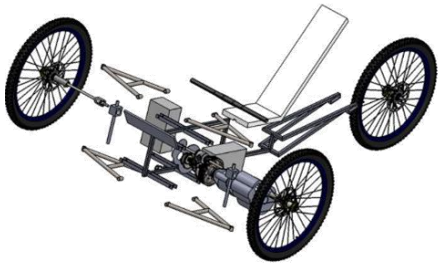
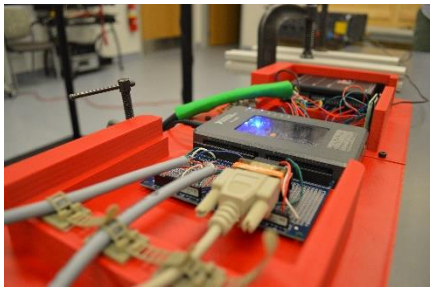
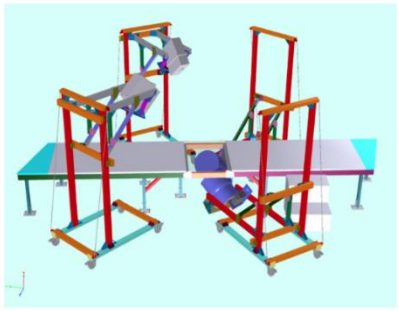
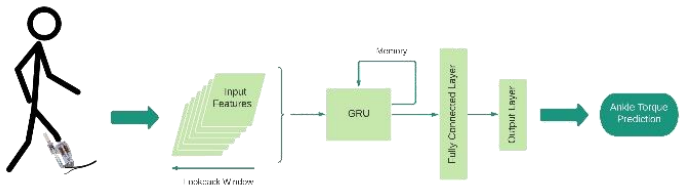
CHRIS PRASANNA

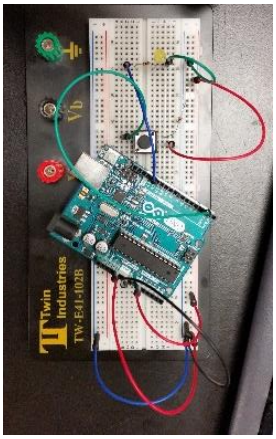
PROJECT PORTFOLIO

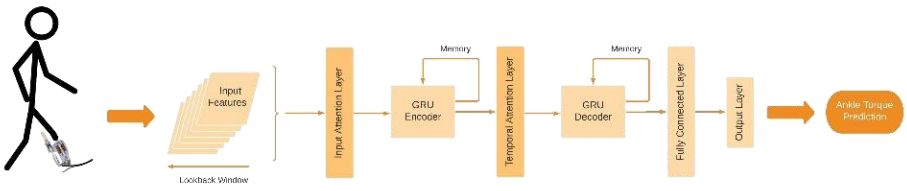












Mechanical Engineering • Mechatronics • Controls • Robotics

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+1.425.772.0656

Robotic Ankle-Foot Prosthesis Controller

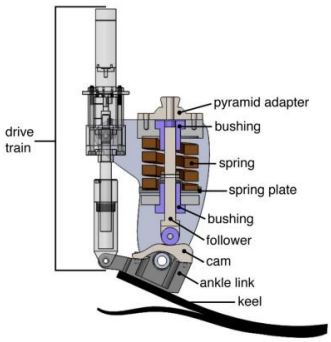
Master's Thesis

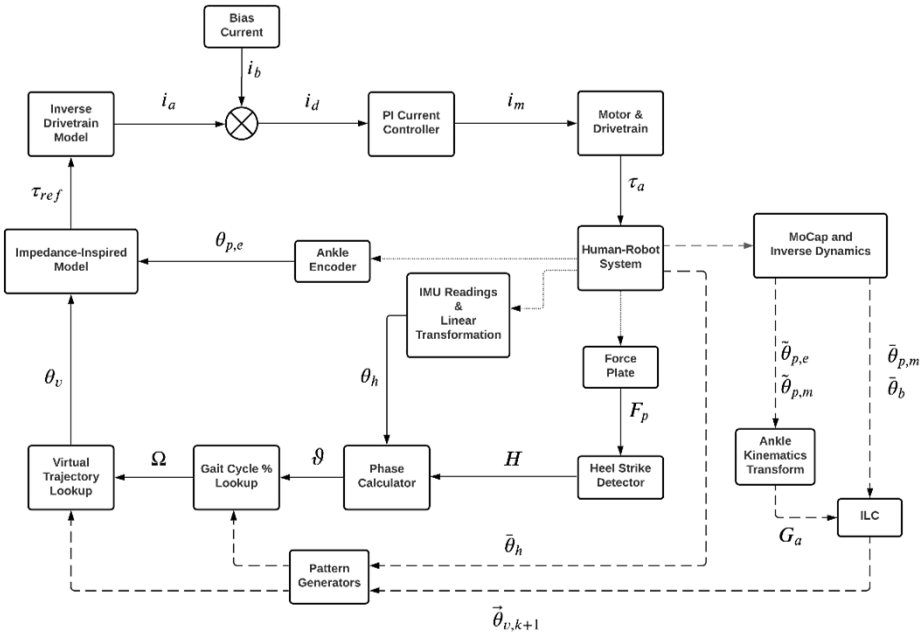
COLLEGE OF ENGINEERING
UNIVERSITY of WASHINGTON

CLiMB
Center for Limb Loss and Mobility

Invented a time-invariant and adaptive control strategy for a robotic ankle-foot prosthesis which significantly improved amputee walking symmetry

Executed bench tests, conducted human subject experiments, implemented a data-driven learning pipeline, and performed statistical analyses to evaluate the robotic prosthesis





Skills: Robotics, Mechatronics, Real-Time Adaptive Control, Electromechanical System Modeling, Rapid Control System Prototyping, Reliability Testing

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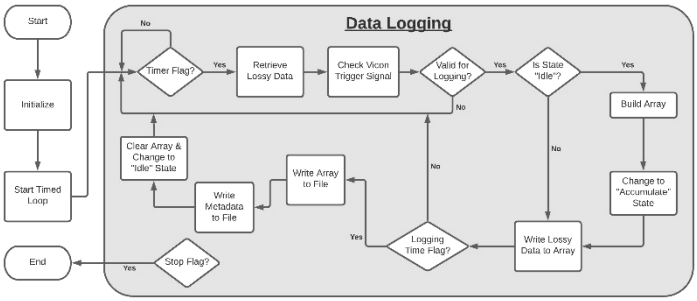
Real-Time Control Program Implementation

