# Subhayan De

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*University of Colorado, Boulder*
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## OVERVIEW

Postdoctoral Associate, Former Viterbi Ph.D. Fellow, **Nationality:** Indian.

## EDUCATION

**Ph.D. in Civil Engineering** May 2018
*University of Southern California, Los Angeles*
GPA: **4.0 out of 4.0**.
Thesis title: "A Novel Probabilistic Hybrid Framework for Model Validation".
Thesis advisor: Prof. Erik A. Johnson.
Co-advisor: Prof. Steven F. Wojtkiewicz.

**M.S. in Electrical Engineering** May 2016
*University of Southern California, Los Angeles*
GPA: **4.0 out of 4.0**.
Projects: *Structural system identification, model selection, and damage detection using wavelet approaches*, *Machine Learning for Musical Year Prediction.*

**M.Eng. in Structural Engineering** 2011-2013
*Indian Institute of Science (IISc), Bangalore*
GPA: **7.5 out of 8** (Rank: 1st).
Thesis title: *"Bayesian model selection in structural engineering"*.
Project: *Application of Multigrid Methods in Structural Mechanics Problems.*

**B.Eng. in Civil Engineering with Honours** 2007-2011
*Jadavpur University, Kolkata*
GPA: **9.28 out of 10** (Rank: 3rd).
Project: *Genetic Algorithm in Civil Engineering Applications.*

## EXPERIENCE

**University of Colorado, Boulder**
*Postdoctoral Associate* June 2018 - present
Ann and H.J. Smead Department of Aerospace Engineering Sciences
University of Colorado, Boulder
*Collaborators:* Prof. Alireza Doostan and Prof. Kurt Maute
*Lecturer for Random Vibrations* Spring 2019
Ann and H.J. Smead Department of Aerospace Engineering Sciences
University of Colorado, Boulder

*Visiting Scholar* May 2018 - June 2018
Ann and H.J. Smead Department of Aerospace Engineering Sciences
University of Colorado, Boulder

**University of Southern California**

*Graduate Research Assistant* 2014, 2016-2017
Sonny Astani Department of Civil and Environmental Engineering
University of Southern California
*Supervisor:* Prof. Erik A. Johnson.

*Viterbi Ph.D. Fellow* 2013, 2015
Sonny Astani Department of Civil and Environmental Engineering
University of Southern California

*Teaching Assistant for CE 408: Risk Analysis in Civil Engineering* Fall 2017
Sonny Astani Department of Civil and Environmental Engineering
University of Southern California

*Teaching Assistant for CE 529a: Finite Element Analysis* Summer 2017
Sonny Astani Department of Civil and Environmental Engineering
University of Southern California

*Teaching Assistant for CE 205: Statics* Fall 2016
Sonny Astani Department of Civil and Environmental Engineering
University of Southern California

**Indian Institute of Science**

*Graduate Research Assistant* 2012-2013
Department of Civil and Environmental Engineering
Indian Institute of Science
**Supervisors:** Prof. C. S. Manohar and Prof. Debraj Ghosh

## JOURNAL PUBLICATIONS

### Published

1. **S. De**, S. F. Wojtkiewicz, and E. A. Johnson, "Computationally Efficient Optimal Design of Passive Control Devices for a Benchmark Cable-Stayed Bridge", *Structural Control and Health Monitoring*, (2017).

2. **S. De**, E. A. Johnson, S. F. Wojtkiewicz, and P. T. Brewick, "Computationally-Efficient Bayesian Model Selection for Locally Nonlinear Structural Dynamic Systems", *Journal of Engineering Mechanics (**Editor's choice**)*, (2018).

3. **S. De**, P. T. Brewick, E. A. Johnson, and S. F. Wojtkiewicz, "Investigation of Model Falsification using Error and Likelihood Bounds with Application to a Structural System", *Journal of Engineering Mechanics (**Editor's choice**)*, (2018).

4. **S. De**, P. T. Brewick, E. A. Johnson, and S. F. Wojtkiewicz, "A Probabilistic Hybrid Framework for Model Validation with Application to Structural Dynamics Modeling", *Mechanical Systems and Signal Processing*, (2019).

**In review**

5. **S. De**, J. Hampton, K. Maute, and A. Doostan, "Topology Optimization under Uncertainty using a Stochastic Gradient-based Approach", *Structural and Multidisciplinary Optimization*, (in review).

6. **S. De**, K. Maute, and A. Doostan, "Bi-fidelity Stochastic Gradient Descent for Structural Optimization under Uncertainty", *Computational Mechanics*, (in review).

7. **S. De**, E. A. Johnson, and S. F. Wojtkiewicz, "Multilevel estimation of marginal likelihood for Bayesian model selection", *Mechanical Systems and Signal Processing*, (in review).

8. **S. De**, J. Britton, M. Reynolds, and A. Doostan, "Transfer Learning of Neural Networks using Bi-fidelity Data for Uncertainty Propagation", *International Journal for Uncertainty Quantification*, (in review).

