# VIDESH SUMAN

MS CS Student @ UMass Amherst

*sumanvid97* ◇ *vsuman@cs.umass.edu* ◇ *sumanvid97* ◇ *sumanvid97.github.io*

## EDUCATION

**University of Massachusetts (UMass) Amherst** [Sep '19 - Present]
*MS* in Computer Science *Amherst, MA*

- Relevant Courses – Computer Vision, Applied Numerical Optimization

**Indian Institute of Technology (IIT) Bombay** [Jul '15 - May '19]
*BTech* in Civil Engineering *Mumbai, India*

- Thesis – Super-resolution of rainfall projections using Deep Learning techniques
- Relevant Courses – Machine Learning, Advanced Machine Learning, Deep Learning, Reinforcement Learning, Medical Image Computing

## RESEARCH & WORK EXPERIENCE

**MixMatch for Visual-Language Reasoning Tasks** [Oct '19 - Present]
***Computer Vision*** *under Prof. Subhransu Maji* *CICS, UMass Amherst*

- Leveraging a holistic approach for semi-supervised learning (SSL) on pre-trained LXMERT for NLVR2.
- Achieved the baselines of vanilla self-training, and mixup (on labeled examples), a regularization technique achieved by linear interpolation of datapoints in their latent and output spaces.
- Induced interpolation of textual inputs at the sentence level latent space on GPT2 (finetuned on NLVR2), semantic interpolation is of textual input is hard due to their discrete nature.
- Implemented MixMatch strategy with limited labeled examples, with mixup on labeled and unlabeled examples.
- Performing the data augmentation step by adding noise to the pretrained visual and textual embeddings.

**Segmenting Bird Roosts from Weather Radar Data** [Sep '19 - Present]
***Independent Study*** *under Prof. Daniel Sheldon and Prof. Subhransu Maji* *CICS, UMass Amherst*

- Finetuned MistNet to improve (reduce false positives) on segmenting bird roosts in the weather rada scans.
- Using the finetuned model's segmentation projections to improve roost detection on the unlabeled legacy scans.
- Working towards the future step of formulating a full instance segmentation pipeline like Mask R-CNN for radar scans, for improved roost detection and tracking.

**Data Informed Network Simulation | Microsoft Research India** [May '19 - Jul '19]
***Research Internship*** *under Dr. N. Natarajan and Dr. V. Padmanabhan* *Bengaluru, India*

- Formulated a data-driven network simulator which can learn the behaviour of an ensemble of per-packet-level network traces from unicast communications between a sender and a receiver (e.g., file transfer, real-time calls).
- Devised probabilistic and neural versions of a state space modeling approach to estimate a sequence of (domain-agnostic) network states, conditioned on past state(s), leveraging the use of state-transition matrices.
- Performed experiments with data from a pre-configured ns-2, and real network traces from Skype calls.
- Evaluated state-space models along with the deepAR forecasting model for unseen data on metrics capturing realism, like CDFs for per-packet delays, packet loss rates, and Hellinger scores from state-transition matrices.
- For model applicability, derived a log-likelihood score for a given unseen input trace, based on training data.

**Statistical Downscaling of Rainfall Projections using CNNs [Report] [Poster]** [Jul '18 - May '19]
***Undergraduate Thesis*** *under Prof. Amit Sethi & Prof. Subimal Ghosh* *IIT Bombay, Mumbai*

- Leveraged computer vision techniques to predict daily observed rainfall projections at high (∼25 km) resolution for the Indian landmass, from reanalysis simulations of climate variables at low (∼250 km) resolution.
- Owing to the 10× scaling factor and varying local rainfall patterns throughout India, only the central zone (among the seven meteorologically homogeneous zones) was subjected to subsequent experimentations.
- Designed custom CNN architectures with dense blocks, dilated & transpose convolutions, and cyclic learning rate schedulers to achieve MSE of 5 mm/day (better than kernel regression approach) throughout test data.

**Intelligent Conversational Platform | The Walt Disney Company** [May '18 - Jul '18]
***Internship*** *in Consumer Technologies under Mr. Aftab Sheikh* *Mumbai, India*

- Devised a PoC on intelligent virtual assistants for use-cases like Helpdesk assistance & in-app voice search.
- Designed conversations, and trained the agents for effective intent & context recognition with custom entities.
- Integrated pre-existing data with the entities and deployed them on cloud for fulfilled responses.

## TECHNICAL PROJECTS

**Unsupervised Learning for Archetypal Style Analysis [Report] [Code]** [Mar '19 - Apr '19]
***Advanced Machine Learning*** *under Prof. Sunita Sarawagi* *Computer Science, IIT Bombay*

- Derived 32 archetypal styles from van Gogh's 2046 artworks, implemented the universal style transfer technique.
- Verified the findings of the paper like quality of stylization & archetypal analysis through multiple experiments.

**Progressive Neural Networks for Multitask Learning [Report] [Code]** [Oct '18 - Nov '18]
***Reinforcement Learning*** *under Prof. Shivaram Kalyanakrishnan* *Computer Science, IIT Bombay*

- Investigated the prospects of multitask learning by adding lateral connections to the A3C framework. The idea was to transfer knowledge from source task (Pong) to target task (Breakout) to improve results on target task.

**Single Image Super-resolution using Adversarial Learning [Report] [Code]** [Oct '18 - Nov '18]
***Deep Learning*** *under Prof. P. Balamurugan* *Operations Research, IIT Bombay*

- Implemented a GAN for image super-resolution on Pascal VOC2012, using SRResNet as the generator network.
- Incorporated perceptual loss along with the adversarial loss for photo-realistic super-resolved generator outputs.

**Flappy Bird AI [Blog] [Code]** [Mar '18 - Apr '18]
***Machine Learning*** *under Prof. Amit Sethi* *Electrical Engineering, IIT Bombay*

- Trained an environment agnostic bot for the game using Q-learning & Deep Q-Network to produce a comparative analysis between the two frameworks. The DQN framework learnt significantly faster.
- Ensured early convergence by incorporating $\varepsilon$-greedy & experience replay strategies while training.

## SCHOLASTIC ACHIEVEMENTS

- Secured a national rank of **1490** among ∼140k candidates in JEE Advanced [2015]
- Conferred with the prestigious KVPY fellowship; national rank of **374** among ∼100k students [2014]

## ORGANIZATIONAL EXPERIENCE

- **Convener, Web and Coding Club (WnCC)** (2016-17) - Part of the 12-member team responsible for holding workshops, talks, sponsored hackathons with the spirit of fostering institute-wide coding culture. Some of the highlights of my WnCC tenure: Community Wiki, Seasons of Code, research meetings.
- **Marketing Coordinator, Mood Indigo** (2016) - Part of the 13-member team responsible for pursuing the marketing budget of Asia's largest college cultural festival through corporate sponsorship and brand integration.
- **Web Coordinator, Mood Indigo** (2016) - Part of the 7-member technical team responsible for developing websites and online portals for the fest, also providing technical assistance during the four days of the fest.