

# CHIAO-WEI HSU

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## 🎓 EDUCATION

### Stanford University (Auditing Courses)

Palo Alto, CA

*Digital Nomad at Startup House* 🌀

*Since Sep. 2024*

- ♣ AI Agents and Simulations (Individual/Group/Population-Level Generative-Agent Based Model and Simulation for Emergence and Equilibria) with a group project: *RecruitSim* 🌀.
- ♣ Parallel Computing (CUDA, CUTLAS, SIMD, RDD).
- ♣ Big Data Systems (nanoDB, transaction scheduling and synchronization).

### Northwestern University

GPA: 3.892/4.0

Evanston, IL

*Master of Science in Computer Science*

*Sep. 2023 – Dec. 2024*

- ♣ **Project:** “*Scaling Law for Deep Learning*” supervised by Han Liu 🌀.
- ♣ **Seminar Project:** “*Financial LLMs and FinGPT*” supervised by Han Liu 🌀.
- ♣ ML: Minimax, Bayesian Learning, Causal Inference, Decision Tree, Logistic Regression, EM Algorithm, Naive Bayes, Knowledge Representation and Reasoning, Deep Reinforcement Learning: A2C, PPO.
- ♣ DL: Quantization, LoRA, Retrieval-Augmented Generation, Diffusion Model, Linear RNN (Mamba), Transformer with RLHF, Mixture of Experts.
- ♣ CV/Graphics: Color Constancy, In-Pixel/On-Sensor Computation, Coded Aperture, Lensless Imaging.

## 🧰 EXPERIENCE

### Machine Learning Intern

Irvine, CA

*Himax Imaging Corp.*

*Jun. 2024 – Sep. 2024*

- Engineered a unified model for **Emotion, Attention, Body Detection, Face Expression** model based on **YOLO** with **TFLite** and **Vela**.
- Utilized **Model Pruning, Quantization**, and **Quantization-aware Training** to obtain a compression ratio of 46% on an **endpoint AI device** (milliwatts).
- Implemented Task Automation with Natural Language Commands by a fine-tuned **LLM** and **Text-to-Speech** and **Speech-to-Text** for AIPC.
- Integrated **Websocket, Shared Memory**, and **Named Pipe** for **Inter-Process Communication** among the **microcontroller**, the **host PC**, and the application.
- Developed a library to communicate with the **microcontroller** FT4222 driver.
- Developed an **LLM-powered Windows Desktop App** that integrates with the **edge device and operating system** on AIPC by **ElectronJS, ReactJS**, and **C++/C#** with **microcontroller** library and **Qt GUI framework**.
- Developed a **RESTful API** for the **AI PC** by **Django** and **Django REST framework** with **PostgreSQL**.

### Machine Learning Engineer (Research Assistant)

Taiwan

*Academia Sinica*

*Nov. 2018 – Dec. 2022*

- Developed a Person-Company Profile Generation System with **Django, MySQL Database**, and **typical Natural Language Processing** pipelines.
- nlds 🌀: Developed a python library of natural language data structure with **Design Patterns**—Composite, Factory, Template, Command, Facade, Adapter, Delegate, Builder, Strategy, Iterator, Dependency Injection, and Meta Class.
- Engineered a **Knowledge-driven Multi-Modal QA System** integrating **vision, speech, and text** data, advancing capabilities in cross-modal information processing [3].
- Enhanced **state-of-the-art** performance by 4% on the **Named Entity Recognition (NER)** task through strategic **fine-tuning of Transformers**, applying **Multi-Task** and **Incremental Learning** techniques, and leveraging **Data Augmentation** [1][2].
- Designed a **Hierarchical Multi-Head Multi-Layer Attention** mechanism from the ground up, enhancing model interpretability and performance.
- Implemented **Adaptive Boosting** for Ensemble Learning.

### Software Developer

Taiwan

*Luye Gaotai*

*Oct. 2016 –Part-Time– Aug. 2017 –Full-Time– Jul. 2018*


- Developed a **3D vision graphics** (autostereogram 🌀) program by **JavaScript**.
- Developed a portal website using **HTML5/CSS3, Bootstrap, PHP**, and **JavaScript**.

## Alternative Military Service (Software Developer)


Taitung County Government

Taiwan

Sep. 2016 – Aug. 2017

- Developed a **Windows GUI Desktop Application** (CODE ) to automate newspaper clipping, publisher annotation, scanning, emailing, and titling with AutoHotKey (an interpreted scripting language with OOP support) and **OCR** (Optical Character Recognition).