**In preparation**

9. **S. De**, T. Yu, P. T. Brewick, E. A. Johnson, and S. F. Wojtkiewicz, "Response Prediction of Uncertain Structural Systems with Passive Control Devices using Model Falsification", *Journal TBD*, (in preparation).

## CONFERENCE

1. **S. De**, M. Kamalzare, E. A. Johnson, and S. F. Wojtkiewicz, "Efficient Optimal Design of Passive Structural Control Devices for Complex Structures", *ASCE Engineering Mechanics Institute Conference, McMaster University, Hamilton, ON, Canada*, (Student Paper Competition Finalist) (2014).

2. **S. De**, M. Kamalzare, E. A. Johnson, and S. F. Wojtkiewicz, "Computationally Efficient Bayesian Model Selection for Structural Systems with Local Nonlinearities", *ASCE Engineering Mechanics Institute Conference, McMaster University, Hamilton, ON, Canada*, (2014).

3. **S. De**, S. F. Wojtkiewicz, and E. A. Johnson, "Efficient Optimal Design-Under-Uncertainty of Passive Structural Control Devices", *Proceedings of the 12th International Conference on Applications of Statistics and Probability in Civil Engineering (ICASP12), Vancouver, BC, Canada, T. Haukaas (Ed.)*, (2015).

4. **S. De**, E. A. Johnson, and S. F. Wojtkiewicz, "Fast Bayesian Model Selection with Application to Large Locally-Nonlinear Dynamic Systems", *6th International Conference on Advances in Experimental Structural Engineering, 11th International Workshop on Advanced Smart Materials and Smart Structures Technology, University of Illinois, Urbana-Champaign, IL, USA*, (2015).

5. **S. De**, E. A. Johnson, S. F. Wojtkiewicz, and P. T. Brewick, "Efficient Bayesian Model Selection for Locally Nonlinear Systems incorporating Dynamic Measurements", *10th International Workshop on Structural Health Monitoring (IWSHM)*, (2015).

6. **S. De**, P. T. Brewick, E. A. Johnson, and S. F. Wojtkiewicz, "Exploration of Error Rate Criteria to Decide Bounds for Model Falsification", *ASCE Engineering Mechanics Institute Conference, Vanderbilt University, Nashville, TN, USA*, (2016).

7. **S. De**, P. T. Brewick, E. A. Johnson, S. F. Wojtkiewicz, and I. Bermejo-Moreno, "Error and Likelihood Bounds for Falsification of Dynamical Models", *IMAC XXXV Conference, Hyatt Regency Orange County, CA, USA*, (2017).

8. **S. De**, E. A. Johnson, and S. F. Wojtkiewicz, "Efficient Uncertainty Quantification for Locally Nonlinear Dynamical Systems", *ASCE Engineering Mechanics Institute Conference, University of California, San Diego, CA, USA*, (Student Paper Competition Finalist) (2017).

9. **S. De**, P. T. Brewick, E. A. Johnson, and S. F. Wojtkiewicz, "Model Falsification in a Bayesian Framework", *ASCE Engineering Mechanics Institute Conference, University of California, San Diego, CA, USA*, (2017).

10. **S. De**, T. Yu, E. A. Johnson, and S. F. Wojtkiewicz, "Model Validation of a 4 Story Base Isolated Building using Seismic Shake-Table Experiments", *11th U.S. National Conference on Earthquake Engineering, Los Angeles, CA, USA*, (2018).

11. **S. De**, E. A. Johnson, and S. F. Wojtkiewicz, "Uncertainty Quantification of Locally Nonlinear Dynamical Systems using Polynomial Chaos Expansion", *SIAM Conference on Uncertainty Quantification (UQ18), Hyatt Regency Orange County, Garden Grove, CA, USA*, (2018).

12. **S. De**, A. Dasgupta, E. A. Johnson, and S. F. Wojtkiewicz, "Probabilistic Model Validation of Large-Scale Systems using Reduced Order Models", *SIAM Conference on Uncertainty Quantification (UQ18), Hyatt Regency Orange County, Garden Grove, California, USA*, (2018).

13. **S. De**, T. Yu, A. Dasgupta, E. A. Johnson, and S. F. Wojtkiewicz, "Probabilistic Model Validation of the Isolation layer of a Full-Scale Four-Story Base-Isolated Building", *ASCE Engineering Mechanics Institute Conference, Massachusetts Institute of Technology, Cambridge, MA, USA*, (2018).

14. A. Dasgupta, **S. De**, A. Dasgupta, E. A. Johnson, and S. F. Wojtkiewicz, "Probabilistic validation of material models", *ASCE Engineering Mechanics Institute Conference, Massachusetts Institute of Technology, Cambridge, MA, USA*, (2018).

15. **S. De**, K. Maute, and A. Doostan, "Topology Optimization under Uncertainty using Stochastic Gradients ", *Topology Optimization Roundtable, Albuquerque Marriot, Albuquerque, NM, USA*, (2019).

