Mahima Agarwal

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Education

Cluster Innovation Centre, University of Delhi Expected May 2026

Bachelor of Technology in Information Technology and Mathematical Innovations *New Delhi*

- **Relevant Coursework:** Data Structures and Algorithms (C++), Prob and Stat in CS (Python, R), Intro to CS (C), Object Oriented Programming(C++, Java), Linear Algebra w/Computational Applications (Matlab), Single and Multivariate Calculus w/Computational Applications (Python)

Open Source Experience

Wikimedia Foundation May 2024 – Aug 2024

Outreachy Intern *Remote*

- Developed a **data visualization tool** for tracking the quality evolution of Wikipedia articles maintained by different WikiProjects.
- Leveraged **Wikimedia APIs**, **Wiki Quarry**, and **Toolforge** with **SSH access** to manage and optimize data workflows in a remote server environment.
- Handled millions of data rows using advanced **query optimization** and **data warehousing** techniques to ensure scalable analysis.
- Integrated **language-agnostic model predictions** into the tool to provide more accurate and universal quality assessments.
- Conducted extensive pre-development **research** to align with Wikimedia standards, presenting outcomes at the **IIIT Hyderabad Hackathon** and the **Wikimedia Technology Summit 2024**.

Key Learnings: Statistical Graphics, Data Analysis, Data Warehousing, Query Optimization, PAWS, SSH, MariaDB, API Integration, Toolforge, Pre-project Research, Documentation, Presentation Skills.

Research Experience

CyPSi Laboratory Feb 2024 – April 2024

Research Intern *Delhi*

- Developed a **retinal image segmentation project** utilizing advanced **deep learning** techniques to support medical diagnostics and enhance imaging analysis.
- Implemented **U-Net** and **Convolutional Neural Networks (CNNs)** for high-precision segmentation of retinal images obtained from fundus photography.
- Integrated **Generative Adversarial Networks (GANs)** to augment the dataset, improving model generalization through enhanced data diversity.

Key Learnings: Deep Learning for Medical Imaging, CNNs, U-Net, GAN-based Data Augmentation, Python (TensorFlow/PyTorch), Medical Dataset Handling.

IoTIoT.in Oct 2023 – Jan 2024

Artificial Intelligence Intern *Remote*

- Led the development and training of an **Indian Food Recognition Model**, leveraging **supervised machine learning techniques** to enhance prediction accuracy and inference speed.
- Optimized model efficiency through **scalable AI deployments**, integrating Node.js and Express to build efficient APIs for real-time food recognition.
- Conducted extensive model testing to ensure accuracy across diverse datasets, accounting for variations in lighting, angles, and food presentation.

Key Learnings: Machine Learning Model Development, API Integration (Node.js, Express), Scalable AI Deployment, Dataset Preprocessing, Real-Time Inference Optimization.

Projects

Using Reservoir Computing (RC) for Image Encryption and Forecasting of Hyperchaotic Finance Model
| *Reservoir Computing (RC), Cryptography, Chaos Theory, Fractional Order Systems, Security Metrics*

- Developed an advanced **image encryption** scheme using **Reservoir Computing (RC)** models to enhance security and efficiency in transmitting visual data.
- Integrated **chaos theory** and **fractional-order** systems to improve iamge encryption for real-time applications.
- Applied **chaotic sequences from reservoir models** for diffusion, ensuring unpredictability throughout the encryption process.
- Utilized a **two-key system**: the first key generates parameters (**rho** and **phi**) for encryption steps, while the second key controls chaotic diffusion for enhanced randomness.
- Implemented **shuffling techniques** and **bitwise XOR operations** to scramble pixel values, followed by reshaping the encrypted sequence back into image format.
- Conducted performance and security analysis, validating encryption robustness against **differential attacks** through **NPCR, UACI, and histogram variance metrics.**
- **Currently writing a research paper** based on this project for publication.

