Linus Liu

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Personal Profile

I am Linus Liu, a second-year student at Rice University pursuing dual B.S. degrees in **Computer Science** and **Mathematics**. Driven by a passion for **building efficient systems** and scalable infrastructure, I am eager to apply my background in algorithmic optimization, and deep learning to the next generation of technology.

Education

1. Bachelor of Science, Rice University Houston, TX, USA Sep 2024 – May 2028 (Expected)
Department of Computer Science & Mathematics

- **Core Courses:** Algorithmic Thinking, Introduction to Program Design, Computer Organization (Systems), Multivariable Calculus, Operations Research, Introduction to Robotics, Honor Linear Algebra.
- **Relevant Focus:** Statistical modeling and regression in Python (scikit-learn), foundational linear algebra, and data processing through deep neural networks.

2. HS Affiliated to Renmin University of China Beijing, China Sep 2021 – Jun 2024
Top 5 % Student According to Grade

- High School Students working on Chemistry and Mathematics Olympiad in China

Experiences & Projects

1. Research Assistant (Deep Learning) Rice University, Houston, TX November 2025 - Present
Biosignal Gesture Recognition with Deep Learning (Advisor: Prof. Momona Yamagami)

- Developed a gesture recognition pipeline using **PyTorch** to process 88-channel EMG and IMU sensor data, classifying complex upper-body movements for VR/AR applications.
- Implemented a hybrid neural network architecture combining **1D CNN** for feature extraction and a two-layer **LSTM** for temporal sequence modeling. Achieved **100% accuracy** on test sets.
- Engineered a comparative **Template Matching** algorithm using **PCA** for dimensionality reduction and Euclidean distance metrics to validate model performance against statistical baselines.
- Conducted hyperparameter grid search to optimize kernel sizes, hidden layers, and dropout rates, successfully debugging model convergence issues to exceed performance thresholds.

2. Machine Learning Intern, HVAC Algorithm Control Group Lenovo Ltd., Beijing April 2025 to August 2025
Training a Decision Pre-trained Transformer for HVAC Control

- Framed multi zone HVAC control as a sequential decision modeling problem, and implemented a decision pretrained transformer policy that maps historical context (observations and control signals) to next step actions under operational constraints.
- Built a reproducible training and evaluation workflow in **Python** for model variants and baselines, running controlled ablations on context length, model capacity, and regularization to support iterative model improvements.
- Diagnosed failure cases through log and metric analysis, iteratively refining data filtering and training settings to improve stability and robustness in offline evaluation and replay based testing.
- Leveraged **JAX** for accelerated model training, and standardized experimentation with an experiment tracking workflow plus containerized environments and structured configuration management to ensure deterministic, reproducible runs across machines.
- Worked with control and platform engineers to support internal integration and monitoring, emphasizing versioned configurations and clear experiment documentation for handoff.

3. Lead Full Stack Developer, Game2Learn Rice University, US September 2025 – Present
AI-Powered Gamified Learning Platform

- Architected a responsive web application that transforms static user files into interactive learning games, designed to enhance user engagement through immediate feedback loops.

- Implemented a modular frontend using **React + TypeScript (Vite)**, organizing complex game logic across reusable components and utilizing React Context for efficient state management.
- Integrated the **Google Gemini API** to dynamically ingest and parse user documents, optimizing prompt engineering to ensure low-latency content generation.
- Designed lightweight event logging mechanisms to capture user behavioral data (choices, errors, response patterns), enabling downstream statistical analysis and hypothesis testing.

4. Datathon (Machine Learning, Finance Track) Rice University January 2026
RevPAR Growth Prediction for Multifamily Properties
(Sponsor: BroadVail Capital Partners)

- Built an end-to-end regression pipeline in **Python** (**pandas**, **scikit-learn**, **LightGBM**) to predict multifamily property **RevPAR growth** from property attributes and neighborhood amenity counts within **10/15/30-minute** drive-time trade areas, modeling both pre and post COVID windows.
- Designed a robust preprocessing and feature engineering stack: long-to-wide pivot by property ID and time window, ordinal encoding for quality grades (A+ to D) with city-level imputation, winsorization and **log1p** transforms, and monotonic constraints across drive-time rings, producing **304** numeric features over **10,527** training samples.
- Implemented a hybrid **stacking** ensemble with **RandomForest**, **GBDT**, and **LightGBM** base models, generating out-of-fold predictions via **5-fold** cross-validation and training a **Ridge** meta-learner for final prediction (with property-level grouping for leak-resistant scoring predictions).
- Improved generalization over single models and simple averaging, achieving **RMSE = 0.0477** and $R^2 = 0.759$ on a holdout split, and delivered model diagnostics through residual analysis and feature-importance comparisons.

5. FEAT: Automated Test Generation Framework Rice University, Houston, TX August 2025 - December 2025
Software Engineering Project (Advisor: Dr. Luis F. Guzman Nateras)

- Engineered an end-to-end automated testing tool in **Java** that generates, executes, and optimizes test suites for Python functions using **Differential Testing** methodologies.
- Designed a robust **Object-Oriented** architecture to model dynamic Python data structures (Lists, Dicts, Sets) within Java, enabling the generation of semi-exhaustive combinatorial test inputs.
- Implemented a greedy optimization algorithm solving the **Set Cover Problem** to reduce large base test suites into a minimal "concise" set while maintaining **100% bug detection coverage**.
- Developed a modular system integrating a **JSON** configuration parser, a multi-process test runner, and a result analyzer to automatically identify discrepancies between reference solutions and buggy implementations.

6. Research Assistant Beihang University, Beijing, China December 2021 – November 2022
Sodium-ion Battery Materials Research (Advisor: Prof. Lin Guo, CAS Academician)

- Introduced a novel sodium-ion battery anode material: **2D amorphous iron sulfide-selenide nanosheets**.
- Quantitatively evaluated cycling performance and retention across conditions. Achieved first-cycle specific capacity of **883.69 mAh g^{-1}** with **80%** capacity retention over 70 cycles.
- Employed a **constrained-region ion-exchange** synthesis method for these anode nanosheets—first demonstration in literature.
- Documented experiments with clear controls and comparisons to support reproducibility and reliable interpretation of results.

Honors & Awards

1. China Youth Talents Program **Chemistry Discipline Excellence Award** 2022
Top honor awarded by the Ministry of Education, China

- One of only 250 high school students nationwide to receive this honor (top **0.1%**), in recognition of outstanding independent research contributions.

2. S.-T. Yau High School Science Award, China **Third Prize, China** 2023
Chemistry Division

- Ranked among the top 120 in the Chemistry division nationwide.

3. U.S. High School Mathematical Contest in Modeling (HiMCM) **Meritorious Award** 2022
Developed Bee Colony Growth Mathematical Model

- Developed a mathematical model using Python and MATLAB, emphasizing clear assumptions, sensitivity analysis, and evidence-based conclusions.

Skills

Coding Skills: Python • Java • C • TypeScript/JavaScript • LaTeX • MATLAB • Golang
Frameworks & Tools: PyTorch • JAX • scikit-learn • Docker • React
Languages: English (Native), Mandarin (Native)