Mikhail Hayhoe

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EDUCATION

University of Pennsylvania   *Philadelphia, PA*
Ph.D. in Electrical & Systems Engineering   *August 2017 – December 2022 (Expected)*
   Thesis Topic: Machine learning and predictive modeling of phenomena on networks
Relevant Coursework: Machine Learning, Graph Neural Networks, Data Mining, Statistics, Probability, Optimization

Queen's University   *Kingston, Ontario, Canada*
M.A.Sc. in Mathematics & Engineering   *August 2015 – August 2017*
   Thesis Topic: Modeling, analyzing, and controlling epidemics on networks
B.Sc. in Mathematics & Engineering (*First Class Honours*)   *August 2011 – June 2015*

SKILLS

- Python (NumPy, Pandas), SQL (MySQL, SQLite), Matlab, Java, C++, HTML, PHP, Git
- Predictive modeling, statistical modeling and regression
- Data science, big data analytics, and data visualization (matplotlib, seaborn, plotly)
- Data analytics, causal analysis, data cleansing, exploratory data analysis
- Machine learning and artificial intelligence (ML/AI) including scikit-learn, PyTorch, and Keras/TensorFlow, autograd (JAX), geometric and graph deep learning, multitask learning, reinforcement learning
- Written and oral communication across varying levels of technical expertise
- Leadership and advanced teaching certification from the University of Pennsylvania

RELEVANT EXPERIENCE

Machine Learning Researcher   *September 2020 – Present*
Warren Center for Network & Data Sciences, University of Pennsylvania

- Produced a novel framework for machine learning on hyper-graphs in PyTorch that achieves **over 46% higher accuracy** than competitors and other baselines
- Created state-of-the-art statistical and probabilistic guarantees on performance of graph neural networks for both **supervised and unsupervised learning with potentially billions of nodes and edges**
- Designed custom SQLite database and ingested Ethereum block-chain transactions to develop algorithms that can run in **less than 100 milliseconds** for cryptocurrency miners to select the most profitable subset from among up to **10,000 transactions at a time** and achieve up to a **400% increase in revenue**
- Built simulation environment in Python for training and experimentation of a reinforcement learning algorithm via self-play for a card game using Keras/TensorFlow, **beating heuristic algorithms over 90% of the time**
- Managed and mentored **eleven junior researchers**, individually and in teams, for projects on graph machine learning and predictive modeling of epidemics

Network Data Science Researcher   *August 2017 – August 2020*
Warren Center for Network & Data Sciences, University of Pennsylvania

- Designed end-to-end predictive modeling and data-driven strategic decision-making product for balancing COVID-19 interventions and economic costs in Philadelphia and nine surrounding counties, showing **50+ lives could be saved each month** in Philadelphia alone by strategically managing lockdowns and hospital capacity
- Developed Python pipeline to ingest and aggregate anonymized cellphone location data from **more than 30 million unique devices** and COVID-19 health outcomes datasets of **3,000 U.S. counties**
- Built a dashboard summarizing output of the COVID-19 interventions product at the state level, platforming the model to be used as a **causal inference, recommendation, and decision support tool**
- Created and implemented novel algorithm in C++ for **unsupervised user clustering** across subsets of social networks with **as many as 50,000 accounts and over 800,000 mutual connections** which produces up to a **300% improvement in accuracy** over competitors in the presence of measurement errors
- Selected as one of **five top presentations** out of **over 800** in a national conference.