

Michael Liu

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Projects

ArXtract: AI Search Engine for ML Research @ CxC Hackathon

arxtract-cxc.vercel.app [🔗](#)

- Built a full-stack research tool (React + TypeScript frontend, FastAPI backend) for analyzing machine learning papers through user prompts and arXiv inputs.
- Implemented embedding-based retrieval using cosine similarity between user research queries and paper abstracts/paragraphs to rank relevant sections of arXiv papers.
- Built a retrieval-augmented chatbot that answers research questions by ranking paper chunks using embedding similarity and responding using the top-scoring sections.
- Engineered structured extraction of key ML fields (task type, problem, contribution, datasets) to standardize paper summaries.
- Implemented related-paper discovery using embedding-based similarity search over arXiv API.

Enhancing Microaneurysm Segmentation in Retinal Fundus Imaging @ WAT.ai

[github/fundus-image-segmentation](https://github.com/fundus-image-segmentation) [🔗](#)

- Built a PyTorch data pipeline with image-mask augmentations for fundus imaging datasets.
- Designed and trained (via SSH) HydraLA-Net (U-Net Variation) models for the semantic segmentation of microaneurysms, hemorrhage, soft and hard exudates from scratch in PyTorch.
- Wrote task-specific loss functions (e.g. Focal Tversky) to address class imbalance.
- Conducting ablation studies on applications of contrast enhancement preprocessing and loss function selection to improve small-lesion segmentation performance.
- Designed technical diagrams (model architecture, pipeline, dataset statistics) for research publication.

Technical Skills

Programming Languages:	Python, SQL, C, Typescript
Data/ML:	LLM/Prompt Engineering, PyTorch, scikit-learn, Pandas, NumPy, Matplotlib
Databases/Tools:	PostgreSQL, MySQL; Git, GitHub; Jupyter Notebook, VS Code; Excel, Tableau
Frontend:	React.js, HTML, CSS, Vite

Job Experience

Machine Learning Engineer WAT.ai

Waterloo, ON
Sept 2025 - Present

- Collaborating with a small team of students on an applied medical imaging project focused on improving the segmentation of microaneurysms in fundus imaging.
- Led dataset curation and preprocessing, implementing reproducible data pipelines for data splits and augmentation to support ablation studies.
- Co-authoring a research paper detailing our methodology and results.

Tennis Instructor & Tennis Racquet Stringer Unionville Tennis Club/Premier Racquet Clubs Markham

Markham/Unionville, ON
Apr 2022 - Aug 2025

- Coached 500+ hours across 4 summers leading group camps and private hitting sessions
- Built a personal racquet-stringing service for local tennis players from my basement.

Education

University of Waterloo BMath in Mathematics

Sept 2025 - Apr 2030

- Major Average: 94% — Cumulative Average: 93%, Student ID: 21177966
- Activities: Varsity Cross-Country, Varsity Track, WAT.ai (Artificial Intelligence) Design Team