

# John C. Kegelman

SENIOR SOFTWARE ENGINEER AT PELOTON TECHNOLOGY

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## Education

### Stanford University

PH.D. IN MECHANICAL ENGINEERING

Stanford, CA

Apr. 2012–Dec. 2018

- Thesis topic: Learning from Highly-Skilled Drivers to make Automated Vehicles Safer

### Stanford University

M.S. IN MECHANICAL ENGINEERING

Stanford, CA

Sep. 2009–Apr. 2012

- Coursework focused on controls, advanced dynamics and simulation, and electromechanical design.

### Johns Hopkins University

B.S. IN MECHANICAL ENGINEERING

Baltimore, MD

Sep. 2005–May 2009

- 4.0 GPA. Minored in Entrepreneurship and Management.

## Research Interests

I investigate how we can learn from highly-skilled race car drivers to make automated vehicles safer. I explore how human control techniques at the limits of handling can be adapted into algorithms for autonomous vehicles. I can contribute a deep understanding of vehicle dynamics and controls with practical experience and a great appreciation that all models are wrong, but some are useful.

## Experience

### Peloton Technology

SENIOR SOFTWARE ENGINEER

Mountain View, CA

May 2017–PRESENT

- Implemented a distributed safety monitoring system for a commercial platooning system following the ISO 26262 standard.
- Collected, compiled, and analyzed braking data to inform the safety of the intended functionality (SOTIF) analysis of a commercial platooning system.
- Developed a graphical user interface in Python for vehicle data visualization and exploratory data analysis.
- Contributed to the estimation, modeling, and control algorithms, including a comprehensive simulation and testing environment.

### Dynamic Design Lab

GRADUATE RESEARCH ASSISTANT, PI: PROF. J. CHRISTIAN GERDES

Stanford, CA

Sep. 2009–Dec. 2018

- Collected, compiled, analyzed, and openly published vehicle dynamics data from highly-skilled professional race car drivers during live racing events to gain insights into vehicle control at the limits of handling.
- Compared human performance with autonomous vehicles to improve operating capabilities of active vehicle safety systems.
- Implemented autonomous vehicle control using drive-by-wire hardware and convex optimization software to operate at the handling limits while following a desired trajectory.
- Implemented and tested control algorithms on experimental vehicles using C and MATLAB.
- Pioneered a comprehensive, noninvasive vehicle instrumentation suite for vintage race cars with significant historical value.
- Developed a graphical user interface in MATLAB for vehicle data visualization and exploratory data analysis.
- Assembled and maintained an end-to-end solution from surveyed GNSS base stations to on-board integrated navigation systems enabling research vehicles to operate reliably with centimeter-level position measurement accuracy.
- Installed and operated a Linux-based NTRIP caster to broadcast Differential GNSS corrections from multiple servers to multiple clients.

### Stanford Department of Mechanical Engineering

SENIOR TEACHING ASSISTANT — MECHANICAL SYSTEMS DESIGN, PROFS. MARK CUTKOSKY AND PAUL MITIGUY

Stanford, CA

Jan.–Mar. 2016

- Developed curriculum and coordinated team of five other teaching assistants.
- Led hands-on laboratory and tutorial sessions for course with 150 undergraduates exploring characteristics of machine elements.
- Advised design-project teams emphasizing the balance of physical and virtual prototyping based on engineering analysis.

TEACHING ASSISTANT — MECHANICAL SYSTEMS DESIGN, PROF. J. CHRISTIAN GERDES

Jan.–Mar. 2012

- Aided hands-on laboratory and tutorial sessions for course with 150 undergraduates exploring characteristics of machine elements.
- Advised design-project teams emphasizing the balance of physical and virtual prototyping based on engineering analysis.

## Johns Hopkins Department of Mechanical Engineering

Baltimore, MD

TEACHING ASSISTANT — MECHANICAL ENGINEERING FRESHMAN LABORATORY, PROF. ALLISON OKAMURA

Sep.–Dec. 2008

- Helped plan, organize, and conduct weekly hands-on laboratory sessions.
- Provided assistance during weekly laboratory sessions for approximately 20 students per session exploring basic physical science and engineering principles pertaining to mechanical engineering.

UNDERGRADUATE RESEARCH ASSISTANT, PI: PROFS. CHARLES MENEVEAU AND JOSEPH KATZ

Jan.–May 2007

- Designed and documented new test section, including a fractal canopy, for the project titled *Measuring and Modeling Interactions of the Turbulent Atmospheric Boundary Layer with Multiscale Ground Topology* to be conducted in the laboratory's axial turbomachinery water tunnel.

