HELBERT PAAT

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EXPERIENCE

- **The Hong Kong Polytechnic University** *Jan 2024 - Feb 2025*
  Machine Learning Researcher Hong Kong
  - (1) Worked with huge MRI & CT datasets and used architectures based on generative diffusion models and DNNs for medical image synthesis. Introduced Frequency Domain Uncertainty Quantification (FDUQ), a framework that estimates spatial uncertainty in image samples of diffusion models by analyzing variations in the magnitude spectrum through the Fourier transform. This method provides valuable uncertainty metrics and visualizations that help radiologists. Supervised by Prof. Guohao Shen at the Department of Applied Mathematics.
  - (2) developed human-AI models to enhance classification performance based on real predictions from the CIFAR-10H and ImageNet-16H datasets and theoretically and empirically explored how multiple human experts collaborate, identifying conditions that allow them to benefit from conformal prediction sets. By introducing a greedy algorithm to select relevant subsets of experts, our approach achieves near-optimal subsets. The work is accepted in AAMAS 2025 as Full Paper (acceptance rate of 24.5%).

- **The Hong Kong University of Science and Technology** *Sep 2021 - Nov 2023*
  Graduate Research Assistant Hong Kong
  - Conducted research on image and LiDAR-based 3D object detection & uncertainty estimation and proposed a framework for semi-supervised 3D object detection. Worked with pre-processing and analysis of large datasets (such as KITTI and nuScenes datasets) for self-driving purposes using deep learning models built on Pytorch. The work is accepted in ICRA 2024. Supervised by Tong Zhang (Fellow of ASA, IEEE, and IMS) and collaborated with Qing Lian.

- **Fatima Fellowship 2023**
  Fellow Remote
  - worked on Monte Carlo methods, variational inference, and score-based generative models for solving inverse imaging with applications to Magnetic Resonance Imaging (MRI). Supervised by Varun Ajit Kelkar from UIUC.
  - Fatima Fellowship is an international mentorship program for aspiring researchers in computer science)

- **Fatima Fellowship 2022**
  Fellow Remote
  - Conducted research on Algorithmic Recourse. Supervised by Kaivalya Rawal (researcher at Oxford).

- **Manulife Business Processing Services** *August 2019 - August 2020*
  Actuarial Assistant Quezon City, Philippines
  - part of the Pricing Team in pioneering Manulife Myanmar. Conducted research on the economic market of Myanmar, analyzed profitability using actuarial software & VBA programming, and drafted official Product Pricing Reports and Risk Proposal Outlines. Applied theoretical knowledge and gained business insights.

- **Manulife Business Processing Services** *June 2018 - July 2018*
  Actuarial Intern Quezon City, Philippines
  - Conducted research on the Long Term Care Insurance product offered in the US using SQL and MS Access.

EDUCATION

- **The Hong Kong University of Science and Technology (HKUST)** *Sep 2021 - Nov 2023*
  MPhil in Computer Science and Engineering (CSE) Hong Kong SAR, China
  - GPA: 3.72/4.00

- **University of the Philippines, Los Banos** *June 2019*
  B.Sc. in Applied Mathematics Los Banos, Laguna
  - GPA: 3.90/4.00

Publications

C=Conference, S=In Submission, W=Work in Progress

[C.1] Helbert Paat, et al. (2024). **MEDL-U: Uncertainty-aware 3D Automatic Annotation based on Evidential Deep Learning**. In *International Conference on Robotics and Automation (ICRA)*, IEEE. pp. 13976-13982. (Major AI - CORE **A*** conference (44.8% acceptance rate))

[C.1] Helbert Paat, Guohao Shen (2025). **Conformal Set-based Human-AI Complementarity with Multiple Experts**. In *International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*. (Major AI - CORE **A*** conference (24.5% acceptance rate))

[W.1] Helbert Paat, Guohao Shen (2025). **Utilizing the Frequency Domain for Distribution-free Uncertainty Quantification of Diffusion Models in Biomedical Imaging**.

Skills

- **Programming Languages:** Python (Proficient), Fortran (Basic), SQL (Basic), Matlab (Basic)
- **Data Science & Machine Learning:** Pandas, Scikit-learn, Keras, PyTorch, NumPy, Matplotlib, Jupyter, Seaborn
- **DevOps & Version Control:** Git
- **Specialized Area:** Machine Learning, 3D Computer Vision, Uncertainty Estimation, LiDAR Object Detection, Biomedical Imaging
- **Mathematical & Statistical Tools:** Basic R (for statistics), Excel (with advanced functions)
- **Other Tools & Technologies:** Visual Studio Code, LaTeX, tmux
- **Research Skills:** Literature Review, Data Collection & Analysis, Statistical Analysis Software, Technical Writing & Documentation

Honors and Awards

- **UPLB Class Valedictorian of 2019 (Rank 1)** *June 2019*
  University of the Philippines, Los Banos
- **College of Arts and Sciences Faculty Medal for Academic Excellence** *June 2019*
  College of Arts and Sciences, UPLB
- **Institute of Mathematical Sciences and Physics Valedictorian** *June 2019*
  IMSP
- **Full Undergraduate Scholar** *Aug 2015*
  Department of Science & Technology (DOST)
- **UP Presidential Scholarship Recipient**
  UP System

Teaching Experiences

- **Design and Analysis of Algorithms** *Fall and Spring Terms A.Y. 2022-2023*
  HKUST
- **Computer Programming II (Data Structures and Algorithms)** *Second Semester A.Y. 2020-2021*
  UP Diliman
- **Computer Programming I (Python)** *First Semester A.Y. 2020-2021*
  UP Diliman

Related Courses

- **Advanced Deep Learning Architectures (HKUST)** (4.0/4.0)
- **Machine Learning (HKUST)** (4.0/4.0)
- **Deep 2D/3D Visual Scene Understanding (HKUST)** (4.0/4.0)

Certifications

- **Society of Actuaries (US)** Exam Probability Passer *(exam sponsored by Manulife)* *Nov 2019*
  - The exam provides a comprehensive assessment of the candidate's understanding of probability concepts and how these are applied in actuarial science. The exam topics include probability theory, random variables, and distributions. Candidates need to demonstrate an understanding of calculus, insurance, and risk management.
- **Society of Actuaries (US)** Exam Financial Math Passer *(exam sponsored by Manulife)* *Oct 2018*
  - The exam assesses candidates' understanding of fundamental financial mathematics concepts. Candidates apply those concepts to calculate values for various cash flow streams to use with valuing loans and bonds, asset/liability management, and investment income.