Kushagra Mahajan

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Education

Carnegie Mellon University, School of Computer Science **Aug. 2021 – Present**
Master of Computational Data Science — GPA: 4.06/4.00 *Pittsburgh, PA*

- *Coursework*: Machine Learning, Machine Learning for Large Datasets, NLP, Cloud Computing, Visual Learning and Recognition, Multilingual NLP, Multimodal ML
- ***Capstone Project*: Amazon Alexa Prize Simbot Challenge** – Building state-of-the-art systems for navigation, localization, mapping and interaction of a virtual assistant bot with the Arena environment based on user-assigned real-world tasks in collaboration with **Amazon Alexa AI**.

Indraprastha Institute of Information Technology Delhi (IIIT Delhi) **Aug. 2014 – Dec. 2018**
Bachelor of Technology in Computer Science — GPA: 8.78/10.00 *Delhi, India*

- Coursework: Computer Vision, Probabilistic Graphical Models, Data Mining, Collaborative Filtering, Machine Learning (Teaching Assistant - Fall '18), Data Structures and Algorithms, Compiler Design, Database Systems, Operating Systems.

Experience

Amazon **May 2022 – Aug 2022**
Software Engineering Intern — Installments Team *Seattle, WA*

- Improved web page notification system for payment failures to be more descriptive and provide rectification steps to customers. Reduced customer tickets regarding payment failures by 72%.

Tata Research and Innovation Labs **Feb. 2019 – April 2021**
Machine Learning Research Engineer — Computer Vision Team | *Advisors: Dr. Lovekesh Vig & Dr. Gautam Shroff* *Delhi, India*

- Designed a meta-learning based framework for skin lesion and chest x-ray classification, and segmentation of medical and natural scene images. Published **3 papers** [2, 3, 4] and built **2 products** for chest x-ray analysis, and skin lesion detection.
- Explored disentangling biological signals from noise in cellular images and achieved top-5 percentile in NeurIPS 2019 challenge with test accuracy 96.06%. Also worked on distributed training, abnormality detection in X-rays using GANs, visual attention.
- Built an end-to-end alignment and information extraction system for document images using a novel keypoint extraction algorithm. Product sold to the **Landmark Group**. Published **1 paper** [5] and filed **1 US patent** [1].

Intel Corporation **Aug. 2017 – Dec. 2017**
Machine Learning Research Intern | *Advisor: Mr. Tigi Thomas* *Bangalore, India*

- Created a highly optimized sensor-based gesture detection and recognition model for on-device deployment surpassing benchmarks for memory constraints and output latency. Tested by deploying model on laptop hardware.

CVML Lab, IIIT Delhi **Aug. 2016 – Dec. 2018**
Undergraduate Researcher | *Advisor: Prof. Chetan Arora* *Delhi, India*

- Used texture descriptors to improve clothing segmentation by 3% for **visual fashion image and attribute search** systems.
- Exploited the pose structure to enhance SoA fine-grained classification performance by 2-3% across standard FGVC datasets. Curated an Amazon pose-aware apparel dataset. Published **2 papers** [6, 7]. Work was in collaboration with **Staqu Technologies**.

Projects

Amazon Alexa Prize Simbot Challenge **Spring 2022 - Present**
CMU Capstone Project | *Advisor: Prof. Yonatan Bisk*

- Building state-of-the-art systems for navigation, localization, mapping and interaction of a virtual assistant bot with the Arena environment based on user-assigned real-world tasks in collaboration with **Amazon Alexa AI**.

Natural Language Inference for Code-Switched Hinglish **Spring 2022**
Course Project: Multilingual NLP | *Advisor: Prof. Alan Black*

- Improved state-of-the-art NLI performance on GLUECoS benchmark by 6% for code-switched Hindi-English by translating to matrix or embedded language, and adaptation of language models to the code-switched domain using PyTorch. [Report]

Twitter Cloud Native Web Service with Microservices **Spring 2022**
Course Project: Cloud Computing | *Advisor: Prof. Majd Sakr*

- Created an ETL pipeline using Spark for processing 1.2TB Twitter data, and a microservice based architecture using Kubernetes for data retrieval and running analytic jobs in a cost constrained setting.

Patents and Publications

[1] **K. Mahajan**, M. Sharma, L. Vig, Tata Consultancy Services Limited. "Method and System for Keypoint Extraction from Images of Documents". Filed at the Indian Patent Office. Number: 201921035983 (PCT filed. Number: WO2021044447A2)

[2] A. Pandit, **K. Mahajan**, S. Kunde. et. al. "Data-Efficient Training of High-Resolution Images in Medical Domain". 29th European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN) 2021. [PDF]

[3] **K. Mahajan**, M. Sharma, L. Vig. et. al. "CovidDiagnosis: Deep Diagnosis of COVID-19 Patients Using Chest X-Rays". IEEE International Workshop on Thoracic Image Analysis, MICCAI 2020. [PDF]

[4] **K. Mahajan**, M. Sharma, L. Vig. "Meta-DermDiagnosis: Few-Shot Skin Disease Identification using Meta-Learning". IEEE International Conference on Computer Vision and Pattern Recognition 2020 Workshops (CVPRW). [PDF]

[5] **K. Mahajan**, M. Sharma, L. Vig. "Character Keypoint-based Homography Estimation in Scanned Documents for Efficient Information Extraction". CBDAR workshop at the 15th IEEE International Conference on Document Analysis and Recognition (ICDAR) 2019. [PDF]

[6] **K. Mahajan**, T. Khurana, A. Chopra, I. Gupta, C. Arora, A. Rai. "Pose Aware Fine-Grained Visual Classification Using Pose Experts". 25th IEEE International Conference on Image Processing (ICIP) 2018. [PDF]

[7] T. Khurana, **K. Mahajan**, C. Arora, A. Rai. "Exploiting Texture Cues for Clothing Parsing in Fashion Images". 25th IEEE International Conference on Image Processing (ICIP) 2018. [PDF]

Skills & Achievements

Programming Languages, FrameWorks and Tools: Python, C, C++, Java, SQL, Tensorflow, Pytorch, Keras, PySpark, Caffe, OpenCV, Scikit, NumPy, Pandas, SciPy, EspNet, Kafka, Samza, HBase, MongoDB, AWS, Azure, Kubernetes
Achievements: *Travel Grant*: AICTE-INAE for ICIP 2018, *Dean's List*: 2017-2018, Teaching Fellow at Vivekananda Kendra, Delhi.