

# David Black

+1-778-229-6477  
dgblack@ece.ubc.ca

## Education

### B.A.Sc. Engineering Physics

University of British Columbia, Vancouver

(September 2016 — May 2021)

Engineering Physics is the combination of mechatronics engineering with the equivalent of an honors degree in physics. By building off a comprehensive foundation of physics and mathematics, the goal is to develop and design innovative engineering solutions at the forefront of technology.

### High School

St. George's School, Vancouver

(September 2011 — June 2016)

Known as one of the best and most competitive high schools in Canada. I won gold at the Canadian secondary schools national championships in rowing. I also re-established and co-led the school outdoors club, finished 3<sup>rd</sup> in Canada in the National Latin Sight-Translation contest, and won several other awards.

## Experience

### Surgical Mixed Reality (Engineering Physics Capstone Project II)

Robotics and Control Laboratory, UBC, Vancouver

(July 2020 – April 2021)

Developing real time, 3D registration and overlay of ultrasound imagery on a patient using a Microsoft HoloLens 2 for needle biopsies and other applications. Involves computer vision and graphics work.

### Robotics Engineer (Co-op)

A&K Robotics, Vancouver

(May – August 2020)

Worked as a member of the 3-person hardware team in a robotics start-up specializing in autonomous, mobile robots. During the 4 months we designed from scratch two separate mobile robots, and implemented major changes on two more. I effectively worked as a third, equal member of the hardware team, and contributed substantially to each project.

### Robotic PET Phantom (Engineering Physics Capstone Project I)

BC Cancer Research Centre / UBC Vancouver

(September – April 2020)

Designed and built a robotically actuated, physiologically accurate, anthropomorphic phantom for use in PET motion correction studies. Involved mechatronic design and PET physics, as well as project management in a team of engineers, biologists, and physicists. I was awarded the 2020 UBC Engineering Design and Innovation Day Faculty Award for this work.

### Surgical Robotics Research Engineer (Co-op)

Robotics and Control Laboratory, UBC, Vancouver

(April – December 2019)

Working towards a haptic feedback system for the da Vinci surgical robot. This involved a variety of mechanical design tasks like CAD modeling, robot kinematics and dynamics, and rapid prototyping. I also

worked in Python, C++, and MATLAB using ROS, da Vinci Research Kit, designing flexible PCBs, serial communication systems, and master/slave teleoperation. *(Evaluation letter available upon request)*

### Advanced Development Intern (Co-op)

Carl Zeiss Meditec AG, Oberkochen

(January 2018 — April 2019)

Working in a small team on a new technology in the field of quantitative fluorescence microscopy-based neurosurgery. This involved lab research and design work in the fields of optics and biophotonics, as well as programming and data analysis using computer vision, image processing, and augmented reality. Upon completion of the 4-month internship, I was hired through Zeiss Canada to continue work on the project (40 hrs per month). *(Evaluation letter available upon request)*

### UBC Engineering Physics Robot Course

UBC Vancouver

(June — August 2018)

In this intensive course we were given 6 weeks to build an autonomous robot that performs a variety of challenging tasks. In competition our robot was the only one of 20 to complete all the tasks. Please see my team's website for more information: <https://scooter2018enph.wordpress.com/>

### Vehicle Dynamics Team Lead

UBC Solar Team

(September 2016 — January 2018)

UBC Solar Car Team is a student engineering design team dedicated to creating a fully solar powered car. I learned about project management, vehicle dynamics, applying for funding, and CAD and simulation software.

