John D. Co-Reyes

PhD Student in AI

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Summary

I'm a PhD student at UC Berkeley advised by Sergey Levine and doing research on deep reinforcement learning. My goal is to build general purpose algorithms that will enable machines to autonomously acquire complex behavior across wide variety of domains including robotics, computer vision, and NLP. My research interests are in learning latent dynamics models for visual model based RL, meta-learning RL algorithms and optimizers, and merging unsupervised objectives with open world environments to support the emergence of general intelligence. I have 1st and 2nd author research papers at ICLR, ICML, NeurIPS, and CoRL.

Education

2016 – Present **PhD in Computer Science** *University of California Berkeley*
Advisor: Prof. Sergey Levine.
Research: Deep Reinforcement Learning, Robotics, Artificial Intelligence

2012–2016 **B.S. in Computer Science** *California Institute of Technology*
Advisors: Prof. Yisong Yue and Prof. Pietro Perona.
Research: Computer Vision, Machine Learning

Publications

ICLR 2021 **Evolving Reinforcement Learning Algorithms**
John D. Co-Reyes, Yingjie Miao, Daiyi Peng, Esteban Real, Sergey Levine, Quoc V. Le, Honglak Lee, Aleksandra Faust.
open review. ICLR Oral presentation (1.8% acceptance rate). Also appeared at NeurIPS 2020 Deep Reinforcement Learning Workshop. Mentioned in Google AI Year in Review, Analytics India Magazine

under review **Ecological Reinforcement Learning**
John D. Co-Reyes*, Suvansh Sanjeev*, Glen Berseth, Abhishek Gupta, Sergey Levine.
website. Also to appear at NeurIPS 2019 Deep Reinforcement Learning Workshop

CoRL 2019 **Entity Abstraction in Visual Model-Based Reinforcement Learning**
Rishi Veerapaneni*, **John D. Co-Reyes***, Michael Chang*, Michael Janner, Chelsea Finn, Jiajun Wu, Joshua Tenenbaum, Sergey Levine.
arXiv link. Also appeared at ICML 2019 Generative Modeling and Model-Based Reasoning for Robotics and AI Workshop

ICLR 2019 **Guiding Policies with Language via Meta-Learning**
John D. Co-Reyes, Abhishek Gupta, Suvansh Sanjeev, Nick Altieri, Jacob Andreas, Pieter Abeel, Sergey Levine.
arXiv link. Also presented orally as best paper at NeurIPS 2018 Meta-Learning Workshop

ICML 2018 **Self-Consistent Trajectory Autoencoder: Hierarchical Reinforcement Learning with Trajectory Embeddings**
John D. Co-Reyes*, YuXuan Liu*, Abhishek Gupta*, Benjamin Eysenbach, Pieter Abbeel Sergey Levine.
arXiv link.

NeurIPS 2017 **EX2: Exploration with Exemplar Models for Deep Reinforcement Learning**
Justin Fu*, **John D. Co-Reyes***, Sergey Levine.
arXiv link. NeurIPS Spotlight presentation (3.4% acceptance rate).

Invited Talks

October 2020 **Evolving Reinforcement Learning Algorithms** *Google Brain Reinforcement Learning Seminar.*

February 2019 **Representation and Exploration in Reinforcement Learning** *Redwood Center for Theoretical Neuroscience.*
talk recording

Work Experience

August 2016 - Present **Graduate Student Researcher,** *UC Berkeley*
Deep Reinforcement Learning, Robotics, AI
under Prof. Sergey Levine.
- Research on building reinforcement learning algorithms that allow agents to autonomously acquire a wide variety of skills in complex environments.
- First author and second coauthor papers published at ICLR, ICML, NeurIPS, CoRL.

Dec 2020 - Present **Machine Learning Consultant,** *Rebel Space Technologies*
Reinforcement Learning for Smarter RF Communication.
- Providing machine learning and reinforcement learning expertise on the problem of developing autonomous satellite and radio network communication systems.

Sep-Dec 2020 **Student Researcher,** *Google Brain*
Reinforcement Learning
under Aleksandra Faust and Honglak Lee.
- Research on developing reinforcement learning algorithms automatically.
- First author research paper accepted to ICLR (oral).
- Present work at Brain RL Symposium.

