Kevin Ta

Software Developer · Robotics · Mechatronics

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Education

ETH Zürich (Swiss Federal Institute of Technology) *Zürich, Switzerland*
M.Sc. in Robotics, Systems, and Control *Sep. 2020 - Dec. 2022*
- GPA: 5.73 / 6.0

UBC (University of British Columbia) *Vancouver, Canada*
B.A.Sc. in Mechanical Engineering, Mechatronics Specialization *Sep. 2014 - May 2020*
- GPA: 3.97 / 4.0

Skills

Programming	Python, Rust, C, C++, C#, MATLAB, LaTeX, ROS
Computer Vision	calibration, SLAM, probabilistic robotics, deep learning, NeRFs, 3D reconstruction, semantic & object detection
Robotics	controls, reinforcement learning, kinematics/dynamics, dynamic programming & optimization
Sensors	lidars, radars, ToF cameras, LWIR (thermal) cameras, event cameras, RGB cameras
Mechatronics	SolidWorks, CAD, systems modelling, solid mechanics, thermal modelling, electromechanical systems

Publications

Ze Yang, George Chen, Haowei Zhang, **Kevin Ta**, Ioan Andrei Bârsan, Daniel Murphy, Sivabalan Manivasagam, and Raquel Urtasun, "UniCal: Unified Multi-Sensor Neural Calibration," European Conference on Computer vision (ECCV), Milan, Italy, 2024.

Tim Broedermann, David Brueggemann, Christos Sakaridis, **Kevin Ta**, Odysseas Liagouris, Jason Corkill, and Luc Van Gool, "MUSES: The Multi-Sensor Semantic Perception Dataset for Driving under Uncertainty," European Conference on Computer vision (ECCV), Milan, Italy, 2024.

Kevin Ta*, Erik Sandström*, Luc Van Gool, and Martin R. Oswald, "UncLe-SLAM: Uncertainty Learning for Dense Neural SLAM," IEEE/CVF International Conference on Computer Vision Workshops (ICCVW), Paris, France, 2023.

Kevin Ta, David Brueggemann, Tim Broedermann, Christos Sakaridis, and Luc Van Gool, "L2E: Lasers to Events for 6-DoF Extrinsic Calibration of Lidars and Event Cameras," IEEE International Conference on Robotics and Automation (ICRA), London, United Kingdom, 2023.

Jessica Y. Bo, **Kevin Ta**, Rio Nishida, Gordon Yeh, Vivian W. L. Tsang, Megan Bolton, Manon Ranger, and Konrad Walus, "ATTENTIV: Instrumented Peripheral Catheter for the Detection of Catheter Dislodgement in IV Infiltration," International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Glasgow, Scotland, 2022.

Mahsa Khalili, **Kevin Ta**, Jaimie F. Borisoff, and H. F. Machiel Van der Loos, "Offline and Real-Time Implementation of a Terrain Classification Pipeline for Pushrim-Activated Power-Assisted Wheelchairs," International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Guadalajara, Mexico, 2021.

Mahsa Khalili, **Kevin Ta**, Jaimie F. Borisoff, and H. F. Machiel Van der Loos, "Offline and Real-Time Implementation of a Personalized Wheelchair User Intention Detection Pipeline: A Case Study," IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), Vancouver, Canada, 2021.

Mahsa Khalili, Keenan T. McConkey, **Kevin Ta**, Lyndia C. Wu, H. F. Machiel Van der Loos, and Jaimie F. Borisoff, "Development of A Learning-Based Terrain Classification Framework for Pushrim-Activated Power-Assisted Wheelchairs," International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Montreal, Canada, 2020.

Research

ETH Zürich Computer Vision Lab *Zürich, Switzerland*

Master Thesis *May 2022 - Nov. 2022*
- Researched the modelling of aleatoric uncertainty with shallow `MLPs` to aid localization and reconstruction performance of a `NeRF`-based pipeline built in `pytorch`, improving performance on challenging benchmarks.
- Fused multiple sensor observations by learning the implicit weighting from the learned uncertainty to improve neural scene reconstruction.

Semester Thesis *Mar. 2022 - May 2022*
- Fully calibrated a perception sensor stack featuring a state-of-the-art event-based camera, a traditional frame-based camera, a MEMS LiDAR, and a spinning RADAR using `OpenCV`, `Open3D`, `Scipy-Optimize`, and custom-built algorithms.
- Established a novel method of direct lidar laser correspondences in bias-tuned event cameras to perform temporally-decoupled 6-DoF calibration using accumulated event activity without motion-based reconstruction.
- Enabled the collection a novel autonomous driving dataset (`MUSES`) focused on new sensing modalities for adverse conditions.