## Skills

- Mechanical Design
- C++, MATLAB, LaTeX, Python, ROS, da Vinci Research Kit (very familiar)
- C, Java, Assembly Language, VHDL (proficient)
- CAD (Solidworks, Onshape, AutoCAD Fusion 360), FEA and CFD (ANSYS), Altium
- Prototyping using 3D printer, laser & water-jet cutter, lathe, mill, saw, drill, angle grinder, Dremel, etc.
- Control systems, PID, teleoperation, communication through RS-485, RS-232, I2C
- Medical Imaging, nuclear medicine, biophotonics, optics (Physics and Engineering)
- Analog and digital circuit design, prototyping, and debugging, PCB design on Altium
- Microcontrollers/computers including Arduino, STM32, Raspberry Pi
- Robotics (mechanical design, kinematics, dynamics, controls)
- Stepper motors, servos, motor controllers, rotary encoders, IR sensing, analog signals processing, etc.
- Physics, mathematical modeling, optimization
- Research, data analysis, report and paper writing, conference posters, abstracts, and presentations

## Awards and Recognition

- [UBC Engineering Design and Innovation Day 2020 Faculty Award \(May 2020\)](#)  
Awarded for my work on the robotic PET phantom
- [Edith Grace Buchan Scholarship \(November 2019\)](#)  
Awarded for excellence in engineering, nominated by a member of the Faculty of Applied Science
- [UBC Science Coop International Work-term Award \(January 2018\)](#)  
Awarded for outstanding international work term placement for coop
- [Trek Excellence Scholarship for Continuing Studies \(September 2017\)](#)  
Awarded to students in the top 5% of their faculty and year
- [David Overton Memorial Prize \(June 2014\)](#)  
Awarded to student in grade 10 who has made the greatest contribution to the school in terms of effort, performance and participation.
- [Academic Excellence Medal \(June 2013, 2014, 2015, 2016\)](#)  
Top ten in grade (of 160) academically in grades 9, 10, 11, and 12
- [Dogwood District Scholarship \(October 2016\)](#)  
Awarded for outstanding effort and performance in a specific area of school and/or extracurricular activity.
- [BC Provincial Exam Scholarship \(October 2016\)](#)  
Awarded for exemplary performance on BC provincial exams.

## Publications

- [6-DOF Force Sensing for the Master Tool Manipulator of the da Vinci Surgical System](#)
  - [Robotics and Automation Letters 2020 \(Published\)](#)
  - [International Conference on Robotics and Automation 2020 \(Presented\)](#)
  - First Author
- [Design and Manufacture of Anatomically Realistic, Actuated, Elastic Lung Inserts for PET/CT Phantom Studies with Respiratory Motion](#)
  - [American Association of Physicists in Medicine / Canadian Organization of Medical Physics Joint Conference 2020 \(Presented\)](#)
  - Awarded blue ribbon for high reviewer scores
  - First author
- [Real-time kinetics of Protoporphyrin-IX after 5-ALA administration in Low Grade Glioma](#)
  - [German Neurosurgery Society 2020 \(Presented\)](#)
- [Ultra-Low-Noise FPGA-Based 6-Axis Optical Force-Torque Sensor: Hardware and Software](#)
  - [IEEE Transactions on Industrial Electronics 2020 \(Under Review\)](#)
  - Second Author
- [Fluorescence-Based Measurement of Real-Time Kinetics of Protoporphyrin IX After 5-Aminolevulinic Acid Administration in Human In Situ Malignant Gliomas](#)
  - [Journal of Neurosurgery 2019 \(Published\)](#)
  - Not included as author because Zeiss did not wish to disclose their development work in the field at the time. However, I designed and built the measurement device and software, did most of the data analysis, and wrote a section of the paper. I can provide proof of authorship upon request.

- Fluorescence Real-Time Kinetics of Protoporphyrin IX after 5-ALA Administration in Low-Grade Glioma
  - Neurosurgery 2020 (Under Review)
- 5-ALA induced porphyrin contents in various brain tumors - Implications regarding imaging device design and their validation
  - Journal of Neurosurgery 2020 (Under Review)
- Design of a Breathing, Anthropomorphic Phantom for Positron Emission Tomography
  - IEEE Transactions on Medical Imaging 2020 (In Preparation)
  - First author

## Miscellaneous

- Avid mountaineer, rock climber, backcountry skier
- Enjoy tinkering with electronics, fixing and designing mechanical parts, writing useful little programs
- Completely fluent in German and English
- Play cello