Shubham Chaudhary

PhD Scholar, Department of Computer Science & Engg.
Indraprastha Institute of Information Technology Delhi
Okhla Industrial Estate, Phase III
New Delhi, India - 110020

Email: shubhamch@iiitd.ac.in
linkedin.com/shubhamchdhary
github.com/shubhamchdhary
shubhamchdhary.github.io

Summary

PhD Scholar with experience and a keen interest in designing algorithms and creating testbeds for sustainable and efficient video analytics, live video streaming, and edge computing.

Education

- **Indraprastha Institute of Information Technology Delhi** — New Delhi, India
  Ph.D (Computer Science & Engg.) — *Jan 2021 - Present*
  - Advisor: Dr. Arani Bhattacharya
  - Research Topic: Edge Computing based Traffic Surveillance
  - Current CGPA: 8.65/10
- **Kamla Nehru Institute of Technology Sultanpur** — Uttar Pradesh, India
  Bachelor of Technology (Electrical Engineering) — *2017 - 2020*
  - Project: Fog Vision System for Automobiles
  - First Division with Hons
  - Percentage: 80.13
- **Government Polytechnic Basti** — Uttar Pradesh, India
  Diploma in Electrical Engineering — *2014 - 2017*
  - Silver Medalist in EE Department
  - First Division with Hons
  - Percentage: 80.64

Certificates/Scorecards

- **TMA PhD School** — 26 - 27 June 2023
  Certificate Link : Google Drive Link — *TMA Conference, Naples, Italy*
- **IIT Bombay CSERL Bootcamp 2022** — 16 May - 24 June 2022
  Certificate Link : Google Drive Link — *IIT Bombay*
- **Computer Vision - Image Basics with OpenCV and Python** — April 2020
  Certificate No. : 9V2CB9CLTD8U — *Coursera*
- **Video Basics with OpenCV and Python** — April 2020
  Certificate No. : 8SVQYGQWMFPP — *Coursera*
- **GATE** — 2020
  Score : 417
- **Digital Signal Processing** — Oct 2019
  R No. : NPTEL19EE50S61721049 — *NPTEL*
- **Python Masterclass: Learn Python3 Programming Fast** — Feb. 20, 2019
  Certificate No. : UC-OA0HL1O5 — *Udemy*
- **MATLAB** — April 13, 2018
  Certificate No. : KNIT-18/SLN/MTB/031488 — *Ritusha Consultants Pvt Ltd*

Projects

- **Scalable and Sustainable Video Analytics on Edge using Sensor Clustering**
  Research Project

  The proliferation of video analytics in applications like autonomous driving and traffic surveillance requires on-premise (on edge) execution of deep learning models to meet latency requirements and curb bandwidth usage. A cheaper model is typically deployed due to power and compute constraints. However, these shallower models are prone to accuracy drift. In this project, we propose to intelligently assign individual models to each camera/vehicle by clustering the ones with similar visual scenes to reduce the number of allocated models. To circumvent the data drift, we retrain the model assigned to the cluster, which undergoes accuracy deviation.

- **Improving Live Video Streaming QoE using Video Tiles utilizing Multipath**
  Research Project

  The growing popularity of live online classes, even in remote areas, stresses the need for a good quality of experience to enhance learning. However, the current wireless technology is unable to cater to the bandwidth and latency requirements. Using multiple interfaces available on devices opens up the possibility of mitigating the problem. Therefore, we designed a system of aggregating the cellular network connectivity of multiple devices in the vicinity trusted by the user. We utilized tiled video encoding, where different spatial portions of a frame are sent through different network paths based on their priority.

  Short Paper Link : `https://ieeexplore.ieee.org/abstract/document/10041371`

- **TileClipper: Lightweight Selection of Regions of Interest from Videos for Traffic Surveillance**
  Research Project

  The increasing focus on traffic safety calls for better traffic monitoring and control. The most commonly proposed solution is to extensively deploy cameras to monitor traffic and send the video to servers in data centers for detailed processing by running deep neural networks. To curb the high data ingestion, in this project, we developed a system that utilizes tile sampling, where a limited number of rectangular areas within the frames are sent to the server. Furthermore, we designed an algorithm using tile bitrate to select the relevant tiles adaptively.