Master's Thesis

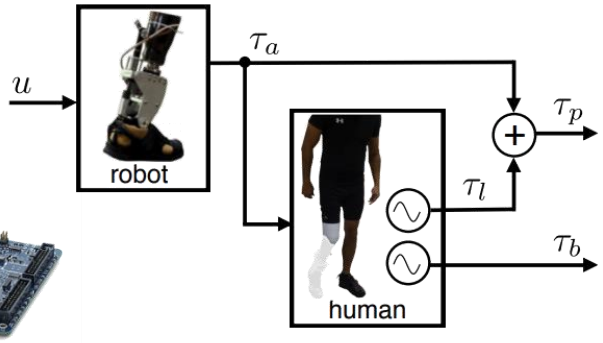
COLLEGE OF ENGINEERING
UNIVERSITY of WASHINGTON

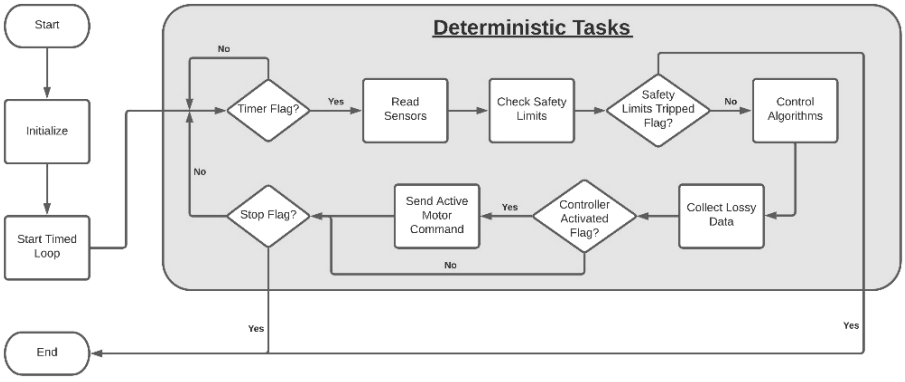
CLiMB
Center for Limb Loss and Mobility

Designed an extensive and reliable real-time LabVIEW program responsible for robotic prosthesis system control, sensor fusion, filtering, wireless network communication, coordinate system transformations, data logging, and visualization



Successfully learned and implemented advanced control techniques such as iterative learning, robot model inversion, spectral methods, PCA, and real-time mechanical phase variables in order to achieve the best controller performance





LabVIEW

Skills: LabVIEW, Microcontrollers, Embedded Computing, Real-Time Control, DAQ, Sensor Integration, Digital Signal Processing, HMI/GUI Development

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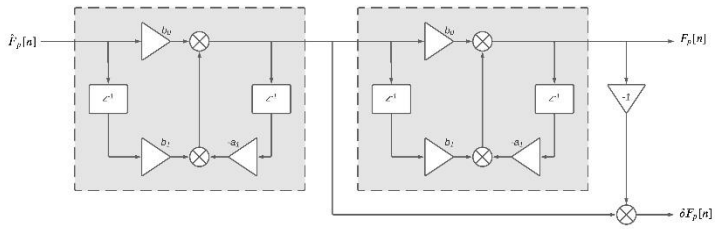
Embedded System Design & Fabrication

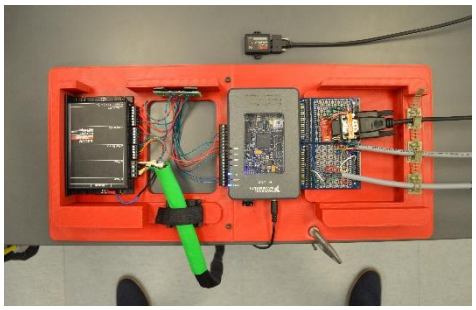
Master's Thesis

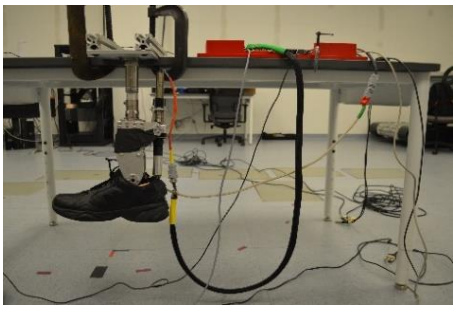
COLLEGE OF ENGINEERING
UNIVERSITY of WASHINGTON

CLiMB
Center for Limb Loss and Mobility

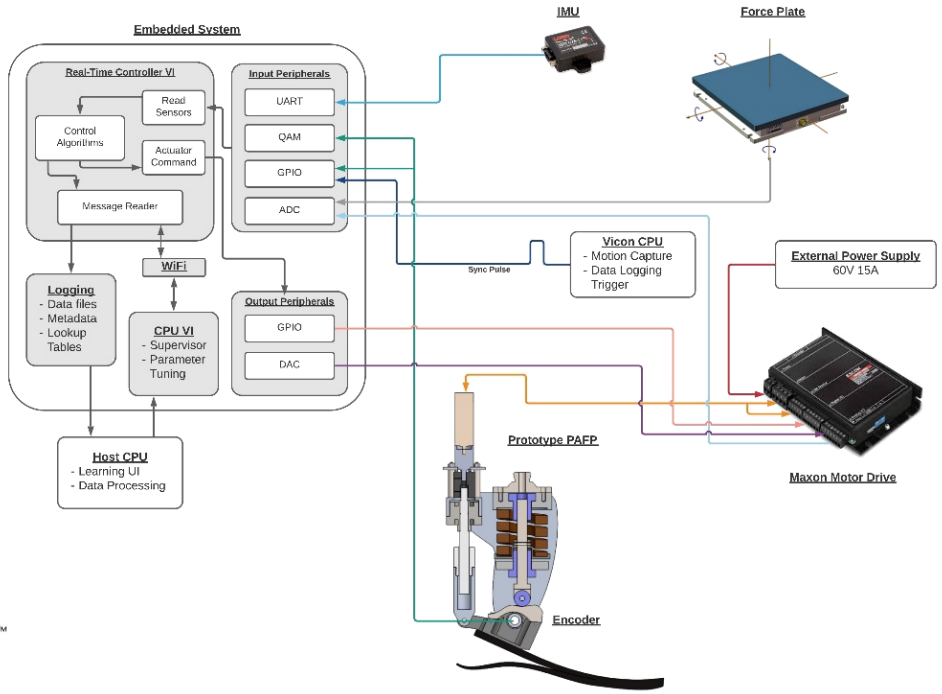
Built and programmed a compact embedded system designed to handle real-time deterministic tasks, sensor fusion, digital and analog signal processing, multi-microcontroller communication, and low-level BLDC motor feedback control tasks







Designed and fabricated the 3D-printed housing structure, multiple sensor interfaces, soldered protoboard circuits, custom shielding, and wire strain relief mechanisms



maxon PRECISION MOTORS

NATIONAL INSTRUMENTS™

Skills: 3D Printing, Machining, Troubleshooting, Serial Communication, Circuits, Soldering, BLDC Motor Control, Component Selection, Shielding

