Soumil Chugh

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https://soumilchugh.github.io/

Employment History

Aug 2020 – · · · · **Senior AI/ML Research Engineer,** Huawei Technologies, Toronto, Canada.

- Led the development of LLM agents to elevate user experience in system-level applications, including intelligent image editing in the Photos app and color recommendation features in a digital painting tool for artists.
- Designed a deep-research LLM agent leveraging Retrieval-Augmented Generation (RAG) for comprehensive report creation, incorporating capabilities such as smart editing, multi-source content merging, and automated visualization.
- Built an LLM-based agent to automate user-recorded workflows in the Chrome browser, enabling cross-domain support for websites in entertainment, travel, food, and more, functionally similar to GPT-Operator.
- Designed a gesture recognition ML model integrating LLM-based function calling to accurately interpret diverse hand-drawn and custom gestures made with a stylus on a tablet, achieving 90% precision and recall.
- Fine-tuned large language models using Parameter-Efficient Fine-Tuning (PEFT) techniques like LoRA and adapter tuning to enable AI-powered sticker prompt generation in the Notes app and color palette creation in the painting app.
- Led the research and deployment of advanced computer vision and deep learning methods for gaze tracking, achieving a 25% improvement in accuracy and a 50% reduction in latency over previous systems.

Aug 2020 – May 2024 **Machine Learning Consultant (Part-Time),** General Prognostics (GPx), Boston, USA.

- Developed custom software for data collection from smartwatches, ensuring high-quality data was available for training and testing predictive models.
- Designed and implemented predictive models for healthcare diagnostics based on the collected smartwatch data, achieving 70% prediction accuracy for patient outcomes.
- Provided technical leadership in the development of a machine learning pipeline that reduced data processing time by 30%.
- Conducted in-depth research, contributing to the publication of multiple patents.

Employment History (continued)

Sep 2015 – July 2018 — **Senior Software Engineer,** Jana Care, Bengaluru, India.

- Spearheaded the development of a smartphone-controlled robotic system for automating complex blood tests, successfully securing FDA approval.
- Developed and integrated Bluetooth Low Energy (BLE) stacks on Android and Cortex ARM-M4 platforms, ensuring reliable connectivity and performance.
- Authored comprehensive technical design documentation to facilitate system development and collaboration.

Education

Aug 2018 – Aug 2020 — **MASc., University of Toronto, Canada** in Computer Engineering.
Thesis title: *Eye Tracking System for a Virtual Reality Headset.*

Aug 2011- May 2015 — **BE., Punjab University, India** in Electronics and Communication.
Thesis title: *Non-invasive hemoglobin monitoring device*.

Skills

Deep Learning Techniques	**NLP, LLMs, MultiModal LLMs, Neural Networks**
Programming Languages	**Python, C, C++, Java**
Deep Learning Frameworks	**PyTorch, Tensorflow**
Web and Mobile Development	**TypeScript, Android**
Tools and Technologies	**OpenCV, Git, LangChain, Openai, Docker, Google Cloud, Firebase**

Research Publications

Patents

1. S.Chugh, J.Ye, and M.Eizenman, *Corneal reflection multi-camera eye tracking systems*, Filing:in process, 2024.
2. Y. Zhao, A.Lu, S.Chugh, C.Yan, and Y.Deng, *Multi-modal interaction for selecting semantic regions in agent-based image editing*, Filing: in process, 2024.
3. Y. Zhao, S.Chugh, C.Yan, and W. Y.Deng, *Methods for cross-media configuration on virtual keyboard theme*, Filing: in process, 2024.
4. S.Chugh, J.Ye, and M.Eizenman, *A model-based approach for glint-free gaze tracking*, Filed: 2023-11-01, 2023.
5. J.Ye, M.Singh, and S.Chugh, *Methods and systems for gaze assisted interaction*, Filed: 2023-02-01, 2022.
6. S.Chugh, J.Ye, and M.Eizenman, *Methods and systems for gaze tracking using one corneal reflection*, Filed: 2022-08-01, 2022.
7. M.Depa, S.Chugh, Javi, Sean, and Theressa, *Quality control of user-generated biological sample cards*, Filed: 2022-11-01, 2021.

8 S.Chugh and J.Ye, *Methods and devices for gaze estimation*, Filed: 2021-12-01, 2021.

Conference Proceedings

1 S. Chugh, J. Ye, Y. Fu, and M. Eizenman, "Csa-cnn: A contrastive self-attention neural network for pupil segmentation in eye gaze tracking," in *Proceedings of the 2024 Symposium on Eye Tracking Research and Applications (ETRA)*, 2024, pp. 1–7.

2 S. Chugh, B. Brousseau, J. Rose, and M. Eizenman, "Detection and correspondence matching of corneal reflections for eye tracking using deep learning," in *2020 25th International Conference on Pattern Recognition (ICPR)*, IEEE, 2021, pp. 2210–2217.

3 S. Chugh and A. Akula, "Effect of different signal processing techniques on a calibration free pulse oximeter," in *2018 3rd International Conference for Convergence in Technology (I2CT)*, IEEE, 2018, pp. 1–6.