Shea Cardozo

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Research Interests

I am broadly interested in generalization in computer vision and its applications to autonomous systems. This encompasses building 4D world models for dynamic scenes, creating robust scene representations via multimodal sensor fusion, and learning causal models for multi-agent behaviour prediction and planning.

Education

2023 - 2027 **PhD in Computer Science** — University of Waterloo
Waterloo Intelligence Systems Lab
Supervisor: Professor Krzysztof Czarnecki

2021 - 2022 **Master of Science in Applied Computing** — University of Toronto
Data Science Concentration

2017 - 2021 **Bachelor of Mathematics in Statistics** — University of Waterloo
Co-operative Program. Dean's Honours.

Skills

Programming Languages Proficiency with Python, R, and C++. Experience with Java, C#, DART, Haskell, Scheme (Racket), SQL, VBA, HTML/CSS.

Deep Learning Frameworks Proficiency with PyTorch. Experience with Jax, TensorFlow

Development and Deployment Git, Linux, AWS, GCP, VSCode, RStudio, Jupyter Notebooks

Publications

- Shea Cardozo, Gabriel Islas Montero, et al. 2022. *Explainer Divergence Scores (EDS): Some Post-Hoc Explanations May be Effective for Detecting Unknown Spurious Correlations*. Presented at the AIMLAI workshop at CIKM 2022. Available at link.

Industry Experience

Machine Learning Scientist — May 2022 - Sept. 2023
Tenyks

- Chief Machine Learning Scientist at Tenyks (YC'S21) reporting directly to the CTO, researching and prototyping new methods for classification, detection, and segmentation tasks. Projects include:
  - Created a synthetic data pipeline for zero-shot anomaly detection via inserting photorealistic synthetic anomalies into clean data using RGB pixel masks and neural image inpainting.
  - Implemented a scalable system for open-set object retrieval based on visual and text prompting using 'Segment Anything' proposals and 'OpenCLIP' data embeddings. Fine-tuned 'OpenCLIP' embeddings on domain-specific data to improve retrieval performance beyond baseline.
  - Prototyped multiple active learning and core set approaches to suggest an efficient data annotation strategy for settings with minimal annotated data and expensive annotation costs.
  - Implemented a sequence of automated 'data quality checks' to detect common dataset issues in computer vision such as a high prevalence of occlusion or inconsistent class definitions.
  - Formulated a novel evaluation criteria for post-hoc neural network explanations to detect dependence on spurious correlations. Verified and submitted our work as a workshop paper.

Data Scientist - Claims AI Team Sept. 2020 - Dec. 2020
Intact Insurance

- Constructed a pipeline to automatically classify insurance documents from image and text data using an ensembled 'ResNet' convolutional neural network and 'BERT' transformer neural network.
- Experimented with multi-objective non-gradient optimization methods such as the 'NSGA-II' genetic algorithm to optimize model prediction thresholds to mark unclassified documents for manual review.

Data Scientist - Analytics May 2020 - Aug. 2020
Noom Inc.

- Specified and fit an autoregressive time series model with seasonal effects to predict the influx of user support tickets to ensure sufficient resource availability.
- Trained and benchmarked a set of 'GloVe' vector embeddings constructed from internal food data to improve user meal recommendation and tracking.

Actuarial Analyst - DataLab Division Sept. 2019 - Dec. 2019
Intact Insurance

- As part of the 'Rating Revolution' team, trained 'XGBoost' gradient-boosted decision tree models to replace the existing generalized linear models used in home insurance pricing
- Created a Python visualization tool to analyze how different pricing models impact wider financials.

Associate Actuarial Programmer Jan. 2019 - Apr. 2019,
Moodys Analytics May 2018 - Aug. 2018

- Implemented highly performance sensitive financial calculations into our insurance software platform using the C++ programming language, with focus on long-term maintainability.
- Expanded UI functionality to more transparently display to clients how financials are calculated.

Personal Projects

Adversarial Conditional UNET

- Trained a UNET model to generate adversarial examples using the CIFAR-10 dataset to fool a variety of state-of-the-art image classification models, inspired by existing work in adversarial denoising.
- Verified trained model can conduct targeted attacks on models not used in training with only marginal decrease in success rate, indicating successful generalization of the generated adversarial examples.

Landscape Style-Transfer

- Created an Android application that employs a CycleGAN style-transfer model to transform natural landscape photos from the camera into images that resemble portraits.
- Employed a 'Flask' RESTful API to transfer photographs taken on the application on the local mobile device to the model hosted on a remote server.

This JoJo Does Not Exist

- Trained a StyleGAN2 image generation model to generate faces that resemble characters from the manga "JoJo's Bizarre Adventure", using a custom dataset scraped using a 'Selenium' Python bot.
- Employed a Google Cloud Platform VM to train model for 72 hours on a Linux GPU instance.

Trump Tweet Generator

- Trained the GPT-2 338M language model on former US President Donald Trump's twitter feed.
- Built a web app using the 'Flask' Python package to display generated tweets.