# Jong Hoon Park

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## EDUCATION

**Carnegie Mellon University (CMU)** **May 2024**
Master of Science in Mechanical Engineering – Research in Machine Learning | GPA: 3.9/4.0
Coursework: AI/Machine Learning, Deep Learning, On-Device Machine Learning, Big Data, Visual Learning & Recognition

**University of California, Davis** **Dec 2019**
Bachelor of Science in Aerospace Engineering and Mechanical Engineering

## WORK EXPERIENCE

**Robotics Institute at Carnegie Mellon University – Graduate Research Assistant** **Pittsburgh, PA**
**Multimodal Machine Learning for Pilot Mental Workload Estimation** **May 2023 – Apr 2024**

- Developed multimodal ML pipelines (model development, training, validation) with industry scientists for supervised classification tasks predicting pilot workload, enhancing accuracy by 12% using XGBoost.
- Collected, analyzed, and processed big time-series biosensor data (e.g., heart rate) from 28 pilots using Python.
- Utilized an eye tracking camera, computer vision (OpenCV's SIFT for feature detection), and deep learning-based image semantic segmentation to process camera and screen-recorded videos for feature extraction.

**Predictive Modeling for Airplane Trajectory in Airports** **May 2023 – Aug 2023**

- Assisted in developing a transformer-based deep learning model to forecast airplane motion, funded by Boeing.
- Preprocessed airport maps into graphs, leading to outstanding motion forecasting with a 4.6m error.

## ACADEMIC PROJECTS

**AI Powered Q&A System using RAG and LLMs**| *Python, PyTorch, NLP, LLMs, LangChain* **Jan 2024 – May 2024**

- Built a Q&A system leveraging RAG, LLMs (Mistral), prompt engineering, and a vector database with LangChain and Hugging Face, accurately retrieving information from documents.
- Employed NLP methods, such as text chunking and vectorization into semantic embeddings, to process texts.
- Evaluated RAG implementation by generating and testing multiple-choice questions, improving accuracy by 30%.

**Cockpit View Image Segmentation** | *Python, PyTorch, Computer Vision* **Nov 2023 – Dec 2023**

- Fine-tuned a Mask R-CNN model for object detection and semantic segmentation on 2D aviation cockpit images.
- Created a dataset by segmenting and augmenting 200+ cockpit view images to facilitate domain adaptation.

**Generative AI Model Optimization on Device** | *Python, PyTorch, Model Compression* **Sept 2023 – Dec 2023**

- Optimized a large image generation model (73 million parameters) for GPU inference on an NVIDIA Jetson Nano, addressing FLOPs, parameter count, inference latency, and accuracy across varied input and model sizes.
- Implemented knowledge distillation, reducing model size by 58% with minimal performance drop.
- Enhanced inference speed on device by 94% on GPU via post-training static quantization to float16 domain.

**Generative AI Modeling for Image Generation** | *Python, PyTorch, Computer Vision, Gen AI* **Oct 2023**

- Trained GAN on CUB 2011, refining image generation (38% lower FID) via Wasserstein loss and gradient penalty.
- Built and trained VAE on CIFAR-10, improving image generation (8% lower reconstruction loss) via β-annealing.
- Implemented a diffusion model (DDPM) to optimize image generation compared to VAE, achieving an FID of 63.

**Human Facial Emotion Recognition** | *Python, PyTorch, Computer Vision* **Oct 2022 – Dec 2022**

- Constructed and trained a CNN model from scratch on 290k images, achieving 70% emotion prediction accuracy.
- Demonstrated emotion recognition using OpenCV for face detection and assessed performance with F1 scores.

## SKILLS

**Languages:** Python (proficient), C++ (intermediate), MATLAB (intermediate)
**Frameworks:** PyTorch, OpenCV, Scikit-learn, Pandas, Hugging Face, CUDA, Linux, ROS, Git, Docker, SQL
**AWS:** SageMaker, PySpark, Data Wrangler, Lambda, S3, EMR, ETL

## PUBLICATIONS

[1] **How is the Pilot Doing: VTOL Pilot Workload Estimation by Multimodal Machine Learning on Psycho-physiological Signals** Jong Hoon Park, Lawrence Chen, Ian Higgins, Steven Willits, Mohammadreza Mousaei, Eliot Xing, Sebastian Scherer, Jean Oh, *IEEE International Conference on Robot and Human Interactive Communication*, 2024 [Link]