

DR PARUL YADAV

ML Researcher & Assistant Professor

Department of Computer Science and Engineering

Institute of Engineering and Technology, Lucknow (<https://ietlucknow.ac.in>)

(+91) 9838252188

parulyadav@ietlucknow.ac.in, parul.pec@gmail.com

<https://www.ietlucknow.ac.in/people/pyadav>

0000-0001-6004-7589

SUMMARY

I have knowledge and experience in data science and machine learning, especially data pre/ post-processing (feature selection, feature reduction, plotting, visualization), supervised and unsupervised learning (classification, regression, clustering), model deployment and scaling strategies. I have extensive understanding of Synthetic Data Generation, Data Analysis, Data Visualization, Statistical Computing and Machine Learning among other things.

I have designed and implemented novel generative model(s) using state-of-the-art variants of VAE/ GAN/ Copula/ LLMs for generating synthetic tabular and time-series data and further extending the model on biomedical images and signals. I have generated reports using effective data visualization strategies along with relevant metrics (involving various statistical tests, machine utility and similarity measures) for the comparison of real data and synthetic data. I have experience in leveraging cloud computing resources for deploying the tools.

I participate actively in continued learning through conferences and professional research. I have published more than 23 research articles in peer-reviewed International Journals and Conferences. I believe in students' abilities to learn and innate thirst for knowledge with the right environment. I have been actively supervizing PhD scholars for their doctoral research, post-grads for their dissertations and under-grads for their projects.

RESEARCH INTERESTS/ AREA

Synthetic Data Generation and Generative Models
Data Analytics, Machine Learning and Cyber Security
Verification of Machine Learning Models

SKILLS

- Synthetic Data Generation (multi-modal tabular data, multi-variate time series data, biomedical images and signals)
- AI/ ML Methodologies, Data Analysis and Mathematical modelling
- Deep learning frameworks (Pytorch, TensorFlow)
- Programming: Python (numpy, panda, scikit-learn, matplotlib), R, C, C++

COMPETENCY

- Fluency in spoken and written english
- Good communication and presentation skills
- Ability to work independently and within team
- Ability to lead projects and complete within stipulated time.
- Always keen to learn and use new softwares/ models/ frameworks etc.

EXPERIENCE

- More than **15 years** of **Research and Teaching** experience
Taken duties and assignments like Teaching, Mentoring, Program Leader, Research Supervision, Project Guidance.
Taught courses like Data Analytics, Data Visualization, Statistical Computing, Natural Language Processing, Data Structure and Algorithm Design, Theory of Computation, Compiler Design and Discrete Structures etc. to under-graduate and post-graduate students.
- Reviewer of SCI/ SCIE indexed journals like Journal of Supercomputing.
- Supervised post-graduate students for their dissertation and under-graduate students for their projects.

FUNDED PROJECTS

- **Project Title:** Synthetic Data Generation (SynD) using Machine Learning Algorithm in Cyber Physical Systems
Nodal Centre: C3iHub, IIT Kanpur
Funding Source: Department of Science and Technology, India
Funding Amount: INR 21,36,980.00
Status: Ongoing (2021-23)
Description: Privacy laws such as the (GDPR) and the obligations imposed on organizations by these laws acts as a hurdle in the use of data in Cyber Physical Systems, especially when it contains personal data and sensitive personal data. To ensure that synthetic data can be used where synthetic data generation tools play an important role. Another problem that organizations face is that real data may not be available at all. This is the precise problem which is addressed in the project. The tool developed in the project is an AI based platform that will be used to generate synthetic data. Synthetic data is data that is created in such a manner that it retains the same statistical value as the real data but it removes any personal data or sensitive personal data. This helps organizations use the data that they would otherwise be barred from using because it contains personal data and sensitive personal data. This data is differentially private.
- **Project Title:** Analysis and Prediction of Influent and Effluent Quality Parameters for a UASB-Based Wastewater Treatment Plant in Asia
Funding Source: In house
Funding Amount: INR 2,80,000.00

Status: Completed (2020-23)

Description: This project is based on a prediction/forecasting of an influent quality parameter, namely total MLD, as well as effluent quality parameters, namely MPN, BOD, DO, COD and pH for the real-time data collected pre-, during and post-COVID-19 at the Bharwara WWTP in Lucknow, India. It is the largest UASB-based wastewater treatment facility in Uttar Pradesh and the second largest in Asia. In this project, we proposed a novel model namely, wPred comprising extensions of SARIMA with seasonal order and ANN-based ML models to estimate the influent and effluent quality parameters, respectively, and compared it with the existing machine learning models.

