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.

National Taiwan University & Ghent University — GPA: 4.23/4.3 — Taiwan and Belgium
Dual Degree of Master of Science in Photonics & Optoelectronics — *Sep. 2012 – Jan. 2016*

- ⚚ 2015 member of Phi Tau Phi Scholastic Honor Society of the Republic of China.
- ⚚ Made the first place (1/107) in the second semester of 2012 and published a paper in one top conference [4].

National Cheng Kung University — GPA: 3.78/4.0 — Taiwan
Bachelor of Engineering in Electro-Optical Engineering — *Sep. 2008 – Jun. 2012*

- ⚚ Distinguished Achievement Award in the Physics Contest (within top 10%).
- ⚚ Signal Processing, Analog Circuits, Digital Circuits

💼 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)   Taiwan
Taitung County Government   *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   Taiwan
MiDs/Tidyman 🔗   *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   Belgium
Unite   *Aug. 2015 – Feb. 2016*
- Developed two **mobile app** prototyes 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 Blockhcains 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 complied 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.

[4] Hsu et al., *"An Autostereoscopic Display Structure Based on Diffractive Optical Elements and Tunable Refractive Elements"*, SID '14

🏆 HONORS

- **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.