FRANK YANG

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EDUCATION

Northwestern University **Evanston, IL**
B. S. in Computer Science and *Mathematics* *Expected, Sep 2020 – June 2024*
- GPA: 3.99/4.00 | Dean's List for all quarters | Researcher in 3DIM Lab

Northwestern University **Evanston, IL**
M. S. in Computer Science *Expected, Sep 2023 – June 2024*
- GPA: 3.99/4.00
- Concentrations: Optics-based computer vision and Artificial Intelligence

Relevant coursework: Computational Photography, Advanced Topics in Computer Vision, Deep Learning, Deep Generative Models, Probability and Stochastic Processes, Foundations of Optimization, Real Analysis, Abstract Algebra

RESEARCH INTEREST

I have a broad interest in computer vision and reinforcement learning. Specifically, I am working on a RL approach to safety-critical control system. This curiosity fuels my research vision in my PhD education— a commitment to contributing to the evolution of autonomous control technologies. Whether applied to robotics or commodity vehicles, I envision a future where vehicles navigate roads with an optimal balance of efficiency and safety.

PUBLICATION

Yang, F., Wen, Y. **Efficient Encoding of Graphics Primitives with Simplex-based Structures.** Midwest Machine Learning Symposium, 2023.

RESEARCH EXPERIENCE

Simplex-based Structure Encoding **Evanston, IL**
Independent Researcher *Dec 2022 – May 2023*
- Advised by: Ying Wu, Professor of EECS at Northwestern University
- Surveyed the proposed encoding method from "Instant NGP with Hash Encoding" by NVIDIA; researched on more efficient encoding of graphics primitives for data compression and volumetric rendering
- Established theoretical foundations for simplex-based structures adapted from simplex noise algorithm
- Benchmarked in C++/CUDA kernels, accelerated giga-pixel image fitting speed by 9.4% and improved NeRF interpolation and rendering speed by 41.2% as compared to the baseline method

Transformer-based Lie Detection **Evanston, IL**
Independent Researcher *Feb 2022 – Jan 2023*
- Advised by: Zach Wood-Doughty, Assistant Professor of Instruction at Northwestern University
- Conceptualized a ViT-based detection model that detects lies from micro-facial, audio, and textual features with PyTorch
- Trained a transformer encoder and a LSTM binary classifier from fine-tuning Inceptionv3 with 121 clips of trial testimonies
- Labeled 4.5M frames from 8 real-life datasets and pinpointed 20 micro-gestures and AUs that most contributes to lying
- Resulted an out-of-sample lying classification accuracy of 76%, outperforming lie detection models in scholarly research

Computational 3D Imaging and Measurement Lab **Evanston, IL**
Research Assistant *May 2021 – June 2022*
- Advised by: Florian Willomitzer, Associate Professor of Optical Sciences at University of Arizona
- Assisted in creating GhostScan, a python 3D imaging framework that facilitates non-technical users to discover micro-painting degradation in Kokomo glass test tiles
- Streamlined and packaged a 3-step calibration sequence (intrinsic, radiometric, and geometric) to PyPI, allowing μm-level precision prior to starting Phase Measuring Deflectometry

- Benchmarked performance with FLIR camera on specular objects; lowered reprojection error to 0.34-pixel, decreased calibration time by 23 min

TEACHING EXPERIENCE

Undergraduate TA, CS396 Web Development *Apr 2022 – June 2022*

- Mentored 20+ students about the basics of creating web applications, including building a web socket and RestAPI, setting up a Postgres database, designing usable interfaces, and deploying the website for public use
- Oversaw the grading and led office hours for 50+ students for inquiries on college-level projects and homework assignment

Graduate TA, CS310 Scalable Software Architectures *Sep 2023 – Present*

- Led office hours for 300 students on homework assignments, implementing highly scalable architectures such as hosting Elastic Beanstalk services, uploading files to S3 bucket and updating query records on AWS RDS
- Monitored course Piazza on general inquiries on SQL vs. noSQL databases, content delivery networks, and load balancers

Project Manager, Institute of Electrical and Electronics Engineers *Nov 2022 – Apr 2023*

