Jeremy Orosco

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CITIZENSHIP — U.S. Citizen

EDUCATION / ACADEMIA

University of California San Diego
Postdoctoral Scholar July 2019–July 2021
PI: James Friend
- UC President's Postdoctoral Fellowship (2020–2021)
- Research areas:
  - rigorous macroscopic theory of micro-scale atomization
  - micro-scale capillary wave turbulence
  - nozzle-free micro-scale droplet generation and control
  - fast (large amplitude) bulk acoustic streaming
  - acoustic streaming in fractal porous media
  - ultrasonic modulation of *in vivo* cell signaling

University of California San Diego
Ph.D. Mechanical Engineering 2019
- UC President's Dissertation Year Fellowship (2018–2019)
- San Diego Fellowship (2014–2018)
- Graduate Student of the Year
- Interests and expertise:
  - applied math, control and stability, identification and estimation, nonlinear/nonconvex optimization, fluid mechanical systems, condensed matter systems, radiative mechanics
  - generalized differential models for anomalous spectroscopic dispersion
  - generalized frequency-domain analysis for emergent nonlocal dynamics in many-body systems
  - predictive analytics with machine learning models / feature engineering

University of California San Diego
M.S. Mechanical Engineering 2016
- San Diego Fellowship (2014–2018)
- Courses (GPA: **3.88**):
  - MAE 280 A/B: Linear Systems and Control
  - MAE 288 A: Optimal Control
  - MAE 283 A: Open-loop System Identification
  - MAE 283 B: Closed-loop System Identification and Approximate Control
  - MAE 284: Robust and Multivariable Control
  - MATH 271 A/B/C: Nonlinear Optimization (UC/EQC/IEQC)
  - MAE 210 A/B/C: Fluid Mechanics and Hydrodynamic Stability
  - MAE 208: Engineering Mathematics

University of California San Diego
B.S. Mechanical Engineering 2014
- Provost Honors, Warren College Honor Society
- Selected Courses:
  - MAE 143 A/B/C: Signals, CT/DT Control Systems
  - MAE 144: Embedded Control and Robotics
  - MATH 120 A: Complex Analysis

MiraCosta Community College
A.A. Pre-Engineering 2011
- Medal of Honor Scholarship
- President's List, President's Permanent Honor Roll
- President, Phi Theta Kappa Honor Society
- All California Academic Team

Employment

Controls Engineer (intern) June 2016–December 2016
Cymer / ASML
- Individually undertaken project to research, design, and implement automation upgrades to existing experimental apparatus.
- Machine vision driven feedback loop based on observation of a modulated hydrodynamic instability and multi-stage actuation of an imaging assembly.
- Applied technical skillsets based on project deliverables:
  - mechanical design (5%)
  - software/hardware high- and low-level interfacing (15%)
  - hydrodynamics and hydrodynamic instabilities (15%)
  - control theory (25%)
  - machine vision (40%)

Publications

Orosco, J. and Friend, J.: Thermodynamic limit on acoustic conversion efficiency for fast bulk acoustic streaming. (in preparation)

Orosco, J. and Friend, J.: Multiscale articulating differentials method for analysis and modeling of nonlinear continuous systems: Application to microacoustofluidics. (in preparation)

Orosco, J. and Zhang, S. and Friend, J.: Closed-form solution for ultrasonically-driven bulk jet streaming. (in preparation)

Orosco, J., Connacher, W., Zhang, S., and Friend, J.: Time-dependent phase unwrapping for holographic measurement of continuous interfacial dynamics. (in preparation)

Orosco, J. and Coimbra, C. F. M.: Finite Memory Nonlocal Features for Solar Power Forecasting. (in preparation)

Orosco, J. and Coimbra, C. F. M.: Simple expression for low-expense approximation of the Bloch-Grüneisen intrinsic resistivity. (in preparation)

Zhang S., **Orosco, J.**, and Friend, J.: Mechanism for low-power onset of capillary waves driven by high-frequency ultrasound. (in preparation)

Connacher, W., **Orosco, J.**, and Friend, J.: Droplet ejection at controlled angles via acoustofluidic jetting. Physical Review Letters (2020) **Link** - **PDF**

Orosco, J. and Coimbra, C. F. M.: Temperature-dependent infrared optical and radiative properties of platinum. International Journal of Heat and Mass Transfer (2019) **Link** - **PDF**

Orosco, J. and Coimbra, C. F. M.: Temperature-dependent carrier transport: Low-complexity model for the infrared optical and radiative properties of nickel. Journal of Applied Physics (2019) **Link** - **PDF**

Orosco, J. and Coimbra, C. F. M.: Anomalous carrier transport model for broadband infrared absorption in metals. Physical Review B (2018) **Link** - **PDF**

Orosco, J. and Coimbra, C. F. M.: Variable order modeling of nonlocal emergence in many-body systems: Application to radiative dispersion. Physical Review E (2018) **Link** - **PDF**

Orosco, J. and Coimbra, C. F. M.: On a causal dispersion model for the optical properties of metals. Applied Optics (2018) **Link** - **PDF**

Orosco, J. and Coimbra, C. F. M.: Optical response of thin amorphous films to infrared radiation. Physical Review B (2018) **Link** - **PDF**