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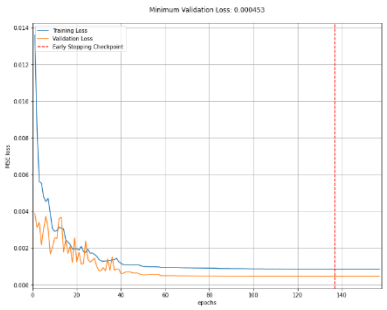
Deep Learning: Human-Robot Dynamics

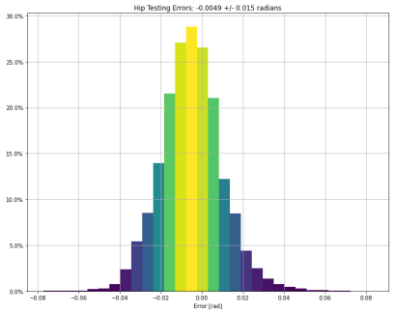
Master's Thesis

COLLEGE OF ENGINEERING
UNIVERSITY of WASHINGTON

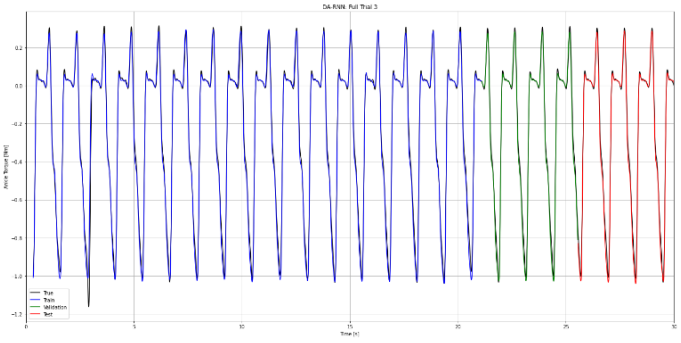
CLiMB
Center for Limb Loss and Mobility

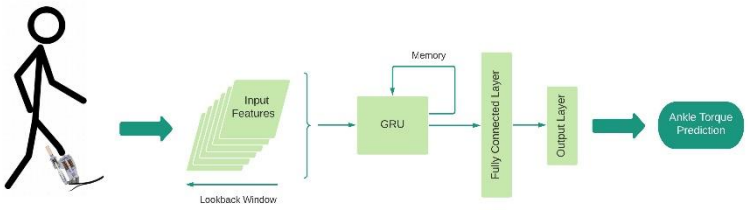
Developed 3 deep neural network models (FFNN, GRU, DA-RNN) to accurately predict human-robot system dynamics for future prosthesis control methods

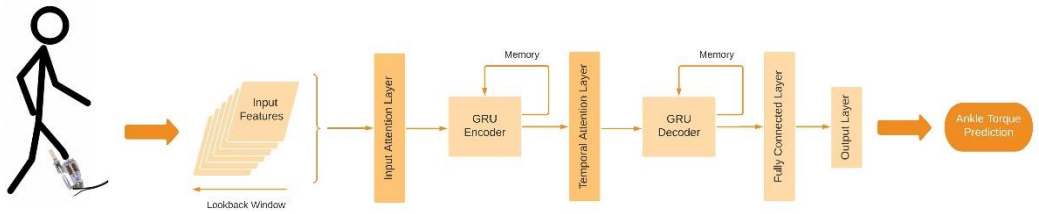




Implemented key deep learning techniques, including but not limited to, hyperparameter optimization (Optuna framework), attention mechanisms, parallel computing, mini-batches, normalization, data augmentation, validation, early stopping, additive Gaussian noise, and rolling lookback windows







Skills: Python, Pytorch, Hyperparameter Optimization, Dynamical System Modeling, Time Series Analysis & Forecasting, System ID, Feature Manipulation

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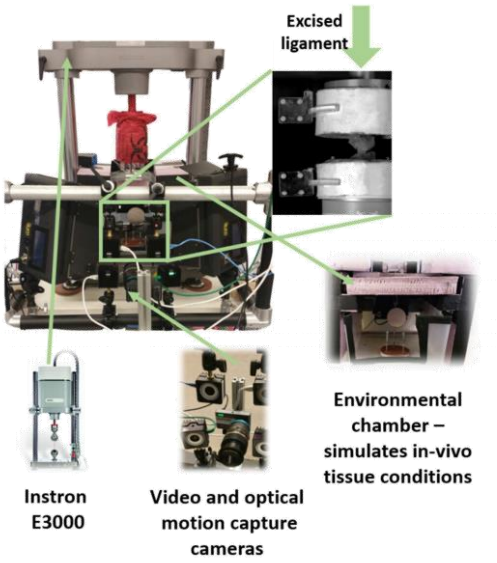
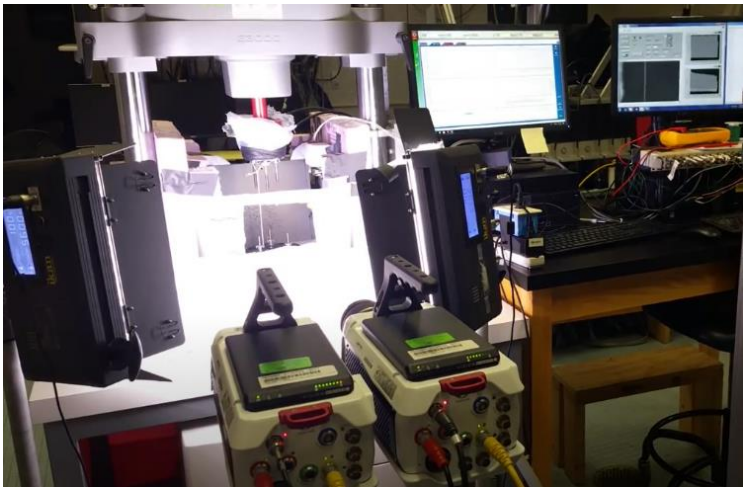
Automated Temperature Feedback Controller

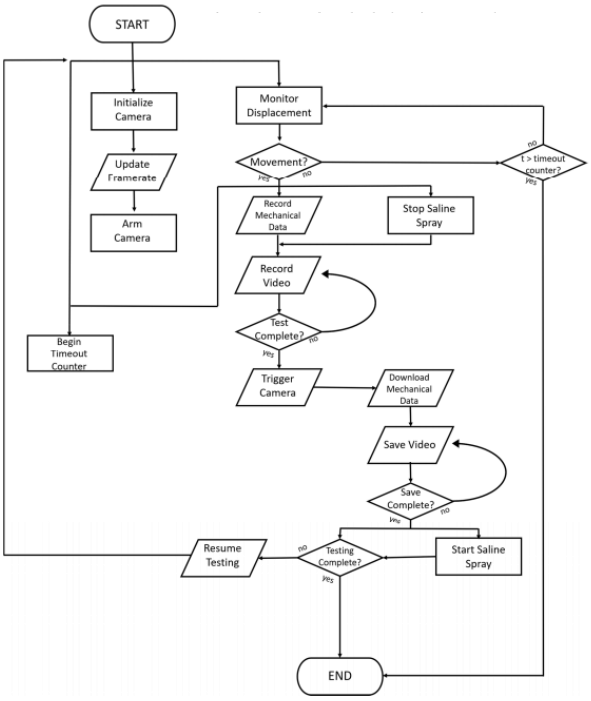
Professional Experience

Created a closed-loop feedback controller for a mechanical testing environmental chamber using an Arduino, LabVIEW, thermal sensors, and heat lamps in order to reach and maintain a desired temperature for simulating biological conditions