  Project Repo : `https://github.com/shubhamchdhary/TileClipper`

- **Fog Vision System for Automobiles**
  B.Tech. Project

  The project aimed at developing a system capable of providing a view of forthcoming objects to automobile drivers in foggy or hazy weather conditions and even at night. The developed system uses a LIDAR sensor, having infrared light to penetrate the fog, and Raspberry Pi as it's main computing unit.

  Project Link : `https://github.com/shubhamchdhary/Fog_Vision_System`

Professional Experience

- **Department of Computer Science** Stony Brook, NY, USA
  Stony Brook University *July 2024 to present*
  Visiting Research Scholar
  Working with Dr. Aruna Balasubramanian on the problem of running deep learning models on edge devices, specifically focusing on Computer Vision models as it pertains to autonomous driving.

- **Department of Computer Science & Engg.** New Delhi, India
  Indraprastha Institute of Information Technology Delhi *Jan 2021 to December 2023*
  - *Teaching Assistant (Aug 2023 to Dec 2023)*
    Working as Teaching Assistant for the course Wireless Networks. The work involves grading answer sheets, providing tutorials and remedial lessons to students.

- *Teaching Assistant (Jan 2023 to May 2023)*
  Working as Teaching Assistant for the course Wireless Networks. The work involves grading answer sheets, providing tutorials and remedial lessons to students.
- *Teaching Assistant (Aug 2022 to Dec 2022)*
  Worked as Teaching Assistant for the course Computer Networks. The work involved grading answer sheets, providing tutorials and remedial lessons to students.
- *Teaching Assistant (Sept 2021 to Jan 2022)*
  Worked as Teaching Assistant for the course Operating Systems. The work involved evaluation and grading of answer sheets.
- *Teaching Assistant (Jan 2021 to May 2021)*
  Worked as Teaching Assistant for the course Digital Circuits. The work involved grading answer sheets, providing tutorials and remedial lessons to students.

- **LastMileS Workshop** Bangalore, India
  COMSNETS 2022 *2022*
  Volunteer
  Worked as Workshop Volunteer during the LastMileS Workshop at the COMSNETS 2022 conference held in Bangalore. The work involved helping the Co-Chairs in smooth conduct of the workshop and coordinating the talks and paper presentations.

- **Department of Electrical Engg.** Basti, Uttar Pradesh, India
  Government Polytechnic Basti *2017*
  Media Representative
  Worked as College Media Representative during the Zonal Games at the college. The work involved coordinating with news media and press and providing them information/results of different sports.

Publications & Patents

1. **Shubham Chaudhary**, Navneet Mishra, Keshav Gambhir, Tanmay Rajore, Arani Bhattacharya, Mukulika Maity. "COMPACT: Content-aware Multipath Live Video Streaming for Online Classes using Video Tiles", In the Proceedings of the 16th ACM Multimedia Systems Conference (MMSys'25) to be held in Stellenbosch, South Africa. **Submitted**

2. **Shubham Chaudhary**, Arani Bhattacharya, Saket Anand, Aruna Balasubramanian. "Scalable and Sustainable Video Analytics on Edge using Sensor Clustering", In Proceedings of the 15th ACM Wireless of the Students, by the Students, and for the Students Workshop (S3) in conjunction with the 30th Annual International Conference on Mobile Computing and Networking (MobiCom'24) to be held in Washington D.C., D.C., USA. **Accepted**

3. **Shubham Chaudhary**, Arani Bhattacharya. "Network Architecture Search for Sustainable Traffic Surveillance", Poster in Doctoral Consortium at the 7^{th} ACM SIGCAS/SIGCHI Conference on Computing and Sustainable Societies (COMPASS'24) held in Delhi, India. **Accepted**

4. **Shubham Chaudhary**, Aryan Taneja, Anjali Singh, Purbasha Roy, Sohum Sikdar, Mukulika Maity, Arani Bhattacharya. "TileClipper: Lightweight Selection of Regions of Interest from Videos for Traffic Surveillance", In the Proceedings of the 2024 USENIX Annual Technical Conference (ATC'24) held in Santa Clara, California, USA. **Published**

