Haoming Liu

+86 131 6313 8787 | hammond.liu@nyu.edu | Homepage: hmdliu.site | GitHub: hmdliu | Shanghai, China

EDUCATION

New York University Shanghai September 2019 – May 2023 (expected)
New York University (Study Away Program) September 2021 – May 2022
Bachelor of Science in Computer Science, *Minor in Mathematics*
Cumulative GPA: 3.91/4.00 | Major GPA: 3.95/4.00
Selected Coursework: Computer Vision (A), Deep Learning (A), Machine Learning for Language Understanding (A), Artificial Intelligence (A), Information Visualization (A), Algorithms (A), Data Structures (A)
Scholarship: NYU-SH Dean's List for Academic Year 2019 - 2021, NYU-SH Research Assistant Funding 2021 & 2022
NYU-SH Dean's Undergraduate Research Funding 2020 & 2021

PUBLICATION & PREPRINT

[1] **Haoming Liu***, Li Guo*, Zhongwen Zhou, and Hanyuan Zhang. Pyramid-Context Guided Feature Fusion for RGB-D Semantic Segmentation. *Proceedings of the 2022 IEEE International Conference on Multimedia and Expo Workshops (ICMEW)*, 2022. [URL]

[2] Li Guo*, **Haoming Liu***, Chengyu Zhang, Yuxuan Xia, Xiaochen Lu, and Zhenxing Niu. Boosting Few-Shot Segmentation via Instance-Aware Data Augmentation and Local Consensus Guided Cross Attention. *Submitted to the 2023 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*.

RESEARCH

Few-Shot Segmentation with Adaptive Data Augmentation and Cross Attention
Research Assistant advised by Professor Li Guo NYU Shanghai, May 2022 – November 2022

- Probe an instance-aware data augmentation strategy to improve the diversity of support images and reduce the distribution inconsistency between the support and query images.
- Formulate a cross attention module via 4D dense correlation and local consensus constraints to align query features with support features and improve the model's generalization ability.
- Setup a neat and scalable codebase for few-shot segmentation research (available on GitHub).
- Co-author a paper (as the **1st author**) which has been submitted to the conference of **CVPR 2023.**

RGB-D Semantic Segmentation via Pyramid-Context Guided Feature Fusion
Research Assistant advised by Professor Li Guo NYU Shanghai, May 2021 – March 2022

- Devise a strong and efficient two-branch baseline model for RGB-D semantic segmentation.
- Explore a feature fusion paradigm to adaptively refine and aggregate feature maps by incorporating the contextual information at various scales. Our network applies such a paradigm to both multi-modal and multi-level feature fusion and archives SOTA performance on all RGB-D semantic segmentation benchmarks.
- Open-source the implementation of the proposed methods along with the codebase (available on GitHub).
- Publish a paper (as the **co-1st author**) at the 3DMM workshop of **ICME 2022**.

Generalized Few-shot Segmentation with Contrastive Learning and Knowledge Distillation
Capstone Project mentored by Professor Li Guo NYU Shanghai, September 2022 – December 2022

- Devise a contrastive loss in the pre-training stage to model pixel-to-pixel relations and enhance feature embeddings.
- Propose a more practical training scheme for generalized few-shot segmentation. Reformulate the cross-entropy loss and devise a knowledge distillation loss to preserve base class knowledge during novel class adaptation. Integrate all the proposed methods and obtain sizable performance gains on both base and novel classes.
- Setup a neat and scalable codebase and open-source the code for the proposed methods (available on GitHub).

Evaluating Parameter-Efficient Tuning Methods in Low-Data Regimes
Course Project mentored by Professor Sam Bowman NYU Center of Data Science, March 2022 – May 2022

- Reproduce four SOTA parameter-efficient tuning methods on top of the HuggingFace and OpenDelta libraries.
- Evaluate the performance of these methods on various natural language understanding tasks (i.e., sentiment analysis, natural language inference, reading comprehension, and Q&A) with different portions of training samples provided.
- Observe monotonic and significant performance drops while reducing the sample sizes by a log scale (100%, 10%, 1%, 0.1%). Verify that a parameter-efficient tuning method with a larger ratio of tunable parameters generally has stronger performance on NLU tasks but usually converges slower, regardless of the sufficiency of data.

