Soham Chitnis

sc11537@nyu.edu | soham-chitnis10.github.io | soham-chitnis10 | soham-chitnis | Soham Chitnis

Education

New York University — *New York, USA*

M.S Computer Science (Courant Institute of Mathematical Sciences) — *Sept. 2024 - Present*

Birla Institute of Technology and Science, Pilani — *Goa, India*

B.E Computer Science, Minor in Data Science — *Nov. 2020 - July 2024*

- **Relevant Completed Official Coursework:** Machine Learning, Deep Learning, Fundamentals of Data Science, Reinforcement Learning, Linear Algebra, Probability & Statistics, Calculus, Operating Systems, Computer Programming, Data Structures & Algorithms
- **Thesis:** *Grounding Large Language Models for Chart Understanding* (Link)

Publications

1. **Chitnis, S.**, Patwardhan, M., Srinivasan, A., Verlekar, T.T., Vig, L., Shroff, G. 2024. **`AutoRef`: Generating Refinements of Reviews Given Guidelines** (Presented at ACL 2024 SDP Workshop) Link: Paper
2. **Chitnis, S.**, Mantripragada, K., Qureshi, F.Z., 2024. **SpACNN-LDVAE: Spatial Attention Convolutional Latent Dirichlet Variational Autoencoder for Hyperspectral Pixel Unmixing** (Presented at IEEE IGARSS 2024 as Oral) Link: Paper & Oral Presentation
3. **Chitnis, S.R.**, Liu, S., Dash, T., Verlekar, T.T., Di Ieva, A., Berkovsky, S., Vig, L. and Srinivasan, A., 2023. **Domain-Specific Pre-training Improves Confidence in Whole Slide Image Classification**. (Presented at IEEE EMBC 2023 as Oral) Link: Paper, Oral Presentation & Code

Research Experience

APP Center for AI Research (APPCAIR), BITS Pilani — *Goa,India*

Undergraduate Researcher | Website — *Feb. 2022 - May 2024*

Project 1: Deep-learning methods for digital pathology image analysis

- **Supervisors: Prof. Tanmay Verlekar**, **Dr. Tirtharaj Dash**, **Prof. Ashwin Srinivasan**
- **Collaborators: Dr. Sidong Liu**, Macquarie University, Sydney
- Proposed domain-specific pre-trained feature extraction model for Whole Slide Image Classification using the state-of-the-art multiple instances learning methods: CLAM & TransMIL and a new metric, Confidence for the same. The proposal improved confidence and achieved a new state-of-the-art performance of WSI-based glioma subtype classification (96.85% AUC ROC), showing high clinical applicability in assisting glioma diagnosis.
- Experimented with state-of-the-art feature encoders: ConvNeXT, EfficientNet, DenseNet, ResNet to study the effect of model's structure on WSI classification.

Project 2: LLM Agents for Critical Analysis and Review of Research Manuscripts

- **Supervisors: Dr. Manasi Patwardhan**, **Dr. Gautam Shroff**, **Dr. Lovekesh Vig** (TCS Research) **Prof. Ashwin Srinivasan**, **Prof. Tanmay Verlekar** (APPCAIR, BITS Pilani)
- Developed `AutoRef`, a multi-agent LLM-based system for generating reviews of scientific articles (reviewer agent), feedback of reviews (feedback agent), and an iterative algorithm to refine a review given the reviewing guidelines.
- Evaluated `AutoRef` on a subset of ICLR 2023 papers, achieving 15 % & 217 % improvement in feedback score when starting with machine-generated and human reviews, respectively.
- The `AutoRef` makes the decision to Accept or Reject. Over iterations, the false positives (True = Reject & Predicted = Accepted) are reduced.

* **Project 3:** Molecule Generation using Graph Autoencoders & Variational Graph Autoencoders.

- **Supervisor: Dr. Tirtharaj Dash**
- Generate novel drug molecules for cancer cure through Deep Graph Generators: Graph Autoencoder and Variational Graph Autoencoder.

Tata Consultancy Services Research — *Pune, India*

Research Intern — *Sept. 2023 - Dec. 2023*

- **Project:** Grounding Large Language Models for Chart Understanding
- **Supervisor: Dr. Manasi Patwardhan**
- Explored efficient grounding large language models to charts and investigated the impact of language-image pre-training of visual encoders on Chart VQA task. Found contrastively pre-trained models (CLIP & ChartCLIP) more efficient than non-contrastively pre-trained (DePlot) during training while achieving similar results.

