

Sahil Khose

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RESEARCH INTERESTS

Computer Vision, Continual Learning, Zero-Shot Learning, Semi/Self-supervised Learning and NLP.
Solving deep learning problems using a limited (ideally zero) amount of data is what piques my interest.

EDUCATION

Georgia Institute of Technology, Atlanta, USA

Aug 2022 – May 2024

MS in [Computer Science](#)

Manipal Institute of Technology, Manipal, India

2018 – 2022

B.Tech in [Computer and Communication Engineering](#) (Big Data Minor GPA: 10.0)

CGPA: 8.56/10

EXPERIENCE

Indian Institute of Science, Bangalore, India

Jul 2021 – Jul 2022

AI Research Assistant

Advisors – [Dr. Suresh Sundaram](#) & [Dr. Chandan Gautam](#)

- Innovated solutions for various problems in the **Continual Generalized Zero-Shot Learning (CGZSL)** setting at the **Artificial Intelligence and Robotics Lab**.
- Worked on Sketch Based Image Retrieval, Domain Generalization and Object Detection in a CGZSL setup.

Manipal Institute of Technology, Manipal, India

Apr 2021 – Jul 2022

Medical AI Research Assistant

Advisor – [Dr. Harish Kumar JR](#)

- Developed a medical diagnosis system for **fovea segmentation** using semi-supervised segmentation.
- Worked on **macular degeneration classification** with interpretability for ophthalmology diagnosis.

Project MANAS – AI Robotics Research Team, MIT, Manipal, India

Feb 2019 – May 2021

AI Perception Developer

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

ACHIEVEMENTS

- **Project MANAS** stood **World Rank 1** at the **27th Intelligent Ground Vehicle Competition (IGVC 2019)**.
- **IGVC 2019 Awards:** Grand Award - 1st (Lescoc Cup), Interoperability - 1st, Design - 2nd, Cybersecurity - 3rd.
- **Project MANAS** won the the **Mahindra \$1Million Challenge (top 13 out of 153 teams in India)**.
- **Top performer** on Task 1 & 6 with special recognition on multi-task performance at [SMM4H](#), [NAACL 2021](#).
- Received the **Best Paper Award** at [New In ML](#), [ICML 2022](#).

PUBLICATIONS

1. Continual VQA for Disaster Response Systems

[Poster] Tackling Climate Change with ML at [NeurIPS 2022](#) [GitHub](#) | [Paper](#)

Sep 2022

- Authors: Aditya Kane*, V Manushree*, **Sahil Khose***
- We use the **CLIP** architecture and evaluate its **zero-shot and linear classifier** performance on the FloodNet dataset, surpassing its previous supervised benchmarks.
- We address the bottleneck of gathering labels in disaster response situation and propose using 3 different experience replay algorithms for a **continual learning setup**.

2. An Efficient Modern Baseline for FloodNet VQA

[Best Paper Award] New in ML at [ICML 2022](#) [GitHub](#) | [Paper](#)

May 2022

- Authors: Aditya Kane*, **Sahil Khose***
- We design a simple and efficient VQA system on the FloodNet dataset achieving **state-of-the-art performance**.
- We revisit fundamental combination methods for VQA with **modern image and text feature abstraction models**.
- This simplified system requires significantly less **training and inference time** than modern VQA architectures.

3. Transformer based ensemble for emotion detection

[[Oral](#)] WASSA at **ACL 2022** [GitHub](#) | [Paper \(aclanthology\)](#)

Mar 2022

- Authors: Aditya Kane, Shantanu Patankar, **Sahil Khose**, Neeraja Kirtane
- Additional Links: [Experiments](#) | [Slides](#) | [Poster](#) | [Video](#)
- Developed ensemble based solution consisting of multiple **ELECTRA** and **BERT** models.
- Proposed methods for **synthetically generating datasets** to mitigate class imbalance.
- Studied the behaviour of our models on various raw and synthetically generated datasets.

4. AMD Classification and Fovea Segmentation using Semi-Supervised Learning

Under Review

Oct 2021

- Authors: **Sahil Khose***, Ankita Ghosh*, Harish Kumar J. R.
- Faculty Advisor: Dr. Harish Kumar J. R.
- Developed a semi-supervised segmentation pipeline to train on **484** images for fovea segmentation.
- Designed a interpretable classification system on a dataset of **627** datapoints. The task being age-related macular degeneration with an imbalance of **1:5:5**. We use **Score-CAM**, **SS-CAM**, and **IS-CAM** to visualize the activation maps.