This system effectively reduced steady state percent error to 3.5%







ARDUINO LabVIEW INSTRON®

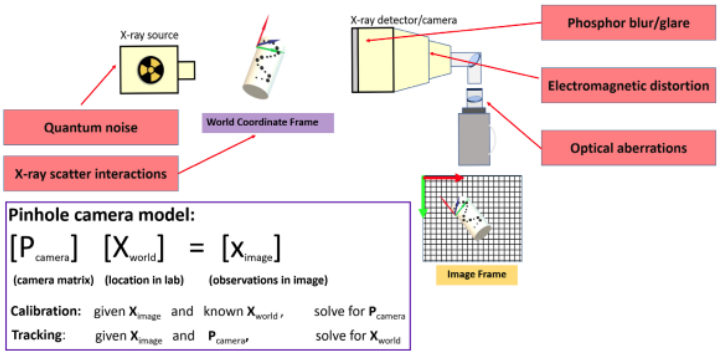
Skills: Arduino, C/C++, Embedded Computing, LabVIEW, Automatic Control, Mechanical Testing, Sensors, Circuit Design, Fabrication, Soldering

C.Prasanna95@gmail.com +1.425.772.0656

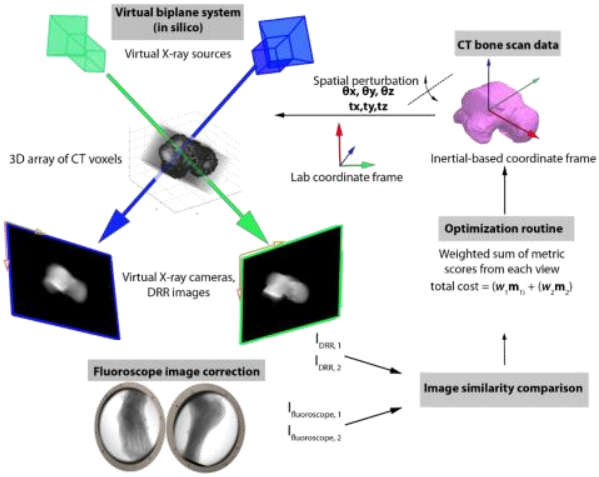
X-Ray Video-Based 3D Bone Motion Tracking

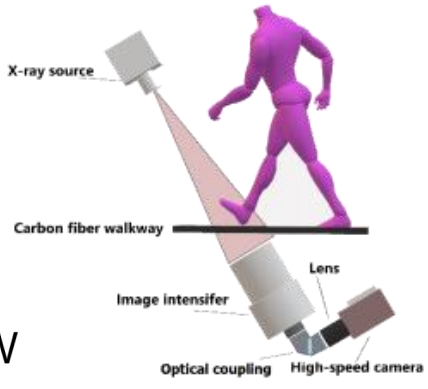
Professional Experience

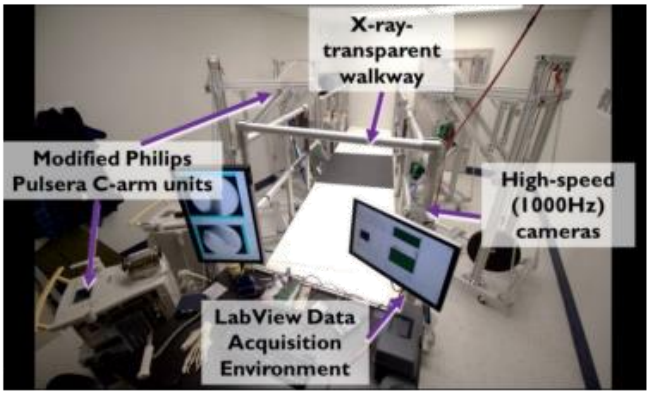
Conducted research that aims to reduce limb loss and developed novel techniques using X-rays, computer vision, and image processing techniques in order to better evaluate lower limb bone motion



Led and collaborated on mechanical design projects for unique laboratory equipment needs, including but not limited to, high-speed camera gantries and computer vision calibration objects







LabVIEW

Skills: Computer Vision, Video tracking, 3D Pose & Motion Estimation, Design, Machining, Signal Processing, MATLAB, LabVIEW, Data Analysis

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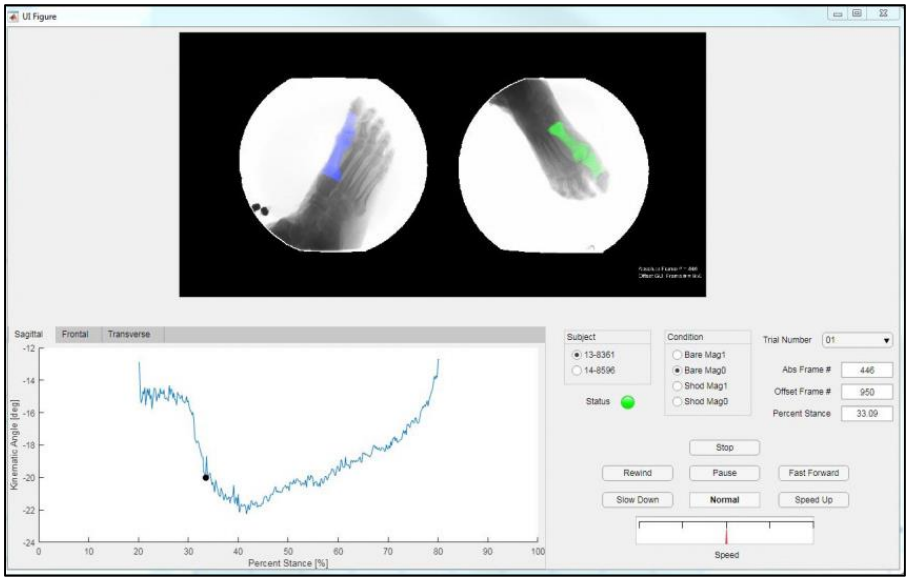
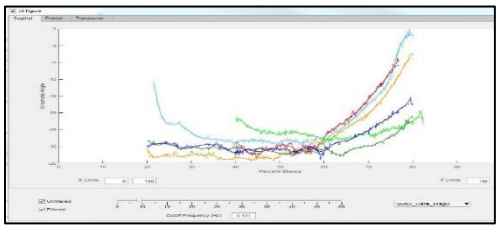
Video Processing & Motion Tracking Pipeline