June-Aug 2020 **Research Intern,** *Google Brain*
AutoRL
under Aleksandra Faust and Honglak Lee.
- Research on developing reinforcement learning algorithms automatically within the Brain RL team.
- Developed language for representing reinforcement learning algorithms symbolically with a computational graph and evolutionary methods for efficiently searching over this space.

June-Aug 2016 **Research Intern,** *Clarifai*
Computer Vision and Segmentation Models
under CEO Matthew Zeiler.
- Worked on image and video segmentation models, improving accuracy, data efficiency, and generalization to new data.

Jan-June 2016 **Research Intern,** *Nervana Systems (Acquired by Intel)*

Jun-Sep 2015 **Performance Optimizations for Open Source Deep Learning Software, Language Models, Reinforcement Learning**
under co-founder Arjun Bansal.
- Worked on implementing fast video action classification using 3D CNN's on the Sports-1M dataset (1 million YouTube videos) and deep reinforcement learning algorithms on Atari. Blog Post: Deep Reinforcement Learning with Gym
- Worked on optimizing neural network training on distributed GPU's, writing fast RNN's / LSTM's, and rewriting parts of open source deep learning library (Neon) to support various models including GoogLeNet. Implemented an image captioning model that runs 200x faster than existing implementation (NeuralTalk). Blog Post: Implementing Language Models

Sep-Mar 2016 **Undergraduate Researcher,** *California Institute of Technology*

Mar-June 2015 **Machine Learning and Computer Vision**
under Prof. Yisong Yue and Prof. Pietro Perona.
- **Utilizing Taxonomies in Multiclass Classification**: Exploring how class taxonomies can enhance multiclass training and prediction and improve tradeoff between accuracy and specificity. Designed and implemented neural network that branches into decision tree of multiclass classifiers that shows increased classification on ImageNet when data is sparse.
- **Deep Learning for Social Action Detection of Fruit Flies**: Designed system for using neural networks to classify actions of fruit flies from video. Achieved comparable classification performance to existing methods which used extra temporal features.

June-Sept 2014 **Software Development Engineer Intern,** *Amazon*
Distributed Machine Learning.
- Rebuilt a distributed machine learning system with Elastic Map Reduce and HBase to help select new products to add to the Amazon catalog. Designed indexing, subsetting, and matching algorithms for duplicate detection among hundreds of millions of products, increasing run time performance by 6x and recall by 4x.

June-Sep 2013 **Summer Undergraduate Research Fellow,** *NASA Jet Propulsion Lab*
Android Development and Lunar Mapping.
- Developed mobile mapping application to access lunar data extracted from JPL lunar orbiters. Used Esri GIS to construct interface for viewing multiple map layers and used OpenGL for creating 3-D surface models from laser altimeter data.

Mentoring

Undergrads Suvansh Sanjeev (UC Berkeley, now PhD student at CMU), Andrew Liang (now at Covariant AI), Rishi Veerapaneni (UC Berkeley, now PhD student at CMU)

Service

Reviewing 2019: NeurIPS, ICML, ICLR

Mentoring **Berkeley AI Research Mentoring Program**
Mentoring underrepresented undergraduates in AI

Teaching Experience

Spring 2021 **UC Berkeley** *Graduate Student Instructor.*
CS182: Designing, Visualizing, and Understanding Deep Neural Networks

Spring 2019 **UC Berkeley** *Graduate Student Instructor.*
CS188: Artificial Intelligence

Fall 2015 **California Institute of Technology** *Teaching Assistant.*
CS 11: Introduction to Java

Selected Software Projects

Apr 2015 **Instagram Fashion Trend Detection System**
Github page under Prof. Adam Wierman, California Institute of Technology.
paper Designed and built system to detect fashion trends on Instagram by crawling, scraping, and analyzing tags and images over time. Wrote technical paper and presented poster at Caltech Undergraduate Research Symposium.

Oct 2015 **Natural Language Question Answer Engine**
Github page under Prof. Donnie Pinkston, California Institute of Technology.
Researched and combined multiple NLP systems (Word2Vec, QANTA, Quepy) with data from DBpedia to build natural language question answer engine.

Technical Skills

Languages Python, Java, C++, C, MATLAB, Javascript
Libraries Tensorflow, Torch, CUDA, ROS
OS GNU/Linux (Ubuntu), Microsoft Windows, Android
Other AWS, GCP, Git, LaTeX