RepMAF: A Re-parameterizable Building Block for Multi-scale Representation Learning

Course Project mentored by Professor Rob Fergus NYU Courant, October 2021 – December 2021

- Devise a building block with multiple branches extracting features at different granularities, where each branch adopts the RepVGG block and can be converted to a more hardware-friendly architecture at inference time. Use channel-wise attention to adaptively integrate the output feature maps from each branch.
- Achieve remarkable performance gain compared to multiple baselines of similar scales (e.g., VGG, RepVGG, etc.) on the CIFAR-10 dataset with a moderate inference speed.

PROJECT

Semi-supervised Object Detection (Course Competition) NYU Courant, April 2022 – May 2022

- Perform Masked Autoencoder (MAE) pre-training on a ViT-base model using 512K unlabeled images (ImageNet subset, of size 224×224). Fine-tune the backbone with 3K labeled images from 100 classes, where a plain FPN from ViTDet and a standard Faster R-CNN detection head are adopted as the predictor.
- Achieve 30.3% mAP on the hidden test set and is ranked 3rd among 21 class teams. This competition is held in the graduate-level deep learning course, supervised by *Professor Yann LeCun* and *Professor Alfredo Canziani*.

Contract Parsing & Key Information Extraction NYU Shanghai, July 2021 – September 2021

- Parse the contracts (in Chinese) for an urban construction corporation. Extract key information via the Tesseract OCR engine and template matching, store them in a MySQL database, and build a set of online APIs using Flask.

Daily Life Logging & Visualization Everywhere, September 2020 – Present

- Record all my activities on Google Calendar and assign category labels (i.e., work, rest, neutral, and sleep).
- Export the data regularly and visualize them using D3.js and React, which gives insights about my work-life balance and helps me make better use of my time. Some visualizations can be found here.

Real-time Face Mask Detection with YOLO v4 NYU Shanghai, September 2020 – December 2020

- Train a YOLO v4 model on a Kaggle dataset to perform real-time face mask detection (i.e., masked or unmasked).

Large-parallax Image Stitching via Sub-plane Segmentation NYU Shanghai, July 2020 – September 2020

- Align and stitch images with large parallax based on SIFT features and K-Means guided sub-plane division.
- Achieve satisfactory qualitative results and a close-to-SOTA performance (by SSIM measure) over 37 image pairs.

Encrypted Chat System & Cloud Drive NYU Shanghai, November 2019 – December 2019

- Introduce Fernet encryption to a chat system powered by TCP sockets. Implement a set of cloud drive functionalities through the FTP protocol (e.g., uploading, downloading, sharing, memory-efficient storage, encryption, etc.).

TEACHING & LEADERSHIP

Machine Learning Course Assistant (STEM Lead) NYU Shanghai, September 2022 – Present

- Hold weekly review sessions and office hours to help students digest course materials.
- Co-facilitate course assistant training and provide feedback to program supervisors regularly.

Information Visualization Course Assistant NYU Shanghai, January 2021 – May 2021

- Hold weekly review sessions and office hours to help students digest course materials.
- Receive the "Outstanding Communication Award" at the end of the semester.

Computer & Data Science Club President NYU Shanghai, June 2020 – June 2021

- Recruit over 100 club members and hold weekly activities (e.g., workshop series, hackathon, gatherings, etc.).
- Co-host the "Love Data Week Datathon" event series with the NYU Data Science Club.

SKILL & INTEREST

Programming Skills: Python, C, Javascript, Matlab, HTML, CSS, Linux, Git, LaTeX, Markdown, Slurm

Language Skills: Native in Mandarin, Working proficiency in English (TOEFL 105, 27 for Speaking)

Interests: Yi Jing(I Ching), Guqin, Guitar, Eight-ball, Jogging

Last Update: December 2022