Audrey Olivier

Assistant Professor
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Professional Experience

University of Southern California, Dept. of Civil and Environmental Engineering
Assistant Professor — *2021 – –*

Johns Hopkins University, Hopkins Extreme Materials Institute
Postdoctoral Fellow — *2018 – 2020*

Columbia University, Dept. of Civil Engineering & Engineering Mechanics
Associate Research Scientist — *2020 – 2021*
Postdoctoral Fellow — *2017 – 2018*
PhD in Civil Engineering and Engineering Mechanics — *2013 – 2017*

Education

Columbia University, Dept. of Civil Engineering & Engineering Mechanics
Ph.D. — *October 2017*
- Dissertation: Enhancements of Online Bayesian Filtering Algorithms for Efficient Monitoring and Improved Uncertainty Quantification in Complex Dynamical Systems
- Advisor: Prof. Andrew W. Smyth

M.S. — *May 2013*
- Major in Structural Engineering

École Centrale de Nantes, Nantes, France
Diplôme d'Ingénieur (equivalent to a M.S., joint degree with Columbia University) — *November 2013*
B.S. in Engineering — *November 2011*

Publications

Published in peer-reviewed journals

[10] S. Mohammadi, **A. Olivier**, and A. Smyth. "Probabilistic Prediction of Trip Travel Time using Hierarchical Bayesian Learning". In: *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering* 9 (2 2023). DOI: 10.1061/AJRUA6.RUENG-981.

[9] **A. Olivier**, M. Adams, A. Smyth, S. Mohammadi, K. Thomson, T. Kepler, and M. Dadlani. "Data analytics for improved closest hospital suggestion for EMS operations in New York City". In: *Sustainable Cities and Society* 86 (2022), p. 104104. DOI: 10.1016/j.scs.2022.104104.

[8] A. Bhaduri, A. Gupta, **A. Olivier**, and L. Graham-Brady. "An efficient optimization based microstructure reconstruction approach with multiple loss functions". In: *Computational Materials Science* 199 (2021), p. 110709. DOI: 10.1016/j.commatsci.2021.110709.

[7] **A. Olivier**, M. D. Shields, and L. Graham-Brady. "Bayesian neural networks for uncertainty quantification in data-driven materials modeling". In: *Computer Methods in Applied Mechanics and Engineering* 386 (2021), p. 114079. DOI: 10.1016/j.cma.2021.114079.

[6] **A. Olivier**, D. Giovanis, B. Aakash, M. Chauhan, L. Vandanapu, and M. Shields. "UQpy: A general purpose Python package and development environment for uncertainty quantification". In: *Journal of Computational Science* 47 (2020), p. 101204. DOI: https://doi.org/10.1016/j.jocs.2020.101204.

[5] **A. Olivier** and A. Smyth. "A marginalized unscented Kalman filter for efficient parameter estimation with applications to finite element models". In: *Computer Methods in Applied Mechanics and Engineering* 339 (2018), pp. 615–643. DOI: 10.1016/j.cma.2018.05.014.

[4] **A. Olivier** and A. Smyth. "On the Performance of Online Parameter Estimation Algorithms in Systems with Various Identifiability Properties". In: *Frontiers in Built Environment* 3 (2017). DOI: 10.3389/fbuil.2017.00014.

[3] **A. Olivier** and A. Smyth. "Particle filtering and marginalization for parameter identification in structural systems". In: *Structural Control & Health Monitoring* 24 (3 2017), e1874. DOI: 10.1002/stc.1874.

[2] **A. Olivier** and A. Smyth. "Review of Nonlinear Filtering for SHM with an Exploration of Novel Higher-Order Kalman Filtering Algorithms for Uncertainty Quantification". In: *Journal of Engineering Mechanics* 143.11 (2017), p. 04017128. DOI: 10.1061/(ASCE)EM.1943-7889.0001276.

[1] **A. Olivier** and A. Smyth. "Trade offs between statistical agreement and data reproduction in the generation of synthetic ground motions". In: *Probabilistic Engineering Mechanics* 43 (2016), pp. 36–49. DOI: 10.1016/j.probengmech.2015.10.009.

Published in peer-reviewed conference proceedings

[2] E. L. de Larrea, H. Lam, E. Sanabria, J. Sethuraman, S. Mohammadi, **A. Olivier**, A. Smyth, E. Dolan, N. Johnson, T. Kepler, A. Quayyum, and K. Thomson. "Simulating New York City Hospital Load Balancing During COVID-19". In: *2021 Winter Simulation Conference (WSC)*. 2021, pp. 1–12. DOI: 10.1109/WSC52266.2021.9715419.

