Emanuel Azcona

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EDUCATION

Northwestern University

– **Ph.D. Electrical Engineering, expected June 2022**
Dissertation: *Examining Latent Cognitive Features as Graphs to Understand the Neuropathology of Alzheimer's Disease, the Effects of Childhood Disadvantage on Neurodevelopment, and Predicting Consumer Behavioral Preference*s

– **M.S. Electrical Engineering, June 2019**

New York University

– **B.S. Electrical Engineering, May 2017, *cum laude***
Thesis: *Multi-class Random Forest Ranking for Predicting NBA Playoff Contention Using Individual Player Statistics*

TECHNICAL SKILLS

Languages:	Python, MATLAB, C++, LaTeX, Bash, SQL, LabVIEW, HTML/CSS (Basic)
Tools/Libraries:	PyTorch, PyTorch Geometric (PyG), Deep Graph Library (DGL), TensorFlow/Keras, Seaborn/Matplotlib, NumPy/SciPy, Pandas, Scikit-learn, Git, Databricks, PySpark, MongoDB, AWS (S3)
Areas of Expertise:	Graph neural networks (GNNs), heterogenous bipartite graphs, 3D mesh manifolds, machine/deep learning, digital signal processing, image/video processing, computer vision, data science, data visualization

INDUSTRY / RESEARCH EXPERIENCE

Ph.D. Candidate & Research/Teaching Assistant *June 2017 – Present*

Northwestern University, Image & Video Processing Lab *Evanston, IL*

- Leading a cross-disciplinary research investigation with faculty partners from Psychology & Behavioral Sciences on modeling human latent preferences as heterogeneous graphs/networks to predict expressed behavioral preferences.
- Executed and tested generative deep learning models to generate new realistic samples of human brain mesh surfaces using conditional variational autoencoders (CVAEs) that are conditioned on Alzheimer's disease (AD) diagnosis.
- Developed graph neural network (GNN) approach to using 3D mesh manifolds of human brain cortex and subcortical structures to classify subjects with AD apart from healthy controls (HC) with an accuracy of 96.35%, outperforming alternative methods.
- Produced a mesh adaptation of visualizing neural network reasoning (Grad-CAM) to visually interpret the influence of shape from varying brain structures in the AD vs. HC classification task and make our deep learning models more transparent.
- Facilitated senior administrative role as the point-of-contact for the lab's high-performance CPU/GPU computing resources.

Graduate Data Science Intern *June – Aug. 2021*

Nike Inc., Sport Activity, Consumer Data Science *Beaverton, OR*

- Proposed and successfully executed a GNN recommender system for suggesting top-K relevant items to athletes* in the digital Nike activity ecosystem (* – if you have a body, you are an athlete).
- Surpassed alternative recommender system approaches, including offline experiments with current production models, achieving a 71% clickthrough rate, 78% catalog coverage, and 20% mean average precision for K=10 recommendations.
- Developed activity data preprocessing pipeline in Databricks using PySpark to comply with Nike's Big Data infrastructure.
- Implemented a lesson plan and led a separate workshop demo on graph representation learning for other teammates in the Consumer Data Science group, including current Senior Data Scientists.
- Partnered with other graduate interns in a cross-disciplinary team to deliver consumer insights around the COVID-19 pandemic.

Artificial Intelligence Intern *June – Aug. 2018, June – Aug. 2019*

Stats Perform, Vista Equity Partners *Chicago, IL*

- Developed scripts for accessing and filtering multi-agent soccer tracking data (France Ligue 1) using MongoDB and AWS (S3).
- Navigated an Agile, collaborative environment surveying machine learning solutions for multi-agent tracking prediction.
- Designed a graph convolutional autoencoder for compressing human tracking data with a 1mm average reconstruction error.
- Initiated a project template for researchers to predict future player location using temporal graph convolutional networks.

PUBLICATIONS / WRITTEN WORK

- Wu Y., **Azcona E.A.** et al. (2021, June 9)**.** Representative Learning of rsfMRI Using LSTM-Variational Autoencoder (VAE) on Subcortical Surface. *Proceedings of 27th Annual Conference of the Organization for Human Brain Mapping (OHBM) 2021*. Conference abstract/poster. **Extended preprint submitted for journal peer review**.
- **Azcona E.A**. et al. (2021, April 15). Analyzing Brain Morphology in Alzheimer's Disease Using Discriminative and Generative Spiral Networks. *Preprint available on bioRxiv*. doi: 10.1101/2021.04.15.440008. **Submitted for journal peer review**.
- Azcona E.A. et al. (2020, October 4). Interpretation of Brain Morphology in Association to Alzheimer's Disease Dementia Classification Using Graph Convolutional Networks on Triangulated Meshes. *Proceedings of International Workshop on Shape in Medical Imaging in Conjunction with MICCAI 2020*. LNCS, vol 12474. Springer. doi: 10.1007/978-3-030-61056-2_8**.**
- Wu Y., Besson P., **Azcona E.A** et al. (2020, October 15). Novel age-dependent cortico-subcortical morphologic interactions predict fluid intelligence: A multi-cohort geometric deep learning study. *Preprint available on bioRxiv*. doi: 10.1101/2020.10.14.331199. **Submitted for journal peer review**.