

# Yuxiang (Felix) Fu

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in [LinkedIn](#) [Github](#)

## EDUCATION

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### University of British Columbia (UBC)

*Bachelor of Science, Honours in Computer Science with distinction*

Honors Advisor: [Prof. Andrew Roth](#)

Vancouver, BC

*Sept. 2019 - Nov. 2023*

- **Academics:** cGPA: 91%, Major course GPA: 92.1%
- **Thesis:** (A<sup>+</sup>)  
*PCVAE: a Controlled deep Variational Autoencoder for Pancancer gene expressions clustering analysis*
- **Relevant courses:** Advanced Machine Learning (A<sup>+</sup>), Randomized Algorithm (A<sup>+</sup>), Stochastic process (A<sup>+</sup>), Differential geometry (A<sup>+</sup>), Real variable

## EXPERIENCE

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### Research Intern USRA - DSL Lab

*UBC Department of Electrical and Computer Engineering | Founded by WLIURA*

May 2023 – Present

*Vancouver, BC*

- **Advisors:** [Prof. Renjie Liao](#), [Prof. Lele Wang](#), [Prof. Ke Li](#)
- Proposed and implemented a novel probabilistic model that maximizes the likelihood, distilling the denoising process of the pre-trained diffusion model which further enables fast inference. Tuned the model so that it excels in generating diverse, high-quality samples and mitigating mode collapse.
- Developed baselines for SportsUV and L5kit dataset for stochastic trajectories generation. Leveraged guided diffusion (deep generative) models to empower the creation of controllable and realistic simulations.
- Contributed and presented in the diffusion probabilistic model reading group on numerical methods for ODEs and SDEs.

### Research Assistant USRA - Roth Lab

*BC Cancer Research Centre | Founded by WLIURA*

May 2022 – Sept. 2022

*Vancouver, BC*

- Presented in a poster conference held at BCCRC with a master's student, showcasing the [LiquidBayes](#) project. The project was published at [ISMB/ECCB 2023 B-145](#) within the High Throughput Sequencing (HiTSeq) track.
- Parallelized and optimized the **Snakemake** workflow by introducing a meta-config object and parsing directory hierarchies. This led to a minimum **90%** reduction in processing time, enabling the deployment each trial with customized config files on the HPC clusters by **Slurm**.
- Implemented a Bayesian network using **Pyro** PPL supported by **Pytorch** according to well-designed probabilistic graphic models. Developed an inconsistent CN model that demonstrated impressive performance. Applied this model on the 10 real patients with matched (DLP+) sequencing data and the results beat the SOTA methods.

### Research Intern

*Institute of Automation Chinese Academy of Sciences (CASIA)*

June 2021 - Aug. 2021

*Beijing, China*

- Participated in deep reinforcement learning (DRL) group meetings supervised by [Dr. Dongbin Zhao](#) (IEEE Fellow). Contributed to a paper publication about benchmarking the DRL model's performance through a simulator for autonomous vehicles (CARLA)
- Built up a deep neural network for the vision component (object recognition) of a programmable robot with **95%+** accuracy. Reorganized the code structure for better readability and scalability.

### Undergraduate Teaching Assistant (5 semesters)

*UBC Department of Computer Science - CPSC210*

Jan. 2021 – Present

*Vancouver, BC*

- Led **30**-student labs both online and in-person and held customized recap and Q&A session. Relayed common problems and demands to the professor. Contributed to building questions for a sample final.
- Helped students to build and debug their projects in **Java** heuristically. Proposed an upgrade plan for the autograder to better locate buggy versions of code and put it into practice.
- Received excellent evaluation scores and favorable feedback from **200+** students in preparedness and teaching quality.