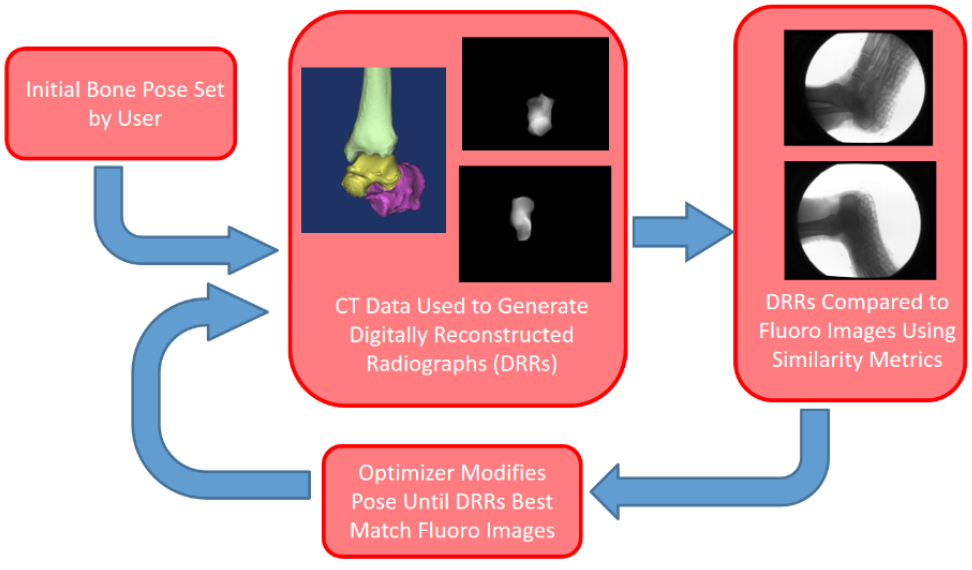
Professional Experience

Implemented automated digital signal processing and quality control GUIs to X-ray video tracking and data analysis protocols



Significantly reduced errors and the amount of necessary manual data processing time





Skills: Signal Processing, GUI Design, MATLAB, Video Tracking, 3D Pose & Motion Estimation, Quality Control, Automation, Data Processing & Analysis

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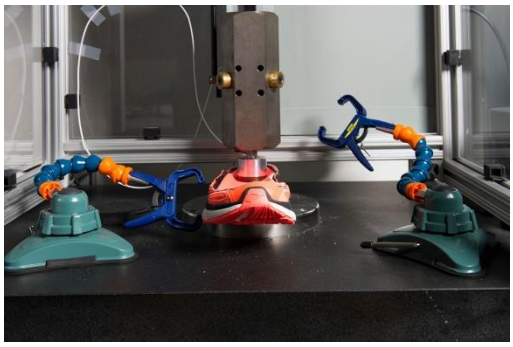
Automated Testing & Analysis Protocol

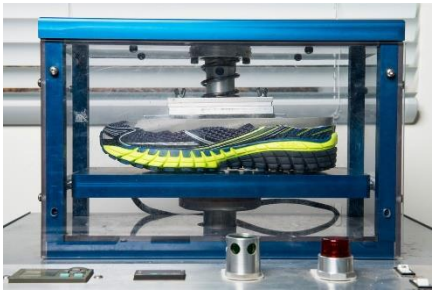
Professional Experience

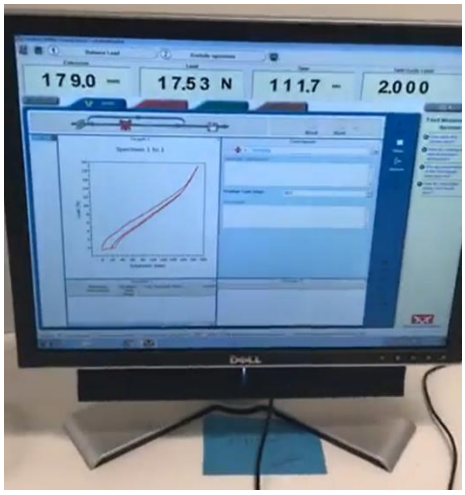
BROOKS

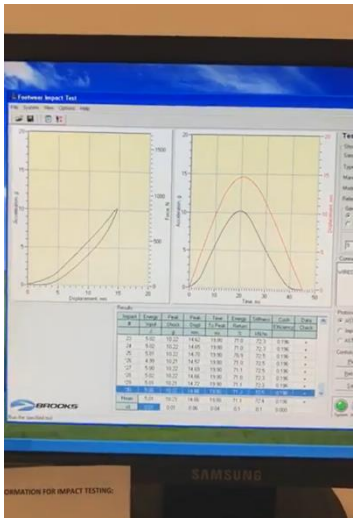
Developed MATLAB Scripts that reduced the amount of time needed to complete the product testing and analysis pipeline by 66%



Reported biomechanical and mechanical testing results to a multidisciplinary and cross-functional team for future product development strategies







+ableau

INSTRON®

Skills: MATLAB, Protocol Development, Automation, Data Processing, Data Analysis, Mechanical Testing, Reliability Test Design & Analysis

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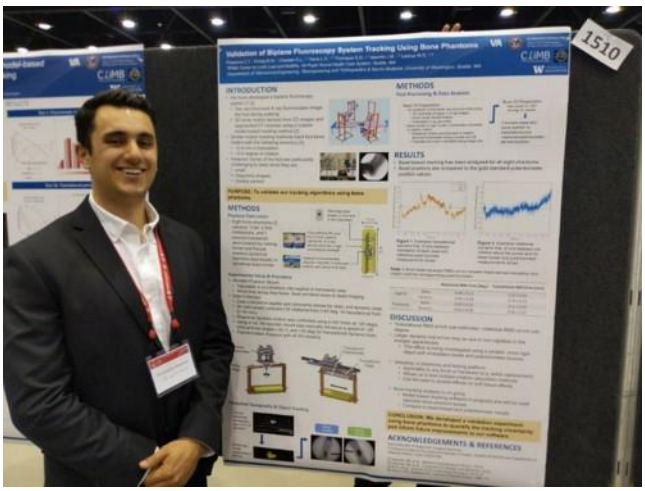
+1.425.772.0656

Conference Presentations

Professional Experience

Was selected to present my research at the following conferences:

- International Society of Biomechanics (2019)
- NW Biomechanics Symposium (2018)
- Young Investigator's Symposium (2018,2020,2021)