PPML using Paillier Cryptosystem | *NumPy, Python, Matplotlib, pandas, Scikit-Learn*

- Showcased the effectiveness of the **PPML** approach in balancing accurate predictions and privacy preservation.
- Integrated the **Paillier cryptosystem** and **linear regression** to derive meaningful insights without compromising individuals' privacy.
- **GitHub**: mahi01agarwal/PPML-using-Paillier-Cryptosystem

Cryptography using Discrete Mathematics | *Python*

- Developed a **text encryption model** using Python and **Discrete Mathematics** concepts.
- Applied techniques like rearranging messages, using matrices for security, and employing number tricks to create a strong encryption method.
- Utilized **modular arithmetic** to make our encryption resistant to decoding attempts.
- **GitHub**: mahi01agarwal/EncryptionDecryption

Chaos-Lock | *MATLAB, Python*

- Developed an **encryption model** in MATLAB based on the application of the Logistic map equation and its chaotic properties.
- Implemented a PRNG based on chaotic dynamics of **Logistic Map Equation**.
- **GitHub**: mahi01agarwal/ChaosLock

Projects

Using Reservoir Computing (RC) for Image Encryption and Forecasting of Hyperchaotic Finance Model
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- Conducted performance and security analysis, validating encryption robustness against **differential attacks** through **NPCR, UACI, and histogram variance metrics.**
- **Currently writing a research paper** based on this project for publication.
- **Key Learnings:** Advanced Cryptography, RC Models, Chaos Theory, Fractional-Order Systems, Security Metrics, NPCR, UACI, Real-Time Data Transmission.

PPML using Paillier Cryptosystem | *NumPy, Python, Matplotlib, pandas, Scikit-Learn*

- Showcased the effectiveness of the **PPML** approach in balancing accurate predictions and privacy preservation.
- Integrated the **Paillier cryptosystem** and **linear regression** to derive meaningful insights without compromising individuals' privacy.

- **GitHub**: mahi01agarwal/PPML-using-Paillier-Cryptosystem
- **Key Learnings:** Privacy-Preserving Machine Learning (PPML), Homomorphic Encryption, Linear Regression, Data Privacy, Python Libraries (NumPy, pandas, Scikit-Learn).

Cryptography using Discrete Mathematics | *Python*

- Developed a **text encryption model** using Python and **Discrete Mathematics** concepts.
- Applied techniques like rearranging messages, using matrices for security, and employing number tricks to create a strong encryption method.
- Utilized **modular arithmetic** to make the encryption resistant to decoding attempts.
- **GitHub**: mahi01agarwal/EncryptionDecryption
- **Key Learnings:** Cryptography with Discrete Mathematics, Modular Arithmetic, Python Programming, Matrix Operations, Encryption Security.

Chaos-Lock | *MATLAB*, *Python*

- Developed an **encryption model** in MATLAB based on the application of the **Logistic Map Equation** and its chaotic properties.
- Implemented a **PRNG** (Pseudo-Random Number Generator) based on the chaotic dynamics of the Logistic Map Equation.
- **GitHub**: mahi01agarwal/ChaosLock
- **Key Learnings:** Chaotic Systems, Logistic Map, PRNG Development, MATLAB Programming, Advanced Encryption Techniques.

Skills

Programming Languages: Python, C, C++, Java, JavaScript, MATLAB, HTML5

Libraries & Frameworks: NumPy, Pandas, Scikit-Learn, TensorFlow, PyTorch, OpenCV, Tkinter

Development Tools & Platforms: Node.js, MongoDB, Docker, Git, GitHub, Toolforge, PAWS

Technologies & Concepts: Machine Learning, Deep Learning, GANs, Cryptography, Reservoir Computing, Data Warehousing

Soft Skills: Research, Problem-Solving, Time Management, Cross-Team Collaboration, Presentation Skills

Volunteering, Leadership, and Awards

- Selected as one of the 34 interns worldwide for the **Outreachy Internship** (May 2024 Cohort).
- Sponsored to attend the **Wikimedia Tech Summit 2024** and invited as a speaker. Served as a panel member for a discussion on **Addressing the Gender Gap in Technology**, representing the youngest female developer on the panel.
- Co-managed and organized **Convoke**, Delhi University's largest tech fest, at the Cluster Innovation Centre, attracting over 1000 participants.
- Volunteered at **PyDelhi**, actively contributing to the Python community in Delhi, and organized a successful PyDelhi meetup at the Cluster Innovation Centre.