Divyat Mahajan

Research Fellow, Microsoft Research Lab India
LinkedIn, Google Scholar, divyatmahajan@gmail.com, +91 7755057756

EDUCATION

Indian Institute of Technology, Kanpur *July 2014-June 2019*
B.S. in Mathematics And Scientific Computing GPA: 8.6/10.0
Double Major in Computer Science And Engineering

CURRENT POSITION

• **Research Fellow** *July 2019-Present*
Microsoft Research Lab India

- Working with Amit Sharma on projects related to Causal Inference and Explainable Machine Learning
- Recent work done on Counterfactual Explanations for Machine Learning classifiers accepted in **NeurIPS2019 - Workshop on Causal Machine Learning**

RESEARCH PROJECTS

• **Generative Zero Shot Learning with Adversarial Domain Adaptation** *Feb 2018-Nov 2018*
Course Project: Topics in Probabilistic Modelling and Inference, Prof. Piyush Rai Arxiv

- Developed a Generative framework for Zero Shot Learning that learns the class data distribution conditioned on attribute vectors
- Inferred the class distribution parameters by end to end learning of the mapping from class attribute to parameters using supervision provided by seen data class labels
- Extended the model using Adverserial Domain Adaption for better estimation of unseen class data distributions
- Obtained results better than many state of the art Zero Shot Learning models on various benchmark datasets under inductive, transductive and generalised setting
- The paper has been accepted in Round 1 submission for **Winter Conference on Applications of Computer Vision (WACV 20)**

• **Visual Program Synthesis** *Jan 2018-Dec 2018*
Undergraduate Project: Prof. Vinay Namboodiri Presentation Report

- Proposed a Deep Generative model for program synthesis of Logo language from the given textual specification
- Used Conditional DC GAN to generate images from input text caption and incorporated LSTM with an attention framework to generate Logo program using information from synthesized images
- Created datasets comprising of text caption describing geometrical shapes with basic components like circles and polygons alongwith the corresponding image and logo program
- Trained the complete pipeline end to end using TensorFlow and generated syntactically and semantically correct Logo program along with good synthesized images for text captions in dataset

RESEARCH INTERNSHIPS

• **Approximate Bayesian Computation for Cancer Simulator** *May 2018-Jul 2018*
Probabilistic Machine Learning Group, Aalto University, Prof. Samuel Kaski Presentation

- Worked on the inference of a complex stochastic simulator based model that represents cancer treatment process of a patient
- Did literature survey of Approximate Bayesian Computation methods and used Bayesian Optimisation for Likelihood Free Inference approach
- Work included Exploratory Data Analysis to determine informative statistics for dimensionality reduction and inference of parameters with Bayesian Optimisation framework implemented using Engine for Likelihood Free Inference (ELFI)

• **Recommender Systems** *May 2017-Jul 2017*
National University of Singapore, Prof. Wynne Hsu and Prof. Lee Mong Li Code

- Worked on building Recommender System that predicts Effectiveness and Side Effects on the usage of a Drug for a Patient
- Created, Preprocessed a dataset and performed Baseline Evaluations using Matrix Factorization algorithms and Regression Models
- Implemented a Deep Learning Model to learn better Latent Features and perform Multi Label Classification of Side Effects

OTHER RELEVANT PROJECTS

• Probabilistic Approach to Sense Embeddings *Sep 2017-Nov 2017*
Course Project: Probabilistic Machine Learning, Prof. Piyush Rai Report Code

- Worked on extending the paper Multimodal Word Distributions, ACL 2017 by Athiwaratkun and Wilson to learn multiple word embeddings relating to the different senses of a word using Gaussian Mixture Model
- Developed a model with reduced number of parameters as compared to the model suggested in the paper by using a linear combination of global parameters to generate local word specific parameters
- Implemented the model using TensorFlow and showed our model leads to less overfitting on smaller datasets and learning more embeddings per word than the model of Athiwaratkun and Wilson

• Stance Classification of Tweets *June 2016-July 2016*
New York Office, IIT Kanpur, Prof. Vincent Ng Code

- Worked on predicting Stance for Tweets against a Target using machine learning algorithms, a task in International Workshop on Semantic Evaluation 2016
- Read research papers on Sentiment Analysis and Stance Classification and used ideas from them to develop a model for tweets that do not express opinion about the main target

• Human Emotion Recognition from Images *Sep 2016-Nov 2016*
Course Project: Machine Learning Techinques, Prof. Piyush Rai Report Code

- Classified the emotion from facial images of humans using machine learning algorithms into seven categories
- Generated features by using Google Cloud Vision API and using Neural Network in the second approach
- Compared the above approaches by implementing Support Vector Machine and K-Nearest Neighbour for classification

AWARDS AND ACHIEVEMENTS

- Received the **Academic Excellence Award, IIT Kanpur** for the academic session 2017-2018
- Selected among the 30 students from 350 applicants for **Aalto Science Institute Internship Program 2018**
- Obtained overall rank **93** and rank **7** among IIT Kanpur teams in **ACM-ICPC 2017** Regionals Online Round(3000+ teams)
- Obtained 2^{nd} rank in International High Performance Computing 2016 organized by **CDAC India** and Techkriti IIT Kanpur
- Obtained Merit with **Rank 13** in Matriculation Examination and **Rank 36** in Senior Secondary Examination
- Secured **Rank 1** in State Mathematics Olympiad organized by Children Science Congress in Himachal Pradesh

RELEVANT COURSEWORK

Machine Learning	Machine Learning Techniques, Probabilistic Machine Learning, Visual Recognition Topics in Probabilistic Modelling and Inference
Statistics	Probability and Statistics, Applied Stochastic Process, Statistical Inference
Algorithms and Theory	Data Structure and Algorithm, Algorithms II, Theory of Computation, Quantum Computing
Systems	Computer Organization, Compiler Design, Operating Systems Computing Lab 1, Computing Lab2, Principles of Database Systems
Mathematics	Advanced Linear Algebra, Mathematical Logic, Numerical Analysis and Scientific Computing Severable Variable Calculus , Ordinary Differential Equations, Partial Differential Equations Real Analysis, Complex Analysis, Abstract Algebra

TECHNICAL SKILLS

Programming Languages	C, C++, Python, Bash, Assembly, Socket Programming, MongoDB, MySQL, PHP, Javascript
Software and Utilities	Git, Docker, Latex, Sklearn, Keras, TensorFlow, ELFI, Numpy, Pandas, Selenium, BeautifulSoup

MENTORSHIP

- (2018) Project Mentor for the course Machine Learning Techniques (CS771A) offered by Prof. Piyush Rai at IIT Kanpur
- (2018) Mentored 5 freshmen students for a project on Recommender Systems under Association of Computing Activities, IITK

EXTRA CURRICULAR ACTIVITIES

- (2017) Managed a team of 5 members to publish 2 editions of Newsletter Alpha under Statmatics, mathematics society of IITK
- (2016) Volunteer in Kanpur team of Blood Connect, NGO working to provide a solution for the shortage of blood in India