



YURI HUDAK, M.S.

BIOMECHATRONICS ENGINEER

SUMMARY

Experienced biomechatronics engineer seeking part-time remote opportunities. I have a background in wearable robotics research, medical device development, and consumer product design, and I've worked for research labs, large companies, and startups. I've led multidisciplinary design teams and managed project planning, fully developed consumer products from concept to manufacturing handoff, and secured repeat consulting contracts with multiple clients.

SKILLS

Mechatronics & Fabrication:

Machine Design, Sensing, Signal Processing, Optimization, Classical Control, SolidWorks, Rhino, 3D Printing, Tolerance Analysis

Software Design: Python, MATLAB, C++, Rhino-Python Integration

Medical Devices: Lifecycle Analysis, Regulatory Pathways, IP Strategies

Biomechanics: Movement Analysis, Wearable Sensing, Motion Capture

EDUCATION

PROFESSIONAL DOCTORATE • MECHATRONICS SYSTEMS DESIGN • TECHNISCHE UNIVERSITEIT EINDHOVEN • NOVEMBER 2021 – OCTOBER 2023

MASTER OF SCIENCE • MECHANICAL ENGINEERING • UNIVERSITY OF WASHINGTON • SEPTEMBER 2018 – JUNE 2020

BACHELOR OF SCIENCE • MECHANICAL ENGINEERING • UNIVERSITY OF VERMONT • AUGUST 2008 – MAY 2012

EXPERIENCE

ACADEMIC WORK

MS DEGREE THESIS • DESIGN AND DEVELOPMENT OF A NOVEL BI-ARTICULAR ROBOTIC PROSTHETIC ANKLE AND KNEE EXOSKELETON SYSTEM WITH OFFBOARD ACTUATION • JULY 2019 – JUNE 2020

Advised by Dr. Patrick Aubin for the degree thesis project on the design and evaluation of a novel off-board powered knee exoskeleton and prosthetic foot/ankle to aid in the investigation of gastrocnemius muscle contribution to gait.

- Designed and validated a novel knee exoskeleton capable of providing physiologic moments to the knee joint while maximizing comfort, custom fit, and rapid production.
- Designed and validated a novel powered prosthetic foot/ankle according to identified design specifications including physiologic power production, distal mass reduction, and strength.
- Sensor selection accounting for noise tolerance and ease of hardware integration.
- Sensor circuit design, electronics bench validation, and assembly.
- Tolerance analysis and specification to ensure precise fit, assembly, and sensor alignment



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MS DEGREE THESIS - CONTINUED

- Designed integrated mechanical safety features to ensure user safety during control system evaluation, failure mode analysis
- Modular exoskeleton test fixture design and fabrication for component load testing, fatigue testing, bandwidth testing, control system validation, and loading through range of motion.
- Contributed to control system design and tuning in Python and LabVIEW
- Developed parametric CAD model for rapid user-specific adjustment without the need for model redesign

MS DEGREE PROJECT • GUIDEWIRE LOSS PREVENTION: UNIVERSITY OF WASHINGTON & SEATTLE CHILDREN'S HOSPITAL • SEPTEMBER 2018 – JUNE 2019

My work on this year-long project required using medical and mechanical engineering knowledge to solve the problem of guidewire loss in patients during central venous catheter (CVC) insertion.

- I worked with a team of mechanical and bioengineering students as well as clinicians to concept, design, and test solutions to this problem.
- Oversaw work of undergraduate student team members and interfaced with stakeholders to manage project progress.
- Completed life-cycle assessment of CVC insertion kit (manufacturing to end-of-life)
- Secured startup funding from the Buerk Center for Entrepreneurship as well as the University of Washington Capstone Fund for innovation development.
- Wrote a business plan exploring two potential business model options and planned an FDA regulatory pathway for our proposed solution.
- In-depth intellectual property investigation and strategy development

PROFESSIONAL WORK

RESEARCH SCIENTIST • CENTER FOR LIMB LOSS AND MOBILITY • JULY 2019 – JULY 2021

Worked as a member of research staff in a leading lower limb loss biomechanics lab within the Veterans Administration Hospital Puget Sound. My objective was to contribute to the improvement of care for people with lower limb amputations through novel technology development and the application of innovative methods to existing technology.

