

Viraj Bagal

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PUBLICATIONS

- Viraj Bagal et al., 'MMBERT: Multimodal BERT Pretraining for Improved Medical VQA', ISBI 2021.
- Minesh Mathew, Viraj Bagal et al., 'InfographicVQA', WACV 2022.
- Viraj Bagal et al., 'MolGPT: Molecular Generation using Transformer-Decoder Model', JCIM 2021.

EXPERIENCE

AI Scientist

April 2021 – Present

Synapsica Healthcare — YC W20

Bangalore, India

- Experienced in working with highly imbalanced datasets and problems like multi-class multi-label classification, object detection, semantic segmentation, keypoint detection.
- Improved F1 score of the initial classification model by **23%** by extensive data cleaning, regularization and by more than **3%** using generalization techniques like SWA and self-distillation.
- Implemented active learning pipeline that significantly reduced the labelling cost.
- Converted a regression problem into keypoint detection in Spine X-rays using heatmaps. Resulted in **>100%** improvement in prediction acceptance compared to previous model.
- Implemented batch processing instead of sequential processing and ONNX runtime accelerator in production pipeline. This resulted in **30%** and **65%** reduction in production pipeline runtime respectively.
- Thus, I have contributed in improving multiple model performances in training, made them more robust and generalized, and also significantly reduced production pipeline runtime.

Deep Learning Research Intern

May 2020 – April 2021

Generative NLP, CCNSB Lab, IIIT

Hyderabad, India

- Worked on building models for scaffold and property conditioned molecule generation.
- Implemented graph based models like vanilla GNNs, GCNs, GATs for molecular generation using Python, Pytorch and Geometric Pytorch.
- Developed custom transformer decoder model similar to GPT that is **94%** smaller and achieved new state-of-the-art results (increase in performance) on conditional molecular generation. Interpretability addressed using saliency maps.
- Implemented RNNs, LSTMs, VAEs, AAEs, GANs for performance comparison against our model. Plots created using matplotlib and seaborn.
- Shorter version of research paper accepted at **AAAI-SDA 2021** workshop. Longer version accepted in **Journal of ChemInformatics (JCIM)**. Virtually presented my work at AAAI 2021 (Conference H5-index: **126**, Impact Score: **25.57**). [Click here for the paper.](#) [Click here for repo.](#)

Deep Learning Research Intern

May 2020 – April 2021

Multimodal (CV + NLP) Understanding, CVIT Lab, IIIT

Hyderabad, India

- Proposed and implemented a novel interpretable visual question answering (VQA) model on medical images, questions and answers.
- The model achieves new state-of-the-art performance with increase in accuracy and bleu score by **5%** while being **66%** more efficient than previous best models.
- Implemented self-supervised training with Masked Vision-Language Modeling and Image-Text Matching on multimodal BERT model using multi-GPU DDP trainig, HuggingFace, Pytorch Lightning, and monitored results using wandb (W&B).
- Implemented various CNN variants like ResNets, DenseNets, EfficientNets for image feature extraction and LSTMs, GRUs for text feature extraction.
- Research paper accepted at **IEEE ISBI 2021** (Conference H5-index: **43**, Impact Score: **6.6**). [Click here for the paper.](#) [Click here for repo.](#)

EDUCATION

Indian Institute of Science Education and Research

MS/MSc in Physics, Minor in Mathematics. GPA: 9.3/10

Pune, India

Aug. 2016 – June 2021

Willingdon College

Science. 85.85%

Sangli, India

Aug. 2014 – May 2016

PROJECTS

MLOps

October 2021

- Model monitoring using Weights and Biases, and Training configuration setup using Hydra.
- Data Version Control using DVC and Model Packaging using Fast API + ONNX + Docker.
- CI/CD using GitHub Actions, and created Container Registry using AWS ECR.
- Serverless Deployment using AWS Lambda and Prediction Monitoring using Elasticsearch Cluster + Kibana.

Multi-Object Tracking Of People

July 2021

- Tested two MOT algorithms: Yolov5 + DeepSORT and FairMOT, on MOT16 dataset.
- Yolov5 + DeepSORT achieved 52% MOTA on MOT16.
- FairMOT achieved 73% MOTA.
- For implementation details, qualitative and quantitative results, [click here](#). For Weights and Biases report, [click here](#).

Text Classification using Graph Neural Networks

February 2021

- Task was to predict the 'Industry tag' when given the description of the industry.
- Done EDA using histograms, wordcloud, kdeplots and scatterplots after TSNE.
- Created a weighted graph for each sample where I draw edge between words that co-occur and the weight is the frequency of co-occurrence.
- Trained and compared Graph Convolution and Graph Attention networks with different poolings.
- [Click here for the notebook](#). [Click here for training and evaluation curves and comparison between models](#).

ACHIEVEMENTS

- Secured **All India Rank 69** in KVPY 2016.
- Secured **All India Rank 2302** in JEE Advance 2016.
- **National Top 1%** in National Graduate Physics Examination 2019.
- 2× Kaggle Expert. Only **8%** of total Kaggle competitors are at this or above this rank
- 16th position (top 2%) in PANDA Competition on Kaggle among 1010 participants.
- Selected in Madhava Mathematics Competition conducted by Homi Bhabha Centre for Science Education, T.I.F.R.
- Three publications. One in [IEEE ISBI 2021](#), one in [WACV 2022](#) and one in [Journal of ChemInformatics \(JCIM\)](#).