Stuti Pathak

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EDUCATION

University of Antwerp	2022 - Current

Ph.D. in Applied Engineering

Indian Institute of Technology (IIT) Indore	2019 - 2021

M.Sc. in Physics, CPI 9.68/10

University of Delhi (DU)	2015 - 2018

B.Sc.(H) in Physics, CPI 8.216/10

EXPERIENCE

G.I.M. - Geographic Information Management NV (certificate)	April 2024 - July 2024

Research Internship with Data Scientist Dr. Nicholus Mboga

Worked in the area of machine learning-assisted 3D vision, specifically in the field of point cloud extraction and completion. Implemented data pre-processing pipelines and deep learning-based point cloud completion algorithms in the context of railway point clouds.

INTERESTS

Point Cloud Processing, Graph Representation Learning, Network Science, Bayesian Machine Learning, Topological Machine Learning

TECHNICAL SKILLS

Languages: Python, MATLAB, Scilab
Data Handling & Machine Learning: PyTorch, scikit-learn, NumPy, SciPy, pandas, Matplotlib, seaborn
Miscellaneous: MeshLab, CloudCompare, Meshroom, Open3D, PyTorch, PyTorch Geometric, PyTorch3D, NetworkX, GPyTorch, pytorch-topological, LaTeX, Docker, High-Performance Computing

PROJECTS

Point Cloud Completion: Persistent Homology for Real-World Point Clouds	Jan 2024 - Current

With P. Kumar, IIT Delhi, Dr. N. Mboga, GIM, Prof. G. Steenackers and Prof. R. Penne, UAntwerp

Using Persistent Homology (PH) among other measures, the lack of rich topological features and complexity in synthetic point clouds when compared to real-world counterparts is demonstrated. Two algorithms based on PH-priors are implemented and their importance is validated by experimenting with a new real-world dataset, proposed in this project.

Feature-Preserving Point Cloud Simplification (code)	May 2022 - Dec 2023

With Dr. T. M. McDonald, University of Manchester, Dr. S. Sels and Prof. R. Penne, UAntwerp

Proposed a novel simplification method which preserves both the salient structural features and the overall shape of a point cloud without any prior surface reconstruction step. This method employs Gaussian processes suitable for functions defined on Riemannian manifolds.

Machine Learning Assisted System Identification of a Composite Plate (code)	Nov 2020 - Aug 2021

With Prof. A. Roy, IIT Indore and Dr. R. Machavaram, IIT Kharagpur

The mechanical properties characteristic of any composite plate were identified in frequency as well as time domain using two types of neural networks: Multi-Layer Perceptron (MLP) and Radial Basis Function Network (RBFN).

Predicting Structure from Dynamics using Neural Networks (code)	Sept 2020 - Oct 2020

With Prof. S. Jalan, IIT Indore

Predicted the structure of an unknown dynamical system given its time series data. A neural network was trained to perform binary classification for two classes of networks: scale free networks and Erdős–Rényi random networks.

Rumour Analysis using Twitter Mention Network (code)	April 2020 - Aug 2020

With Prof. S. Jalan, IIT Indore

Natural Language Processing (NLP) techniques were used to pre-process and tokenize tweets written in Devanagari script, crawled for words related to COVID-19. Analysed how rumours spread through social media platforms and compared the results for two countries: India and South Korea.

Water-Level Controller using Microprocessor 8085	Feb 2017 - April 2017

With Dr. P. Yadav, University of Delhi

The controller built prevented overflowing of water tanks, hence minimized wastage of water.

Publications and Preprints

- S. Pathak, P. Kumar, N. Mboga, G. Steenackers, and R. Penne, "Revisiting point cloud completion: Are we ready for the real-world?," *arXiv preprint arXiv:2411.17580*, 2024 **(link)**

- S. Pathak, T. Baldwin-McDonald, S. Sels, and R. Penne, "GP-PCS: One-shot feature-preserving point cloud simplification with gaussian processes on riemannian manifolds," in *Pattern Recognition* (A. Antonacopoulos, S. Chaudhuri, R. Chellappa, C.-L. Liu, S. Bhattacharya, and U. Pal, eds.), ICPR 2024. Lecture Notes in Computer Science, vol 15318. Springer, Cham. **(link)**

- I. De Boi, S. Pathak, M. Oliveira, and R. Penne, "How to turn your camera into a perfect pinhole model," in *Progress in Pattern Recognition, Image Analysis, Computer Vision, and Applications* (V. Vasconcelos, I. Domingues, and S. Paredes, eds.), CIARP 2023. Lecture Notes in Computer Science, vol 14469, Springer, Cham. **(link)**

Achievements and Talks

- Gave an online talk on Geometric & Topological Machine Learning for Point Cloud Analysis at IIT Indore. 2025

- Gave an oral presentation on GP-PCS: One-shot Feature-Preserving Point Cloud Simplification with Gaussian Processes on Riemannian Manifolds at International Conference on Pattern Recognition (ICPR). **(details)** 2024

- Gave an in-person talk on When Machine Learning meets Point Clouds at Vlaams Supercomputer Centrum (VSC) Users Day held at Research Foundation Flanders (FWO) headquarters. **(details)** 2024

- Gave an in-person talk on Point Cloud Completion at G.I.M. - Geographic Information Management NV. 2024

- Tutored UAntwerp's The Company: Marketing and Finance academic course for engineering students. 2024

- Awarded FWO travel grant for attending summer school in the United Kingdom. 2024

- Organized UAntwerp's biannual Network on Gaussian Processes seminar where Prof. Dr. Stephen Roberts from University of Oxford presented his work on exoplanets. **(details)** 2023

- Gave an in-person talk on Understanding the Significance, Processing and Analysis of Point Clouds at Network on Gaussian Processes seminar held at UAntwerp. **(details)** 2022

- Secured the highest final grade among all the graduating students of the 2021 M.Sc. Physics batch of IIT Indore. 2021

- Secured All India Ranks of 358, 351 and 30 in Indian Institute of Technology Joint Admission test for Masters (IIT JAM) Physics, Joint Entrance Screening Test (JEST) Physics and Delhi University Entrance Test (DUET) Physics respectively. 2019, 2019, 2018

- Awarded Indian Council of Agricultural Research (ICAR) merit scholarships for outstanding success in the Indian Certificate of Secondary Education (ICSE) board examinations as well as the Indian School Certificate (ISC) board examinations. 2013, 2015

Schools and Courses

- **Oxford Machine Learning Summer School** in-person summer school tracks **MLx Health & Bio** and **MLx Representation Learning & Generative AI** conducted by University of Oxford and AI for Global Goals. **(certificate)** 2024

- **Level 1 Dutch language certificate** course conducted by Linguapolis, UAntwerp. **(certificate)** 2023

- **Gaussian Process and Uncertainty Quantification Summer School** in-person summer school conducted by University of Sheffield. **(certificate)** 2022

- **Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization** online course conducted by DeepLearning.AI. **(certificate)** 2021

- **Neural Networks and Deep Learning** online course conducted by DeepLearning.AI. **(certificate)** 2021

- **Machine Learning** online course conducted by Stanford University. **(certificate)** 2019

- **Google AI, Explore ML Beginner Track** in-person course conducted by IIT Indore. **(certificate)** 2019

- **From the Big Bang to Dark Energy** online course conducted by The University of Tokyo. **(certificate)** 2016