# Yushang Lai

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## Education

**Ph.D.**: Mathematical & Computational Biology, Expected in 06/2023
**University of California, Irvine** - Irvine, CA
**PhD Candidate Project: Probabilistic Bayesian Machine Learning for Hematopoiesis**

- Build new probabilistic machine learning pipeline and package for Hierarchical Bayesian Inference framework for Hematopoiesis time series prediction inverse problem via latent variable approach in Julia Language; speed up MCMC Sampling process 50% through Deep Markov Chain Auto-encoder
- Build new stochastic models and new scalable cross-dataset Bayesian Framework, apply probabilistic machine learning algorithm, optimization and model selection: bayes factor in favor of new stochastic model over previous deterministic models is decisive

**CV Research Project: Probabilistic Bayesian Machine Learning for GBM Tumor Recurrence**

- Medical image based modeling of brain tumor GBM, apply inhomogeneous Fisher-Kolmogrov model for infiltrative tumor growth via numerical analysis, computational PDE and probabilistic machine learning.
- Bayesian computational medicine improves patient-specific Maximum a posterior forecasting performance by saving 40% more healthy tissues compare to traditional therapy method

**Bachelor of Science**: Applied Mathematics, 07/2018
**University of California, Irvine** - Irvine, CA

## Skills

Deep Learning, Machine Learning, Bayesian Inference, Statistical Modeling, Data Analysis, Data Visualization

NLP, Julia, Python, Matlab, R, PyTorch, HPC, Latex, CV, TensorFlow, NumPy, Pandas, Scikit-learn, Git, Linux, AWS

## Projects

**NLP Machine Learning Pipeline: Fine Tune Pre-Trained RoBerta Model For Sentiment Analysis**

- Apply Amazon Comprehend to extract entities, people, and sentiments, creating Dashboard and Analyze, explore Insights, store and SQL query dataset in AWS S3 feature store
- Profiling the model training to get the visibility and control to quickly troubleshoot
- Fine tune pre-trained roberta model from huggingface model zoo to do the multi-class classification for sentiment analysis of Kaggle women E-commerce clothing review with AWS sagemaker cloud computing

**NLP: Train ChatBots with Reformer Model and MultiWoz Dataset**

- Use Trax to train bot to answer questions and ask questions if needs more info with fully-labeled collection of human-human written conversation MultiWoz dataset . Generate a dialogue between two bots.
- Apply Local Sensitivity Hashing Method for bucketing and employ Reversible layers to save random access memory for activation of Attention layers and Feedforward layers.

**NLP: Generating New Recipes by Fine Tuning Distilled GPT-2**

- Fine tune Distilled GPT2 model to generate teacher force recipes with the given ingredients.
- Integrate Hugging Face with Google Colab for transfer learning.

**NLP: Fake News Detection with BiLSTM**

- Perform Exploratory data analysis, data clean for News includes Political News and World News
- Train a BiLSTM Deep Neural Network to classify Fake News articles in Tensorflow with test accuracy 99.3%

**CV: Detecting COVID-19 with Chest X-Ray using PyTorch**

- Use Kaggle COVID-19 Radiography databases which includes COVID-19, Normal and Viral Pneumonia
- Train a ResNet-18 model in PyTorch to perform Image Classification with the test accuracy 96.7%

**RL: Alpha-Reversi**

- Propose reinforcement learning model and machine learning features for the Reversi game based on algorithm in the Alpha-Go literature Convolutional Neural Network and Forward Neural Network.
- Build a playable Reversi game in matlab with different difficulty level which ranks by the number of layers as well as the usage of given FNN position value and MC trees positive value.