Bryant E. Avila

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PERSONAL PROJECTS

- **OpenForecast:** is a Streamlit-based fintech web app that forecasts stock prices by analyzing pre-market data using machine learning. It compares recent pre-market prices with the closest matches from the past days to predict short-term price trends at market open. Designed for real-time analysis, the tool leverages pre-market data to provide insights into future stock movements.

- **Contextual Search Tool:** is a project that uses a fine-tuned DistilBERT (transformer) model to enable contextual search within movie scripts based on action and dialogue. It includes Python scripts for scene extraction and embedding generation, allowing for precise searches and improved understanding of script content through machine learning.

PROFESSIONAL EXPERIENCE

Job title: **Machine Learning Engineer - Contract**

Company: **RivetAI** Location: **Remote** From: **June 2024** To: **August 2024**

- Developed an industry-first dataset by leveraging AWS and Azure large language models (LLMs) to generate and augment data from movie scripts, enabling content extraction and analysis. Employed prompt engineering to minimize paraphrasing and ensure structured output in the desired JSON format. This dataset was subsequently used to fine-tune a custom Named-Entity Recognition (NER) transformer model, driving accuracy in entity recognition and establishing a new standard for movie script data processing.

Job title: **Data Scientist - Contract**

Company: **Kcore Analytics** Location: **Remote** From: **November 2023** To: **April 2024**

- Played a key role in a team that successfully designed and implemented an ETL pipeline to track and analyze electoral campaign performance in real-time, enabling data-driven decisions and improving outcome predictions. Leveraged U.S. Census Bureau data, extracted via APIs, to retrieve demographic information at multiple geographic levels. Preprocessed and aggregated this data using Spark and SQL for efficient storage, before performing geospatial analysis with GeoPandas. Integrated the processed data into convolutional graph neural networks, trained with PyTorch, to predict voting outcomes and monitor campaign performance.

Job title: **Computational Research Assistant**

Company: **CUNY Graduate Center** Location: **New York** From: **August 2019** To: **August 2024**

GIS data project.

- Develop a system to predict and manage rat infestations in Manhattan using data from the NYC Open Data repository, heavily dependent on GIS data. It involves analyzing rat inspection data, geographic locations of buildings and parks, restaurant inspections, and subway line locations.

Simulations in neuron dynamics and to improve industrial processes.

- Developed a user-friendly Matlab dashboard designed for scientists without coding experience to model neuron dynamics. The app allows users to easily modify input values such as connectivity, scaling, and noise, and then regenerate outputs. It also provides options for altering measurement techniques, making complex simulations accessible to a broader audience.

Bridging the gap between physics, network theory and neuro-science.

- Collaborated with a multidisciplinary and international team to guide their sourcing of neural activity signals and preprocessing it resulting in an ETL pipeline leading to a prime dataset providing the basis for high quality research.
- Applied advanced concepts of graph theory to study the complex network of a worm's brain, leading to the identification of key structures responsible for synchronization and writing one of the first papers on how a particular type of network symmetry may lurk in the brain's structure. Calculations done via NetworkX and Pandas.

A/B testing of optimal network repairing algorithms with statistical support.

- Applied dozens of statistical measuring techniques on the dataset collected above to capture relational information, transformed each into a unique developed data structure, implemented various community detection algorithms on each, producing a plethora of options to be tested. Filtered results via p-value permutation tests and reproducibility of results to test robustness of the pipeline.
- Developed integer linear programming GUROBI scripts to optimally repair a network informed by aforementioned results and hyperparameters. Rigorously tested code for bugs, improved efficiency and running time 10-fold, and reduced memory consumption. Produced 3 final production level versions for research challenges that lay ahead.

Job title: **Manager - Chemistry Laboratory**

Company: **Fashion Institute of Technology** Location: **New York** From: **January 2018** To: **January 2024**

Budget, Funding and Team Leadership:

- Administered a yearly budget of over $100K, ensuring efficient allocation towards upgrades, chemical and equipment purchasing, and training initiatives. Successfully captured internal funds to spearhead the integration of 3D printing technology in the classroom, enhancing the practical learning experience for students.
- Led and managed a team of staff members, ensuring well-planned and efficient laboratory setups for diverse experiments and demonstrations.

