Kevin Ting-Kai Kuo

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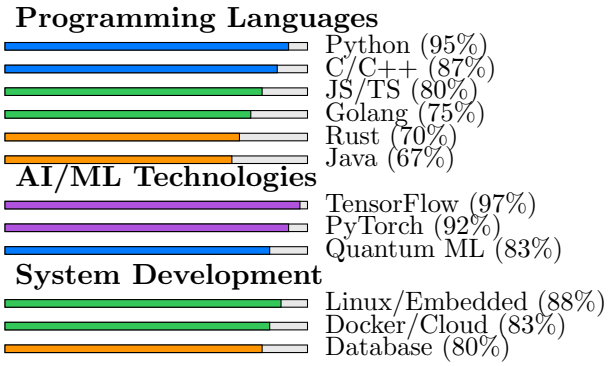
- Medium
- Article List
- The interactive website of my micro-novel

Fast Navigation

You can jump to Software Development and Experience section

Technology Stack Dashboard



Skills

Programming Languages

- Python, C/C++, Javascript/Typescript, Golang, Rust, Java, Lean, PHP, Ruby on Rails, Julia, Shell scripts, Mathematica, R

Working OS Platforms

- Ubuntu Linux, CentOS Linux, Android Linux, RaspberryPi OS, Windows

DL/ML/HPC/Statatistics

DL Frameworks/AI compiler

- Tensorflow:TF/TF-lite/ Tensornetwork/Tensorboard/ Tensorflow C++ API
  Jax
- Pytorch: torch/torch_geometric
- ONNX, MLIR
- HPC tools: Pybind11/BLAS/OpenMP

Algorithms

- ML/DL theory
  Especially, I am sophisticated at a family of **physics-inspired** algorithms called tensor network (also called tensor-train decomposition,TT, or higher order singular value decomposition, HOSVD), which are used in **LoRA in the LLM** field.
- Image signal processing (ISP)
  Edge CV using pre-trained NN models then fine-tuned/migrate learning to in-firm data, **quantized to FP int8** and deployed on RK3399 SoC equipped with camera lens collaboratively RD with FocalTech, for the face verification system.
  HDR tonemapping, color space conversion for CIS camera lens ISP pipeline (with OpenCV). Spherical aberration calibration for the robotic vacuum.
  Circle/edge detection for the eye-moving instrument.
- **Quantum Machine Learning**
  quantum-classical **hybrid CNN architecture** implemented with Google Qiskit/Tensorflow/Pannylane/Strawberryfield running on IBMQ quantum server for solving the ground state energy of the molecule in the IBMQ Quantum Computing Hackathon.

- **Statistics**
  multivariate time series such like ARIMA model, VAR, GARCH etc, with ARIMA(R) and Statsmodel(Python). Currently I am interested in the generalized version of AIC/BIC call WAIC/WBIC using algebraic statistics (algebraic geometry + statistics) invented by Watanabe, Riken.
- Numerical methods
  tensorization/Monte Carlo/Quantum Monte Carlo/Markov Chain Monte Carlo/Simulated annealing for solving com-

binatorical problem, e.g. the variant of travelling saleman problem (TSP) called QAOA, and physics problem (phase transition classification and ground state solution).
- Cryptography: randomness(entropy) extraction, optical-based TRNG implemented by LED packaged on circuit for the electric network data transfer, which was inspired by Samsung mobile phone hardware encryption module.

Software Development

- Profiler: perfetto/logcat/protobuf on Android Linux platform.
- **Real time, Low latency System design on Linux**: NVMe SSD controller tool development and test for several Linux distributions (Ubuntu/CentOS/RPI) using Pybind11 for binding top python API to C++ core library to call the NVMe/PCIe syscalls to the Linux kernel. Besides, we replaced the original ring buffer backend of NVMe devices with IOUring/Liburing for better I/O performance.
- Web: Vue/Node/Django/GCP/Firebase
- Emulator/Simulator:Qemu(open-source)/ AVD(Android)/Simics(Windriver) for SSD device development and test.
- GUI: PyQt5, PySide2
- **Cloud Container virtualization:Docker and Docker-compose**, LXC(Linux generic container technology), Proxmox
- OpenTelemetry for monitoring/logging/telemetry: Prometheus/Grafana/Datadog/Sentry
- **Database: PostgreSQL, MongoDB**
- Agile: Scrum, Jira

Test

- CI/CD: Jenkins/Groovy/Git action
- Test automation framework: Pytest/Postman/ Selemium