Visual Computing Lab, Ontario Tech University — *Toronto, Canada*

Visiting Scholar | Website | Certificate — *June 2023 - August 2023*

- **Project:** Hyperspectral Pixel Unmixing using Latent Dirichlet Variational Autoencoder for Remote Sensing
- **Supervisor: Prof. Faisal Qureshi**
- Extending the Latent Dirichlet VAE to incorporate spatial information. Proposed an isotropic spatial attention CNN encoder that improves RMSE (abundance estimation) and SAD (endmember extraction) metrics for the unmixing task.
- Contributed patch-level data loader for HSI Dataloader python library. Paper accepted at IGARSS 2024 as Oral Presentation. Work done as part of MITACS Globalink Research Internship

The Kwon Lab for Low Vision and Brain Research, Northeastern University *Boston, USA (Remote)*

Research Assistant | Website *Oct. 2022 - April 2023*

- **Project:** Investigating the oblique effect in Deep Neural Networks (DNNs)- CNNs & ViTs
- **Supervisor: Alish Dipani**, **Prof. MiYoung Kwon**
- Creating synthetic benchmark datasets from ImageNet- Stylized, Randomized, Phase Scramble, Metameric, White Noise. Conducted literature review, trained ResNets and Vision Transformers (ViTs) on datasets, and devised an evaluation for investigating the Oblique Effect in DNNs.

Central Electronics Engineering Research Institute (CSIR-CEERI) *Chennai,India (Remote)*

Research Intern | Website | Code | Report *May 2022 - July 2022*

- **Project:** Automated Plastic Segregation using Hyperspectral Imaging for Recycling Plant
- **Supervisors: Dr. Madan Kumar Lakshmanan, Prof. Amalin Prince A.**
- Implemented Pre-processing pipeline for HSI data and CNN models
- Built a dedicated data augmentation module: Random Crop & Resizing, Horizontal Flip, Colour Jitter for HSI and experimented with Self-supervised learning method: SimCLR for HSI.

Teaching Experience

Computer Networks, BITS Pilani *Goa, India*

Teaching Assistant *Jan. 2024 - May 2024*

- Conducted labs on Wireshark and Distance Vector Routing, wrote automatic evaluation scripts for the same, and solved doubts during the lab.

Introduction to Deep Learning, Quark Controls BITS Pilani Goa *Online*

Instructor *July 2022 - August 2022*

- Taught the course "Introduction to Deep Learning" to 200+ students and mentored first-year students for the final project.

Computer Programming, BITS Pilani *Goa, India*

Teaching Assistant *May 2022 - August 2022*

- Conducted doubt solving sessions, evaluated labs and assisted Prof. Anup B Mathew & Prof. Arnab K Paul.

Mathematics-I (Multivariate Calculus), Academic Assistance Program CTE *Goa, India*

Mentor *Dec. 2021 - May 2022*

- Mentored first-year students for Mathematics-I (Multivariate Calculus) and conducted doubt-solving sessions.

Selected Projects

Video Vision Transformers (ViViT) for 3D Medical Images *April 2023*

- Implemented Video Vision Transformer (Original Implementation in JAX) with all variants for 3D Medical Images: MRIs, CT scan in PyTorch. Work done as part of Deep Learning (CS F425)

Implementation of Super-Resolution ResNet(SRResNet) & Super-Resolution CNN(SRCNN) *March 2022*

Code & Report

- Implemented SRResNet & SRCNN paper on Oxford-IIIT Pet Dataset, Conducted experiments and study on interpolation modes & upsampling methods.

Project Kratos *August 2021 - April 2023*

Website

- Developing Mars Rover for Rover Challenges. Worked on developing models for Rock analysis using Computer Vision to detect the presence of life in rocks.

Skills

- **Languages:** Python, C/C++, Matlab, Java
- **Deep Learning Frameworks:** PyTorch, Tensorflow, JAX (Beginner)
- **Tools:** GIT, LaTex, Linux, Windows, MS Office
- **Python Libraries:** Numpy, Scikit-Learn, OpenCV, Matplotlib, Pandas, Scipy, Pyro, Langchain

Co-curricular Activities

- Core member of the Society for Artificial Intelligence & Deep Learning (SAiDL), Electronics & Robotics Club and Life Sciences Team, Project Kratos.
- Organized annual AI Symposium with APPCAIR in 2022 as a member of SAiDL. I hosted a talk on Graph Neural Networks during the Symposium.
- Organized a Machine Learning Hackathon for the TechWeek, Center for Technical Education in the college.

Honors, Scholarships & Awards

2023	**MITACS Globalink Research Scholarship for Internship,** MITACS, Canada	*Goa, India*
2021	**Silver prize,** Machine Learning Hackathon, Center for Technical Education, BITS Pilani	*Goa, India*
2020	**100 percentile (Physics-Chemistry-Mathematics & Mathematics) ,** Maharashtra Common Entrance Test	*Mumbai, India*