## PUBLICATIONS

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### **ESQmodel: biologically informed evaluation of 2-D cell segmentation quality in multiplexed tissue images**

E. Lee, D. Lee, W. Fan, A. Lytle, **Y. Fu**, D. W. Scott, C. Steidl, S. Aparicio, A. Roth, *Bioinformatics 2023*  
[[website](#)][[bioRxiv](#)][[code](#)]

### **LiquidBayes: Integrated analysis of single whole genome sequencing and ctDNA**

K. Yang, **F. Fu**, P. Galipeau, M. Lepur, A. Kreitzman, M. Ko, A. Paguirigan, V. Au, V. Cerda, E. Kong, D. Lai, M. Van Vliet, E. Zaikova, A. Bouchard-Côté, S. Apricio, G. Ha and A. Roth, *ISMB/ECCB 2023* [[poster](#)][[code](#)][[thesis](#)]

### **Adaptive Multi-Task Human-Robot Interaction Based on Human Behavioral Intention**

J. Fu, J. Du, X. Teng, **Y. Fu** and L. Wu *IEEE Access, vol. 9, pp. 133762-133773, 2021* [[website](#)]

## PROJECTS

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### **Behavior Diffuser** | *PyTorch* [Paper in progress]

May 2023 - Present

- Devised and established a diffusion based representation of the joint density of the future trajectories for multiple agents given the past context information. The stochastic trajectories generated by our network, along with the joint distribution, successfully capture the multimodal behavior exhibited in the dataset.
- Developed a distillation network that facilitates efficient inference while preserving high accuracy in motion prediction. Formulated the training & sampling algorithms, derived and validated the reparametrization process.

### **PCVAE (Honours thesis)** | *PyTorch* [[content](#)][[code](#)]

Sept. 2022 - May 2023

- Designed a novel variational autoencoder architecture that controls the primary tissue effect of the bulk RNA sequencing data from [ICGC portal](#). Performed survival analysis on patients in the new site-effect-free clusters.
- PCVAE demonstrated its proficiency in removing the tissue signal under various measures, assessing the quality of latent space. Additionally, it allows for clustering on less dominant features across heterogeneous cancers.

### **Context retrieval evaluation on RALMs** | *LangChain* [[paper](#)][[code](#)]

Mar. 2023 – Present

- Investigated the effectiveness of in-context retrieval augmented language models (RALMs) in QA by comparing and evaluating different context retrieval methods.
- Evaluated three RALMs quantitatively in terms of context-alignment, precision, relevance and coherence.

### **LiquidBayes** | *PyTorch, Pyro/numPyro, Snakemake* [[code](#)]

Sept. 2022 – May 2023

- A Bayesian Network for inferring tumour fraction and clonal prevalences from whole genome sequencing of cell-free DNA and Direct Library Preparation (DLP+) of a matched tissue biopsy.
- MCMC (NUTS) and Variational Inference methods are implemented in Pyro to address intractable integral.

### **Amusement Park Management System** | *SQL, Django, Bootstrap* [[code](#)]

- Accomplished a full stack application using Django and SQLite and received perfect scores.
- Initiated with a comprehensive ER diagram respect to the staff and facilities in the park. Normalized all the relation schemas in BCNF to reduce redundancy.

### **Insight Facade at UBC** | *Typescript, Postman, Mocha* [[code](#)]

## HONORS AND AWARDS

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### **Faculty of Science International Student Scholarship**

Dec. 2020, Nov. 2021, Dec. 2022

- Total grant value: \$27,500

### **Work Learn International Undergraduate Research Awards**

May 2022, May 2023

- This is equivalent to the USRA [NSERC](#) Undergraduate Student Research Awards for domestic students
- Awarded by Department of Computer Science and Department of Electrical and Computer Engineering

### **J Fred Muir Memorial Scholarship**

Sept. 2021

### **Trek Excellence Scholarship**

Oct. 2020, Aug. 2021, Nov. 2022

- Total grant value: \$9,000, top 5% undergraduate in the Faculty of Science

### **Science Scholar/Dean's Honour List**

May 2020,2021,2022,2023

### **Outstanding International Student Award**

Sept. 2019

## TECHNICAL SKILLS

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**Languages:** C, C++, Python (Conda, Numpy, Scipy, Pandas, numba, Matplotlib), Bash, Java, Typescript, R, SQL

**Frameworks:** Pytorch, Pyro, Slurm, Node.js, L5kit, nuscenes

**Developer Tools:** Git/Github, Jupyter Notebook, Vim/Vi

**Modelling techniques:** Probabilistic graphical model, deep generative models, MCMC, causal inference (SCM)