Spandan Madan

[google scholar] [github] [webpage] [email]

CURRENT EMPLOYMENTS

Research Assistant, MIT CSAIL. (Advisor: Fredo Durand)

Contract Researcher, Microsoft Research Redmond, USA. (Manager: Nebojsa Jojic)

EDUCATION

Harvard University, USA May 2018
M.E. in Computational Sciences and Engineering. (**GPA:** 3.835/4)
Thesis Advisors: Hanspeter Pfister (Harvard) and Frédo Durand (MIT).

Indian Institute of Technology Delhi, INDIA Dec 2015
B.Tech. and M.Tech. (**Master's GPA:** 9.0/10, **Bachelor's GPA:** 8.265/10)
Thesis Advisors: David Roos (Upenn) and Durai Sundar (IIT Delhi).

SCHOLARSHIPS FELLOWSHIPS AWARDS

Snap Research Scholarship (2017-2018)
Scholarship based on research proposal submitted to Snap Inc (parent company of Snapchat).

Harvard SEAS Fellow in computer science (2017-2018)

Government of India MHRD Master's scholarship (2015-2016)
Awarded by the Ministry of Human Resource Development, Government of India.

UIST Conference Honorable Mention paper award (2017)
Awarded for our paper on visual importance prediction [4].

RESEARCH EXPERIENCE

Quantifying generalization behaviour of computer vision models Sept 2018 - Present
MIT CSAIL, Advisor: Professor Frédo Durand

- Designed a procedural graphics pipeline to recreate cities using GIS data and 3D geometry.
- This pipeline allows generating large scale data with fine control over parameters like object viewpoints, light source distribution and intensity and other scene attributes.
- Conceptualized and implemented experiments to quantify generalization behaviour of different neural net architectures and optimization strategies using above mentioned pipeline.

Reservoir sampling for automatic dialog data set generation June 2018 - Present
Microsoft Research Redmond, Manager: Nebojsa Jojic

- Developed an algorithm for non-parametric reservoir sampling. Given a stream of data, our algorithm samples points which match a seed distribution (based on the MMD criterion).
- Designed a framework to create conversational agents for Microsoft XBox which build their own dataset by sampling lines from internet using above mentioned sampling algorithm.

Computer Vision for non natural images (Master's Thesis) Dec 2016 - May 2018
Harvard SEAS (Professor Hanspeter Pfister) and MIT CSAIL (Professor Fredo Durand)

- Worked on visual importance prediction for graphic designs and data visualizations. This work was published in UIST'17 and was also awarded the honorable mention award [1].
- Introduced a new dataset of infographics. Designed and implemented a multiple instance learning model to extract regions in inforgraphics most representative of their content [2].
- Conceptualized and implemented a data augmentation strategy for infographics, and used it to train a model to detect icons in infographics using synthetic annotations only [3].
- Studied the impact of title wording on memory recall of the underlying data for a line graphs. This project lead to a publication in the Journal of Vision [4].
- Another journal paper from this work is under preparation and soon to be submitted to IJCV.

Ensembled micro neural networks for targeted gene editing.
Indian Institute of Technology Delhi, Advisor: Professor Durai Sundar

- Conceptualized and implemented an algorithm for designing targeted molecular scissors (zinc proteins) for cleaving DNA at desired locations using an ensemble of shallow neural nets [5][6].

PUBLICATIONS

Computer Vision

1. Bylinskii, Z., Kim, N.W., O'Donovan, P., Alsheikh, S., **Madan, S.**, Pfister, H., Durand, F., Russell, B., Hertzmann, A. (2017) "Learning Visual Importance for Graphic Designs and Data Visualizations", ACM User Interface Software and Technology Symposium (UIST'17, Honorable mention award).
2. **Madan, S.**[*], Bylinskii, Z.[*], Alsheikh, S.[*], Recasens, A.[*], Zhong, K., Pfister, H., Durand, F. , Oliva, A. (2017) "Understanding Infographics Through Textual and Visual Tag Prediction". arXiv preprint arXiv:1709.09215.
3. **Madan, S.**[*], Bylinskii, Z.[*], Tancik, M.[*], Recasens, A., Zhong, K., Alsheikh, S., Pfister, H., Olia, A., Durand, F. (2018) "Synthetically trained icon proposals for parsing and summarizing infographics". arXiv preprint arXiv:1807.10441.
4. Newman, A., Bylinskii, Z., Haroz, S., **Madan, S.**, Durand, F., Oliva, A. (2018). "Effects of title wording on memory of trends in line graphs." Journal of Vision, 18(10), 837-837.

Machine Learning in Biology

5. Dutta, S., **Madan, S.**, Parikh, H., Sundar, D., 2016. "An ensemble micro neural network approach for elucidating interactions between zinc finger proteins and their target DNA". BMC genomics, 17(13), p.1033.
6. Dutta, S., **Madan, S.**, Sundar, D., 2016. "Exploiting the recognition code for elucidating the mechanism of zinc finger protein-DNA interactions". BMC genomics, 17(13), p.1037.

SELECTED COURSE PROJECTS

Tracking the source of rotational invariance in CNN's for Text Recognition
Advances in computer vision (MIT 6.869). Aug 2016 - Dec 2016

Exploring mode collapse in Bayesian GANs
Stochastic methods for Data analysis, inference and optimization (Harvard APMTH 207).

Bayesian hierarchical music recommendation system(working with Spotify)
Harvard CSE Capstone Course - APCOMP297R. Aug 2016 - Dec 2016

INVITED TALKS

- Berkeley Artificial Intelligence Research lab (BAIR) Nov 2017
- MIT Graphics Group Nov 2017
- New England Computer Vision Workshop Nov 2017
- Harvard Business School Oct 2017

REVIEWING EXPERIENCE

- Helped revieiw one paper for TPAMI, 2017.
- Helped revieiw two papers for CVPR, 2018.

TEACHING

- Managing with Data Science (Harvard University, 2018).
- Advanced Topics in Data Science (Harvard AC209B, 2017).

RELEVANT COURSEWORK

MIT - Computer Vision (6.869), Graduate Machine Learning (6.867, audited).
Harvard - Machine Learning (CS181), Stochastic Inference and Optimization (APMTH 207).
IIT Delhi - Special Topics in Machine Learning (Deep learning) (CSV878).

OPEN SOURCE PROJECTS AND TUTORIALS

- An end to end implementation of a machine learning pipeline (~4000 stars on Github).
- Pytorch tutorial on fine tuning for classification
- Tutorial on commonly used Pytorch tasks
- **HINGLISH**: Android app with over 50,000 downloads on google play store
- Me Bot: A framework to quickly launch a chat bots using user provided chats.

[*] implies equal contribution