[1] E. Sanabria, H. Lam, E. L. de Larrea, J. Sethuraman, S. Mohammadi, **A. Olivier**, A. Smyth, E. Dolan, N. Johnson, T. Kepler, A. Quayyum, and K. Thomson. "Short-Term Adaptive Emergency Call Volume Prediction". In: *2021 Winter Simulation Conference (WSC)*. 2021, pp. 1–12. DOI: 10.1109/WSC52266.2021.9715409.

Accepted for publication

[1] T. Kontoroupi, A. Smyth, and **A. Olivier**. "Probabilistic structural identification and prognosis of a full-scale bridge pier subjected to base excitation". Accepted, to be included in proceedings of the 8WCSCM conference.

Submitted for review

[1] **A. Olivier**, S. Mohammadi, A. Smyth, and M. Adams. *Bayesian neural networks with physics-aware regularization for probabilistic travel time modeling*. Under review in Computer-Aided Civil and Infrastructure Engineering.

Conferences and Invited Talks

Invited Talks

- **A. Olivier**, "Bayesian Learning of Neural Networks for Small or Imbalanced Data Sets", invited USACM UQ virtual seminar, December 2021.
- **A. Olivier**, "Data-assisted high-fidelity modeling for monitoring of civil systems," invited talk at École Polytechnique Fédérale de Lausanne, Switzerland, September 2019; Caltech, 2019; UC Berkeley, March 2019; Princeton University, February 2019.
- **A. Olivier**, "Utilisation des algorithmes de filtrage bayésiens pour l'identification des systèmes dynamiques non-linéaires et la conception optimale d'expériences.", invited talk at École Centrale-Supélec, Paris, France, January 2019.

Presentations at conferences

* presenting author

- T. Kontoroupi, A.W. Smyth, **A. Olivier***, "Probabilistic structural identification and prognosis of a full–scale bridge pier subjected to base excitation," 8th World Conference on Structural Control and Monitoring (8WCSCM), June 2022, Orlando, FL.
- **A. Olivier***, M. Adams, S. Mohammadi, A.W. Smyth, K. Thomson, E. Dolan, "Probabilistic data analytics for improved closest hospital suggestion in New York City," Engineering Mechanics Institute (EMI) 2022 Conference, Johns Hopkins University, MD.
- **A. Olivier***, "Bayesian learning of neural networks for small or imbalanced data sets," SIAM UQ 2022, Atlanta, GA.
- G. Soimiris*, **A. Olivier**, R. Becker, J. Knap, M. Shields, "A Diffusion Maps Surrogate Model for the Analysis and Simulation of Three-Dimensional Aluminum Materials with Random Voids," Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology (MMLDT-CSET 2021), San Diego, CA.
- **A. Olivier***, M. Shields, L. Graham-Brady, "Uncovering exploitable insights from microstructures using machine learning algorithms," EMI 2019 Conference, Caltech, CA.
- **A. Olivier***, A.W. Smyth, "A marginalized unscented Kalman filter for efficient parameter estimation with applications to finite element models," 13th World Congress in Computational Mechanics, July 2018, New York, NY.
- **A. Olivier***, A.W. Smyth, "On the performance of on-line parameter estimation algorithms in systems which exhibit challenging identifiability properties," EMI 2017 Conference, San Diego, CA.
- **A. Olivier***, A.W. Smyth, "Strategies to tackle the dimensionality issue for nonlinear Bayesian filtering and parameter identification," EMI 2016 Conference, Nashville, TN.
- **A. Olivier***, A.W. Smyth, "Toward high-dimensional nonlinear structural system Bayesian state/parameter estimation," EMI 2015 Conference, Stanford University, CA.

Poster sessions

* presenting author

- **A. Olivier***, M. Shields, L. Graham-Brady, "Uncovering exploitable insights from microstructures using machine learning algorithms," 2019 Mach Conference, Annapolis, MD.

Funding

- Smart Contingency Analysis Neural Network (SCANN) For Advanced Integrated Resource Planning
  Funding Source: Idaho National Laboratory / DOE
  Award Amount: $98,000.00
  Project Period: February 2023 – September 2023
  Objective(s): Integrate advanced Bayesian Neural Network (BNN) capabilities within SCANN to quantify contingencies and their associated uncertainties, investigate approaches for physics-based multi-fidelity NNs within the Bayesian framework

Funding application experience as a Ph.D. student

- Assisted my PhD advisor in writing a successful National Science Foundation grant.
  Title: High Fidelity Probabilistic Structural Health Monitoring (CMMI-1563364).
  Award Amount: $342,697.00; Project Period: July 2016 – June 2020
- Awarded a $700 travel assistantship to attend the 2018 Engineering Mechanics Institute Conference and the panel discussion on diversity and inclusion.