At NW Biomechanics Symposium, the Best Presentation Award was given to me by a team of judges which consisted of some of the field's leaders and top professionals

Best Presentation Award


Western
Northwest Biomechanics Symposium 2018
Certificate of Appreciation
Christopher Prasanna
In recognition for his outstanding performance in a
PODIUM PRESENTATION
During the 14th Northwest Biomechanics Symposium
Western Washington University, Bellingham, WA
May 5, 2018

Skills: Public Speaking, LaTeX, Effective Communication, Technical Writing, Research, Data Analysis & Visualization, MS Word, MS PowerPoint

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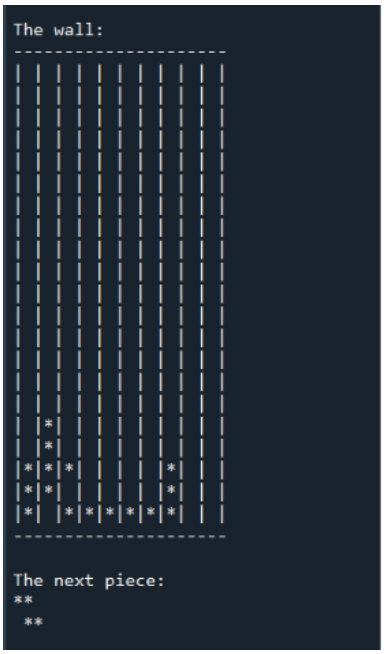
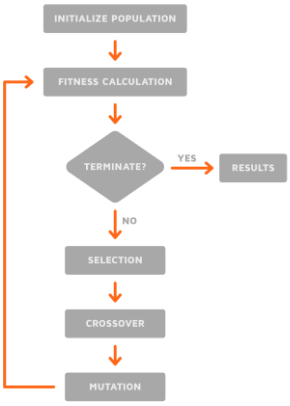
Artificial Intelligence: Tetris Player

Project

COLLEGE OF ENGINEERING
UNIVERSITY of WASHINGTON

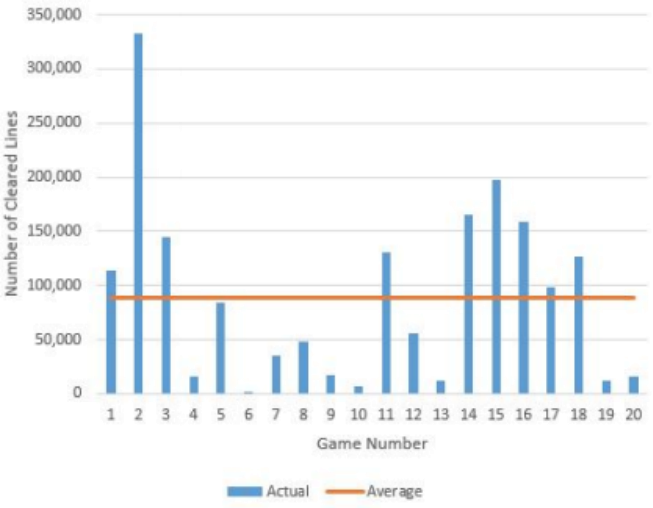
Created a Tetris-playing AI agent in Python that was able to clear over 88,000 lines on average before getting a game over which is significantly higher than the Guinness Record of 4,988 lines cleared by a human player

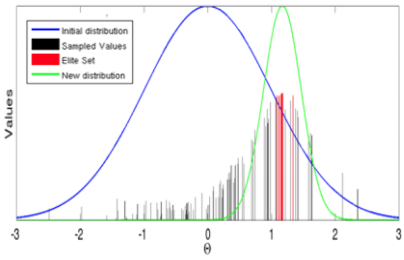




Implemented two reinforcement learning algorithms (genetic programming and cross-entropy method) to train the Tetris-playing AI learner

Devised an additional AI agent that learned and optimized based on both the current piece as well as the next piece ahead. This AI was able to play a single game for 4 days straight without a game over





Skills: Python, Reinforcement Learning, Algorithm Implementation, Black Box Optimization, Genetic / Evolutionary Algorithms, Feature Selection

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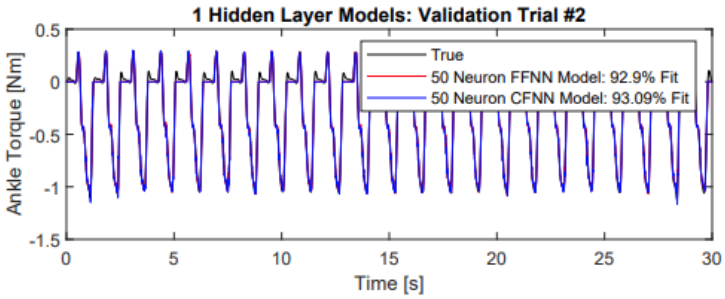
Machine Learning: Human-Robot Dynamics

Project

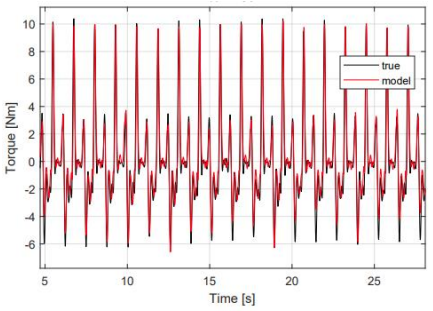
COLLEGE OF ENGINEERING
UNIVERSITY of WASHINGTON

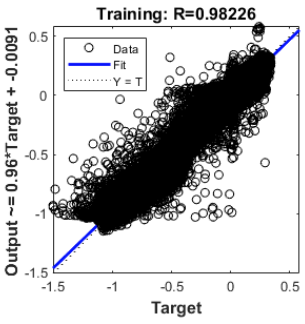
CiMB

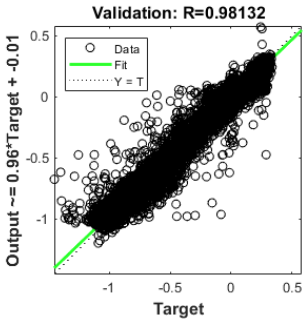
Used previously collected wearable sensor and control signal data from amputee subjects to train multiple machine learning models in order to predict human-robot dynamical system behavior

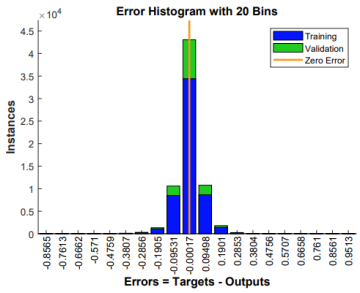


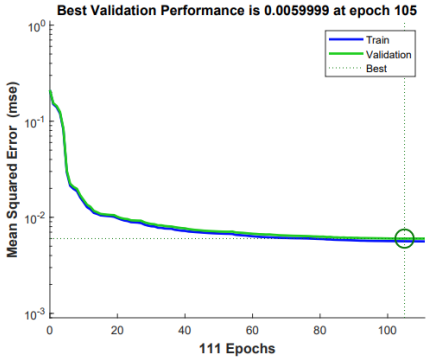
Programmed the following data-driven regression models using MATLAB's toolboxes: shallow neural networks, random forests, least squares regression, and sparse regression

