John McKay, PhD
Research Scientist II · Amazon · Salem, MA

✉ JMcKayPitt@gmail.com
📱 Mobile On Request
🏠 JohnMcKay.github.io

Research Interests

- Development and generalized application of lightweight neural embeddings models.
- Explainable machine learning design to reliably and confidently inform business decisions.

Education

Pennsylvania State University   State College, PA

PhD in Electrical Engineering, Advised by Dr. Vishal Monga   Jan 2015 - Jun 2018

Thesis: *Tailored Algorithms for Synthetic Aperture Image Formation & Analysis*

Arizona State University   Tempe, AZ

Masters in Applied Mathematics, Advised by Dr. Yun Kang   Jan 2013- Dec 2014

University of Pittsburgh   Pittsburgh, PA

B.S. with Majors in Pure Mathematics & Africana Studies (3.7 GPA, 3.8 Math GPA)   Aug 2008 - May 2012

Employment

Amazon - Transport Science (Aug '22 - Present) & Alexa (July '20 - July '22)   Boston, MA

Research Scientist II, Level 5   July 2020 - Present

- Lead scientist on willingness-to-pay customer model for Amazon Freight pricing team. Learned embeddings of shipping customers and freight lanes are generated within recommendation-system-like neural nets for behavioral adjustments to initial bid offers.
- Lead scientist on freight lane price forecast modeling for Amazon Freight pricing by fusing market indicators and freight-based statistics towards future bid predictions with industry sentiment considerations.
- Was lead scientist on two personalized entity-resolution (ER) initiatives: Podcast launch goal and Shopping innovation goal. Podcast launch goal was a byproduct of personalized neural vector search opportunity analysis that received L7 approval after formal review.
- Mentor on fairness in entity resolution internship identifying and alleviating bias in machine learning ER models.
- Performed end-to-end privacy audit and formally deployed Smart Home domain model to production to alleviate high friction bug.
- Diagnosed reporting errors in ER performance monitors and composed `SQL` dashboard for formal monthly Alexa ER business reviews.

Indigo Ag   Boston, MA

Imaging Scientist II   Dec 2019 - July 2020

- Was lead scientist for goal to employ neural network models for hyperspectral image classification.
- Designed and deployed novel ML architectures using Amazon Web Services for automated lab image assessments.
- Collaboratively devised statistical models with biologists for limited-data crop field performance assessment.
- Managed imaging pipeline for automated data collection.

Applied Research Laboratory at Pennsylvania State University   State College, PA

Graduate Researcher (Aug '17 - Jul '18)/Research & Development Engineer (Aug '18 - Nov '19)   Aug 2017 - Nov 2019

- Researched deep learning architectures for training-starved image classification settings.
- Devised and deployed motion estimation solutions for state-of-the-art sonar imaging systems.
- Collaboratively tasked to build and maintain python application with sonar engineers for modular testing of classification networks.
- Devised machine learning strategies for raw acoustic and radar processing problems.

Naval Research Laboratory   Washington, DC

Pathways Research Intern   Jun 2015 - Apr 2017

- Developed a coherent approach for noise and blur robust image classification by exploiting sparse optimization.
- Designed a stochastic approach to dramatically speed up a hierarchical Bayesian method for compressive sensing.

Management Science Associates   Pittsburgh, PA

Business Analyst   May-Dec 2012

- Developed & managed a Java-based agent based model for understanding consumer behavior relating to social media.
- Collaborated on statistical mixed marketing models for assessing social media's impact on CPG advertising campaigns.
- Collaborated on designing hierarchical clustering method for Twitter user segmentation.

