

Viraj Bagal

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ABOUT ME

Experienced Computer Vision professional with **3+ years** of expertise in both research and engineering. Proficient in developing and productionizing models for diverse problems such as image classification, object detection, segmentation, keypoint detection, ranking. **3 Research papers** on multimodal data understanding published in international conferences like WACV, ISBI, JCIM. Demonstrates exceptional problem-solving skills as both an independent contributor and a valuable team player, with the ability to work effectively in a cross-functional team.

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

Machine Learning Engineer

April 2021 – Present

Synapsica Healthcare — YC W20

Bangalore, India

- Managed end-to-end Computer Vision pipeline involving data processing, model training, evaluation, tuning, optimization and deployment.
- Experienced in working on problems like multi-class multi-label classification, object detection, semantic segmentation, keypoint detection, ranking.
- Trained and productionized models like **Transformers, Efficientnets, Yolo, SAM, Unets**
- 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.
- Created **CI-CD** workflow to dockerize, test and deploy the pipeline on AWS. Used **FastAPI** to create endpoints.

Deep Learning Research Intern

May 2020 – April 2021

Generative NLP, CCNSB Lab, IIIT

Hyderabad, India

- Implemented graph based models like vanilla **GNNs, GCNs, GATs** for property conditioned molecule 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.
- 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

- Implemented a novel interpretable visual question answering (VQA) model on medical images that achieves new state-of-the-art performance with an 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 training, 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](#).
- Modified **LayoutLM** model to perform VQA on infographics instead of documents. [Click here for paper](#)

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

PROJECTS

RealTime Tracking

April 2022

- Implemented and compared FairMOT and YOLO+DeepSORT on realtime tracking.
- FairMOT is better than YOLO+DeepSORT on MOTA and False Positive Rate when tested on MOT-16 dataset

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.

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
- Three publications. One in [IEEE ISBI 2021](#), one in [WACV 2022](#) and one in [Journal of ChemInformatics \(JCIM\)](#).

SKILLS

- Technical: Machine Learning, Deep Learning, Computer Vision, Natural Language Processing, Python, Pytorch, TensorFlow, NLTK, Spacy, CoreNLP, PySpark, SQL, Docker, AWS EC2, AWS ECR, AWS Lambda, Git, DVC, ONNX, API Gateway, AWS ElasticSearch, CI/CD, MLOps, FastAPI, Prompt Engineering, MongoDB, LangChain, Transformers, Diffusers, Accelerate, Optimum
- Non-Technical: Good at communicating technical aspects in simpler manner. Good at technical writing. Have experience in managing a team of 2 people at the current company.
- Open Source Contribution: Made contributions to Albumentations library (widely used in Computer Vision) and Pytorch Lightning.