- Review and understand needs of patients with mobility limitations
- Develop novel hardware, software, and mechatronic devices to advance state-of-the-art in lower limb prosthetics, orthotics, and assistive devices
- Experiment design and testing protocol development
- Custom MATLAB and Python software development for analysis and model simulation
- Data collection via gait lab treadmill, force plates, and VICON motion capture system
- Hardware data collection and analysis to evaluate device performance
- Design, produce, and iterate functional prototypes via 3D printing, laser cutting, and machine fabrication
- Oversee work of junior research engineers & interns
- Manage > \$2M equipment in fabrication lab spaces, conduct training for new users, ensure consistent performance of fabrication equipment

INDEPENDENT RESEARCH AND DESIGN CONSULTANT • MARCH 2017 – JULY 2021

Provided research and design engineering consulting services to a variety of clients, with projects ranging from novel software development to consumer product design.



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- Algorithm development and wearable sensor system design for novel fall detection and rehabilitation training product. Part of a consulting team operating under subcontract.
- Concept to production ladder safety equipment product development (CAD design, strength analysis, injection molded components, volume manufacturing)
- Laser plastic welding fixture design for inhaler product

PRODUCT DESIGN ENGINEER • ADVANTEC MARINE • FEBRUARY 2016 – MARCH 2017

- Reported directly to VP of Marketing & Product Management as the internal engineering resource within the product management team to design and develop new products and redesign existing products.
- Supported root cause analysis to fix design flaws and aid continuous product improvement
- Static analysis to predict compliance with deflection/load/failure criteria.
- Cost reduction of products through redesign and manufacturing analysis to meet similar competitor product offering and price point.

PRODUCTION DESIGNER • HUSKY INJECTION MOLDING SYSTEMS • AUGUST 2014 – AUGUST 2015

- Thermal finite element analysis of hot runner manifold system using ANSYS
- Full design of the hot runner system for injection molding using NX Unigraphics CAD software.
- Produced full engineering drawings and specifications with GD&T.
- Considered customer requirements as well as manufacturing limits to produce a high-quality hot runner system within production deadlines.

SELECTED PUBLICATIONS & CONFERENCE PROCEEDINGS

Hudak, Y.F., Li, J.S., Cullum, S., Strzelecki, B., Richburg, C., Kaufman, G.E., Heckman, J., Ripley, B., Telfer, S., Ledoux, W.R., Muir, B.C., Aubin, P.M. A Novel Workflow to Fabricate Patient-Specific 3D Printed Accommodative Foot Orthosis with Personalized Latticed Metamaterial. Medical Engineering & Physics. April, 2022.

Anderson, A., **Hudak, Y.F.**, Richburg, C., Czerniecki, J., and Aubin, P.M. Design and Evaluation of a Knee Flexion Assistance Exoskeleton for People with Transtibial Amputation. International Conference on Rehabilitative Robotics. Rotterdam, NL. July, 2022.

Anderson, A., **Hudak, Y.F.**, Richburg, C., Czerniecki, J., and Aubin, P.M. Design and Evaluation of Powered Ankle Prosthesis with Series and Parallel Elasticity. American Society of Biomechanics Symposium. August, 2021.

Hudak, Y.F., Graf, E., Quigley, C., Darrow, R., Wong, J, and Liu, J. Guidewire Innovation to Prevent Loss of Wire in Catheterization. International Mechanical Engineering Congress and Exposition. Salt Lake City, UT. November, 2019.

Hudak, Y.F., Anderson, A., Richburg, C., and Aubin, P. Offboard Powered Knee Exoskeleton Development, Young Investigator Symposium, VA Puget Sound Healthcare System, Seattle, WA. August, 2019.



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