5. A Studios Approach to Semi-Supervised Learning

[[Poster](#)] ICBINB at **NeurIPS 2021** [GitHub](#) | [Paper](#)

Sep 2021

- Authors: **Sahil Khose**, Shruti Jain, V Manushree
- Additional Links: [Poster](#)
- Performed **distillation** for **semi-supervised learning** producing better and smaller models with lesser labels for real-time deployment. Decreased both **size and inference time** without hurting the performance.
- 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.

6. Extraction of Color Information from Images for Generation of Colored Outlines and Sketches

[[Oral](#)] New in ML, [[Paper](#)] ML4CD, [[Paper](#)] CtrlGen, [[Poster](#)] DGM at **NeurIPS 2021** [GitHub](#) | [Paper](#)

Aug 2021

- Authors: V Manushree, Sameer Saxena, Parna Chowdhury, Manisimha Varma, Harsh Rathod, Ankita Ghosh, **Sahil Khose**
- Additional Links: [Demo](#) | [Poster](#) | [Slides](#)
- 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.

7. Semi-Supervised Classification and Segmentation on High Resolution Aerial Images

[[Spotlight Paper](#)] Tackling Climate Change with ML at **NeurIPS 2021** [GitHub](#) | [Paper](#)

May 2021

- Authors: **Sahil Khose**, Abhiraj Tiwari, Ankita Ghosh
- Additional Links: [Demo](#) | [Blog](#) | [YouTube](#) | [Video](#)
- Handled a dataset of 1450 images with just **25% labelled** data and a **class imbalance of 1:6**.
- ResNet18 with our implemented semi-supervised classification 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.

8. BERT based Transformers lead the way in Extraction of Health Information from Social Media

[[Oral](#)] Published in proceedings of **NAACL 2021** at **SMM4H** workshop [GitHub](#) | [Paper \(aclanthology\)](#)

Apr 2021

- Authors: S Ramesh*, **Sahil Khose***, Abhiraj Tiwari*, Parthivi Choubey*, S Kashyap*, K Lakara*, N Singh*, Ujjwal Verma
- Faculty Advisor: Dr. Ujjwal Verma
- Additional Links: [Poster](#) | [Slides](#)
- **ADE classification**: Handled a **1:13 class imbalance** dataset. Trained **RoBERTa** and **BioBERT**. Achieved valid F1: 85% test F1: 61%. (ADE: Adverse Drug Effects) [**Rank: 1**]
- **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**]

PROJECTS

- 1. Limited Supervision Architecture Zoo** [GitHub](#) Sep 2022 - Present
 - Every week we implement **vital components** of state-of-the-art architectures for limited supervision under **2 hours**.
 - The aim is to get a deeper understanding of the architectures. We read the paper but refrain from looking at the code.
 - We have implemented **ViT, GAN, CycleGAN and DINO** so far. We plan to implement SimCLR and MAE in the near future.
- 2. Zero-Shot Domain Generalization: Unseen Classes in Unseen Domains** Jan 2022 - Apr 2022
 - Used **CLIP** model features and optimized the **CNZSL** architecture on DomainNet to address the joint **domain generalized zero-shot learning** setting.
 - Evaluated on **six different unseen domains** under **three different zero-shot** settings and the proposed solution outperforms state-of-the-art models in this problem setting in most of the domains.
- 3. Self-Driving Car and AGV – Project MANAS** [GitLab](#) | [Website](#) 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 for our autonomous ground vehicle and the self-driving car.
- 4. 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.
- 5. 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).
- 6. 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.
- 7. 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.

TECHNICAL SKILLS

Languages: Python, C++, Java, C
Tools and Libraries: PyTorch, NumPy, OpenCV, Matplotlib

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 **presentations and explanations** on cutting edge research papers in the field of AI.*
- NAACL 2021 reviewer** Mar 2021
Reviewed multiple research papers as a part of the review committee for SMM4H Workshop.
- Research Society Manipal – AI division mentor** Nov 2020 – Present
***Mentoring and guiding** several students to pursue research in the field of Deep Learning.*
- Medium** | **WordPress** | **Website Feed** Oct 2018 – Jul 2022
*Documented my BTech college journey with a series of tech and non-tech **blog posts**.*