Innovation, Characterization, Management & Design:

- Collaborated with faculty in pioneering the development of sustainable materials, including bacterial leather, alginate & mushroom fabrics, and mycelium wood. Managed that projects were running on time before end of semester reporting.
- Conducted detailed characterization of biological samples using Scanning Electron Microscope (SEM) and other measuring equipment to diligently report findings relevant for further advancement.
- Utilized advanced generative design software plus AutoCAD to innovate and prototype new furniture designs, and shoe soles contributing to the institute's portfolio of cutting-edge creations.

Job title: **Data Analyst and Electron Microscopy Specialist**

Company: **Molecular Biology lab at CCNY** Location: **New York** From: **April 2016** To: **November 2017**

- Pioneered a novel multi-processing technique to fit an initial Protein Data Bank model obtained via molecular dynamics or homology modeling (producing possible structures) to a gradual exposure of a 3D electron density obtained via high resolution cryo-electron microscopy. EMAN2, Coot and Chimer python packages were used in the process.
- Analyzed vast biochemistry datasets composed of millions of images through Relion and R, extracting pixel patches using advanced statistical software/packages, leading to the generation of atom-resolution 3D electron density models of molecules. Utilized generated insights to guide the future preparation of samples, achieving desired outcomes.
- Authored C shell & Python scripts, streamlining the process of the above for running multiple calculations via python or executing software automatically in parallel while manipulating thousands of files being careful with the limited amount of storage available.

Job title: **Lab Assistant**

Company: **Quantum Sensing lab at CCNY** Location: **Remote** From: **January 2014** To: **December 2015**

- Designed new components for this system using AutoCAD, tested their effects on the internal magnetic field of an NMR via COMSOL Multiphysics. Simulating quantum interactions with Matlab and the smoothness of the magnetic fields of our house made 3-axis helmholtz coil system.
- Developed ETL pipeline through LabView code + python to control data acquisition from a Nuclear Magnetic Resonance machine through National Instrument devices to trigger execution of valves, and electromagnetic readout for optimal timed collection of a quantum information. Optical configuration for interaction with quantum sensors.
- Worked in the field of oncology by modifying the surface structure of nanodiamonds to improve their absorption rates into cancer cells. Utilized a defect with quantum properties found within diamond as an internal temperature probing device in conjunction with fluorescent microscopy.

AWARD:

Secured a prestigious National Science Foundation SBIR Phase I grant worth 275K in 2023 for pioneering an artificial intelligence system to enhance transparency and predict trends in democratic elections through sentiment analysis and network theories.

PUBLICATIONS

- Avila B, et al. "Symmetries and synchronization from whole-neural activity in *C. elegans* connectome: Integration of functional and structural networks." PLOS ONE. 2024.
- Tommaso G, Avila B, et al. "Fibration symmetry-breaking supports functional transitions in a brain network engaged in language." Nature. 2024.
- Avila B, et al. "Fibration symmetries and cluster synchronization in the Caenorhabditis elegans connectome." PLOS ONE. 2024.
- Tommasone M, Avila B, et al. "Scale-up of Dry Impregnation Processes for Porous Spherical Catalyst Particles in a Rotating Drum: Experiments and Simulations." Granular Matter - Springer. 2023
- Khayat R, Avila B, et al. "Cryo-electron microscopy structure of the 70S ribosome from Enterococcus faecalis." Nature. 2020.
- Khayat R, Avila B, et al. "Porcine circovirus 2 uses a multitude of weak binding sites to interact with heparan sulfate, and the interactions do not follow the symmetry of the capsin." Journal of Virology. 2019.

EDUCATION

PhD in Physics at the CUNY Graduate Center — September 2019 - December 2024
MPhil in Physics at the CUNY Graduate Center — September 2019 - February 2022
BS in Physics at the City College of New York — February 2012 - February 2016

TECHNICAL SKILLS:

Programing Languages & Soft-skills:
Leadership, Innovation, Data analysis, NumPy, SciPy, Pandas, SKlearn, Matplotlib, TensorFlow, PyTorch, Geopandas, NetworkX, Selenium, integer linear programming, GUROBI, LLM, R, C shell, Fortran, Matlab, SQL, LateX, Labview, Relion, Fusion 360, Solidworks, GitHub, ArcGIS, AutoCAD, Salesforce, huggingface, NLP, NLU, transformers, fine tuning.