Teaching

Courses taught at USC:

UG: undergraduate, G: graduate course

- Probability Concepts and Civil Engineering (CE119, UG, 2 units)
  Fall 2022 (39 students), Fall 2021 (35 students)
- Uncertainty Quantification in Civil and Environmental Engineering (CE599, G, 2 units)
  New course introduced in Fall 2021
  Fall 2022 (12 students), Fall 2021 (8 students)
- Structural Identification and Health Monitoring (CE599, G, 4 units)
  New course introduced in Spring 2023
  Spring 2023 (7 students)

Occasional lecturer (as a graduate student / postdoc):

- Dynamics and Vibrations (UG, Columbia University)
- Probabilistic Methods in Civil Engineering and Mechanics (G, Johns Hopkins University)
- Advanced Mechanics (G, Columbia University)
- Uncertainty and Risk in Infrastructure Systems (G, Columbia University)

Teaching Assistant (Columbia University, 2015-2016):

- Advanced Design of Concrete Structures (G, Fall 2015, 26 students)
- Design of Prestressed Concrete Structures (G, Spring 2016, 13 students)
- Engineering for Developing Communities (UG, Spring 2016, 48 students)

Mentoring

Current PhD students:

- Nicholas De Araujo Gonzalez Casaprima, started Fall 2022
- Javad Ghorbanian, started Spring 2022
- Nihan Bilgin, started Fall 2021

Committee member:

- Qualifying exams
  2022: Stepp Mayes (Prof. Sanders)
  2021: Ezgi Cinar (Prof. Lynett)
- Screening exams
  2023: Elie Hamouche (Prof. Ghanem), Zhexian Li (Prof. Savla), Kelli McCoy (Prof. Ghanem), Rashid Shams (Prof. Nweke), Abigail Stehno (Prof. Lynett), Zhengtao Yao (Prof. Ghanem)
  2022: Zihao Wang (Prof. Soibelman), Minhao Wu (Prof. Nweke)

Honors and Awards

Rising Stars in Computational & Data Sciences, 2019:

Oden Institute for Computational Engineering and Sciences, UT Austin
Selected to attend the "Rising Stars in Computational & Data Sciences" workshop for young female researchers (2019).

Mindlin Scholar in Civil Engineering and Engineering Mechanics (May 2017):

The Fu Foundation School of Engineering and Applied Science, Columbia University
In recognition of superior achievement and in honor of the integrity, curiosity, and creativity exhibited as a student during doctoral studies.

Caltech's 2017 "Young Investigator Lecturer in Engineering and Applied Science":
Division of Engineering and Applied Science, California Institute of Technology
Selected to present my work at Caltech (while a PhD student)

Department Teaching Assistant Excellence Award (Fall 2015):
Dept. of Civil Engineering and Engineering Mechanics, Columbia University
Recipient for outstanding performance as a TA for the Advanced Design of Concrete Structures course.

Service

Research Community

Professional Memberships:
- ASCE/EMI *2022 – –*
- USACM *2022 – –*

Reviewer for peer-review journals:
Mechanical Systems and Signal Processing, Journal of Engineering Mechanics, Journal of Sound and Vibration, Structural Control & Health Monitoring, Mechanics of Materials, IEEE Transactions on Aerospace and Electronic Systems

Other:
- Organizing mini-symposia at various conferences in the Summer 2023, including a mini-symposium on "Learning from small data: Data-driven methods and machine learning for uncertainty quantification in engineering applications" (at UNCECOMP), and "Maximizing information content for data-scarce engineering mechanics applications" (at EMI)
- Invited Panelist and Mentor – mini-symposium on "Building Research Careers in Structural Control and Monitoring", 8WCSCM conference, June 2022

Department Service (USC)

- Revision of MSCE Program for Structures-Mechanics-Materials *2022*
- Annual Faculty Review (AFR) Committee *2022*
- TA/RA Awards Selection Committee *2021*

Department Service (as a graduate student)

Columbia University:
- Managed the Department Graduate Student Seminar (2015 - 2017).
- Participated as a student representative in committee meetings such as the Industry Advisory Committee.

École Centrale de Nantes:
- *Forum Atlantique Association*, Member (2011 - 2012). In charge of transportation-related matters during annual event.
- *Centrale Idées Association*, Treasurer (2011 - 2012).

Outreach

- *Afterschool STEM Mentoring Program*, Mentor (2016 - 2017). Taught/mentored a class of about fifteen 5th graders; focus was set on teaching STEM (Science, Technology, Engineering, Mathematics) lessons, one hour per week.
- *Language Exchange Program Fellow, International House*, New York (Spring 2016). Organized languages classes/meetings between I-House residents.
- *Read Ahead, New York*. Mentor (2014 - 2015). Mentored a 5-th grader throughout the year and provided help in reading.