Mikhail M.Meskhi

CONTACT INFORMATION

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RESEARCH INTERESTS

Machine learning applications in self-adaptive learning systems (learning to learn) such as meta-learning and transfer learning. Natural Language Processing applications for sentiment analysis for stock market prediction. Statistical learning and deep learning applications.

EDUCATION

University of Houston, Houston, Texas USA
Doctor of Philosophy in Computer Science **August 2021 - Present**

University of Houston, Houston, Texas USA
Masters of Science in Computer Science **August 2019 - Present**

RESEARCH EXPERIENCE

Research Assistant

Pattern Analysis Lab - University of Houston **January 2017 - Present**
Advisor: Dr. Ricardo Vilalta

- Research: Transfer Learning and Layer-Wise Relevance Decomposition
  - Currently on-going project on explaining what deep learning models learn in a transfer learning scenario. Using deep taylor decomposition, I try to pin point specific neurons in each layer that have highest relevance for a learning task. My goal is to find whether or not the transferred neurons from the source model that had highest relevance, were useful in the target model.
- Research: Domain Adaptation by Transferring Model-Complexity Priors Across Tasks
  - Developed and implemented a complexity metric based on neighborhood cluster entropy that calculated a given task's complexity.
  - Developed and implemented a novel sampling technique based on the aforementioned complexity metric. Sampling at most complex neighborhoods led to faster models and higher accuracy by transferring knowledge. *(See publication for results)*
- Research: Topological Data Analysis and Meta-Learning
  - Currently working on identifying landmark meta-features based on *Topological Data Analysis* that will facilitate meta-learning by better describing a giving task and selecting a better learning algorithm.
- Research: One-Shot Learning
  - Currently working on identifying a novel approach on how to optimally represent a group of similar objects with a general object. A learning algorithm can train on a single instance and be able to perform well on similar domains better than random. The goal is to over come the need for vast amounts of data needed for neural networks to converge on.

INDUSTRY EXPERIENCE

Data Science Intern

Planning Design Research Corporation (PDR Corp) **February 2019 - August 2019**
Built automated data extracting and processing pipelines using Apache-NiFi that ETL extracted data from architecture programs (i.e. AutoDesk Revit, AutoDesk CAD) into a Hadoop Cluster. I wrote data transformation scripts in Python to extract data from tables in Apache-Spark and load them into Apache-Arrow for Snappy compression and transformation into Parquet data format for standardized data lake structure. Python scripts were automated using Apache-Airflow. I also worked on setting up and defining the data lake structure on Azure Data Store. In the end, Power BI and Tableau would load data from our cataloged data lake to perform analysis and generate reports on architecture projects.

Community Experience

Hackathon Organizer/Founder

North American University **October 2017**

Organized a Major League Hacking (**hackNAU**) partnered hackathon for college students in Texas at North American University. The event gathered over 300 registrants and 100 participants from various Texas universities. Commanded $7,000 fund for event sponsorship/organization.

Publications

Domain Adaptation by Transferring Model-Complexity Priors Across Tasks. R. Vilalta, K. D. Gupta, D. Boumber, **M. M.Meskhi** (2018). Publications of the Astronomical Society of the Pacific. (Link)

Projects

Transfer Explainability *(TEX)* **September 2019**

Explaining neural networks via transfer learning using layer-wise relevance propagation. Submitted demo to the Association for the Advancement of Artificial Intelligence conference 2019. (Link)

OpenML-Python **May 2019**

A connector to the collaborative machine learning platform OpenML.org. The OpenML Python package allows to use datasets and tasks from OpenML together with scikit-learn and share the results online. (Link)

MtL-Progress **April 2019**

Repo to track the progress in Meta-Learning (MtL) and give an overview of the state-of-the-art (SOTA) across the most common MtL problems and research topics. It aims to cover both traditional and core MtL tasks. (Link)

MLRP *(Machine Learning Resume Processing)* **April 2018**

Created a resume parsing system that helped the user to understand what tech company they were best suited for. Won 1st place medal at HackHouston 2017. (Link)

Honors and Awards

MLH (Major League Hacking): First Place Award HackHouston, 2017

North American University: Exceptional Merit Scholarship, 2015-2018

North American University: President's Honor Roll , 2015-2017

Technical Skills

- **Languages:** Python, MATLAB, R, Java, LaTeX, C, Shell/Bash, Javascript.
- **ML Frameworks/Libraries:** Pytorch, Scikit, Pandas, Numpy, OpenML-Python, Mlr.
- **Dev Ops Frameworks:** Airflow, Spark, PostgresSQL, AWS S3, AWS Glue, AWS Aurora, HPC.

References

- Assistant Prof. Dr. Ricardo Vilalta, Department of Computer Science , University of Houston, Houston, TX, USA, rvilalta@uh.edu
- Dr. Dainis Boumber, Department of Computer Science, University of Houston, Houston, TX, USA, dainis.boumber@gmail.com
- Jason Holmes, Planning Design Research Corporation (PDR Corp), Houston, TX, USA, jholmes@pdrcorp.com
- Associate Prof. Dr. Kemal Aydin, Department of Computer Science, North American University, Stafford, TX, USA, kemal@na.edu