Orosco, J. and Coimbra, C. F. M.: On the control and stability of variable-order mechanical systems. Nonlinear Dynamics (2016) **Link** - **PDF**

Conferences

Orosco, J. and Friend, J.: Spatiotemporal differential partitioning for one-dimensional fast acoustic streaming. Presentation. 179th Meeting of the Acoustical Society of America (2020) **Link**

Orosco, J. and Coimbra, C. F. M.: Thermophysical model for the infrared emissivity of metals. Paper and presentation. AIAA SciTech Forum (2019) **Link** - **PDF**

Orosco, J. and Coimbra, C. F. M.: Causal Models for Gauss-Lorentz Response of Solid Media to Radiative Excitation. Poster session. ASME MEED Conference (2018) **PDF**

Manuscript Review

Elsevier's Energy, The International Journal 2014–Present

Springer's Nonlinear Dynamics, An International Journal of Nonlinear Dynamics and Chaos in Engineering Systems 2016–Present

Elsevier's Chaos, Solitons & Fractals, An interdisciplinary journal of nonlinear science 2016–Present

Springer's Journal of Scientific Computing 2016–Present

AIP's Physics of Fluids 2017–Present

Elsevier's Solar Energy, The Official Journal of the International Solar Energy Society 2018–Present

The Optical Society's Applied Optics 2018–Present

Elsevier's International Journal of Non-Linear Mechanics 2018–Present

The Optical Society's Journal of the Optical Society of America A 2020–Present

The Optical Society's Optics Letters 2020–Present

Elsevier's Communications in Nonlinear Science and Numerical Simulation 2020–Present

Professional Memberships

The American Institute of Aeronautics and Astronautics (AIAA) 2018–Present

American Society of Mechanical Engineers (ASME) 2017–Present

The Optical Society (OSA) 2018–Present

Society of Industrial and Applied Mathematics (SIAM) 2017–Present

American Physical Society (APS) 2020–Present

Acoustical Society of America (ASA) 2020–Present

Selected Projects

Solar Power Variability Management (CEC grant EPC-14-008)
- California Valley Solar Ranch (250MW, PV)
  - State of the art machine learning models for power output forecasts
  - Novel memory-based feature sets engineered using cutting-edge mathematics
- Ivanpah Solar Electric Generating System (392MW, CSP)
  - MISO identification-based model of large-scale solar power plant dynamics
  - Determination of spurious plant operation behaviors based on pre- and post-modeling analysis

Self-balancing Robot - MIP
- Individual capstone controls project
- Digital implementation of continuous time modeling and control design

Fly Righting Response Experimentation Device - Fly2R
- Team capstone mechanical design project
- Developed for UCSD's Pharmacology Department for use with experimentation
- Received Departmental Best Project Award

Portable Solar Powered Sensing Station - get(Sol)
- Individual research-based design project
- Self-sustaining/monitoring sensing station, internal web/data management
- 6+ month uninterrupted runtime (unplugged, zero maintenance)

Awards and Distinctions

UC President's Postdoctoral Fellowship 2020–2021
- 1-Year scholarship: tuition, stipend, and tenure track UC hiring incentive

UC President's Dissertation Year Fellowship 2018–2019
- 1-Year scholarship: tuition and stipend

San Diego Fellowship 2014–2018
- 4-Year scholarship: tuition and stipend

MAE Department Graduate Student of the Year Spring 2019
MAE Department Best Project: Fly2R Spring 2014
UCSD Alumni Leadership Scholar July 2012
Coca-Cola Scholar March 2010
MiraCosta College Medal of Honor Scholar Apr 2010
MiraCosta College Foundation Scholar June 2010

Mentorship

William Connacher, MADLab
- PhD candidate in Materials Science at UCSD
- coauthored 2020 publication

Shuai Zhang, MADLab
- PhD student in Mechanical Engineering at UCSD

Anthony Nguyen, MAP
- high school outreach research project, Summer 2018
- accepted to and enrolled in UCSD's aerospace engineering major
- current contributing member of Coimbra Research Group

Jamiree Harrison, UC LEADS
- undergraduate research project, Summer 2017
- Ph.D. student at UCSB beginning Fall 2019

Marcel Louis, STARS
- undergraduate research project, Summer 2015
- Ph.D. student at Princeton beginning Fall 2019

Mackenzie Cottle
- high school outreach research project, Summer 2014
- currently enrolled in UCSD's mechanical engineering major

Technical Skillsets

Programming
- Syntax: Python, Matlab, Mathematica, C/C++, Git/SVN, LaTeX, Bibtex
- Environment: *nix, Windows
- Frameworks: XGBoost, SKLearn, Pandas, CVXPY

Data Science
- Data quality assessment
- Feature engineering
- Regressive models
- Time series analysis

Design and Simulation
- Eagle PCB, Inventor and Autocad, SolidWorks

Circuits and Electronics
- PCB (SMD) prototyping and design, SMD hand-soldering
- Signal conditioning, sensing, actuation
- μC: BeagleBone, Arduino, Raspberry Pi

Rapid Prototyping
- Machining, lasercamm

Graphical Design
- Adobe Photoshop and Illustrator