratory (RREACH), University of British Columbia
Vancouver, Canada

Mechatronics Engineering Intern with Dr. Machiel Van der Loos — *May 2016 – Aug 2016*

- Developed a prototype of their biomedical device, SleepSmartV2, for detecting body temperature, movement, and posture.
- Interfaced digital sensors with a PIC18F4550 microcontroller by implementing SPI and UART communication protocols to process real-time temperature and accelerometer data for SleepSmartV2 (LabVIEW, MATLAB).
- Conducted human research trials with SleepSmartV1 under the guidelines of the Research Ethics Board of Canada.

Max Planck Institute for the Structure and Dynamics of Matter

Hamburg, Germany

Optics Researcher & Programmer Intern with Dr. Wesley Robertson

Jan 2015 - Apr 2015

- Studied the use of an auto-alignment imaging system with experiments using picosecond laser ablation to wetted wells in a nanofabricated structure [3].
- Developed routines and optimized parameters for the imaging based auto-alignment system for high-throughput sampling– reached a sampling frequency of 16 Hz and an alignment accuracy of 3.7μm (LabVIEW, MATLAB).

Research Publications

Journal Publications

1. N. Hachohen, **C. J. X. Ip**, and R. Gordon. "Analysis of Egg White Protein Composition with Double Nanohole Optical Tweezers". *ACS Omega*. 2018, 3, 5, 5266-5272. doi.org/10.1021/acsomega.8b00651
2. Y. Lu, C. L. Pieterse, D. Eggert, **C. J. X. Ip**, F. Busse, S. Keskin, W. D. Robertson, and R. J. D. Miller. "Direct Laser Sampling of Aqueous Solutions from Lab-on-a-Chip Devices for Mass Spectrometry." Submitted March 14, 2018.
3. W. D. Robertson, L. R. Porto, **C. J. X. Ip**, M. K. T. Nantel, F. Tellkamp, Y. Lu, and R. J. D. Miller. "Note: A simple image processing based fiducial auto-alignment method for sample registration." *Rev. Sci. Instrum.* 2015, 86. 086105. doi.org/10.1063/1.4929408.

Conference Proceedings

i. N. Hachohen, **C. J. X. Ip**, G. K. Laxminarayana, T. S. Dewolfe, and R. Gordon. "Nanohole optical tweezers in heterogeneous mixture analysis". *Proc. SPIE 10347, Optical Trapping and Optical Micromanipulation XIV 103470F*, 2017. doi.org/10.1117/12.2273358.

Technical Projects

Snake Game - A* Implementation

Victoria, Canada

Competition to develop a snake player for Battlesnake IO

Spring 2019

- Implemented the A* (A-Star) algorithm in Python to automate path-finding for our snake to compete in the Battlesnake competition.
- See Project: git.io/fjznh

Optics

Vancouver, Canada

Series of experiments conducted for Physics 408 at UBC

Spring 2018

- Performed and analyzed results on three separate experiments: characterization of the HeNe Laser spectrum and mode-control, understanding Fourier optics, and building a Micheleson Interferometer.
- Applied classical Electromagnetic Theory to calculate predicted experimental outcomes and compared them to experimental results.

Experimental Physics

Vancouver, Canada

Series of experiments conducted for Engineering Physics 352 at UBC

Fall 2017

- Presented a poster on pulsed nuclear magnetic resonance (NMR) experiments measuring relaxation times (T1 & T2) for characterizing physical properties of differing chemical solutions.
- Wrote a scientific paper on the characterization and analysis of material acoustic impedance using acoustic experiments and measuring acoustic pressure ratios.
- Presented on the experimental outcomes of using gamma ray spectroscopy to identify unknown elements and the process of using spectroscopic analysis techniques.

Electrical Impedance Tomography

Vancouver, Canada

Project for Applied Mathematics in Approximation and Variable Methods, MATH 406 at UBC

Fall 2017

- Implemented Green's functions and finite element analysis methods (MATLAB) to solve an inverse problem to image a "tumor", given only output voltage measurements around a circular two-dimensional boundary.
- See Project: git.io/vxP3h

Affordable Network Sensors for Alpine Environments

Vancouver, Canada

Capstone Project, Team of Two: Software and Electrical Lead

Fall 2017

- Designed and prototyped a low-powered and cost-effective humidity and temperature sensor for backcountry Alpine environments.
- Programmed C and C++ on a Cortex M0, Nordic Semiconductor nRF51822 microchip, and implemented I2C communication protocol to communicate with digital sensors.
- Developed a solar-powered battery recharging circuit for the sensor system.

Simulating Radiative Heat Transfer

Zurich, Switzerland

Project for Radiation Heat Transfer Course at ETH

October 2016

- Implemented Monte-Carlo Methods in MATLAB to find the configuration factor and net energy radiation from two different surfaces at differing emissivities and temperatures.
- Compared the Monte-Carlo simulation to the analytical solution calculated using the "Radiosity" method.