Publications

Towards Multi-Objective Statistically Fair Federated Learning

Ninareh Mehrabi, Cyprient de Lichy, John McKay, Cynthia He, Bill Campbell, *FL-AAAI-22 (Accepted, 3/1/2022)*

Using Knowledge Graph & Transformers for Implicit Entity/Utterance Resolution   Amazon Internal

X. He, J. McKay, H. Feng, H. Wang, Y. Xue, A. Grewal, S. Dong, Y. Liu, *AMLC 2021*

Behavior Features for Vector Search   Amazon Internal

James Moore, Helian Feng, John McKay, *AMLC 2021*

Coupling Rendering & Generative Adversarial Networks for Artificial SAS Image Generation

A. Reed, I. Gerg, J. McKay, D. Brown, D. Williams, S. Jayasuriya, *OCEANS 2019 - MTS/IEEE Seattle*

Bridging the Gap: Simultaneous Fine Tuning for Imbalanced Data

J. McKay, I. Gerg, V. Monga, *IGARSS 2018*

Robust Sonar ATR Through Bayesian Pose Corrected Sparse Classification

J. McKay, V. Monga, R. Raj, *IEEE Transactions on Geoscience and Remote Sensing*, 2017

Fast Stochastic Hierarchical Bayesian MAP for Tomographic Imaging

J. McKay, R.Raj, V. Monga, *Asilomar 2017*

What's Mine is Yours: Pretrained CNNs for Limited Training Sonar ATR

J. McKay, Isaac Gerg, V. Monga, R. Raj, *OCEANS 2017 - MTS/IEEE Anchorage*

Using Frame Theoretic Convolutional Gridding for Robust Synthetic Aperture Sonar Imaging   Poster Finalist

J. McKay, Anne Gelb, V. Monga, R. Raj, *OCEANS 2017 - MTS/IEEE Anchorage*

Robust Sonar ATR with Pose Corrected Sparse Reconstruction-Based Classification   Poster Finalist

J. McKay, V. Monga, R. Raj, *OCEANS 2016 - MTS/IEEE Monterey*

Localized Dictionary Design for Geometrically Robust Sonar ATR

J. McKay, V. Monga, R. Raj, *IGARSS 2016*

Discriminative Sparsity for Sonar ATR

J. McKay, R. Raj, V. Monga, & J. Isaacs, *OCEANS 2015 - MTS/IEEE Washington*

Grants

Learned Frequency Domain Masks for Training-Size-Robust Sonar Automatic Target Recognition	Amount: 390K
Office of Naval Research, PI: J. McKay, Co-PI: I. Gerg	6/19-12/20
In-Air Circular SAS Platform for ATR Data Generation	Amount: 10K
Internal Research & Development, PI: Thomas Blanford, Co-PI: J. McKay & D. Brown	1/19-7/19

Programming Skills

- **Highly proficient** in python (pytorch, tensorflow, & pyspark), SQL, & R.
- **Proficient** in Scala, Java, & C++

Teaching

PSU	EE 353 Signals and Systems: Continuous and Discrete-Time Linear Systems (Instructor)	Spring 2019
	• Designed curriculum & taught convolutions, Fourier transforms, & sampling.	
	• Earned 6.18/7 rating from student evaluations (90 students, 27 responded).	
PSU	EE 350 Continuous Linear Systems (TA, 2 Sections)	Fall 2015
PSU	EE 350 Continuous Linear Systems (TA, 2 Sections)	Spring 2015
ASU	Math 270 Calculus 1 (TA, 3 Sections)	Fall 2014
ASU	J. Bustoz Math-Science Honors Prgm Intro to Math Bio (TA, 1 Section)	Summer 2014
ASU	Math 270 Calculus 1 (TA, 2 Sections)	Spring 2014
ASU	Program TA Mathematical & Theoretical Biology Institute	Summer 2013
Pitt	Math 0010 College Algebra (TA, 2 Sections)	Fall 2010

Mentoring & Volunteer Work

- Mentored ASU student Christy Contreras in epidemiological modeling with West Allies to Expand Opportunities program, 2014-15..
- Volunteered with the Salt River Project spring & fall 2015 to tutor Native American high school students in math, stats.
- Mentored PSU undergrads Neil Ashtkar & Michael O'Donnell on machine learning for radar time series data, spring-fall 2018.
- Recruited & advised ASU PhD student Albert Reed on physically-realistic sonar image GAN, summer 2019.
- Mentored CMU grad student Swarna Sathyendra to investigate & establish practices for fairness concerns in ER models.
- Community guide for U.S. National Park Service in Salem, MA wherein I help tourists navigate the city weekly at the visitor's center.
- General volunteer with Salem Main Streets project including staffing help tables during Arts Fest, putting up holiday decorations around town, & directing tourists during October Haunted Happenings events.