Tiou Wang

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Education

Sep. 2019 – Jun. 2023 **Harbin Institute of Technology** **Harbin, China**
B.E. in Electronic Information Engineering School of Electronics and Information Engineering

- Undergraduate Weighted Average: **85.2 / 100**

Aug. 2023 – Feb. 2026 **KTH Royal Institute of Technology** **Stockholm, Sweden**
M.Sc. in Information and Internetwork Engineering Information Track, School of EECS

- Graduate GPA: **4.69 / 5**

Sep. 2024 – Sep. 2025 **École Polytechnique Fédérale de Lausanne (EPFL)** **Lausanne, Switzerland**
Exchange Program Electrical and Electronics Engineering

Research Interest

My research focuses on how **structural assumptions in neural networks affect representation capacity and generalization mechanisms**, and aims to reconstruct more expressive continuous models from a **signal processing structural perspective**.

- Identify common structural or representational assumptions in mainstream methods (e.g., static structures, additive synthesis, discrete modeling) and their potential limitations for high-frequency and structured representation;
- Analyze how these assumptions influence spectral distribution, parameter efficiency, and generalization behavior;
- Draw inspiration from modulation and decomposition in signal processing to design new representation mechanisms while maintaining trainability and scalability.

Research directions include: foundation model architecture design, implicit continuous neural representations (INR), multiplicative modulation mechanisms, and parameter-efficient modeling.

Publications

2026 **Tiou Wang** (First Author), *Subtractive Modulative Network with Learnable Periodic Activations*. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2026), Accepted.
Code: github.com/hwtomy/SMN

Research and Professional Experience

Sep. 2025 – Feb. 2026 **Continuous Gene Regulatory Network Inference via Implicit Neural Representations**
Research Project **KTH Royal Institute of Technology**
Supervisor: Prof. Saikat Chatterjee

- Analyze structural assumptions based on **static explicit matrices** in existing methods (e.g., RegDiffusion), and identify their limitations in modeling **continuous and time-varying regulatory relationships** during single-cell differentiation.
- Propose a **matrix-free** continuous modeling approach, parameterizing the score-based diffusion vector field using implicit neural representations (INR/SIREN), reformulating discrete graph generation as a **continuous dynamical system fitting** problem.
- Design a **Jacobian**-based causal extraction method to derive dynamic gene regulatory dependencies from the learned high-dimensional vector field.

Mar. 2025 – Sep. 2025 **Subtractive Modulative Network with Learnable Periodic Activations (SMN)**
Master Thesis **École Polytechnique Fédérale de Lausanne (EPFL)**
Supervisor: Zhuoqian Yang, Prof. Sabine Süsstrunk

- Analyze spectral bias induced by **additive assumptions** in implicit neural representations (INR), and identify their inefficiency in generating high-frequency structures.
- Reconstruct neural networks as a signal-processing-inspired architecture based on **subtractive synthesis**, introducing an oscillator–filter paradigm with **multiplicative modulation** to enhance frequency-selective representation.
- Design a lightweight and parameter-efficient architecture integrating learnable periodic basis functions and modulative masks to improve representational flexibility under low parameter budgets.
- **Experimental Validation**: Achieved **40+ dB PSNR** on 2D image representation tasks and demonstrated consistent improvements on 3D NeRF novel view synthesis, supporting the effectiveness of the proposed spectral modeling mechanism.

Sep. 2024 – Feb. 2025 **Structured Representation Learning from Multiview EEG Data**
Semester Project **École Polytechnique Fédérale de Lausanne (EPFL)**
Supervisor: Abdellah Rahmani, Prof. Pascal Frossard

- Analyze structural assumptions in multi-channel EEG modeling, identifying limitations of independent-channel modeling in capturing cross-channel spatial–temporal dependencies.
- Construct a parameter-efficient self-supervised learning (SSL) framework integrating temporal convolution and graph neural networks (GNN) to model spatial–temporal relationships.
- Compare CNN and GNN in feature space geometry and discriminative capacity; achieve approximately **77% classification accuracy** on the THU dataset with improved cross-subject generalization stability.

Jun. 2024 – Aug. 2024 **Experimental Study on Pointwise Maximal Leakage**
Part-time Research Assistant **KTH Royal Institute of Technology**
Supervisor: Prof. Tobias J. Oechtering

- Study the theoretical framework of Pointwise Privacy Leakage (PML) and its applications in privacy measurement.
- Participate in implementing experimental pipelines under different utility functions and reproduce empirical behaviors of PML.
- Analyze metric trends under different utility settings and compare with existing privacy measures.

Oct. 2022 – Jun. 2023 **CNN-based Infrared Weak Small Target Detection**
Undergraduate Thesis **Harbin Institute of Technology (HIT)**
Supervisor: Prof. Junping Zhang

- Analyze imaging characteristics and noise distributions under low SNR conditions for infrared weak target detection.
- **Method Design**: Design preprocessing strategies combining local contrast entropy and saliency similarity for background suppression and target enhancement.
- Implement an attention-enhanced U-Net-based detection network to improve multi-scale small-target representation.
- Achieve performance improvements over traditional filtering methods and baseline CNN models on public datasets; improve training efficiency through mixed-precision and structural optimization.

Skills

Programming and Frameworks

- Python (PyTorch), C++ (intermediate), MATLAB
- Familiar with deep learning workflows including training, hyperparameter tuning, ablation study design, and result analysis