ETH Zürich Neural Control of Movement Lab

Zürich, Switzerland

RESEARCH ASSISTANT

Oct. 2020 - Jul. 2021

- Prototyped a `VR` headset environment for mental performance training using pupil-based neural feedback.
- Implemented a real-time computer vision pipeline to estimate pupil size from RGB and infrared images using `RANSAC`-based feature extraction and ellipse fitting, achieving pupil size fits within one pixel standard deviation.

UBC Collaborative Advanced Robotics and Intelligent Systems Lab

Vancouver, Canada

MECHATRONICS RESEARCH ASSISTANT

May 2019 - Aug. 2019

- Estimated absolute heading and terrain slope using a 9-axis IMU and a `Kalman Filter` for sensor fusion and systems modelling.
- Wrote custom client-server `TCP/IP` communication framework in `C++` and `Python` to stream kinematic IMU data at a fixed frequency and to continuous process wheelchair states for collaborative co-control.
- Tuned and developed `Gaussian Mixture Models` and `Random Forest` ML pipelines for terrain classification and intention detection using `Scikit-Learn`, producing intermediate representations for assistive wheelchair control.

Centre for Hip Health and Mobility

Vancouver, Canada

RESEARCH ASSISTANT

May 2016 - Aug. 2016

- Collected dynamic data with accelerometers in high impulse linear impact testing to determine optimal helmet padding material and configurations for preventing head trauma.

Experience

Waabi

Toronto, Canada

LOCALIZATION & CALIBRATION, PREV. ONBOARD SYSTEMS | INTERMEDIATE SOFTWARE DEVELOPER

Jan. 2023 - Present

- Enabled end-to-end calibration of an automotive sensor suite in unstructured environments using multi-modality unified `NeRFs`.
- Automated workflows using `AWS`-managed `Airflow` for in-field sensor geometric calibration validation and regression benchmarking.
- Implemented custom calibration alignment metrics in `Python` using joint probability methods, leveraging both photometric and geometric cost functions for cameras, lidars, radars, and INS.
- Implemented fine-grained lidar firing filtering in `Rust` to reduce the incidence of multi-path and self-intersecting points, improving localization and perception performance.

Cruise

San Francisco, California

CALIBRATION HARDWARE | INTERNSHIP

Sep. 2021 - Feb. 2022

- Developed high accuracy calibration and signal processing for the Cruise Origin, a next-generation purpose-built autonomous vehicle platform.
- Investigated the impact of calibration target quality on camera intrinsic calibration using `OpenCV` and a programmable robotics manipulator for repeatable performance studies showcasing a 50% reduced noise in reprojection metrics with metrology-grade targets.
- Communicated calibration station hardware recommendations (RGB cameras, LWIR cameras, and time-of-flight cameras) with clear evidence-based figures generated using `Matplotlib` to internal sales, manufacturing, and hardware teams, as well as external international vendors.

Schneider Electric Solar

Burnaby, Canada

SOLAR PREDICTIVE ANALYTICS AND MODELLING | INTERNSHIP

Jan. 2018 - Aug. 2018

- Created more realistic climate and temperature models by integrating a higher resolution geospatial map hosted in an on-premise `PostgreSQL` database, enabling more accurate reliability forecasting on coastal and mountainous installation sites.
- Ported `MATLAB` reliability simulation code to `Python`, leveraging `Numpy` and `Scipy` for fast matrix and array-based operations.
- Deployed a site anomaly detection via an `Isolation Forest` pipeline from incoming field data using `Scikit-Learn`, identifying higher loads in certain installations which were root-caused to abnormal weather conditions.

Pacey MedTech

Vancouver, Canada

MECHANICAL ENGINEERING | INTERNSHIP

May 2017 - Aug. 2017

- Designed a urinary continence device through rapid prototyping, clinical trials, and low-volume production in a 3-month development cycle.
- Created and maintained documentation and manufacturing drawings to comply with "Class 1" medical device regulations as per Health Canada and the Food and Drug Administration (FDA) using `ISO 9001`.

Smith + Andersen

Burnaby, Canada

MECHANICAL ENGINEERING | JUNIOR DESIGNER

Sep. 2016 - Dec. 2016

- Reviewed various HVAC and plumbing standards including ASHRAE, National Building Code of Canada, BC Building Code, and Vancouver bylaws to affirm designs were sufficient in providing comfort and air quality.
- Calculated heating, cooling, and ventilation loads based on building location, room usage, and building design.

Teaching

UBC Department of Mechanical Engineering

Vancouver, Canada

TEACHING ASSISTANT

Jan. 2019 - Apr. 2020

- Instructed, evaluated, and provided feedback to second year students through thermodynamic and fluid dynamic lab experiments to demonstrate core mechanical engineering topics.
- Delivered lab lectures to go over mathematical concepts and key intuitions explored in lab experiments, ensuring students understood which mechanical phenomena to note in their analyses.