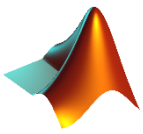


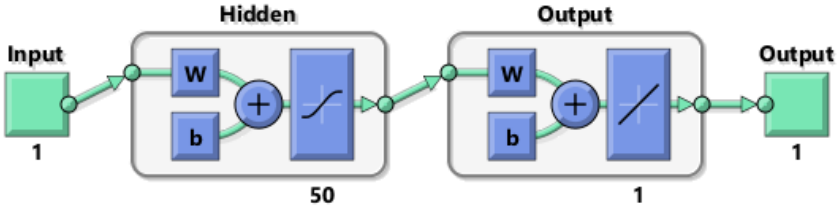












Skills: MATLAB, Machine Learning, Neural Networks, Least Squares Regression, Optimization, System Identification, Data Analysis, Feature Extraction

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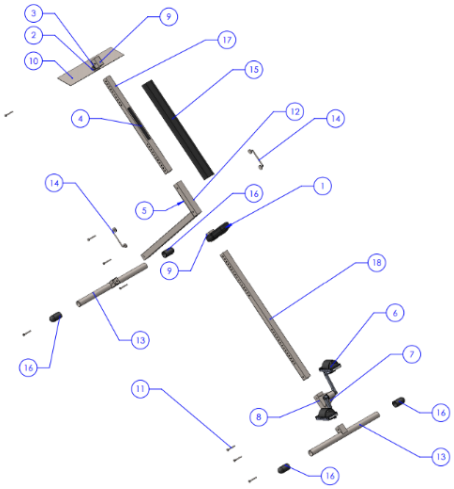
Cerebral Palsy Rehabilitation Product Design

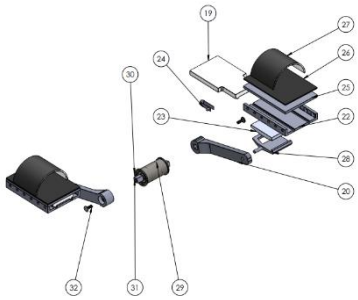
Undergraduate Capstone Project

CAL POLY

UCP United Cerebral Palsy

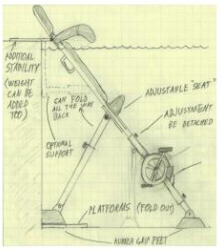
Collaborated with three other young engineers to design and build an underwater stationary cycle. This device is used by the United Cerebral Palsy's clients in order to practice their motor skills and improve their airflow

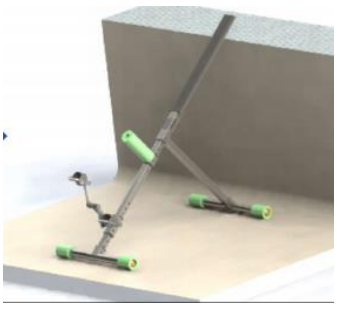




Extensive time spent in the machine shop using CNC mills, welding arcs, drill presses, industrial saws, and surface finishing tools

SOLIDWORKS





Skills: Rapid Prototyping, DFMA, DFMEA, GD&T, Product Design & Development, Machining, CAD (SOLIDWORKS), 3D Printing, Reliability Testing

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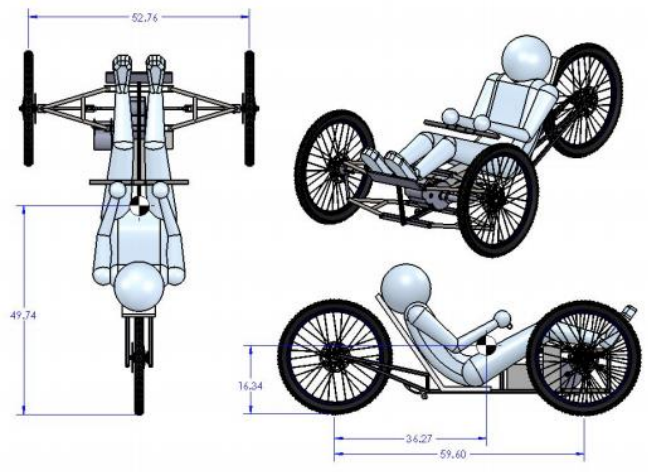
Electric Off-Road Trike Design

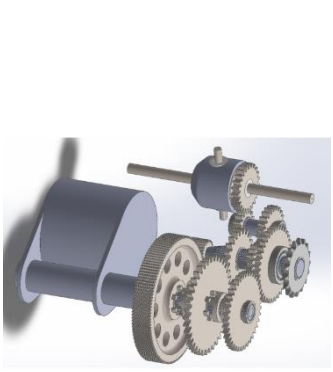
Project

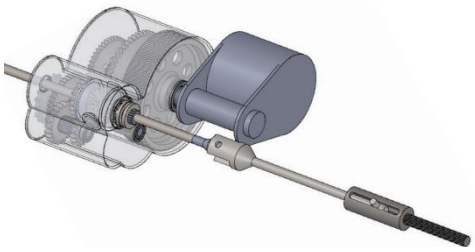
CAL POLY

Collaborated with a team of six to design an all-wheel drive, fully electric off-road tricycle for paraplegic users

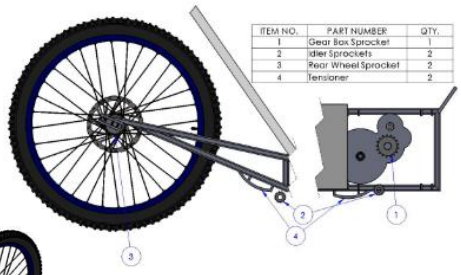


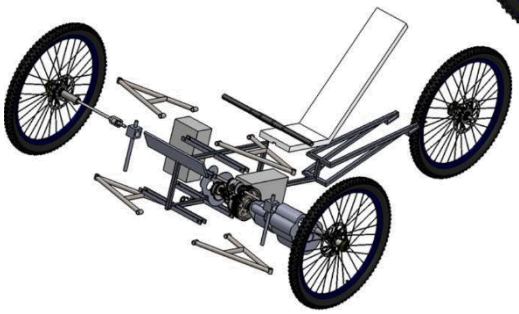
Primarily responsible for designing the rear axle, drivetrain, chain, and sprocket assemblies as well as selecting suitable mechanical components from online vendors

