Sahil Khose

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Profile

My research experience and interests are in the field of Computer Vision, Continual Learning, Zero-Shot Learning, Semi-supervised Learning, NLP and Self-supervised Learning. Solving deep learning problems using a limited (ideally zero) amount of data is what piques my interest.

Education

Manipal Institute of Technology, Manipal 2018 – Present
B.Tech in Computer and Communication Engineering (Minor in Big Data) *CGPA: 8.49/10*

Experience

Indian Institute of Science, Bangalore Jul 2021 – Present
AI Research Assistant *Advisors – Dr. Suresh Sundaram & Dr. Chandan Gautam*

- Working on **Continual Generalized Zero-Shot Learning(CGZSL)**.
- Working on Sketch Based Image Retrieval and Instance Segmentation in a CGZSL setting.

Manipal Institute of Technology, Manipal Apr 2021 – Present
AI Research Assistant *Advisor – Dr. Harish Kumar JR*

- Developed a model for **fovea disc segmentation** using semi-supervised segmentation.
- Working on **macular degeneration classification** using multi-task deep learning.

Project MANAS(AI/Robotics team at Manipal) Feb 2019 – May 2021
AI Perception Developer

- Worked for the **27th Intelligent Ground Vehicle Competition** held in Michigan, USA.
- Worked on building a **level 2-3 autonomy** car on Indian roads for the Mahindra **$1Million Challenge.**

Publications

BERT based Transformers lead the way in Extraction of Health Information from Social Media
*Published in proceedings of **NAACL 2021*** GitHub | aclweb Apr 2021

- Top performer on Task 1 & Task 6 and special recognition on multi-task performance in shared tasks of SMM4H.
- **ADE classification**: Handled a **1:13 class imbalance** dataset. Trained *RoBERTa* and *BioBERT*. Achieved valid F1: 85% test F1: 61%. **[Rank: 1]** *(ADE: Adverse Drug Effects)*
- **ADE span detection**: *RoBERTa* based NER pipeline. Achieved valid F1: 54% test F1: 50%.**[Rank: 2]**
- **COVID classification**: *RoBERTa, DeBERTa, Covid-Twitter BERT, BERTweet, and ensemble* were trained for the 3 class classification problem. Achieved valid F1: 99% test F1: 94%. **[Rank: 2]**

Semi-Supervised Classification and Segmentation on High Resolution Aerial Images
*Accepted at Tackling Climate Change with ML workshop at **NeurIPS 2021*** GitHub |arXiv | Blog | Demo May 2021

- Handled a dataset of 1450 images with just **25% labelled** data and a **class imbalance of 1:6.**
- ResNet18 with our implemented semi-supervised pipeline fetched **96.70% test** accuracy beating the best model of the **FloodNet paper** by a **huge 3% margin** with **less than half** the parameters.
- Implemented a **semi-supervised multi-class segmentation** pipeline for 10 class segmentation. DeepLabv3+ with EfficientNet-B3 backbone fetched us 52.23% mIoU on the test set.
- Analytically and visually analyzed our performance for segmentation on multiple architectures like **UNet, PSPNet, DeepLabV3+** with and without **pseudo label** based semi-supervised learning.

Extraction of Color Information from Images for Generation of Colored Outlines and Sketches
*Accepted at New in ML workshop at **NeurIPS 2021*** GitHub | arXiv | Demo Aug 2021

- Applied image processing techniques and **unsupervised learning** to quantize and extract colors in images and render sketches with colored outlines.
- Used **conditional GANs** for image to colored-sketch generation with the help of colorspace manipulation.

A Studious Approach to Semi-Supervised Learning
Accepted at ICBINB workshop at ***NeurIPS 2021*** *GitHub | arXiv* Sep 2021

- Performed **distillation** for **semi-supervised learning** producing better and smaller models for real-time deployment proving - *fewer the labels, the more this approach benefits from a smaller student network*
- We experimented on: EfficientNet-b5, ResNet18, and MobileNet-V3-Large to demonstrate the benefit of model compression on four label splits, highlighting the semi-supervised advantage and model optimization.

Age-Related Macular Degeneration using Semi-Supervised Learning
Submitting to ***IEEE TMI journal*** *(Advisor: Dr. Harish Kumar JR)* Oct 2021

- Developed a semi-supervised segmentation pipeline to train on **484** images for fovea disc segmentation for opthamology diagnosis. Class imbalance as high as **1:99** in every image
- Performed semi-supervised classification on a dataset of **627** datapoints. The task being age-related macular degeneration with an imbalance of **1:5:5**. Our proposed method surpasses most of the **SOTA results**.

Projects

Self-Driving Car and AGV – Project MANAS GitLab Feb 2019 – May 2021

- Successfully implemented **Lane Detection, Speed Bump Detection, Driving Imitation System, Depth map generation** using multiple cameras and LiDAR input using Deep Learning.

StackGAN for text to image generation GitHub Oct 2020

- Implemented the **StackGAN** (2 stages GAN) architecture from scratch in PyTorch with enhanced BERT data representations for synthesizing photo-realistic bird images from their textual descriptions.

QANet for SQuAD 2.0 (Question-Answering) GitHub Sep 2020

- Implemented the **QANet** architecture from scratch in PyTorch consisting exclusively of convolution and self-attention, achieving **13x** faster train & **9x** faster inference than the BIDAF model (previous SOTA).

Stock Prediction using Hyper Graphs GitHub Aug 2020

- Developed a Hypergraph structured dataset and built a Hypergraph NN based architecture with **Hypergraph CNN, BERT, LSTM and attention network** for stock prediction of 500 stocks over time.

Neural Machine Translation GitHub | Demo Jul 2020

- Built a Neural Machine Translation model using a seq2seq bi-LSTM architecture with attention and hybrid character-word level language modelling. Achieved **37 BLEU** on Spanish-English translation.

Achievements

- Project MANAS stood **World Rank 1** at the 27th Intelligent Ground Vehicle Competition (IGVC 2019).
- **IGVC Awards:** Interoperability - 1st, Design - 2nd, Cybersecurity - 3rd, Grand prize - Lescoe Cup.
- Project MANAS won the Million Dollar Mahindra Rise Prize **(top 13 out of 153 teams in India)**.
- Led a team of 3 to secure an **All India Rank 19** in the Flipkart GRiD 2.0 - level 1.
- Led a team of 4 to secure **Rank 1** in Google Hash Code 2020 in Manipal hub, ranked 500 in India.

Technical Skills

Languages: Python, C++, Java, C
Tools and Libraries: PyTorch, NumPy, Tensorflow, OpenCV, Matplotlib
Experienced in: Computer Vision, NLP, Zero-Shot Learning, Semi-supervised learning, Distillation

Extracurricular

FruitPunch AI (AI expertise head) Aug 2021 – Present
Established the first international chapter of FruitPunch AI, a non profit organization headquartered in Europe. Currently engaged in building the community and promoting AI for social good initiatives

YouTube Channel (Online Educator) Jun 2021 – Present
Conducts ***weekly presentations*** *on cutting edge research papers in the field of AI.*

Research Society Manipal (AI division mentor) Nov 2020 – Present
Mentoring *and* ***guiding*** *several students to pursue research in the field of Deep Learning.*

NAACL reviewer Mar 2021
Reviewed multiple research papers as a part of the review committee for SMM4H Workshop.