

Harsh Maheshwari

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Education

MS in Computer Science 2021–Present

Georgia Institute of Technology, Advised by: **Dr. Devi Parikh**

Bachelor of Technology in Electrical Engineering, (Power and Automation) 2015–2019

Indian Institute of Technology, Delhi, Grade: 8.27/10, Advised by: **Prof. Prathosh AP**

Publications and Pre-prints

5. **Harsh Maheshwari***, Shreyas Shetty*, Nayana Bannur, Srujana Merugu, "CoSIR: Optimal control of SIR epidemic dynamics by mapping to Lotka-Volterra System", under review at **NeurIPS'21**, presented at **CHIL'21 Workshop** and **ICLR'21 Workshop MLPCP** [preprint: 2020.11.10.20211995]
4. **Harsh Maheshwari***, Lucky Dhakad*, Debopriyo Banerjee, Niloy Ganguly, Arnab Bhattacharya "Style-Attention-based Compatible Outfit Generation", under review at **BMVC'21**
3. Shreyas S*, **Harsh Maheshwari***, Avijit Saha*, Samik Datta*, Shashank Jain, Disha Makhija, Anuj Nagpal, Sneha Shukla, Suyash S, "Audience Creation for Consumables - Simple and Scalable Precision Merchandising for a Growing Marketplace" [preprint: arXiv:2011.08575]
2. 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 "A Flexible Data-Driven Framework for COVID-19 Case Forecasting Deployed in a Developing- world Public Health Setting"
1. Nayana Bannur, **Harsh Maheshwari**, Sansiddh Jain, Shreyas Shetty, Srujana Merugu, Alpan Raval, "Adaptive COVID-19 Forecasting via Bayesian Optimization", in **CoDS-COMAD'21** [paper: 10.1145/3430984.3431047]

*Equal Contribution

Work Experience

Data Scientist II - Flipkart Internet Private Limited July, 2019 – July, 2021
Largest E-Commerce platform in India with over 200M users Bengaluru, India

- **Complete The Look** (Prof. Niloy Ganguly - IIT KGP, Dr. Arnab Bhattacharya - Flipkart):
 - Generating **fashion-compatible** and **diverse** outfits for a 'hero' product for Indian users and their preferences.
 - Learning compatibility and generating outfits conditioned on 'style'. We argue that an outfit may be compatible under a certain 'style' and incompatible under other. Under review at **BMVC'21**
 - 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 web tool to get compatibility annotations.
- **Candidate Generation and Ranking** (Samik Datta, Dr. Aditya Rachakonda - Flipkart):
 - Customized **Bayesian Personalised Ranking based Matrix Factorisation** framework for Flipkart homepage recommendation and designed multiple **Lamda MART** & LR based rankers for Flipkart home and product page. (Improvement in overall conversion by 2bps (units/visits) and 16bps (units/visitor) - won an internal **award** for on this work)
- **Audience Creation for Consumables** (Samik Datta - Flipkart):
 - **Problem**: Creating an audience set for a store for precision merchandising on Flipkart Grocery home page.
 - Performed large scale experiments on **temporal point process** based precision merchandising algorithm for Grocery.

A consortium of technologists working as volunteers in collaboration with Wadhvani AI to support public authorities in managing the COVID-19 pandemic by building and deploying technology solutions

- **Forecasting** (Dr. Srujana Merugu - Google Research, Dr. Alpan Raval- Wadhvani AI, Dr. Mohit Kumar- Udaan.com):
 - *Problem:* Given the past case counts of an isolated region, forecast the disease spread dynamics for the next k days.
 - Developed an **ML framework** for infectious disease forecasting based on **SEIR epidemiological model variants** with parameters estimated via **Bayesian optimization**. Achieved less than 10% MAPE error on the forecasts for COVID-19.
 - *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 - Google Research, Wadhvani AI):
 - *Problem:* Given the medical capacity of an isolated region, create a transmission policy schedule to adaptively control the number of infections in an epidemic.
 - Proposed an analytic control framework based on mapping the SIR model to the well studied **Lotka-Volterra** system and **control-Lyapunov** theory. The framework permits design of policies for adaptive control of transmission rate using non-pharmaceutical interventions that limits the overall disease burden.

Internships

Videoken, Bengaluru (Dr. Meghshyam Prasad)

May, 2018 – July 2018

Computer Vision, Deep Learning

- Constructed a classifier which used patches of images, inspired by **patchGAN's discriminator**, to classify slides from software demo frames in a video by using **spatial pyramidal pooling** to deal with images of different sizes.
- 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.
- Achieved high **dice coefficient** by training a U-net for segmenting projected slides out of presentation recordings

Projects

BoardSnapped (Prof. Prathosh AP, IIT Delhi)

Dec, 2017 – July, 2018

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

Skin Segmentation from NIR Images, (Prof. Prathosh AP, IIT Delhi)

Apr, 2018 – Dec, 2018

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

Scholastic Achievements

2015: JEE Advanced: Achieved All India Rank of 834 amongst 1.5 million students

2019: Finalist in Flipkart GRiD Among 11 finalist teams in 4-stage National level AI/ML Challenge

2018: 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

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)

Technical Skills and Relevant Courses

Relevant 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

Languages & Frameworks: Python, Java, C++, C; PyTorch, TensorFlow, MATLAB; Keras, Scikit-learn; Hive, SQL