

Daniel A. Hagen

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EDUCATION

University of Southern California, Viterbi School of Engineering

Los Angeles, CA

DOCTOR OF PHILOSOPHY IN BIOMEDICAL ENGINEERING

May 2016 - Exp. December 2020

- GPA: 3.97
- Recipient of the Provost Fellowship
- Relevant Coursework: Linear Systems Theory, Nonlinear and Adaptive Control

University of Southern California, Viterbi School of Engineering

Los Angeles, CA

MASTER OF SCIENCE IN BIOMEDICAL ENGINEERING

January 2015 - May 2016

- GPA: 3.95
- Relative Coursework: Neuromuscular Systems, Applied Electrophysiology, Physiological Control Systems

University of Arizona

Tucson, AZ

BACHELOR OF SCIENCE IN MATHEMATICS

August 2006 - May 2010

- GPA: 3.60
- Minors: Chemistry, Biochemistry

SKILLS

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|---------------------|--|---|
| • English (Native) | • OpenSim | • Computational Analysis of Dynamical Systems |
| • Python | • Adobe Illustrator | • Linear/Nonlinear Control Theory |
| • MATLAB & Simulink | • Microsoft Office (Excel, Word, PowerPoint) | |
| • CAD | • LaTeX | |

EXPERIENCE

University of Southern California, Department of Biomedical Engineering

Los Angeles, CA

TEACHING ASSISTANT - BME 620L: APPLIED ELECTROPHYSIOLOGY

August 2018 - October 2018

- Coordinate weekly laboratory experiments designed to utilize concepts from biophysics to record physiological electrical phenomena and to stimulate electrically-excitable tissue
- Utilize *Great Lakes NeuroTechnologies* BioRadios and BioCapture software to record electromyography, electroencephalography, and electrocardiography
- Lead weekly group discussions with 15 students to encourage student proficiency in course concepts and lab techniques while focusing on relevant engineering principles

University of Southern California, Division of Biokinesiology and Physical Therapy

Los Angeles, CA

GRADUATE RESEARCH ASSISTANT

January 2016 - October 2018

- Examine and quantify the effects of physical and physiological constraints on the neural control of movement from a mathematical perspective
- Incorporate physiologically-reasonable neurological and mechanical parameters to construct complex models of limb movement
- Create Python and MATLAB scripts to either analyze or control complex, redundant, dynamical systems

University of Southern California, Department of Aerospace and Mechanical Engineering

Los Angeles, CA

GRADUATE RESEARCH ASSISTANT

January 2017 - June 2017

- Applied differential geometry and group theory to the control of a physical limb system under holonomic and nonholonomic constraints
- Characterized the configuration space of tendon-driven redundant systems to better understand constrained movement across the manifold
- Gathered fundamental information regarding the applications and limitations of nonlinear, time-varying analysis and differential topology and presented findings during weekly progress reports

PROJECTS

Redundant Control of a Pendulum Actuated by 2 Nonlinear "Muscles"

Los Angeles, CA

PROJECT LEADER

August 2017 - October 2018

- Programmed an algorithm in Python to control a pendulum by 2 viscoelastic, "muscle"-like actuators through integrator-backstepping
- Derived various dimensionality reduction techniques to explore the redundant input-to-output mapping
- Quantified the effects of initial conditions on the system's strain energy and kinematic-based state approximation error

Muscle Kinematics During a Basketball Free Throw

Los Angeles, CA

PROJECT LEADER, FIRST AUTHOR

August 2015 - June 2017

- Co-authored MATLAB code that generated 100,000 random, feasible basketball free throws from clamped cubic spline algorithms and simplified movement mechanics
- Utilized posture-dependent moment arms to calculate musculotendon velocities associated with each free throw and observe changes across different free throws
- Published a peer-reviewed article in the *Journal of Biomechanics* illustrating how kinematics changes effect neuromuscular requirements, even for similar-looking movements