- **Project Title:** Security and Surveillance Robot

Funding Source: TEQIP-3

Funding Amount: INR 81860.40

Status: Completed (2019-2020)

Description: The robot was designed to assist in domestic, industrial and military applications by doing tasks such as monitoring, patrolling, handle risky industrial tasks like moving heavy goods. The robot has a thermal camera in the front to monitor the situation even in dark light. The camera on the robot is further used to detect faces or objects using machine learning techniques. The robot is wirelessly controlled by a remote.

DOCTORAL SUPERVISION

- **Topic:** Computational Intelligence Methods based Model for Forgery Detection in Digital Multimedia Forensics
- **Topic:** Design and Verification of Machine Learning based Model to Generate Synthetic Data for Biomedical Images

AWARDS

- Received **Research Grant** from Department of Science and Technology, Govt. of India
- Received **Travel Grant** for paper presentation in International Conference held at Hong-Kong

EDUCATIONAL QUALIFICATION

PhD in Computer Science (2020)

Place: IET, AKTU Lucknow

Thesis Title: Formal Modelling of Intrusion Detection System in Mobile Ad-hoc Networks

Supervisor: Prof. Manish Gaur, IET, Lucknow, India

Master in Engineering in CSE and IT

Place: Punjab Engineering College (PEC), Chandigarh, India

Thesis Title: Statistical Analysis based Intrusion Detection System in Mobile Ad-hoc Networks

Supervisor: Dr Joydeep Chandra, IIT Patna, India

PUBLICATIONS

Published more than 23 research papers in international journals/ conferences [All refereed].

Selected publications are listed below

1. **Parul Yadav**, Manish Gaur, Nishat Fatima, Saqib Sarwar, Qualitative and Quantitative Evaluation of Multivariate Time-Series Synthetic Data Generated Using MTS-TGAN: A Novel Approach, Applied Sciences, MDPI, vol. 13, no. 7, 4136, 2023.
DOI: <https://doi.org/10.3390/app13074136>
IF: 2.921, SCIE, CiteScore: Q2 (General Engineering)
2. **Parul Yadav**, Manik Chandra, Nishat Fatima, Saqib Sarwar, Aditya Chaudhary, Kumar Saurabh, and Brijesh Singh Yadav, Predicting Influent and Effluent Quality Parameters for a UASB-Based Wastewater Treatment Plant in Asia Covering Data Variations during COVID-19: A Machine Learning Approach, Water, MDPI, vol. 15, no. 4, 710, 2023.
DOI: <https://doi.org/10.3390/w15040710>
IF: 3.530, SCIE, CiteScore: Q1 (Water Science and Technology)
3. **Parul Yadav**, Manish Gaur, Nishat Fatima, Saqib Sarwar, Quantitative and Qualitative Comparative Evaluation of Small, Medium and Large Scale Tabular Synthetic Data Generated using TVAE and CTGAN, TBA
4. **Parul Yadav**, Aditya Chaudhary, Anand Keshari, Nitish Kumar Chaudhary, Priyanshu Sharma, Kumar Saurabh and Brijesh Singh Yadav, Data Visualization of Influent and Effluent Parameters of UASB-based Wastewater Treatment Plant in Uttar Pradesh, International Journal of Advanced Computer Science and Applications (IJACSA), The Science and Information Organization, vol. 13, no. 2, pp. 598-606, 2022.
DOI: <http://dx.doi.org/10.14569/IJACSA.2022.0130271>
5. **Parul Yadav**, Brijesh Singh Yadav, Modelling of Support Vector Machine for Intrusion Detection System in Ad-hoc Networks using R Programming, Book Chapter in Proceedings of Third Doctoral Symposium on Computational Intelligence, Springer, Lecture Notes on Networks & Systems (LNNS), vol. 479, 2022
DOI: 10.1007/978-981-19-3148-2_65
6. **Parul Yadav**, Manish Gaur, A Process Calculi for Intrusion Detection System in Mobile Ad-hoc Networks, Journal of Communica-