- Led a 6 Engineer-team for creating a ChatGPT plagiarism detector by fine-tuning BERT and classifying inputs with SVM
- Organized weekly sprints; surveyed state-of-the-art deep learning papers such as "Attention is all you need"

PROFESSIONAL EXPERIENCE

Target **Minneapolis, MN**
Software Engineering Intern *Jun 2023 – Aug 2023*

- Developed a Golang application within a Vela pipeline to enforce security standards for internal applications deployment
- Integrated Postgres and Target API-based database with RestAPI for build lifecycle and versioning information retrieval
- Incorporated 90% coverage on unit and integration testing with sqlmock and httptest, achieved Target-specific SLOs

Skuy **Evanston, IL**
Lead Tech Engineer *Apr 2022 – Present*

- Built a cross-platform community network mobile app tailored for college students, amassed 500+ users on both the App Store and Google Play
- Led a 2-months database migration from Heroku to Firebase for service growth and stability
- Managed pull requests for 8 tech engineers to ensure encrypted retrieval and storage for private user info
- Configured CI/CD on Expo for IOS Pod and Android Gradle deployment; employed agile management in 2-week sprints

Amazon Web Services **Seattle, WA**
Software Developer Engineer Intern *Jun 2022 – Sep 2022*

- Implemented and tested a Sagemaker webpage that provides benchmarked health and architecture evaluations for machine learning models
- Challenged and simplified frontend implementation of S3 resource selector with React and Redux; unit tested with ESLint and Cypress
- Presented an end-to-end demo to 150+ Sagemaker engineers; received candidacy to beta-launch Sagemaker model cards on AWS Re:Invent

PROJECT

Reminiscia **Evanston, IL**
Software Developer *Dec 2022 – May 2023*

- Implemented a multimodal text-to-image search application using pretrained vision-language models; Competed in Northwestern Wildhacks
- Employed Vision and CoreML on IOS to allow low-memory-usage calculations of cosine similarity between text and image embeddings
- Distilled original 224MB CLIP model into an 85MB, 6-layer image encoder to improve inference speed on mobile device and improved the inference speed by 1.6 times with minimal loss on accuracy

MatchaNU **Evanston, IL**
Founder & Software Developer *Jun 2021 – Feb 2022*

- Launched a native-IOS application to App Store to assist Northwestern students with course planning and building navigation

- Web-scraped course catalog into classes in JSON format; integrated Google Geocoding API to generate building name from geocoordinates
- Integrated UIKit with Apple Map and LocationManager in SwiftUI to track user location and calculate the optimal walking route to classrooms
- Used by over 1000 Northwestern undergraduates every quarter; constantly making updates from user feedback and quarterly testing

Single-Len Light Field Imaging **Evanston, IL**
Software Developer *Jul 2021 – Feb 2022*

- Introduced a simpler and cheaper alternative to a light-field camera that synthesizes camera aperture and focus point even after a video is taken
- Researched capturing the light-field from a camera with known parameter and wrote a package that achieved the functionality with OpenCV
- Tested with real-life experiments and decreased the functional cost of a light-field camera by 3000% with minimal compromise in image quality

LANGUAGES & SKILLS

- **Languages**: Python, Go, TypeScript, SwiftUI, HTML/CSS/JavaScript, C++
- **Deep Learning:** Torch, CUDA, TensorFlow, OpenCV
- **Web/Mobile Development:** React, React Native, Flask, Redux, Node, ESLint, Cypress
- **DevOps:** RestAPI, AWS, Firebase, Heroku, Elastic Beanstalk, Git, Vela, Docker, MySQL, PostgresSQL

INTERESTS

- **Photography & Film**
  Majoring in Radio Television Video and Film (Portfolio). Participated as gaffer in a 16-student film set "Clark" and 70-student feature film "NEURO 101". Second camera assistant in featured films "Voicemail to My Son" and "Venessa"; Proficient in topics of cinematography and color correction
- **Piano**
  3 years of volunteer teacher in Academy of Music and Arts for Special Education (AMASE); Composed music sheets and individualized lessons most comprehensible to students with visual impairment; Co-founder & Pianist for a 3-member school band "Allison Trio"