Prateek **Bhustali**

PhD Candidate
The Netherlands
p.bhustali@tudelft.nl | omniscientoctopus.github.io | omniscientoctopus | Prateek Bhustali

Education

Delft University of Technology — *Delft, The Netherlands*
PhD Candidate — *May 2022 - Current*

- Supervisors: **Dr. Charalampos Andriotis**, **Dr. Seyran Khademi**
- Research Group: AiDAPT Lab: AI for a sustainable and resilient built environment
- Research interests: reinforcement learning, multi-agent systems

Technical University of Braunschweig — *Braunschweig, Germany*
M.Sc. Computational Sciences in Engineering (1.7/1.0) — *Sep. 2018 - Sep. 2021*

- Focus: uncertainty quantification, structural mechanics, deep learning, numerical Methods for PDEs

R.V. College of Engineering — *Bangalore, India*
B.E. Mechanical Engineering (8.67/10) — *Aug. 2014 - Apr. 2018*

- Focus: numerical linear algebra, production technology

Publications

Assessing the Optimality of Decentralized Inspection and Maintenance Policies for Stochastically Degrading Engineering Systems — *Best Paper (honoray mention)*
[PDF] [Code] [Details] — *BeNeLearn Conference, 2023*

- Authors: **Prateek Bhustali**, Charalampos P. Andriotis
- The paper formulates inspection and maintenance planning as a decentralized POMDP.
- We contrast centralized vs. decentralized multi-agent RL analyzing performance trade-offs in k-out-of-n systems.

Academic Projects

Global Sensitivity Analysis for Vector-Valued Responses of Mechanical Models — *TU Braunschweig*
Master's thesis [Report] [Presentation] [Code] — *Mar. 2021 - Sep. 2021*

- Supervisors: **Jun.-Prof. Dr.-Ing. Ulrich Römer**, **apl. Prof. Dr.-Ing. Ursula Kowalsky**
- Using generalised Sobol Indices to compute the sensitivities of the vector valued response of the Chaboche model (a constitutive model for viscoplastic materials undergoing cyclic loading) to aid its calibration.
- Implemented surrogate modeling techniques (polynomial chaos expansion, Karnhunen-Loève expansion with PCE approximated modes), generalised Sobol indices and the Chaboche model in Python.
- Elementary Bayesian calibration of the Young's modulus using sensitivity analysis results.

Solving PDEs using Physics Informed Neural Networks — *TU Braunschweig*
Student Research Project [Code] — *Apr. 2020 - Jan. 2021*

- Supervisors: **Prof. Dr. Dirk Lorenz**, **Dr. Christoph Brauer**
- Implemented physics-informed neural networks (PINNs) using TensorFlow and PyTorch in Python.
- Studied PINNs and their convergence via numerical experiments with the L-BFGS optimiser for stiff partial differential equations (PDEs).

Teaching

Computational Intelligence for Integrated Design — *Faculty of Architecture, TU Delft*
Teaching Assistant — *2023-Q3, '24-Q3, '25-Q3*

- Prepared teaching materials, delivered lectures and tutorials for sequential decision-making [Material].

Computational Repertoire for Architectural Design and Engineering — *Faculty of Architecture, TU Delft*
Teaching Assistant — *2024-Q1*

- Delivered a lecture on applications of machine-learning in building technology.

Experience

Uncertainty Quantification Group, TU Braunschweig

Braunschweig, Germany

Research Assistant

Nov. 2021 - Mar.2022

- Helped develop the sensitivity analysis module in the open-source UQpy package.
- Implemented state-of-the-art sensitivity analysis metrics.
- Wrote PEP8-compliant Python code, version control using git, unit testing and documentation using Sphinx.

Institute of Machine Tools and Production Technology, TU Braunschweig

OHLF, Wolfsburg and Braunschweig, Germany

Research Assistant

Oct. 2019 - Dec. 2020

- Crash simulation of composite car bumpers on Abaqus and their experimental validation.
- CAD modelling and drafting components for a fibremat gripper system.
- Literature review of bonding mechanisms in composites when thermoforming and injection moulding are combined (ProST: Integrierte Prozesssimulation Spritzgießen und Thermoformen).

Skills

Software	Abaqus, ANSYS, SolidWorks
DL Frameworks	PyTorch, JAX
Programming	Python, MATLAB
Miscellaneous	Linux, git, `vim`, LaTeX
Languages	English(fluent), German(C1), Kannada(Native Speaker), Hindi(fluent)

Honors & Awards

International

2023 **Best Paper (honoray mention)**, BNAIC/BeNeLearn 2023, Joint International Conference on AI and ML — *Delft, Netherlands*

2017 **2nd Place**, Formula Hybrid — *New Hamphsire, U.S.A*

Extracurricular Activities

Ashwa Racing

Bangalore, India

Chief Engineer

Mar. 2016 - Jan. 2018

- Founded in 2003, Ashwa Racing is the premier FSAE team in India that builds Formula 1 style racecars.
- Headed manufacturing of the 2018 combustion-engine and the 2017 hybrid-electric prototypes, each with a budget of approximately 9,000€.
- Head of mechanical systems and safety compliance for 2017 hybrid-electric prototype, which went on to win second place overall.
- Designed, manufactured and assembled battery packs with prismatic cells and high voltage enclosures for the 2017 hybrid-electric prototype.

Team Member

Dec. 2014 - Mar. 2016

- Drafted technical drawings and manufactured mechanical components for prototypes.
- Carried out compliance simulations of the chassis of a combustion-engine-based prototype.