

Harsh Maheshwari

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EDUCATION

Georgia Institute of Technology, Atlanta, US

Master of Science in Computer Science (Specialization: **Machine Learning**)

Aug. 2021 – Present.

Advisor: **Dr. Devi Parikh**; Expected Graduation: May 2023

Indian Institute of Technology, Delhi, New Delhi, India

B.Tech in Electrical Engineering

Jul. 2015 – May. 2019

Advisor: **Dr. Prathosh AP**

PUBLICATIONS and PREPRINTS

1. **CoSIR: Optimal control of SIR epidemic dynamics by mapping to Lotka-Volterra System**, presented at **ICLR'21 Workshop MLPCP and CHIL'21 Workshop**
Harsh Maheshwari, Shreyas Shetty, Nayana Bannur, Srujana Merugu
 2. **Style-Attention-based Compatible Outfit Generation**, under review at **ECIR'22**; accepted for **CODS-COMAD'22 Demo track**
Harsh Maheshwari, Lucky Dhakad*, Debopriyo Banerjee, Niloy Ganguly, Arnab Bhattacharya*
 3. **Audience Creation for Consumables - Simple and Scalable Precision Merchandising for a Growing Marketplace**, Shreyas S*, *Harsh Maheshwari**, Avijit Saha*, Samik Datta*, Shashank Jain, Disha Makhija, Anuj Nagpal, Sneha Shukla, Suyash
 4. **A Flexible Data- Driven Framework for COVID-19 Case Forecasting Deployed in a Developing- world Public Health Setting**, Sansiddh Jain, Avtansh Tiwari, Nayana Bannur, Ayush Deva, Siddhant Shingi, Vishwa Shah, Mihir Kulkarni, Namrata Deka, Keshav Ramaswami, Vasudha Khare, *Harsh Maheshwari*, Soma Dhavala, Jithin Sreedharan, Jerome White, Srujana Merugu, Alpan Raval
 5. **Adaptive COVID-19 Forecasting via Bayesian Optimization**, CODS-COMAD'21
Nayana Bannur, Harsh Maheshwari, Sansiddh Jain, Shreyas Shetty, Srujana Merugu, Alpan Raval
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WORK EXPERIENCE

Graduate Research Assistant, Georgia Institute of Technology

Advised by: **Dr. Devi Parikh**

Aug. 2021 – Present.

- Working on problems related to creative multi-modal generative models.

Data Scientist II - Flipkart, Bengaluru, India

Largest E-Commerce platform in India with over 200M users

July. 2019 – July. 2021

- **Complete The Look (Prof. Niloy Ganguly - IIT KGP, Dr. Arnab Bhattacharya - Flipkart):**
 - Problem: Generating **fashion-compatible** and **diverse** outfits for a 'hero' product for Indian users and their preferences.
 - Designed an architecture and algorithm to learn outfit compatibility conditioned under a 'style'.
 - Designed a **beam search** variant using **determinantal point process** to introduce diversity **across outfits**.
 - Implemented SOTA **fashion-compatibility, apparel segmentation, category classification** models and a flask tool to get annotations.
- **Candidate Generation and Ranking (Samik Datta, Dr. Aditya Rachakonda - Flipkart):**
 - Customized **Bayesian Personalised Ranking based Matrix Factorisation** framework for Flipkart homepage recommendation
 - Designed multiple **Lamda MART** & LR based rankers for Flipkart home and product page.
 - Designed algorithms to improve diversity & freshness of recommendations and handled the trade off with short-term conversion metrics.
 - **Impact:** Improvement in overall conversion by 2bps (units/visits) and 16bps (units/visitor) - *won an internal project award for this work*

Covid19 Volunteer - DSIndiaVsCovid19, Wadhwani AI,

A consortium of volunteer technologists to support public authorities in managing COVID-19

March. 2020 – July. 2021

- **Forecasting (Dr. Srujana Merugu, Dr. Alpan Raval, Dr. Mohit Kumar):**
 - Developed an **ML framework** for infectious disease forecasting based on **SEIR epidemiological model variants**
 - Achieved less than 10% MAPE error on the forecasts for COVID-19 by estimating parameters via **Bayesian optimization**.
 - **Impact:** The system is being used for COVID-19 medical preparedness in war rooms of heavily impacted Indian cities.

- *Controlling an Epidemic* (Dr. Srujana Merugu):
 - Proposed a control framework by mapping the SIR model to the **Lotka-Volterra** system and **control-Lyapunov** theory.
 - The framework permits **design of non-pharmaceutical interventions** that limits the disease burden on an isolated region.
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Internships

Videoken, Bengaluru, India
Computer Vision, Deep Learning

May. 2018 – July. 2018

- Constructed a binary video frame classifier which used patches of images, inspired by **patchGAN's discriminator**.
 - Used **spatial pyramidal pooling** to deal with images of different aspect ratios.
 - Built an OpenCV based semi-automated image segmentation tool using **Django Framework** to reduce human efforts for annotating images by employing object tracking. Used to create annotated dataset quickly.
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Projects

BoardSnapped, Advised by: Dr. Prathosh AP
Video summarisation

Dec. 2017 – July. 2018

- Formulated educational video summarization problem as a keyframe detection problem.
- Used CNNs and **bi-directional convolutional LSTM** models to solve the problem.
- Achieved classification accuracy of **99.3%** and keyframe detection acc. of **97.38%** with precision & recall of **74% & 77%**
Received highest grade by the panel.

Skin Segmentation from NIR Images, Advised by: Dr. Prathosh AP
Segmenting skin pixels from Near Infrared Images

April. 2018 – Dec. 2018

- Generated skin segmentation dataset for NIR Images using a **pix2pix** like **conditional GAN** from RGB images.
 - Trained **ResNet38** and **PSPnet** to segment human skin pixels from NIR Images to achieve high dice coefficient.
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SKILLS & INTERESTS

Research Interest: Computer Vision, Creative AI, Vision + Language, NLP

Deep Learning Frameworks: PyTorch, TensorFlow, Keras

Languages: Python, C++, Java, Hive, SQL

Courses: Deep Learning, Big Data Systems, Mathematical Foundations of ML, Introduction to Machine Learning, Advanced Machine Learning, Computational Learning Theory and Mind, Information bottleneck Theory of Deep Learning, Information Theory, Data Structures and Algorithms, Probability, Linear Algebra

SCHOLASTIC ACHIEVEMENTS

- Awarded **Best Project Award** at Flipkart for a recommendations ranking project (2020)
 - Among 11 finalist teams in 4-stage National level AI/ML Challenge - Flipkart GRiD (2019)
 - **Huawei Seeds for the Future:** Among **4 students** from India selected for a 2-week training program in **China**, studied Chinese Language and Culture in BLCU, Beijing and picked up hands-on experience of **5G**, **IoT** and **Cloud Computing** in Huawei Headquarters, Shenzhen (2018)
 - **All India Rank 834** in IIT-Joint Entrance Exam Advanced among **1.4 million** students. (2015)
 - **NSEP top 1%:** Certified for being in **top 1%** out of 37837 in National Standard Examination in Physics (NSEP) organised by Indian Association of Physics Teachers (IAPT) (2015)
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