tions, vol. 13, no.11, pp. 635-647, 2018
DOI: 10.12720/jcm.13.11.635-647

7. **Parul Yadav**, Manish Gaur, A Behavioural Theory for Intrusion Detection System in Mobile Ad-hoc Networks, Proc. of the International Conference on High Performance Compilation, Computing and Communications (HP3C-2018), Hong Kong, China, pp. 51-60, 15th-17th March, 2018
8. **Parul Yadav**, Manish Gaur, A Survey on Formal Modelling for Secure Routing in Mobile Ad-hoc Networks, Proc.of the International Conference on Distributed Computing and Internet Technology (ICDCIT-2015), Bhubaneswar, Odisha, India, pp. 18-23, 5th-8th February, 2015
9. Nehan Mumtaz, **Parul Yadav**, Manish Gaur, Distance Based Angular Multicast Routing Protocol for Mobile Ad-hoc Networks (DAMRP), Proc.of the 5th IEEE International conference on Communication Systems and Network Technologies (CSNT 2015), Gwalior, India, pp. 253 – 257, 4th-6th April 2015
DOI: 10.1109/CSNT.2015.231.
10. **Parul Yadav**, Brijesh Singh Yadav, Joydeep Chandra, Statistical Analysis Based Efficient Decentralized Intrusion Detection Scheme for Mobile Ad-hoc Networks, Proc.of the 16th IEEE International Conference on Networks (ICON 2008), New Delhi, India, 12th-14th December, pp. 1-6, 2008
DOI: 10.1109/ICON.2008.4772601.

INVITED TALKS

1. Delivered keynote address on **Harnessing Digital Technologies for Inclusion and Accessibility** in a conference on **Recent Advancements in Emerging Technologies** organized by **STPI** in collaboration with **Ministry of Electronics and IT-Government of India**, Department of IT and Electronics-GoUP and SGPGI Lucknow, 2023
2. Conducted Two Months (60 hours) **Training Program on Data Science and Analytics** under the Trained the Trainer Program initiated by **Ministry of Education**, Govt. of India to comply to the call of **Atma Nirbhar Bharat** given by **Hon'ble Prime Minister** of India, and trained more than 150 participants in February-March 2021
3. Invited as **Jury** in **Smart India Hackathon 2020** (Software Edition) conducted by **Innovation Cell, Ministry of Education**
4. Delivered expert lecture on **Artificial Intelligence in Education** through **Webinar** organized by Amity University, 2020
5. Invited talk through **Webinar** in National **Seminar on Significant role of E-education through Social Distancing during Lockdown of Covid-19 Pandemic** organized by SPIU Uttar Pradesh, 2020
6. Keynote speaker in two days **Conference on Emerging Trends in Engineering and Technology** at IET, Dr. Rammanohar Lohia Avadh University , Ayodhya sponsored by TEQIP-III, 2019

7. Co-session chair in **International Conference on Contemporary Computing and Applications** organized by AKTU, Lucknow, 2019
8. Keynote speaker in one week National **Workshop on Artificial Intelligence** organized by IET Ayodhya, 2019
9. Invited talk on **Emerging Trends in IT: Automation and Data Science** at Bhopal, 2018
10. Conducted two days workshops on **Machine Learning using Python** at Lucknow, 2018
11. Conducted three days workshops on **Data Visualization and Machine Learning** at Noida, 2017

**CURRENT
ADMINISTRATIVE
ASSIGNMENTS**

- Associate Dean, Resource Generations and Alumni Relations, AKTU Lucknow
- Warden, Gargi Hostel, IET Lucknow
- Technical Coordinator, ISSACC, IET Lucknow
- Coordinator, Industrial Readiness Committee, IET Lucknow
- Nodal Officer, PMSSS, IET Lucknow
- Coordinator, Robotics Club, IET Lucknow
- Member, Board of Studies, Department of CSE, IET Lucknow
- Member, NAAC/ NBA Committee, IET Lucknow
- Member, Internal Complaint Committee, IET Lucknow
- Member, Women Sexual Harassment and Redressal Cell, AKTU Lucknow
- Coordinator, AKTU Internship Program, AKTU Lucknow

REFERENCES

- Prof Manish Gaur,
PhD, University of Sussex, UK,
Fellow, University of Glasgow, UK,
Pro Vice Chancellor, AKTU Lucknow, India
manish.gaur@ietlucknow.ac.in
- Prof Divakar Singh Yadav,
PhD, University of Southampton, United Kingdom,
Department of Computer Science and Engineering,
Institute of Engineering and Technology, Lucknow, India
dsyadav@ietlucknow.ac.in
- Wg Cdr Dr Anil Kumar,
Director, Amity School of Engineering and Technology,
Amity University, Lucknow, India
akumar3@lko.amity.edu