

David Black

dgblack.github.io/portfolio

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Education

B.A.Sc. in Engineering Physics

University of British Columbia, Vancouver

(September 2016 — April 2021)

Engineering Physics is the combination of mechatronics engineering with the equivalent of an honors degree in physics.

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. We designed and built two separate robots, and made major changes on two more.

Robotic PET Phantom (Engineering Physics Capstone Project I)

BC Cancer Research Centre / UBC Vancouver

(September – April 2020)

Designed and built a robotically actuated anthropomorphic phantom for use in PET motion correction studies. Received 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)

Worked towards a haptic feedback system for the da Vinci surgical robot. Also wrote control software and firmware for a novel, 6-axis optical force/torque sensor, and helped design an MRI elastography device.

Advanced Development Intern (Co-op)

Carl Zeiss Meditec AG, Oberkochen

(January 2018 — April 2019)

Worked on a novel technology in quantitative fluorescence microscopy-based neurosurgery. After the 4-month internship, I was hired to continue working on the project remotely (40 hrs per month).

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 is a student engineering design team dedicated to creating a fully solar powered car. I lead the vehicle dynamics team for the chassis, suspension, steering, and braking, and aided in the aerodynamic design of the aeroshell.

Publications

- **D. Black**, Y. Oloumi, J. Wong, R. Fedrigo, C. Uribe, D. Kadrmas, A. Rahmim, I. Klyuzhin. "Design of an Anthropomorphic Respiratory Phantom for PET Imaging," preprint in techRxiv. 2020.
- S. Kaneko, P. Sporns, S. Schipmann, **D. Black**, W. Stummer. "Fluorescence Real-Time Kinetics of Protoporphyrin IX after 5-ALA Administration in Low-Grade Glioma," in Journal of Neurosurgery. Oct. 2020.
- A. H. Hadi Hosseinabadi, **D. Black** and S. Salcudean, "Ultra Low-Noise FPGA-Based 6-Axis Optical Force-Torque Sensor: Hardware and Software," in IEEE Transactions on Industrial Electronics, doi: 10.1109/TIE.2020.3021648.
- **D. Black**, A. H. Hadi Hosseinabadi and S. E. Salcudean, "6-DOF Force Sensing for the Master Tool Manipulator of the da Vinci Surgical System," in IEEE Robotics and Automation Letters, vol. 5, no. 2, pp. 2264-2271, April 2020, doi: 10.1109/LRA.2020.2970944.
 - Also presented at the International Conference on Robotics and Automation 2020
- S. Kaneko, E. Suero Molina, C. Ewelt, N. Warneke, W. Stummer. "Fluorescence-Based Measurement of Real-Time Kinetics of Protoporphyrin IX After 5-Aminolevulinic Acid Administration in Human In Situ Malignant Gliomas," in Neurosurgery. 2019;85(4):E739-E746. doi:10.1093/neuros/nyz129
 - Please find authorship letter attached.
- **D. Black**, Y. Oloumi, J. Wong, R. Fedrigo, C. Uribe, D. Kadrmas, A. Rahmim, I. Klyuzhin. "Design and Manufacture of Anatomically Realistic, Actuated, Elastic Lung Inserts for PET/CT Phantom Studies with Respiratory Motion," in the American Association of Physicists in Medicine / Canadian Organization of Medical Physicists joint conference 2020. AAPM e-Poster library Poster Number: BReP-SNAP-I-15.
 - Accepted as Blue Ribbon ePoster for very high reviewer scores
- W. Stummer, S. Kaneko, **D. Black**, E. Suero Molina. "5-ALA induced porphyrin contents in various brain tumors - Implications regarding imaging device design and their validation," in Journal of Neurosurgery. 2020
 - Under Review, manuscript number JNS20-2510
- **D. Black**, Y. Oloumi, J. Wong, R. Fedrigo, C. Uribe, D. Kadrmas, A. Rahmim, I. Klyuzhin. "Design of an anthropomorphic respiratory phantom for PET imaging," in Medical Physics. 2021.
 - Under review
- **D. Black**, S. Kaneko, A. Walke, S. Koenig, W. Stummer, E. Suero Molina. "Characterization of autofluorescence and quantitative protoporphyrin IX biomarkers for optical spectroscopy-guided glioma surgery," in Nature: Scientific Reports. 2021.
 - In preparation
- E. Suero Molina, **D. Black**, S. Kaneko, M. Muether, W. Stummer. "Double dose of 5-ALA and its effect on PPIX expression in low-grade glioma," in Neurosurgery. 2021.
 - In preparation

Awards and Recognition

- **Dorothy and Arthur Holt Scholarship (February 2021)**
Awarded to about 9 students in any faculty or degree program at UBC for academic excellence.
- **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.

Skills

- Mechanical Design
- C++, MATLAB, LaTeX, Python, Linux, ROS, ROSBridge, da Vinci Research Kit, Unity, Mixed Reality Toolkit, Oculus (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
- 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
- Physics, mathematical modeling, optimization
- Research, data analysis, report and paper writing, conference posters, abstracts, and presentations

Miscellaneous

- Avid ski mountaineer, rock climber, ultrarunner, road cyclist
- Enjoy tinkering with electronics, fixing and designing mechanical parts, writing useful programs
- Completely fluent in German and English
- Play cello