## Johns Hopkins University Applied Physics Laboratory

Laurel, MD

BIOMEDICINE GROUP INTERN, PI: DR. JAMES BEATY

May–Aug. 2008

- Developed method for capturing primate hand motion using Vicon cameras for the Revolutionizing Prosthetics Program.
- Designed and installed two on-site camera systems, prepared internal manual documentation, and trained multiple staff members to use the system proficiently.

## NASA Langley Research Center

Hampton, VA

LANGLEY AEROSPACE RESEARCH SUMMER SCHOLAR, PI: STEVEN BAUER

Jun.–Aug. 2007

- Collected and compiled experimental data from wind tunnel testing of the separation event of Ares I-X, the experimental flight test vehicle for NASA's next crew launch vehicle.
- Collected, compiled, and analyzed computational data using NASA-developed computational fluid dynamics (CFD) software for the descent database of the Upper Stage Simulator.

## New Horizons Governor's School for Science and Technology

Hampton, VA

CHIEF INVESTIGATOR, PI: DICK DELOACH

Sep. 2004–May 2005

- Research and mentorship program with NASA Langley Research Center.
- Investigated various swimming techniques by applying the Modern Design of Experiments to the biomechanics of swimming.

## Publications

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### JOURNAL ARTICLES

Neural network vehicle models for high-performance automated driving

Nathan A. Spielberg, Matthew Brown, Nitin R. Kapania, John C. Kegelmann, J. Christian Gerdes

*Science Robotics* 4.28 (2019). Science Robotics

Vehicle control synthesis using phase portraits of planar dynamics

Carrie G. Bobier-Tiu, Craig E. Beal, John C. Kegelmann, Rami Y. Hindiyeh, J. Christian Gerdes

*Vehicle System Dynamics* 57.9 (2019) pp. 1318–1337. Taylor & Francis

Insights into vehicle trajectories at the handling limits: analysing open data from race car drivers

John C. Kegelmann, Lene K. Harbott, J. Christian Gerdes

*Vehicle System Dynamics* 55.2 (2017) pp. 191–207. Taylor & Francis

### THESIS

Learning from professional race car drivers to make automated vehicles safer

John C. Kegelmann

Stanford University, PhD, 2018

### CONFERENCE PROCEEDINGS

Analysis of Measured Racing Lines: A Path Primitive Based Curve Fitting Approach

Guido Koch, John C. Kegelmann, J. Christian Gerdes

*The 11th International Symposium on Advanced Vehicle Control*, 2012

Repeatability of arm pull patterns in front crawl swimming

Lester K. Su, John C. Kegelmann

*American Physical Society, 62nd Annual Meeting of the APS Division of Fluid Dynamics*, 2009

### PATENTS

Distributed Safety Monitors for Automated Vehicles

Todd C. Klaus, Colleen K. Twitty, Stephen M. Erlien, John C. Kegelmann, Charles A. Price, Austin B. Schuh, Joshua P. Switkes

## Honors & Awards

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- 2009–2012 Stanford Graduate Fellowship in Science and Engineering
- 2009 NCAA Postgraduate Scholarship
- 2009 ESPN The Magazine Academic All-American of the Year
- 2008 Barry M. Goldwater Scholarship
- 2008 Johns Hopkins University Provost's Undergraduate Research Award
- 2008 Robert George Gerstmyer Award, Johns Hopkins Department of Mechanical Engineering
- 2007–2009 Hodson Trust Scholarship
- 2005–2007 Michael Bloomberg Scholarship
- 2007 American Society of Heating, Refrigeration and Air Conditioning Engineers Scholarship, Baltimore Chapter
- 2006, 2008 Honorable Mention All-American, NCAA Division III Swimming
- 2005 Balanced Man Scholarship, Sigma Phi Epsilon, Johns Hopkins Chapter
- 2005 Armed Forces Communication and Electronics Association Scholarship, Tidewater Chapter

## Extracurricular Activity

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- 2012–2014 Club Cycling Team *Stanford University*
- 2009–2013 **President**, 2010–2012, Club Triathlon Team *Stanford University*
- 2005–2009 **Captain**, 2007–2009, Varsity Men's Swim Team *Johns Hopkins University*
- 2007 **President**, 2008–2009, Pi Tau Sigma, Mechanical Engineering Honor Society *Tau Alpha Chapter*
- 2007 Tau Beta Pi, Engineering Honor Society *Maryland Alpha Chapter*

## Personal

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- Born May 6, 1987, St. Louis, Missouri, USA.