Hanfeng (Jules) Zou

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Education

Vanderbilt University, Nashville, TN 2024–2026(Expected)

Master of Science, Computer Science, in progress GPA: 3.9/4.0

University of Science and Technology of China (USTC), Hefei, China 2020–2024

Bachelor of Engineering, Computer Science and Technology

Research Experience

Graduate Researcher, Vanderbilt University 2024 – Present

Mentor: Prof. Yuankai Huo — Co-mentor: Dr. Xinqiang Yan (Vanderbilt University Medical Center)

- Self-directed research building an end-to-end 3D electrical properties reconstruction pipeline from complex MRI B1+ magnitude/phase data with Hydra-based experiment configs, checkpointing/logging, and inference/visualization scripts.
- Proposed a physics-guided generative formulation: rectified flow / diffusion-style refinement using Helmholtz EPT (via EPTlib) as an analytic prior (base prediction) to inject physical structure without embedding PDE solvers.
- Implemented confidence-aware learning using anatomical edge cues (Canny-style masks) plus known ill-conditioned regions of Helmholtz EPT; explored loss designs that regulate learning by utilizing such confidence information.
- Developed a memory-efficient scalable 3D backbone using Mamba-style sequence modeling with custom 3D tokenization/scan orders, learnable padding tokens, and lightweight CNN residual adapters; implemented FiLM/AdaLN-style conditioning (scale/shift + normalization).
- Designed evaluation beyond global error: per-region/per-tissue metrics and physical plausibility checks (out-of-range conductivity/permittivity rates) plus modular ablation hooks to isolate contributions.

Projects (Selected)

Agent Ninja: Kinodynamic Object Interception RL Environment (ongoing) 2025 – Present

- Designing a Fruit-Ninja-inspired RL benchmark where a speed-limited agent must intercept prioritized objects and avoid hazards, emphasizing timing/prediction and real-time decision-making.
- Planning baselines (PPO/A2C/SAC) and evaluation protocols for controlled benchmarking.

Privacy-Preserving Filter for Social Media Images (system prototype; conference paper style report) 2025

- Built a modular pre-upload privacy pipeline combining OCR→PII detection→redaction with context-aware face anonymization.
- Integrated PaddleOCR + Presidio for text PII, and RetinaFace + gaze/pose cues + DeepPrivacy2 for selective face anonymization; prototyped confidence-gated feature modulation to handle occlusion/blur.
- Profiled performance on a 450-image set (varied resolutions), reporting 5.18s average and 15.15s max single-image latency on RTX 4070.

Network Analysis of Resting-State fMRI (reproducible pipeline + graph analytics) 2024

- Built a reproducible preprocessing and analysis workflow (Docker, NiPype/FSL, Nilearn/Nibabel, NetworkX) to construct ROI connectivity graphs from BOLD time series.
- Constructed positive/negative weighted functional networks and analyzed degree centrality, clustering coefficient, and modularity across conditions; documented failure modes and mitigations for registration/affine issues.

Blockchain System + Smart Contract Voting (Go, Solidity) 2023

- Implemented a Bitcoin-inspired blockchain prototype with core data structures (blocks/transactions), hashing, and chain validation logic; emphasized correctness and failure-case handling.
- Authored and deployed a Solidity voting contract with auditable rules (e.g., eligibility constraints and multi-step voting flow); focused on clear threat model and edge cases.

Transformer Language Model for Shakespearean Text Completion (PyTorch) 2023

- Implemented a Transformer language model in PyTorch (multi-head self-attention, positional encoding, training loop) for Shakespeare-style text completion.
- Built an evaluation/debug workflow (loss/perplexity tracking, qualitative generation via sampling/decoding, and metric visualization with matplotlib).

Deadlock Detection via Graph-to-NuSMV Transformation (C++ / NuSMV) 2023

- Implemented a translator that converts directed graphs into NuSMV models to automatically detect deadlock states via model checking.
- Designed test cases and validation checks (graph parsing, state encoding correctness, and counterexample inspection) to verify that detected deadlocks correspond to graph structure.

KGAT Recommendation System + Web Crawler/Search (PyTorch) 2022

- Crawled data from Douban to build a movie/book dataset and implemented a lightweight search pipeline for retrieval and indexing.
- Implemented a KGAT-based recommender in PyTorch and compared design variants using standard top-K recommendation metrics and qualitative error analysis.

Skills

ML/AI: PyTorch, diffusion/flow, 3D modeling, evaluation/metrics, CV/NLP pipelines
Tools: Hydra/OmegaConf, Git, Docker, Linux, Research compute workflows
Programming: Python, C/C++, Go, Solidity, SQL, Assembly(RISK-V, x86); LaTeX