16. **S. De**, K. Maute, and A. Doostan, "Optimization under Uncertainty Using Stochastic Gradients", *15th U.S. Congress on Computational Mechanics, Austin, TX, USA*, (2019).

17. **S. De**, E. A. Johnson, and S. F. Wojtkiewicz, "Efficient Evidence Estimation for Bayesian Model Selection", *ASCE Engineering Mechanics Institute Conference, California Institute of Technology, Pasadena, CA, USA*, (2019).

18. A. Glaws, R. King, M. Reynolds, A. Doostan, and **S. De**, "Physics-informed Deep Learning for Multi-fidelity Uncertainty Quantification", *Workshop on Research Challenges and Opportunities at the interface of Machine Learning and Uncertainty Quantification, Los Angeles, CA, USA*, (2019).

19. **S. De**, J. Britton, M. Reynolds, A. Doostan, "Neural Network Training using Bi-fidelity Data for Uncertainty Quantification", *SIAM Conference on Uncertainty Quantification (UQ20), Munich, Germany*, (2020).

## RESEARCH PROPOSALS

- Assisted authoring CSD&E: *Collaborative Research: A New Framework for Computational Model Validation*, United States National Science Foundation, collaborative grants 16-63667 & 16-62992, September 2017 to August 2020, **$615,914** total (based on Ph.D. dissertation).
- Assisted authoring *Physics-Informed Deep Learning with Scientific Perceptual Loss Networks and Multifidelity Uncertainty Quantification* (submitted to United States Department of Energy for funding).

## INVITED TALKS

- Department of Civil and Environmental Engineering, University of Southern California, *Efficient Bayesian Model Selection for Locally Nonlinear Systems incorporating Dynamic Measurements*, March, 2015.
- Department of Civil Engineering, Indian Institute of Science, Bangalore, *Probabilistic Hybrid Model Validation Framework*, December, 2017.
- Department of Civil Engineering, Indian Institute of Technology, Kanpur, *"Applications of Probabilistic Hybrid Model Validation Framework to Structural Problems"*, January, 2018.
- Department of Aerospace Engineering Sciences, University of Colorado, Boulder, *"Incorporating Uncertainty into Modeling: Applications to Model Validation and Design Optimization"*, November, 2019.

## SYNERGISTIC ACTIVITIES

- **Organized** and **chaired** a minisymposium on "Advances in Design Optimization under Uncertainty" at the 15th U.S. Congress on Computational Mechanics, July-August, 2019.
- **Chaired** a session on "Polynomial Chaos and Polynomial Approximation" at the SIAM Conference on Uncertainty Quantification (UQ18), Hyatt Regency Orange County, Garden Grove, California, USA, April, 2018.
- **Reviewer** for Structural Control and Health Monitoring, Computer Methods in Applied Mechanics and Engineering, Computational Geomechanics, ASCE Journal of Bridge Engineering, and AIAA Journal.

## PROGRAMMING SKILL

MATLAB, C, Python, PyTorch, TensorFlow, OpenFOAM

## ACADEMIC BACKGROUND

**Dynamics:** Structural Dynamics, Finite Element Method in Dynamics, Random Vibrations and Structural Reliability.
**Mathematics:** Probability, Uncertainty Quantification, Ordinary Differential Equations, Optimization.
**Signal Processing:** Digital Signal Processing, Machine Learning, Wavelets.
**Control Theory:** Linear Feedback Control, Linear System Theory, Robust and Multivariable Control.

## HONOURS & AWARDS

- Recipient of best dissertation award in Civil Engineering at University of Southern California, 2018.
- Recipient of Viterbi Graduate School Ph.D. Fellowship (2013-2017) and Gammel scholarship (Spring 2017) from University of Southern California.
- Recipient of Ministry of Human Resource Development, Govt. of India Scholarship for Graduate studies (August, 2011-July, 2013).
- Recipient of travel grants from USC Graduate Student Government for attending *ASCE Engineering Mechanics Institute Conference*, 2014 & 2017, *IMAC XXXV Conference*, 2017.
- *ASCE Engineering Mechanics Institute Conference* Probabilistic Methods student paper competition finalist in 2014, 2017.
- Recipient of scholarship from National Science Foundation to attend the Asia-Pacific Summer School on Smart Structures Technology, 2015.
- Selected as *Research Assistant of the month* in March 2015.
- GATE (Graduate Aptitude Test in Engineering) All India Rank: 5th in the year 2011 (Civil Engineering).
- University Medal from Jadavpur University, 2011.

## ASSOCIATION MEMBERSHIPS

- The American Society of Civil Engineers (ASCE).
- The Society for Industrial and Applied Mathematics (SIAM).
- The United States Association for Computational Mechanics (USACM).

## EXTRACURRICULAR ACTIVITIES

- Senior Diploma in Fine Arts with Distinction.
- Junior Diploma in Acoustic Hawaiian guitar with Distinction.
- Treasurer of Balaka: Bengali Association of USC in 2017.
- Organized a Bengali festival in campus for 2014-2016.