

# Shumon Koga

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*Control Algorithm Engineer for Batteries, Climate, and 3D-Printing*

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## EDUCATION

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- Ph.D. in Mechanical and Aerospace Engineering,** **Sep. 2014-Present**  
University of California, San Diego
- M.S. in Mechanical and Aerospace Engineering,** **Sep. 2014-Mar. 2016**  
University of California, San Diego
- B.S. in Applied Physics,** **Apr. 2010-Mar. 2014**  
Keio University

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## WORKING EXPERIENCE

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- University of California at San Diego,** **Sep. 2014-Present**  
Research Assistant | Advisor : Prof. Miroslav Krstic  
Research Interests : Control of PDEs, Lithium-ion batteries, Sea ice, 3D-Printing
- Developed the control and estimation algorithm for thermodynamic phase change materials.
  - Applied the designed algorithm to (i) lithium-ion batteries, (ii) Arctic sea ice for climate systems, (iii) polymer 3D-printing via screw extrusion.
  - Instructed four visiting students for their research projects, all of which resulted in paper submissions to a journal or conference.
- NASA Jet Propulsion Laboratory,** **Oct. 2017-Nov. 2017**  
Research Intern | Advisor : Dr. Ian Fenty  
Project “Estimating the Circulation and Climate of the Ocean (ECCO)”
- Derived a new approach for state estimation of a simple physical model using the adjoint method, and showed a better performance compared to the previous approach via numerical experiment.
  - Derived the adjoint method for a multi-layer ice melting model and checked the performance via numerical experiment.
- Keio University,** **Apr. 2013-Mar. 2014**  
Bachelor Student Researcher | Advisor : Prof. Youhei Fujitani
- Applied LQG control associated with the adjoint method for nonlinear stochastic optimal control and estimation to investigate the maximum power extracted by the Feynman Ratchet.

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## SKILLS

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**Programming :** C, C++, MATLAB, Fortran, Mathematica,

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## AWARDS

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**2014 :** California Research Assistantships/Teaching Assistantships

## **PUBLICATIONS**

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### **Journal Papers**

1. **S. Koga**, M. Diagne, and M. Krstic, “Control and State Estimation of the One-Phase Stefan Problem via Backstepping Design”, IEEE Transactions on Automatic Control, provisionally accepted
2. J. Feiling, **S. Koga**, M. Krstic, T.R. Oliveira, “Extremum Seeking for Static Maps with Actuation Dynamics Governed by Diffusion PDEs”, Automatica, provisionally accepted
3. J. Wang, **S. Koga**, Y. Pi, and M. Krstic, “Axial Vibration Suppression in a PDE Model of Ascending Mining Cable Elevator”, ASME Journal of Dynamic Systems, Measurement, and Control, submitted

### **Conference Papers**

1. **S. Koga** and M. Krstic, “Control of Two-Phase Stefan Problem via Single Boundary Heat Input”, 57th IEEE Conference on Decision and Control, 2018, submitted
2. M. Buisson-Fenet, **S. Koga**, and M. Krstic, “Control of Piston Position in Inviscid Gas by Bilateral Boundary Actuation”, 57th IEEE Conference on Decision and Control, 2018, submitted
3. T.R. Oliveira, J. Feiling, **S. Koga**, and M. Krstic, “Scalar Newton-based Extremum Seeking for a Class of Diffusion PDEs”, 57th IEEE Conference on Decision and Control, 2018, submitted
4. **S. Koga**, I. Karafyllis, and M. Krstic, “Input-to-State Stability for the Control of Stefan Problem with Respect to Heat Loss at the Interface”, 2018 American Control Conference, 2018
5. **S. Koga**, D. Straub, M. Diagne, and M. Krstic, “Thermodynamic Modeling and Control of Screw Extruder for 3D Printing”, 2018 American Control Conference, 2018
6. **S. Koga**, L. Camacho-Solorio, and M. Krstic, “State Estimation for Lithium Ion Batteries with Phase Transition Materials”, ASME 2017 Dynamic Systems and Control Conference, 2017
7. **S. Koga** and M. Krstic, “Delay Compensated Control of the Stefan Problem”, 56th IEEE Conference on Decision and Control, 2017
8. **S. Koga** and M. Krstic, “Arctic Sea Ice Temperature Profile Estimation via Backstepping Observer Design”, 1st IEEE Conference on Control Technology and Applications, 2017
9. **S. Koga**, R. Vazquez, and M. Krstic, “Backstepping Control of Stefan Problem with Flowing Liquid”, 2017 American Control Conference, 2017
10. **S. Koga**, M. Diagne, and M. Krstic, “Output Feedback Control of the One-Phase Stefan Problem” 55th IEEE Conference on Decision and Control, 2016
11. **S. Koga**, M. Diagne, S. Tang, and M. Krstic, “Backstepping Control of the One-Phase Stefan Problem” 2016 American Control Conference, 2016

## **Graduate Coursework**

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**Mechanical Engineering Department** : Linear Systems, Linear Control, Nonlinear Systems, Nonlinear Control, Optimal Control, Optimal Estimation, Control of Distributed Parameter Systems, Math Analysis, Real Analysis, Numerical Methods for Differential Equations

**Math Department** : Stochastic Differential Equation

**Computer Science Department** : Machine Learning Theory