

# KUSHAGRA MAHAJAN

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## EDUCATION

<b>Carnegie Mellon University, School of Computer Science</b> Master of Computational Data Science — GPA: 4.06/4.00 <ul style="list-style-type: none"><li>Coursework: Machine Learning, Machine Learning for Large Datasets, NLP, Cloud Computing, Visual Learning and Recognition, Multilingual NLP, Multimodal ML, <b>Best Capstone Solution Award</b></li></ul>	Pittsburgh, PA Aug. 2021 – Present
<b>Indraprastha Institute of Information Technology Delhi (IIIT Delhi)</b> Bachelor of Technology in Computer Science — GPA: 8.78/10.00 <ul style="list-style-type: none"><li>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.</li></ul>	Delhi, India Aug. 2014 – Dec. 2018

## EXPERIENCE

<b>Amazon</b> Software Engineering Intern — Installments Team <ul style="list-style-type: none"><li>Analyzed payment failure data and <b>improved web page notification</b> system for <b>payment failures</b> to be more descriptive and provide rectification steps to customers using <b>Java</b>. Reduced customer tickets regarding payment failures by 72%.</li></ul>	Seattle, WA May 2022 – Aug 2022
<b>Carnegie Mellon University</b> Meta AI Sponsored Research Assistant — Advisor: Prof. Louis-Philippe Morency <ul style="list-style-type: none"><li>Working with <b>Meta AI</b> on <b>user satisfaction estimation for VR/AR glasses</b> using several modalities like <b>3D visual data</b> (3D head pose estimation, view normalization, and 3D generation), acoustic, and physiological modalities.</li></ul>	Pittsburgh, PA Feb 2023 – Present
CMU Capstone — Advisor: Prof. Yonatan Bisk <ul style="list-style-type: none"><li>Built state-of-the-art systems for navigation, localization, mapping and interaction of a <b>virtual assistant bot</b> based on user-assigned real-world tasks in collaboration with <b>Amazon Alexa AI</b>. Currently <b>ranked #1 on the Amazon Leaderboard</b>.</li></ul>	Jan. 2022 – Dec. 2022
<b>TCS Research and Innovation Labs</b> Machine Learning Engineer — Computer Vision Team   Advisors: Dr. Lovekesh Vig & Dr. Gautam Shroff <ul style="list-style-type: none"><li>Designed a <b>meta-learning</b> based framework for <b>skin lesion</b> and <b>chest x-ray classification</b>, and <b>segmentation</b> of medical and natural scene images. Published <b>3 papers</b> [2, 3, 4] and built <b>2 products</b>.</li><li>Explored <b>disentangling biological signals</b> from noise in <b>cellular images</b> using <b>CNNs and ArcFace loss</b> and achieved top-5 percentile in <b>NeurIPS 2019 challenge</b> with test accuracy 96.06%. Worked on <b>distributed training</b>, <b>GANs</b>, <b>visual attention</b>.</li><li>Built an end-to-end <b>alignment and information extraction</b> system for document images using a novel <b>keypoint extraction algorithm</b>. Product sold to the Landmark Group. Published <b>1 paper</b> [5] and filed <b>1 US patent</b> [1].</li></ul>	Delhi, India Feb. 2019 – April 2021
<b>Intel Corporation</b> Machine Learning Intern   Advisor: Mr. Tigi Thomas <ul style="list-style-type: none"><li>Created a highly optimized <b>sensor-based gesture detection and recognition</b> model for <b>on-device</b> deployment surpassing benchmarks for memory constraints and output latency. Tested by deploying model on laptop hardware.</li></ul>	Bangalore, India Aug. 2017 – Dec. 2017
<b>CVML Lab, IIIT Delhi</b> Machine Learning Intern   Advisor: Prof. Chetan Arora <ul style="list-style-type: none"><li>Used texture descriptors (<b>Gabor filters</b>) to improve clothing segmentation (<b>DeepLabV2, FCN</b>) by 3% for <b>visual fashion image and attribute search</b> systems. Exploited <b>pose structure</b> to enhance SoA <b>fine-grained classification</b> performance by 2-3% using CNNs across standard FGVC datasets. Published <b>2 papers</b> [6, 7].</li></ul>	Delhi, India Aug. 2016 – Dec. 2018

## PROJECTS

<b>Twitter Cloud Native Web Service with Microservices</b> Course Project: Cloud Computing   Advisor: Prof. Majd Sakr <ul style="list-style-type: none"><li>Created an <b>ETL pipeline using Spark</b> for processing <b>1.2TB Twitter data</b>, and a <b>microservice</b> based architecture using <b>Kubernetes</b> for data retrieval and running analytic jobs in a <b>cost constrained</b> setting.</li></ul>	Spring 2022
<b>Multimodal Image to Recipe Generation</b> Course Project: Multimodal ML   Advisor: Prof. Louis-Philippe Morency <ul style="list-style-type: none"><li><b>Transformer based</b> recipe generation from food images using a novel approach comprising <b>co-learning</b> ingredients, <b>component-aware embeddings</b>, <b>contrastive loss</b> for semantic similarity, and <b>improved evaluation metrics</b>. [Report]</li></ul>	Fall 2022
<b>Natural Language Inference for Code-Switched Hinglish</b> Course Project: Multilingual NLP   Advisor: Prof. Alan Black <ul style="list-style-type: none"><li><b>Improved SoA</b> on GLUECoS benchmark by <b>6%</b> for <b>code-switched Hindi-English</b> by translating to matrix or embedded language, and adaptation of language models to the code-switched domain using <b>transformer models XLM-R, mBERT, mT5</b> etc. [Report]</li></ul>	Spring 2022

## PATENTS AND PUBLICATIONS

[1] <b>K. Mahajan</b> , 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: WO202104447A2)	
[2] A. Pandit, <b>K. Mahajan</b> , 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] <b>K. Mahajan</b> , 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] <b>K. Mahajan</b> , 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] <b>K. Mahajan</b> , 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] <b>K. Mahajan</b> , 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, <b>K. Mahajan</b> , 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, Spark, PySpark, Caffe, OpenCV, Scikit, NumPy, Pandas, SciPy, EspNet, Kafka, Samza, HBase, MongoDB, AWS, Azure, Kubernetes, Docker  
**Achievements:** Best Capstone Solution Award (MCDS at CMU), Travel Grant: AICTE-INAE for ICIP 2018, Dean’s List: 2017-2018.