## Co-Founder & COO

MiDs/Tidyman 

Taiwan

Mar. 2016 – Oct. 2016



- Managed, organized and led team with CEO to make big decisions, and set up goals for our team.
- Left the team after pivoting from a tech startup to a non-tech service startup, which fundraised 2M dollars in 2023.

## Co-Founder & Software Developer

Unite

Belgium

Aug. 2015 – Feb. 2016

- Developed two **mobile app** prototypes with **Java** and **Ionic** respectively for “tribe gatherer” (PITCH ) based on crowdsourcing network (i.e., crowd coordination) in timely connection to street security, scientific work, coordinative project, or community work. (DEMO )

## PROJECTS

### RecruitSim CODE

Jan. 2019 – Jan. 2021

- Simulated with Generative Agents to study the emergence and the equilibrium of the system with observed bias in the hiring process of the startups.

### Stock Trading using Deep Reinforcement Learning VIDEO

Mar. 2024 – Jun. 2024

- Trained a **Stock Trading Agent** by **A2C** and **PPO** to obtain an annual return of 29%.

### Information Retrieval and Multi-Document Analysis CODE

Jan. 2019 – Jan. 2021

- Implemented **Entity Linking** and **Relation Extraction** for **Wikidata Knowledge Graph**.
- Incorporated **K-Mean** and **Hierarchical Clustering** algorithms to group similar documents.
- Improved the **Re-ranking** model of an Information Retrieval System by 0.24 f1-score.
- Implemented a BERT-based **Query Generation** model and threshold-tuning P-R curve.
- Extracted syntactic patterns based on **Dependency Parsing** and **Part-of-Speech Tagging** based on LSTM.

### Decentralization and Blockchains System VIDEO

Mar. 2024 – Jun. 2024

- Developed a **P2P Network** for the blockchain system using **Rust**.
- Implemented the data structures (e.g., Transaction, Block, Blockchain, Mempool) and algorithms for **Gossiping Protocol** and the **Proof of Work** consensus for the mining process.

### Interpreter by Racket/Lisp CODE

Jan. 2024 – Mar. 2024

- Built a **parser**, a **compiler**, and a **garbage collector** using **Mark & Sweep** and **Two-Space Collection**.
- Implemented features of deferred substitution, higher order functions, state, error handling, and recursions.

### AI-Driven Grocery Logging and Recipe Suggestions App DEMO

Sep. 2023 – Apr. 2024

- Adopted **ReactJS**, **Vite**, and **Firebase**; conducted tests using **Cypress**.
- Developed a **Serverless RESTful API** with **ExpressJS** as back-end deployed with **AWS ElasticBean**.
- Incorporated **API Gateway** with **AWS Lambda Functions**.
- Engineered prompts for GPT-4 Vision**, deployed **OCR** to scan receipts, and implemented features to send expiry notifications and receipt suggestions.

### AI-Powered Driver Companion Mobile App DEMO

Mar. 2024 – Apr. 2024

- Incorporated AI models, **YOLOv4**, **GPT-4**, **Text-To-Speech**, **Speech-To-Text**, to streamline from image recognition to natural language processing.
- Adopted **Django** as back-end, and **React Native**, **Expo** for mobile development.

### Robotic Arm with Arduino DEMO

Sep. 2015 – Dec. 2016

- Implemented and compiled the inverse kinematics algorithm, and burnt **bootloader** in **microcontroller** of **Arduino**.
- Designed the robot arm with **3D printing**, **laser cutter** and assembled the components with **C++**.

## PUBLICATIONS

- [1] Hsu et al., “A Redundancy-Enhanced Framework For Error Correction in Named Entity Recognition”, pre-print ’24.
- [2] Hsu et al., “GlobalNER: Incorporating Non-local Information into Named Entity Recognition”, pre-print ’23.
- [3] Liang et al., “A Flexible and Extensible Framework for Multiple Answer Modes Question Answering”, ROCLING ’21.

## HONORS

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- ✂ **First Place** at the 2020 Formosa **Artificial Intelligence Grand Challenge**; developed a Multi-Round Dialogue System and Question Answering System.
  - ✂ Led the team of 4 students to **top 11%** in 2024 eBay Machine Learning Competition.
  - ✂ **3rd Place** in the Taitung **Mobile App Design Competition** 2015 for innovative app development.
  - ✂ **Silver Award** at Global Startup Weekend 2015; **Silver Award** at Sanmen Startup Competition 2016; **2nd Place** at PitchCamp for building an upcycling C2C/B2C platform and consultancy as a **then-cofounder**.
  - ✂ **Outstanding Social Youth** of 2017 awarded by Chiayi City for exceptional community service and leadership.