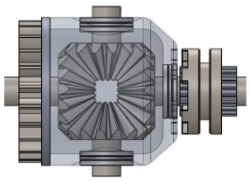




Designed complex parts and large assemblies for the tricycle's frame, electrical components, and powertrain system using SOLIDWORKS







SOLIDWORKS

Skills: CAD (SOLIDWORKS), GD&T, Design, Component Selection, Safety Factors, Electromechanical System Modeling, Powertrain Design

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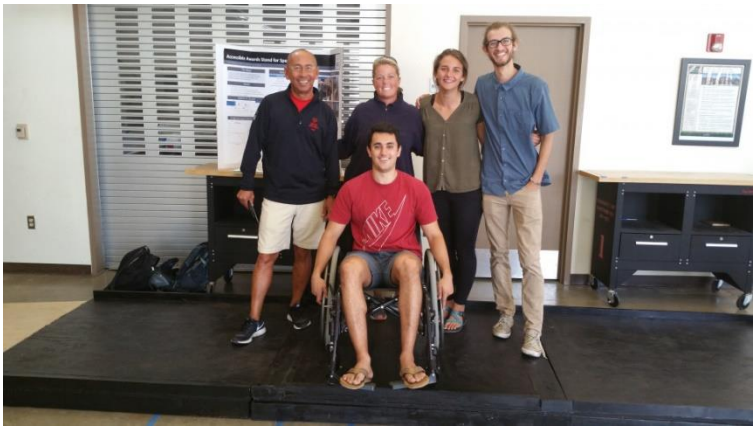
Special Olympics Award Stand Fabrication

Project

Special Olympics Southern California

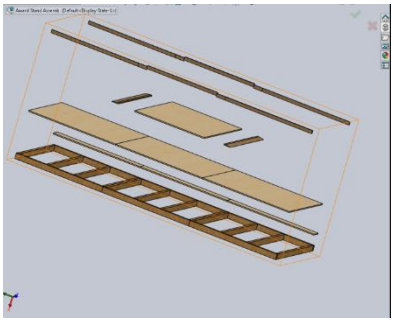
CAL POLY

Fabricated a wheelchair-accessible and load-supporting award stand for a local Special Olympics organization



Conducted DFMA to reduce production time and constructed final design drawings using GD&T standards

Corresponded with a small engineering team and the client in order to ensure a successful product launch



SOLIDWORKS

Skills: CAD (SOLIDWORKS), DFMA, GD&T, Design, Reliability Testing & Analysis, Design Verification, Machining, Woodworking, Vendor & Client Coordination

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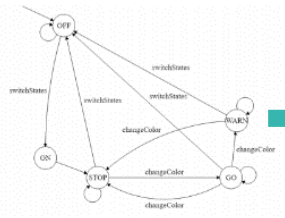
Relevant Graduate Coursework

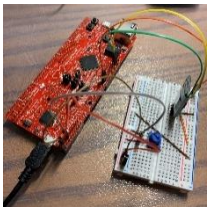
M.S. in Mechanical Engineering

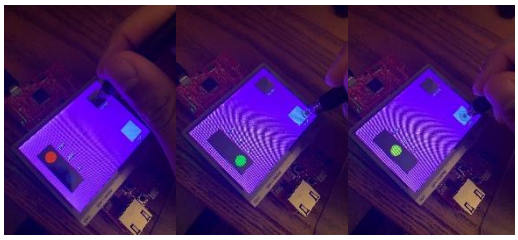
COLLEGE OF ENGINEERING
UNIVERSITY of WASHINGTON

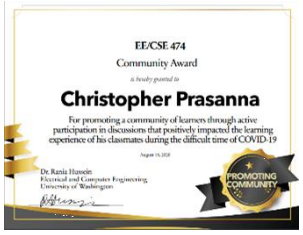
Embedded Systems

Built various real-time embedded systems from the ground up using a microcontroller (TI Tiva/Stellaris), register datasheets, and C programming



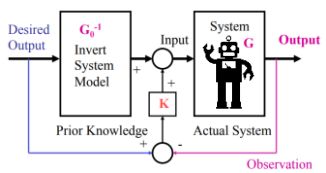


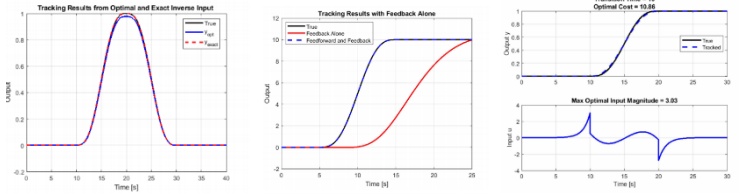




Feedforward & Inversion-Based Control

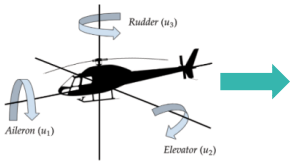
Integrated feedforward control laws with feedback-based controllers to improve precision output tracking when feedback alone has limitations

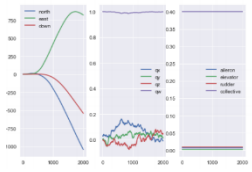


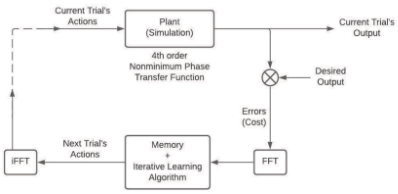


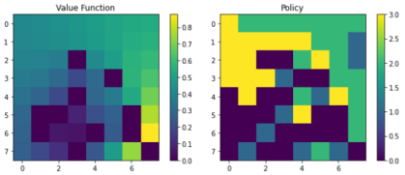
Modern Adaptive Control & Reinforcement Learning

Built adaptive software in Python that applied modern machine learning and optimization techniques to robotic decision-making









Other Advanced Courses: Data-Driven Modeling & Control, Numerical Methods & Computing, Linear Systems, Adv. Dynamics & Vibrations, Automatic Control

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Hobbies & Interests

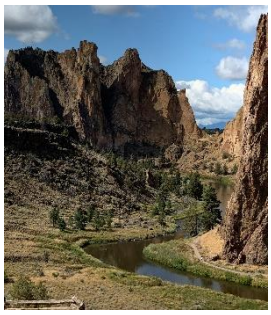
Hiking



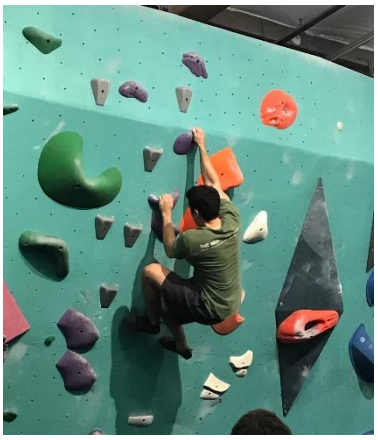
Cooking




Travel


Sports & Fitness

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