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| APPOINTMENT | Graduate Research Assistant Shields Uncertainty Research Group Department of Civil and Systems Engineering Johns Hopkins University | Sept. 2019 - present |
| CONTACT INFORMATION | 303 Latrobe Hall, 3400 N Charles St Baltimore, MD 21218 USA ✉ kontolati@jhu.edu (e-mail) 💻 katianakontolati.com (personal website) in linkedin.com/in/katiana-kontolati (LinkedIn) 📄 github.com/katiana22 (GitHub) | |
| RESEARCH INTERESTS | My research is centered around physics-informed machine learning and uncertainty quantification. I focus on the development of probabilistic data-driven approaches for accelerating and enhancing predictive modeling and optimization in physics-based and engineering systems under uncertainty. | |
| EDUCATION | Johns Hopkins University , Baltimore MD, USA Ph.D. in Civil and Systems Engineering <ul style="list-style-type: none"> • Research areas: Physics-informed machine learning, uncertainty quantification • Advisor: Michael D. Shields, Associate Professor • G.P.A.: 3.85/4.0 National Technical University of Athens , Athens, Greece M.Sc. in Applied Mechanics, GPA: 9.40/10.0 Major: Non-linear Dynamics University of Thessaly , Volos, Greece Diploma in Civil Engineering, (5-year curriculum), GPA: 8.90/10.0 Major: Structural Engineering, Numerical Analysis | Aug. 2019 - present Sept. 2017 - July 2019 Sept. 2012 - July 2019 |
| EXPERIENCE | General Electric (GE) Research , Niskayuna, NY Research Engineer Intern, Probabilistic Design & Optimization <ul style="list-style-type: none"> • Designed and developed a transfer learning framework to leverage multi-fidelity CFD simulation data of industrial gas turbines (IGT) for efficient aerodynamic assessment based on the airfoil shape design of turbine blades. • Developed a time series analysis framework as part of a BWRX-300 nuclear reactor digital twin to predict mechanical stresses and optimize operation and proactive maintenance. • Performed surrogate modeling on low-dimensional manifolds and improved predictive accuracy of hydrogen flame propagation in zero-emission hydrogen internal combustion engines (ICE). Los Alamos National Laboratory , Los Alamos, NM Applied Machine Learning Research Fellow, CCS-3 <ul style="list-style-type: none"> • Developed a framework for constructing neural density estimators with normalizing flows on spectral latent spaces for regression and uncertainty quantification in very high-dimensional experimental spectral data. • Applied proposed framework to laser-induced breakdown spectroscopy (LIBS) spectra generated by the Mars Curiosity rover to predict the elemental composition of Martian rocks and soil with associated uncertainties. • Presented work at NeurIPS 2021 Workshop on Machine Learning and the Physical Sciences. | May 2022 - present Jun. 2021 - Aug. 2021 |

Johns Hopkins Univeristy, Baltimore, MD
Shields Uncertainty Research Group

Aug. 2019 - present

- Developing methodologies based on low-dimensional manifold learning and deep learning for surrogate modeling and uncertainty quantification in high-dimensional stochastic systems. Open-sourcing all codes on GitHub.
- Implemented proposed techniques for a variety of applications including parameterizing macroscopic models from atomistic simulation data and learning solutions of non-linear PDEs describing complex physico-chemical processes.
- Published 6 papers (5 first-author, 2 under review) in peer-reviewed journals and presented in 5 International Conferences.
- Co-developer of **UQpy** (Uncertainty Quantification with python), a general purpose Python toolbox for modeling uncertainty in physical and mathematical systems. Contributing to the *Dimension Reduction* and *Surrogates* modules.

Aktor S.A., Athens, Greece

June. 2016 - Sept. 2016

Construction Managemet Intern

- Oversaw the entire planning and building process of the retrofitting of the Akron Ilion Krystal building and reported the quality of performance on site to all site construction managers.
- Developed CAD drawings, calculated final material quantities and costs and performed preliminary engineering reviews on the detailed construction and demolition plan drawings.
- Utilized structural and earthquake engineering software SAP2000, for preliminary numerical analysis of structural elements during the demolition process.

HONORS & AWARDS

National Science Foundation Fellowship

Sept. 2021

MMLDT-CSET Conference, San Diego, California

Teaching Assistant Award

May 2021

Department of Civil and Systems Engineering, Johns Hopkins University

Applied Machine Learning Summer Research Fellowship

Feb. 2021

Los Alamos National Laboratory

Joseph Meyerhoff Fellowship

Aug. 2019

Whiting School of Engineering, Johns Hopkins University

Graduate Research Fellowships

Mar. 2019

Cornell University & ETH Zürich (declined)

COST Travel Grant

Apr. 2017

European Cooperation in Science & Technology, Action TU 1304

TEACHING EXPERIENCE

Gateway Computing: Python (EN.500.113)

Fall 2021

Course Assistant, Johns Hopkins University

Introduction to Research (EN.560.511)

Spring 2021

Teaching Assistant, Johns Hopkins University

PUBLICATIONS

Journal Publications (* denotes equal contribution)

1. Goswami, S.*, **Kontolati, K.***, D. Shields, M., E. Karniadakis, G., (2022). Deep transfer learning for partial differential equations under conditional shift with DeepONet. <https://doi.org/10.48550/arXiv.2204.09810> (under review).
2. **Kontolati, K.***, Goswami, S.*, D. Shields, M., E. Karniadakis, G., (2022). On the influence of over-parameterization in manifold based surrogates and deep neural operators. <https://doi.org/10.48550/arXiv.2203.05071> (under review).
3. **Kontolati, K.**, Loukrezis, D., Giovanis, D. G., Vandanapu, L., Shields, M. D. (2022). A survey of unsupervised learning methods for high-dimensional uncertainty quantification in black-box-type problems. *Journal of Computational Physics*, 111313. <https://doi.org/10.1016/j.jcp.2022.111313>.

