Haokai Xuan

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Education

- **University of Waterloo** *Sep. '24 - Apr. '29*
  Bachelor of Computer Science, Honours Co-op, GPA: 3.61/4.00 Waterloo, Canada

Experience

- **4AG Robotics** *Sep. 2025 – Apr. 2026*
  Machine Learning Intern Salmon Arm, Canada
  - Developed unsupervised lens smudge detection in PyTorch using contrastive learning and coreset sampling; integrated in C++ to mitigate downstream failures caused by unhealthy lenses.
  - Optimized mushroom cap quality classification model by designing a multi-head architecture with focal loss and Albumentations; performed custom random search hyperparameter tuning in PyTorch, improving F1 score to 85%
  - Pioneered MLflow experiment tracking with PostgreSQL metadata and MinIO artifact storage on training VM, used by all team members. Automated cleanup of outdated experiments via a cron job Bash script.
  - Finetuned YOLOX-m object-detection model in SuperGradients to reduce false classifications of dirty mushrooms, improving F1 score from 70% to 84%.
  - Improved performance of mushroom bed object-detection model through implementing grid search hyperparameter tuning and achieved an F1 score 88%.

Skills

- **Languages:** Python, C/C++, JavaScript, Java, Racket, HTML/CSS, MySQL, PostgreSQL
- **Frameworks:** Django, Flask, FastAPI, React, ExpressJS, PyTorch, TensorFlow, scikit-learn
- **Tools:** Git, Linux Bash, Vim, GDB, Supabase, Axios, Docker, SDL3, Arduino, Flutter, Jupyter, NumPy, OpenCV, Pandas, MLflow, Matplotlib, Seaborn

Projects

- **FIFA 2026 World Cup Champion Predictor** *May. 2026* [ ]
  - Implemented and trained logistic regression and gradient descent from scratch with NumPy to acquire industry-level F1 score of 68% along with Monte Carlo Simulation to predict championship probabilities.
- **Dog or Dough: Meme-inspired image classification.** [ ] *Sep. 2025* [ ]
  - Engineered fully custom vectorized linear neural network with NumPy including loss function, softmax output, and back propagation. Developed full-stack UI with React, TailwindCSS and FastAPI for inferencing with trained model.
- **Flappy Arms: Flappy Bird remix.** [ ] *Oct. 2024 - Jan. 2025* [ ]
  - Developed Flappy Bird where user controls bird position through doing push ups monitored by a camera using the Haar Cascade algorithm in Pygame and OpenCV.
- **Chess++: Play chess from C++.** *Apr. 2026* [ ]
  - Built a full-featured chess game in C++ with a graphical UI using SDL3. Facilitates 2 players including AI modes implemented with minimax and alpha-beta pruning, including complete rule enforcement, and clean OOP architecture using MVC, smart pointers, and UML diagram.

Certifications

- **Supervised Machine Learning** *Apr. 2026*
- **Deep Learning Specialization** *Dec. 2025*
- **Python Mastery** *Aug. 2024*