Ruobing Zhao

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https://ruobingzhao.github.io/

RESEARCH INTERESTS

Optimal control; mathematical physics; quantum field theory; stochastic differential equations; calculus of variations; mathematical finance

EDUCATION

Ph.D. Mechanical Engineering (Control Theory)   2013/9 - 2019/8
University of California, San Diego
  "Stationary-Action Stochastic Control Representation of the Schrödinger Initial Value Problem"
  Dissertation Committee:
  William M. McEneaney (Chair), Ruth J. Williams (Co-chair),
  Robert R. Bitmead, Jorge Cortés, Patrick J. Fitzsimmons

B.S. Chemical Engineering (major) Mathematics (minor)   2009/9 - 2013/6
University of California, Los Angeles
  with Honors; major GPA: 3.74; minor GPA:4.00 (out of 4.00)

EXPERIENCE

Research Assistant   2013/9 - 2019/8
University of California, San Diego
  Studied the connection between stochastic control problems and second-order Hamilton-Jacobi-Bellman partial differential equations (HJB PDEs) that arise in classical and quantum mechanics. Developed a high performance control-theoretic numerical method for these HJB PDEs. Developed a numerical method utilizing controlled diffusion process representation to solve Schrödinger initial value problems (IVPs). Studied the conditions for existence of strong solutions for a class of degenerate stochastic differential equations (SDEs).

Teaching Assistant   2014/9 - 2019/6
University of California, San Diego
  Received overwhelmingly good reviews from students. Teaching evaluations are available on website.
  Teaching History:
  Graduate courses: Optimal Control*, Real Analysis for Application
  Undergraduate courses: Numerical Methods*, Introduction to Programming with Matlab
  * Recommended in 100% of student evaluations in recent assignments

SERVICE

Reviewer for European Control Conference and Automatica

HONORS

- Dean's Honor List multiple times during undergraduate studies at UCLA

- 2013-2016 Charles Lee Powell Foundation Graduate Fellowship

- 2018 UCSD Departmental Dissertation Writing Fellowship

PUBLICATIONS

6. "Strong Solution Existence for a Class of Degenerate Stochastic Differential Equationss", with W. McEneaney, P. Dower, H. Kaise, *International Federation of Automatic Control (IFAC) World Congress 2020.*

5. "Staticization and Iterated Staticization", with W. McEneaney, *Submitted to SIAM Journal on Control and Optimization.*

4. "Iterated Staticization and Efficient Solution of Conservative and Quantum Systems", with W. McEneaney, *Proceedings of SIAM Conference on Control and Its Applications 2019.*

3. "Employing the Staticization Operator in Conservative Dynamical Systems and the Schrödinger Equation", with W. McEneaney, *Proceedings of Asian Control Conference 2019.*

2. "Diffusion Process Representations for a Scalar-Field Schrödinger Equation Solution in Rotating Coordinates", with W. McEneaney, *Numerical Methods for Optimal Control Problems, Springer INDAM Series, Vol. 29*

1. "A Diffusion-Based Solution Technique for Certain Schrödinger Equation Dynamical Systems", with W. McEneaney, *Proceedings of European Control Conference 2018*.

CONTRIBUTED LECTURES AND PRESENTATIONS

5. SIAM Conference on Control & Its Applications 2019, Chengdu, China
"Iterated Staticization and Efficient Solution of Conservative and Quantum Systems" (with W. McEneaney)

4. Asian Control Conference 2019, Kitakyushu, Japan
"Employing the Staticization Operator in Conservative Dynamical Systems and the Schrödinger Equation" (with W. McEneaney)

3. SIAM Conference on Control & Its Applications 2017, Pittsburgh, PA
"Hamilton-Jacobi Equations for Two-Point Boundary-Value Problems in Conservative Systems and Dequantized Schrödinger Equations" (with W. McEneaney, P. Dower)

2. SIAM Conference on Control & Its Applications 2017, Pittsburgh, PA
"A Complex-valued Controlled-diffusion Representation for the Schrödinger Equation in a Rotating Frame" (with W. McEneaney)

1. Southern California Control Workshop 2017, Caltech
"Diffusion Process Approximation for a Solution of the Schrödinger Equation" (with W. McEneaney)

REFERENCE

Professor William McEneaney (Ph.D. advisor), wmceneaney@eng.ucsd.edu