Extracurricular Activity

UBC Supermileage   *Vancouver, Canada*

TEAM CAPTAIN   *Sep. 2019 - Aug. 2020*

- Achieved 2nd place at the Shell Eco-Marathon Americas and 2nd place at the SAE Supermileage Competition in 2019, requiring adaptable engineering and troubleshooting in high pressure competition environments.
- Coordinated 65 students in the technical development of two ultra-efficient vehicles driven by an internal combustion engine (`ICE`) and a battery electric (`BEV`) motor in the Prototype and Urban Concept vehicle classes respectively.
- Managed a $100,000 project budget and engineering resources to construct technical road maps for building and optimizing two ultra-efficient vehicles.
- Constructed detailed development reports involving performance simulation and component optimization to showcase sound engineering and design judgement.
- Optimized for aerodynamic design resulting in 14% less drag force and for component topology resulting in 10% less component weight to increase energy efficiency of the ICE Prototype vehicle to a decade-high mileage of 2229 MPG.

VEHICLE MECHANICS LEAD   *Sep. 2018 - Aug. 2019*

SAFETY OFFICER   *Sep. 2017 - Aug. 2018*

AERODYNAMICS LEAD   *Sep. 2016 - Aug. 2018*

GENERAL MEMBER   *Sep. 2015 - Aug. 2016*

Attentiv Medical   *Vancouver, Canada*

PROJECT FOUNDER & CONTRIBUTOR   *Sep. 2019 - Aug. 2020*

- Explored the problem of IV infiltration in vulnerable neonatal populations through extensive interviews with clinicians, regulators, and entrepreneurs to create a technically and commercially feasible user-focused design.
- Conceptualized and prototyped a sensor-embedded catheter to detect the onset of IV infiltration, validated using a variety of simulated biological and phantom models.

Honours & Awards

COMPETITIONS

2021	**Principal Award**, MDDC Biomedical Engineering Design Competition		*Vancouver, Canada*
2020	**National Winner**, James Dyson Award		*Canada*
2020	**Winner**, Microsoft Discover AI - Healthcare Stream		*Montreal, Canada*
2020	**Runner-up**, Innovation OnBoard, UBC's Premier Start-up Competition		*Vancouver, Canada*
2020	**Faculty Award**, UBC New Venture Design Showcase		*Vancouver, Canada*
2020	**Industry Award**, UBC New Venture Design Showcase		*Vancouver, Canada*
2020	**4th Place**, SAE Supermileage		*Virtual*
2019	**2nd Place**, SAE Supermileage		*Marshall, Michigan*
2018	**3rd Place**, SAE Supermileage		*Marshall, Michigan*
2017	**6th Place**, SAE Supermileage		*Marshall, Michigan*
2018	**Design Excellence Award**, SAE Supermileage		*Marshall, Michigan*
2019	**2nd Place**, Shell Eco-Marathon Americas - ICE Prototype		*Sonoma, California*
2018	**7th Place**, Shell Eco-Marathon Americas - ICE Prototype		*Sonoma, California*
2017	**20th Place**, Shell Eco-Marathon Americas - ICE Prototype		*Detroit, Michigan*

ACADEMIC AWARDS

2021	**Finalist**, International Conference on Robot & Human Interactive Communication Best Student Paper	*Virtual*
2020	**Mechanical Engineering Leadership Award**, UBC Department of Mechanical Engineering	*Vancouver, Canada*
2020	**Dean's Honour List (x5)**, University of British Columbia	*Vancouver, Canada*
2019	**Quantitative** 170/170 (97th %) **| Verbal** 166/170 (98th %), Graduate Record Examinations (GRE)	-
2019	**Academic Achievement Award (x4)**, UBC Department of Mechanical Engineering	*Vancouver, Canada*
2018	**Trek Excellence Scholarship (x3)**, University of British Columbia	*Vancouver, Canada*
2018	**Donald J. Evans Scholarship in Engineering**, UBC Faculty of Applied Science	*Vancouver, Canada*
2018	**University of British Columbia Scholarship**, University of British Columbia	*Vancouver, Canada*
2017	**S. Cyril Maplethorp Memorial Scholarship in Engineering**, UBC Faculty of Applied Science	*Vancouver, Canada*
2016	**Talisman Energy Scholarship in Mechanical Engineering**, UBC Department of Mechanical Engineering	*Vancouver, Canada*
2014	**Chancellor's Scholar Award**, University of British Columbia	*Vancouver, Canada*
2014	**British Columbia Government Scholarship (Top 20)**, Provincial Government of British Columbia	*Canada*
2014	**Post-Secondary Entrance Scholarship**, Engineers and Geoscientists of British Columbia	*Canada*