Experience

2024

Senior engineer, IKG Team, 2024 Sep. - now

- Develope browser-end multimedia player for video streams using FFmpeg, WebGPU,WebAssembly, accelerating streams with **NVIDIA encoder** and customizing **AI-masking frames** from SRS **mediaserver**
- Authentication for stream requests
- Serial port communication (USB, RS232) for game machine **micro-controller(MCU)**
- Object storages for VODs with Tencent/BytePlus cloud services
- Websockets/MQTT for game state machine message passing to Database (**PostgreSQL, MongoDB**)
- **Monitoring/Logging/Telemetry** for network TTFF/latency with Prometheus, google analytics, Sentry **on cloud server**
- Monte Carlo for event simulations.
- Technology stacks: Python/C++/ Typescript/JavaScript/Go
- Documenting with **Confluence**
- **Co-working with Europe team** for game projects

Senior engineer, Arcadyan Technology Co. Ltd., 2023 Dec.- 2024 July

- Google xTS test suite for Android TV development, deployed and ran on Ubuntu Linux server
- Test automation cluster build-up (24-48 physical devices) for passing over 1-million test cases nightly by **sharding**.
- **Leadership:** Dispatch/Schedule remote contractors to complete a xTS test suite cycle per week
- **OTA/eMMC firmware update**

2023-24

Senior engineer, Marvell Technology Co. Ltd., 2023 Jan.-Dec.

- SSD NVMe protocol front-end test/simulation tool development/test for **SSD controller firmware**, including device enumeration,function level hot reset features **for cloud server storage**
- Test tool GUI development with PySide2
- Used qTest for regression test documenting, Jfrog for constructing CI upstream and software release. CI/CD and release.Wrote Java/Groovy/Shell scripts for CI/CD code on Jenkins.

- Docker/Manylinux to make software release more portable
- Slack/Jira for agile development

Software Freelancer, 2022 Sep.-Dec.

- AI pose detection for body training posing correction with PoseNet.

Algorithm engineer, Tyrafos Technology, 2022 Mar.-Jul.

- Real-time face recognition/fingerprint verification on embedded devices using neural network quantization in TF-lite
- Real-time Image signal processing (ISP) such like HDR, 3A on mobile camera in OpenCV
- Optical TRNG encryption module on mobile phones obeying NIST entropy extraction test suite

Full-stack engineer and Co-founder, Eunomia (a legal-tech startup), 2020 Jul.-2022 Jan.

- Build-up the GUI of a document editor with Sequence-to-Sequence model with PyTorch for NLP core, for the purpose of collaboration with lawyers and other workers in legal industry. Our WebUI was implemented with Vue.js/Quill.js, deployed on GCP/Firebase.
- Obtained the 2nd place in the 1st Lawsnote Legaltech Hackathon, 2020, Taiwan.
- Assisted by NCCU innovation center start-up incubator.

Education

BA, Economics, National Chengchi University, 2016-2018

- RA (Ministry of Science and Technology), Taiwan Policy Center, 2017-2018
- Graduate/undergraduate maths courses: advanced calculus, stochastic process, advanced probability, stochastic PDE (2016 summer school, NTU), differential geometry
- Graduate/undergraduate econ courses: Financial time series, Econometrics, Game theory, Macroeconomics, Microeconomics
- TWSIAM conference 2018, poster paper, forecasting for win rate of NBA teams using HMM model with Dirichlet prior implemented by R

MA, Economics, National Chengchi University, 2018-2019 (incomplete)

- ICAPE 2020 Conference (San Diego), oral presentation: *Shinn-Shyr Wang, Ting-Kai Kuo and Wen-Chieh Lee, National Chengchi University: Combating thick polar networks: is there any effective way other than the strategic network formation?* Contribution: theoretical proof/numerical simulation for studying opinion convergence speed of manipulated social networks with echo-chamber effect implemented by Networkx and Numpy. I also set-up a manipulated chatroom with Node.js and Firebase providing for experimenters to use and monitored the opinion dynamics from the back-end.
- TA, principle of economics, 2018 autumn
- **RA, Music and Culture Technology Lab, Institute of Information Science, Academia Sinica, 2019**: Music score learning using graph neural network and topological data analysis with Tensorflow, Scikit-learn, Librosa.

MA, Applied Physics, National Chengchi University, 2019-2020 (incomplete, master thesis defense passed)

- RA, Condensed Matter Center, NTU/ Institute of Applied Physics, NCCU
- TA, computational physics, 2019 spring, teaching quantum Monte Carlo
- Research: tensorize neural networks on condensed matter physics and conventional supervised learning task (image recognition) implemented by Tensorflow/Keras/Tensornetwork
- Courses: quantum computing, quantum mechanics, statistical mechanics, computational physics
- Seminar project: implemented quantum exponential adder with qiskit in quantum computing course

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Math/Physics/TCS Research Interest

- Mathematica/Sagemath(Python) for symbolic/numerical computation for the Mathematical Physics.
- Computer Automatic Proof in Lean4/Coq/ Isabelle language.
- **Currently, I am working with Dr. Kuo, En-Jui (UMD) and Dr. Kam, Chon-Fai (SUNY Buffalo) with: (1) Mack polynomial in string theory and (2) Hyperdeterminant in quantum entanglement, respectively.**