Yilai Liu

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EDUCATION

Beijing University of Posts and Telecommunications
Undergraduate Degree Sept 2021 – Jul 2025
GPA: 88/100
Major: Telecommunications Engineering and Management, Multimedia Specialization
Core Modules (Percentage System): Communication Theory(96); Machine Learning(94); JAVA High-level Language Programming(94); Advanced Mathematics (92); Advanced Transform(91); Computer Vision (ongoing).
Research interests: Large Language Models and Visual Language Models; LLM Agents

Research EXPERIENCE

T1-Guided Generative Model for T1w/T2w Ratio Synthesis for Intracortical Myelin Segmentation **BEIJING**
Supervised by Jiaying Zhang July 2024 – Present

- Background: The T1w/T2w ratio is used for highlighting differences in myelination across brain tissues because it has distinct properties in T1-weighted and T2-weighted images. However, T1w and T2w are not used at the same time in clinical treatment. The routine examination of newborns requires T2w since their brain tissues are still in the developing phase and have a huge amount of water, which is the high-brightness part of T2w. On the contrary, adults have more fat instead of water in the brain and T1w can highlight the tissues with more hat. Thus, the T1w/T2w ratio can't be directly obtained in the above situation.
- Using the adult T2w image to guide the T1w/T2w ratio synthesis in 3D space.
- Method: Training a latent diffusion model to use T2w image to guide the generation of T1w's features in latent space and incorporate it to the backbone with 3 steps/ Fusing the features of T2w and generated T1w in 3D Unet.

Research of Cloud-edge Collaboration Architecture for LLMs Agent in Task Automation **BEIJING**
Collaborating with The Chinese University of Hong Kong, Shenzhen July 2024 – Present

- Expanded the distributed synergy AI benchmarking project Ianvs with metric standards for LLM agent performance in task automation.
- Explored the architecture for cloud-edge collaboration for LLMs Agent in task automation, distilling the knowledge for LLAMA-70B in the cloud to the LLAMA-7B locally during deployment and finally making the ability of the 7B model approach the 70B model in characteristic requirements.

Pattern Recognition and Intelligent System Laboratory (School of Artificial Intelligence)-
Edge Guided Fine-grained Enhancement for Semantic Change Detection **BEIJING**
Supervised by Chuang Zhang May 2024 – July 2024

- Improved the SOTA (ScanNet) performance in semantic change detection tasks on remote sensing.
- Addressed imprecision in fine-grained details, especially in the accuracy of edge location.
- Implemented SimAM attention block, which similarity depends on how close the difference between local value and mean value with the variation, with decoder for better important feature fusion. Used sober filters in the encoder to extract and enhance edge information.
- Improved SOTA mIoU from 73.37 to 73.74 on the SECOND dataset.

COMPETITIONS

2024 ISPRS TC I Contest on Remote Sensing

-Change Detection in High-resolution and Multi-temporal Optical Images April 2024 - May 2024

- Rank (Report+Precision): 2/43, Precision Rank: 1/43
- Discovered temporal changes in Region of Interest (ROI) based on the high-resolution and multi-temporal optical images.
- Searched for available change detection feature fusion methods with the LSKNET-UnetFormer architecture and reproduced them.
- Reproduced FDAF (Flow Dual-Alignment Fusion, a learnable position exchange map to learn global features) and used it in the feature fusion. Used AuxHead with focal loss to handle the problem of sample imbalance.
- Improved MIou from 49.15% to 49.65%.

PROJECT EXPERIENCE

College Students' Innovative Entrepreneurial Training Plan Program -

GeoMind **BEIJING**

Back-end and Algorithm Developer June 2023 – Present

- Built a platform for visualizing base map annotations using a framework based on Vue3 and Django.
- Used Django to build user systems and design the algorithm for annotation to make conversions between the positions of the mouse in UI and tilemap levels and coordinates.
- Pre-trained and integrated a road annotations model based on ViT encoder and D-LinkNet decoder to the platform to assist the annotator to finish recognition, segmentation, and classification Tasks.
- Awarded the first prize in school competition, selected for the Municipal contest and National championship.

AWARDS

- **Second Prize** in the Chinese Mathematics Competitions May 2023
- **University-level Scholarship x3** Sept 2021 - Sept 2024

HIGHLIGHT OF COMPETENCE

- **Analytics and Research:** Proficient in semantic segmentation and change detection; Experienced in LLMs fine-tuning.
- **Proficiency in Traditional Image Processing and Signal Processing**: Skilled in traditional image processing (e.g., Canny edge detection, JPEG using Matlab); experienced in signal transforms (e.g., FFT, DCT).
- **Self-learning:** Acquired deep learning knowledge by self-learning.

Skills

- **Coding: Python, Java, Matlab, C**
- **Frameworks: PyTorch, Transformers, PEFT, Django**