4. R. M. dos Santos, K., Giovanis D., Loukrezis, D., **Kontolati, K.**, D. Shields M. (2022). Grassmannian diffusion maps based surrogate modeling via geometric harmonics. *International Journal for Numerical Methods in Engineering*, 1-23. <https://doi.org/10.1002/nme.6977>.
5. **Kontolati, K.**, Loukrezis, D., Giovanis, D., M. dos Santos, K., D. Shields, M. (2022). Manifold learning-based polynomial chaos expansions for high-dimensional surrogate models. *International Journal for Uncertainty Quantification*, 12(4): 39-64. <https://doi.org/10.1615/Int.J.UncertaintyQuantification.2022039936>.
6. **Kontolati, K.**, Alix-Williams, D., Boffi, N. M., Falk, M. L., Rycroft, C. H., and Shields, M. D. (2021). Manifold learning for coarse-graining atomistic simulations: Application to amorphous solids. *Acta Materialia*, 215, 117008. <https://doi.org/10.1016/j.actamat.2021.117008>.
7. **Kontolati, K.** and Siettos, C. (2019). Numerical analysis of mesenchymal stem cell mechanotransduction dynamics reveals homoclinic bifurcations. *International Journal of Non-Linear Mechanics*, 113, 146-157. <https://doi.org/10.1016/j.ijnonlinmec.2019.04.001>.

Conference Proceedings

1. **Kontolati, K.**, Loukrezis, D., R. M. dos Santos, K., Giovanis, D., D. Shields M. (2022). Manifold learning for forward and inverse UQ in high dimensions, *SIAM Conference on Uncertainty Quantification*, Atlanta, Georgia, USA, April 12-15.
2. **Kontolati, K.**, Klein, N., Panda, N., Oyen D. (2021). Neural density estimation and uncertainty quantification for laser-induced breakdown spectroscopy spectra, *NeurIPS 4th Workshop on Machine Learning and the Physical Sciences*. [paper], [poster].
3. **Kontolati, K.**, Loukrezis, D., Giovanis, D., R. M. dos Santos, K., D. Shields M. (2021). Non-linear manifold-learning based dimensionality reduction for surrogate modeling and uncertainty quantification, *Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology*, San Diego, California, USA, September 26-29.
4. **Kontolati, K.**, L. Falk M., H. Rycroft C., D. Shields M. (2021). Atomistic-informed calibration of partial differential equations for material applications via machine learning. *SIAM Conference on Mathematical Aspects of Material Science*, Bilbao, Spain, May 17-28.
5. **Kontolati, K.**, Alix-Williams D., L. Falk M., H. Rycroft C., D. Shields M. (2021). Stochastic multi-scale material modeling via manifold learning. *4th International Conference on Uncertainty Quantification in Computational Sciences and Engineering*, Athens, Greece, June 27-30.
6. **Kontolati K.**, Koukouselis, A, Panagouli, O. (2017). Numerical investigation of weak-axis I profile connections, *9th Hellenic National Conference on Steel Structures*, Larissa, Thessaly, Greece, October 5-7.

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| INVITED TALKS | General Electric (GE) Research , Probabilistics Seminar, Niskayuna NY | Oct. 2021 |
| | CRUNCH Seminar , Division of Applied Math., Brown University, Providence RI | Sept. 2021 |
| | Dynamical Systems and Complexity , 26 th Summer School, Athens Greece | Jul. 2019 |
| TECHNICAL SKILLS | Languages: Python, FORTRAN, SQL | |
| | Software: PyTorch, Tensorflow, Mathematica, MSC Marc, AutoCAD 2D/3D | |
| | Operating Systems: Microsoft Windows, Apple MacOS, Linux/Unix | |
| | Software Development: UQpy (Uncertainty Quantification with Python) | |
| SERVICE & LEADERSHIP | Reviewer for peer-reviewed journals: Journal of Computational Physics | 2020 - present |
| | Graduate Representative Organization (GRO) , Advocacy Chair, JHU | 2020 - 2021 |
| | Homewood Council of Inclusive Excellence (HCIE) , GS2F member, JHU | 2020 - 2021 |
| | ISAH Ambassador @ Hopkins , Education and Administration Committee, JHU | 2020 |
| | Homewood Graduate Board (HGB) , Representative Ph.D. student of Whiting School of Engineering, JHU | 2020 |

Machine Learning in Science & Engineering Conference 2020,
Volunteer, Columbia University

2020

LANGUAGES English (fluent), Greek (native), Japanese (learner)