Thermal Time-Of-Flight Flow Meter

Vancouver, Canada

Capstone Project, Team of Three

Sep 2016 – Apr 2017

- Developed a electro-mechanical device to detect flow velocity within a PVC pipe using a thermal time-of-flight principle for use in a helium recovery system.
- Prototyped with thermistors and nichrome wire and acquired signals through Arduino which were processed in MATLAB.
- Implemented low-pass filters in hardware and used autocorrelation analysis to improve the signal-to-noise ratio of microvolt signals.

Senior Design Engineering Robot Competitions

Western Canada

Autonomous Robot Designs, Team of Four

Fall 2015 - Fall 2017

- Developed autonomous robots with VEX in an 8 hour span and presented to a panel of technical judges.
- Placed first at UBC Senior Design competition and was invited to participate at the 2016 Western Engineering Robot Comopetition in Kelowna, BC.
- See Competitions: https://git.io/vx6Rb

Autonomous Robot for Object Retrieval

Vancouver, Canada

Project for ENPH 253, Team of Four

Summer 2015

- Designed, prototyped, and developed a fully autonomous robot using in-house modified Arduino microcontroller and electro-mechanical components such as servo and DC motors, IR sensors, sheet and bulk metals and 3D printed components.
- Designed and implemented the software for PID control and machines states (Arduino IDE) and interfaced with sensors and actuators
- See Project: https://goo.gl/7Vdaqm

Formula Electric / E-Racing, University of British Columbia

Vancouver, Canada

Engineering Student Team: Electrical Team Member

Sep 2014 - Aug 2016

- Helped develop circuitry for the Tractive System Active Light and designed a 3D printed waterproof casing for the system.
- Gained experience in PCB layout, mechanical braking systems, component specification, waterproofing, and CAD.
- See Website: http://www.ubcformulaelectric.com/

Orbit, University of British Columbia

Vancouver, Canada

Engineering Student Team: Structural Sub-Team Member

Sep 2013 - Apr 2014

- Developed a vacuum flange for testing the satellite in sub-atmospheric conditions.
- Gained experience in vacuum systems, mechanical prototyping, and waterjet cutting.
- See Website: https://www.ubcorbit.com/

Honors & Awards

Competitions

2017	**2nd Place**, The University of British Columbia, Senior Design Competition	*Vancouver, Canada*
2015	**1st Place**, The University of British Columbia, Senior Design Competition	*Vancouver, Canada*

Awards

2018	Dean's Honour List	*Vancouver, Canada*
2017	NSERC Undergraduate Student Research Award	*Victoria, Canada*
2016	Engineers in Scrubs Undergraduate Student Research Award Fellowship	*Vancouver, Canada*
2016	Applied Science Coordinated International Exchange Award	*Vancouver, Canada*
2013	District Dogwood Authority Award Scholarship	*Victoria, Canada*
2013	Carol Lobb Award for Athletics, Good Academic Standing, and Contribution to School Community	*Victoria, Canada*

Professional Development

Conferences & Courses

May 2019	Stanford d.School: Research as Design Pop-Out Course.	*Stanford, USA*
Mar 2019	BC Tech Summit. *Company Representative & Attendee.*	*Vancouver, Canada*
May 2016	Innovation in Health and Research Technologies Symposium. *Student Attendee.*	*Vancouver, Canada*

Certification

2017	Laser Safety Training	*Victoria, Canada*
2017	Workplace Hazardous Materials Information System (WHIMIS) Training	*Victoria, Canada*
2016	Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans Course on Research Ethics	*Vancouver, Canada*

Leadership Experience

Volunteer Judge for Robotics Events — *Vancouver/Victoria, Canada*

VEX & FIRST Robotics Judge — *Spring 2018 - Spring 2019*

- Judged and awarded high-school level student robotics teams for VEX and FIRST Robotics events.

VP Graduate Representative — *Vancouver, Canada*

Engineering Physics Student Association — *Sept 2017 - April 2018*

- Organized the graduate class of Engineering Physics to meet graduation requirements.
- Prepared funding documentation and organized a professional development trip for the graduate class of Engineering Physics to San Fransisco to network with Graduate Schools and industries.

VP Events Executive — *Vancouver, Canada*

Engineering Physics Student Association — *Sept 2015 - May 2017*

- Organized successful events for students, faculty, and alumni.
- Applied for and obtained licensing for Engineering Physics related events and acquired over $15,000 in funding and other sponsorships from university organizations and private companies.

Outdoor Leader — *Victoria, Canada*

St. Michael's Outdoor Leadership Program — *Sept 2011 - June 2013*

- Guided a five-day sea kayaking trip around the Gulf Islands for a group of grade 10 students.
- Developed skills including wilderness first aid to plan, organize, and lead outdoor trips.