

## RESEARCH INTERESTS

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- Stochastic multiscale modeling of complex systems including: granular materials, turbulent flows and multi-agent systems.
- Machine learning methods for discovering physical laws from data.

## EDUCATION

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<b>Stanford University</b> Ph.D. in Granular Materials, Advisor: Daniel Tartakovsky Department of Energy Resources Engineering Thesis: <i>Stochastic multiscale modeling of complex materials</i>	Palo Alto, CA 2017–2020
<b>University of California San Diego</b> M.S. in Fluid Dynamics Department of Mechanical and Aerospace Engineering	San Diego, CA 2013–2016
<b>American University of Beirut</b> B.Eng. in Mechanical Engineering	Beirut, Lebanon 2009–2013
<b>Lebanese National Higher Conservatory of Music</b> B.A. in Piano Performance	Beirut, Lebanon 2003–2013

## PUBLICATIONS

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1. **Bakarji, J.**, Callaham, J., Brunton, S. & Kutz, N., “Dimensionally Consistent Learning with Buckingham Pi”, *arXiv preprint*, 2022
2. **Bakarji, J.**, Champion, K., Kutz, N. & Brunton, S. “Discovering Governing Equations from Partial Measurements with Deep Delay Autoencoders”, *arXiv preprint*, 2022
3. **Bakarji, J.**, & Tartakovsky, D. M., “Data-driven discovery of coarse-grained equations”, *Journal of Computational Physics*, 2020
4. **Bakarji, J.**, & Tartakovsky, D. M., “Microstructural heterogeneity drives reaction initiation in granular materials”, *Applied Physics Letters*, 2019
5. **Bakarji, J.**, O’Malley, D., & Vesselinov, V. V., “Agent-based socio-hydrological hybrid modeling for water resource management”, *Water Resources Management*, 2017
6. **Bakarji, J.**, & Tartakovsky, D. M., “On the use of reverse Brownian motion to accelerate hybrid simulations”, *Journal of Computational Physics*, 2017
7. **Bakarji, J.**, Keniar, K., Cheikh, M., & Lakkis, I., “A reduced-order model of a microfluidic transistor.”, *ASME International Mechanical Engineering Congress and Exposition*, 2013

8. **Bakarji, J.**, & Tartakovsky, D. M. , “Stochastic pore collapse models in granular materials”, *arXiv preprint, 2020*
9. **Bakarji, J.**, D. M. , “Machine Learning for Music Glove Instrument”, *arXiv preprint, 2020*

## EXPERIENCE

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<b>University of Washington</b> Postdoctoral Fellow, Mechanical Engineering, w/ Steven Brunton and Nathan Kutz	Seattle, WA 2020-Current
– Data-driven discovery of nonlinear dynamics in complex systems	
<b>Los Alamos National Lab</b> Earth and Environmental Sciences	Los Alamos, NM Summers 2014-16
– Computational agent based modeling for socio-hydrological simulations	
<b>University of California San Diego</b> Music Technology Lab	San Diego, CA 2015-2016
– Design, building and machine learning of a glove musical instrument	
<b>University of California Berkeley</b> Swarm Lab	Berkeley, CA Summer 2012
– Finless micro-rocket: Modeling, control, manufacturing of micro-rockets without fins	
<b>American University of Beirut</b> Microflows and Microscale Heat Transfer Lab	Beirut, Lebanon 2011-2013
– Modeling and simulation of a lab-on-a-chip microfluidic transistor	

## TEACHING

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- **Instructor** at GTLogic Summer 2021  
*Introduction to Machine Learning*
- **Instructor** at University of Washington Spring 2021  
*Deep Learning for Fluid Dynamics*
- **Instructor** at American University of Beirut Summer 2018  
*Introduction to Multiphase Flow in Porous Media*
- **Teaching Assistant** at Stanford University Winter 2017  
*Applied Mathematics for Reservoir Engineering*
- **Teaching Assistant** at UC San Diego Fall 2017  
*Introduction to Uncertainty Quantification*
- **Teaching Assistant** at UC San Diego Winter 2016  
*Dynamics*
- **Teaching Assistant** at UC San Diego Winter 2015  
*Dynamics and Control of Aircraft Vehicles*
- **Teaching Assistant** at UC San Diego Spring 2014

## *Aircraft Engineering Design*

- **Teaching Assistant** at UC San Diego Summer 2015  
*Introduction to Music Technology*
- **Instructor** at Lebanese National Higher Conservatory of Music 2011-2013  
*Piano performance*
- **Online Lectures** on YouTube  
<https://www.youtube.com/c/JosephBakarji>

## LANGUAGES

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- **Programming:** Python (Tensorflow), Matlab, Julia, C/C++, Fortran, Labview, Assembly
- **Spoken:** English (Fluent), French (Fluent), Arabic (Fluent), Italian (Intermediate).

## AWARDS

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- Henry J. Ramey, Jr. Fellowship Award, Stanford University 2020
- Frank G. Miller Fellowship Award, Stanford University 2018
- MATLAB Award, Big Earth Hackathon 2017
- Best Poster Award, Los Alamos National Laboratory 2016
- SME boat competition gold medal 2013

## SPEAKER

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- USC Invited seminar speaker (Los Angeles, CA) 2022
- APS Division of Fluid Dynamics (Phoenix, AZ) 2021
- SIAM Annual Meeting (Virtual) 2021
- CMU Scientific Machine Learning - Invited Speaker (Virtual) 2021
- SIAM Computational Science and Engineering Conference (Virtual) 2021
- SIAM Computational Science and Engineering Conference (Spokane, WA) 2019
- Multiscale Modeling Workshop AFOSR (Eglin FL, WA) 2018
- Air Force Research Lab Annual Review (Washington, DC) 2016
- SIAM Geosciences Conference (Stanford, CA) 2014

## SOFTWARE

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[www.github.com/josephbakarji/](http://www.github.com/josephbakarji/)

- **granular-compaction:** Monte Carlo 1D dynamic compaction of a two-phase multiscale granular material
- **NewsAndTime:** Machine learning algorithm for predicting date of publication from content of news article
- **learning-pdf:** Sparse identification of PDF equation and closure models based on Monte Carlo simulations

- **Socio-hydro-abm:** Agent based simulations and control of socio-hydrological models
- **Gluvn:** Sensor I/O and machine learning for Music glove instrument

## MUSIC

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[www.soundcloud.com/user-343358875](http://www.soundcloud.com/user-343358875)

- International composition conference for young composers, Cergy Pontoise, France 2011
- Compositions performances by Quatuor de Beyrouth (2006) and Symblema (2012)
- Second prize, AUB's got talent 2012
- Third prize, Babikian piano competition 2009
- First prize, Lions Club piano competition 2008
- Second prize, LaMajeur piano competition 2008
- Piano concert, Lebanese National Conservatory 2008
- Master classes with S. Bunin, E. Sombart, W. Howrani and W. Mousallem
- Piano concert, Lebanese National Conservatory 2008