DHRUV MADEKA

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EDUCATION

New York University, Machine Learning and Data Science, New York, NY September 2016-
- Courses in Foundations of Machine Learning, Deep Learning, Deep learning for NLP
- GPA: 4.00

Boston University, M.S. Mathematical Finance, Boston, MA   January 2014
- GPA: 4.00   • Special Recognition Award: Best Student by GPA

University of Michigan, B.S.E. Industrial & Operations Engineering, Ann Arbor, MI   2012
- Graduated Cum Laude   • Dean's List, University Honors

EXPERIENCE

Amazon   2017-
Principal Machine Learning Scientist, Supply Chain Optimization Team   New York, NY

Research
- Developed novel model-free deep reinforcement learning techniques for handling a dynamic inventory management system with stochastic lead-times, lost sales and price-matching
- Developed a novel method for decoding time-series with context awareness that was published in the NIPS Time Series workshop in 2017
- Developed novel attention mechanisms that were intended to solve contextual awareness for promotion lift forecasting and an attention mechanism for learning long-term dependencies and stabilizing forecast volatility
- Developed novel techniques in generative modelling for time series that led to publications and talks at ICML's Deep Generative Models workshop and the KDD Time Series workshop in 2018
- Developed non-machine learning solutions for different problems related to consistency of forecasts, improvements to stochastic gradient descent for sampled training and clustering customers based on tensor decompositions
- Actively contributed to the internal science community through numerous talks, workshop organizations and publications at internal Amazon conferences

Production Deployment
- Led the science team that deployed large scale encoder-decoder models to predict distributions of demand worldwide for all products on the Amazon website
- Developed a scaled production deployment and training of a model-free Reinforcement Learning algorithm for predicting the optimal inventory of products on the Amazon website
- Led the development of a python codebase in Gluon, pyarrow and numpy that performed distributed training and model management for different stages of launch

Bloomberg LP   2014-2017
Quantitative Researcher, Quantitative Research Department   New York, NY

Mathematical Research:
- Developed new models for the US Presidential Elections, using techniques from Statistics and Machine Learning, that outperformed established players such as FiveThirtyEight and the New York Times
- Application of deep networks and advanced stacking models to predicting bond default
- Research in the application of Deep Learning to data retrieval from charts
- Research in new methods for scoring model predictions and their applications to online learning - which was subsequently incorporated in multiple Bloomberg functions
- Advanced research work in statistics, particularly in time series estimation and prediction through move-based statistics
- Research in the use of functional Ito calculus as a more efficient way to estimate conditional expectations

Software Development:
- Founding developer and primary maintainer of the leading open-source python interactive visualization library - bqplot
- Work in prototyping different research projects using MXNet and Keras
- Development of an object oriented framework used for creating interactive dashboards in the Jupyter Notebook to visualize training of deep networks – including the development of innovative new quantities to visualize for gauging the generalization capability of the network
- Assisted in the development of a Python based quantitative library for an advanced research platform using numpy, pandas, scikit-learn
- Gained experience in high-performance Python development, including Cython (primarily) and JIT compilers such as numba (for certain use cases)
- Developed advanced functionality for the generic simulation of Stochastic Differential Equations through higher order numerical schemes

SKILLS Python – *development on the numpy, pandas, ipywidgets and bqplot libraries*, MXNet/Gluon, Keras, Machine Learning, Data Analysis, Data Visualization, Stochastic Calculus, Malliavin Calculus, Probability Theory, Advanced Statistics, R, Econometrics, Derivatives

PUBLICATIONS Cliché, M., Rosenberg D., Madeka, D., Yee, C., "Scatteract: Automated extraction of data from scatter plots", ECML-PKDD 2017

Wen, R., Torkkola, K., Narayanaswamy, B., Madeka, D., "A Multi-Horizon Quantile Recurrent Forecaster", NIPS Time Series Workshop 2017

Madeka, D., Swiniarski, L., Foster, D., Razoumov, L., Torkkola, K., Wen, R., "Sample Path Generation for Probabilistic Demand Forecasting", ICML Deep Generative Models Workshop 2018

Taleb, N.N., Madeka, D., "All roads lead to quantitative finance", Quantitative Finance 2019

INVITED PRESENTATIONS

- Morgan Stanley, Internal Presentation, "An economic understanding of the Recovery Theorem"
- University of Michigan, Practitioners Seminar, "Dynamic Factor Model Asset Allocation"
- Bloomberg Quant Seminar, April 2015, "Dynamic Factor Model Asset Allocation"
- Bloomberg Quant Seminar, August 2015, "Malliavin Calculus made simple"
- Bloomberg Quant Seminar, November 2016, "Election Methodologies"
- Bloomberg Quant Seminar, November 2020, "MQTransformer"
- Columbia University, Invited Guest Lecturer, MATH 4079, "McKean Stochastic Differential Equations"
- Startup ML Conference, Invited Speaker, "Machine Learning for Delinquency and Default Risk"
- NYC d3-js Meetup, Invited Speaker, "Interactive Visualization in the Jupyter Notebook"
- PyData Ann Arbor, Invited Speaker, "Interactive Visualization in the Jupyter Notebook"
- TD Ameritrade Data Science Innovation Center, Invited Guest, "Machine Learning in Finance"
- University of Michigan, Mathematics Seminar, "Machine Learning in Finance"
- PyData Seattle, July 2017, Invited Speaker, "bqplot – Seamless Interactive Visualizations in the Jupyter Notebook"
- SciPy, July 2017, Invited Speaker, "bqplot – Seamless Interactive Visualizations in the Jupyter Notebook"
- NYU Mathematics Seminar, November 2017, "Deep Learning"
- SciPy, July 2018, Invited Speaker, "Machine Learning workflows in Jupyter"
- KDD Time Series Workshop, August 2018, Invited Speaker, "Sample Path Generation for Probabilistic Demand Forecasting"
- ICLR Reproducibility in Machine Learning Workshop, May 2019, Invited Speaker, "Coordinating deployments of complex models at scale"

WORKS IN PROGRESS

- Madeka, D., "Accurate Prediction of Electoral Outcomes", 2017
- Eisenach, C., Patel, Y., Madeka, D., "MQTransformer: Multi-Horizon Forecasts with Context Dependent and Feedback-Aware Attention", 2020