# Jubayer Ibn Hamid

jubayer@stanford.edu | https://jubayer-hamid.github.io/ | (650) 505-8846

## EDUCATION
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**Stanford University**
B.S in **Mathematical Physics**                                                                    CA, USA (Sept'19 - Present)
M.S in **Computer Science**                                                                         CA, USA (Jan'24 - Present)

## TECHNICAL SKILLS
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**Languages**: Python, C++, C, MATLAB     | **Frameworks:** PyTorch, JAX, Equinox, Hydra, Tensorflow, Keras, Git

## PUBLICATIONS *(* denotes equal contribution)*
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**Tripod: Three Complementary Inductive Biases for Disentangled Representation Learning**          (2024)
Kyle Hsu*, **Jubayer Ibn Hamid***, Kaylee Burns, Chelsea Finn, Jiajun Wu
*(Under Review)*

**What Makes Pre-trained Visual Representations Successful for Robust Manipulation**          (2023)
Kaylee Burns, Zach Witzel, **Jubayer Ibn Hamid**, Tianhe Yu, Chelsea Finn, Karol Hausman
Paper Website  *(Preprint)*

## RESEARCH EXPERIENCE
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**Stanford Artificial Intelligence Laboratory,** Researcher (IRIS Lab)                    CA, USA (Jan, 2023 - Present)
- Key research interests - machine learning, offline reinforcement learning, representation learning, foundation models
- (Prof. Chelsea Finn and Kaylee Burns) Visual representations designed for manipulation and control tasks do not generalise under distribution shifts such as change in lighting and texture. Demonstration of segmentation ability is a strong predictor of out-of-distribution generalisation among vision transformer models.
- (Prof. Chelsea Finn, Prof. Jiajun Wu and Kyle Hsu) Co-led a project where we researched on inductive biases for **disentangled representation learning** in quantised latent spaces. Our model, Tripod, attained state-of-the-art results on disentanglement benchmarks.

**Stanford Applied Physics,** Researcher (Stanford LIGO Group - ML team)                    CA, USA (Feb, 2022 - Aug, 2022)
- Worked under Dr. Ricardo Bassiri and Dr. Kiran Prassai on designing reduced thermal noise coatings for LIGO including macroscopic and/or microscopic material characterizations for amorphous thin films.
- Made computer simulations of the atomic structure of Germania using LAAMPS.
- Used machine learning (Gaussian Process Regression) to predict BKS potential parameters of Germania

**Kavli Institute for Particle Astrophysics and Cosmology**, Researcher                    CA, USA (June, 2021 - Sept, 2021)
- Worked under Dr. Chao-Lin Kuo where we designed novel cavities to detect axion particles (candidate particles for dark matter).
- Designed parts for a new formulation of conic-shell cavities using SolidWorks and simulations of EM fields.
- Research showed that the conic shell cavity's dimension changes symmetrically which improves axion detection by the square of its frequency.

## RELEVANT COURSEWORK
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**Computer Science**:
- Reinforcement Learning, Natural Language Processing, Deep Generative Models, Machine Learning, Deep Learning, Artificial Intelligence, Design and Analysis of Algorithms

**Mathematics**:
- Abstract Algebra - Group Theory/Ring Theory, Representation Theory/Module Theory, Topological Manifolds/Differential Topology, Real Analysis, Complex Analysis, Differential Geometry, Convex Optimisation.

**Physics**:
- Quantum Field Theory, Quantum Mechanics, Lagrangian/Hamiltonian Mechanics, Statistical Mechanics, Electrodynamics

# PROJECTS
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**Non-Markovian Policies in Offline Reinforcement Learning:** Designed and implemented a Non-Markovian LSTM-based and transformer-based  Implicit Q-learning (IQL) algorithm for offline Reinforcement Learning.

- LSTM model outperformed Decision Transformers (including online finetuned versions) on all environments, including large, stochastic environments in D4RL such as *antmaze-large-play, antmaze-umaze* while attaining approximately the same performance on *antmaze-large-diverse.* It also attained marginally better performance than Markovian IQL on some environments while matching its performance on others.

**Few-shot classification of disaster-related Tweets:** Implemented (1) a prototypical neural network and (2) a DistilBERT model with supervised contrastive learning loss trained on few-shot datasets (< 100 training examples). Model achieved an accuracy of 78.31% when trained on a few-shot dataset of 100 examples and 82.93% when trained on 5176 examples.

**High Society Gameplay AI:** Built a deep Q-learning model that can play the popular board game "High Society" incorporating bidding, predicting behaviour of other players and delayed rewards. Model was trained by playing against earlier versions of itself.