5. Keshav Gambhir, Tanmay Rajore, **Shubham Chaudhary**, Taral Jain, Avishi Gupta, Mukulika Maity, Arani Bhattacharya. "NATIVE: Network Aggregation based Tiled Live Video Streaming", Demo Paper in Proceedings of International Conference on COMmunication Systems & NETworkS (COMSNETS'23) held in Bangalore, India. **Published**

6. **Shubham Chaudhary**, Aryan Taneja, Anjali Singh, Mukulika Maity, Arani Bhattacharya. "VISTA: Fast and Efficient Traffic Surveillance by Tile Sampling", In Proceedings of the Workshop on Last-mile Challenges and Standardization Opportunities in Smart Infrastructure (LastMileS) in conjunction with International Conference on COMmunication Systems & NETworkS (COMSNETS'22) held in Bangalore, India. **Accepted**

Patents

1. **Shubham Chaudhary**, Aryan Taneja, Anjali Singh, Arani Bhattacharya, Mukulika Maity. "Method And System Facilitating Data Optimization In A Data Transmission Process".
   Indian Patent Application Number: 202211028440. **Published**

Talks/Tutorials/Exhibitions

- Hands-on Sesion: How To Leverage Multipath?
  - ACM Winter School 2023, IIIT Delhi, New Delhi, India Dec 2023
- Project Exhibitor (As part of IIIT Delhi 5G Lab)
  - India Mobile Congress 2023 Oct 2023
- Hand-on Session: Simulation and Performance Analysis of MIMO Systems using Python
  - 5G Workshop 2023, IIIT Delhi, New Delhi, India July 2023

Skills

- **Programming Languages:** Python, C++(familiar), Java/Android, MATLAB
- **Libraries/Software Packages**: numpy, pandas, sklearn, matplotlib, PyTorch, OpenCV, folium
- **Other Softwares/Tools**: Linux, Git, FFmpeg, GPAC, Kvazaar, ns3, gem5
- **IoT Devices** : Raspberry Pi, Jetson Nano, Jetson Xavier, Odroid H3+, Arduino, LiDAR.

Awards & Medals

- TiH-iHub Anubhuti's Chanakya Doctoral Fellowship (2024)
- Best Teaching Assistant Award (2024)
- Microsoft student travel grant to attend and present our paper at the USENIX ATC 2024 conference held physically in Santa Clara, California, USA.
- Full travel grant to attend TMA PhD School and TMA Conference 2023 held physically in Naples, Italy.
- Full travel grant to attend COMSNETS 2023 physically held in Bangalore, India.
- Best Paper Award at LastMiLeS workshop, COMSNETS 2022, for the preliminary paper, "VISTA: Fast and Efficient Traffic Surveillance by Tile Sampling".
- Travel grant to attend COMSNETS 2022.
- Silver Medal, Diploma in Electrical Engg., Govt. Polytechnic Basti (2017)
- Silver Medal, Debate, Govt. Polytechnic Basti (2016)

Academic Service

- Member of Artifact Evaluation Program Committee of SIGCOMM 2024

References

- Dr. Arani Bhattacharya
  Assistant Professor, Department of Computer Science & Engineering
  Indraprastha Institute of Information Technology Delhi
  New Delhi, India
  Email: arani@iiitd.ac.in

- Dr. Mukulika Maity
  Assistant Professor, Department of Computer Science & Engineering
  Indraprastha Institute of Information Technology Delhi
  New Delhi, India
  Email: mukulika@iiitd.ac.in

- Dr. S K Sinha
  Professor and Training & Placement Officer, Department of Electrical Engineering
  Kamla Nehru Institute of Technology Sultanpur
  Uttar Pradesh, India
  Email: sksinha@knit.ac.in

- Mr. Dhananjai Singh
  Former Lecturer, Department of Electrical Engineering
  Kamla Nehru Institute of Technology Sultanpur
  Uttar Pradesh, India
  Email: dhananjai.eee@gmail.com

- Mr. A. K. Chaturvedi
  Former Head, EE Dept, Govt. Polytechnic Basti
  Uttar Pradesh, India
  Email: agya_akc02@rediffmail.com