

# MACY MORA-ANTOINETTE

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Data scientist with interdisciplinary background in biomedical sciences, deep learning for video and image classification, and predictive analytics for advertising and user behavior. Earned a reputation as a highly dependable team player, problem-solver, and project manager in multiple environments, especially fast-paced and cross-functional.

## Skills

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- Python (Pandas, NumPy, SciPy, Scikit-learn, Matplotlib, SQLite, PyTorch)
- R (dplyr, ggplot2, ggsignif, lm)
- MATLAB
- SQL (Google Cloud Platform)
- Analytics and Model Building
- Statistical Methodologies
- Public Speaking and Scientific writing
- Project Management
- Mentorship and Leadership

## Research Experience

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### Cornell University

Aug 2018 – present

*Graduate Research Assistant*

*Ithaca, NY*

- Applied time-series change detection analysis in MATLAB on videos of cellular dynamics indicated by fluorescence (16-bit pixel intensity); performed frequency domain analysis as well as network analysis
- Performed image processing, object identification, and histogram statistical analyses of pervasive nerve fibers in 3D reconstructions of bone taken from light-sheet fluorescent microscopy (20-60GB/sample, 60+ samples)
- Designed instrumentation with a MATLAB Design App and printed circuit board that synchronized two high-precision piezo-driven actuators to remove motion artifacts for intravital imaging of living mice with two-photon microscopy
- Established automated image analysis codes using JavaScript-based Macros in ImageJ/FIJI to determine geometric parameters of high resolution (20  $\mu\text{m}$ ) X-rays for rapid analysis of hundreds of mouse bone scans
- Applied statistical tests (ANOVA followed by Bonferroni, T-test or Tukey HSD; ANCOVA with generalized linear models (GLM); PCoA dimensional reduction) in R to analyze differences across several bone quantitative assays
- Received Young Investigator Award; published three first-author publications; presented four podium talks at national conferences and the World Congress; mentored and trained 7 undergraduate students

### Twitter

June – Aug 2022

*PhD Data Science Intern*

*New York, NY*

- Mapped software developers' perceptions of work enablement to behavioral data tracked with tool telemetry
- Cleaned and preprocessed survey data; extracted time series data from Google BigQuery (SQL) and joined across 3 different databases with the survey data to identify related tools for developers
- Used random forests to identify unique tools for each developer category; ran linear and ordinal logistic regressions to determine the relationship of tool usage and latency on work enablement in Python
- Presented final outcomes to stakeholders, specifically heads of research and developer effectiveness

### Massachusetts Institute of Technology

June – Aug 2016 and 2017

*Engineering Intern*

*Cambridge, MA*

- Prototyped a smart system with a magnetic sensor connected to an Arduino circuit to fit into a nasogastric tube to autonomously identify and retrieve a drug delivery device within the stomach
- Programmed a computer numerical control (CNC) mill in preparation for mass production of device manufacturing
- Demonstrated proof of concept for retrieval system safely inside the stomach of a living pig; as a result, received return offer and a co-authorship in Science Translation Medicine and on a US patent application

## Machine Learning Projects - Semester Long/Capstone

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### Ads Recommendation for Best Buy

Aug – Dec 2022

*Tools: Collaborative and Content-Based Filtering, XGBoost, Synthetic Minority Oversampling Tech (SMOTE)*

- Reporting directly to data scientists at Best Buy, used deep learning networks on a dataset of over 2 million customer observations to determine the best 3/130 product category recommendations for personalizing market communications and ads

### Human Motion Prediction

Jan – May 2022

*Tools: Pytorch, RNN, Transformer-Encoder, Temporal Convolutional Network, MSE, ADE, Google Colab Pro*

- This project was an adaptation of fairmotion from Facebook (META) AI Research. Used deep neural networks to predict human motion using an 18GB/25,000 sequence subset from the largest Archive of Motion Capture (AMASS).

### Sports Analytics Classifiers

Aug – Dec 2021

*Tools: Scikit-learn, SVM, Random Forest, Naive Bayes, K-Nearest Neighbor, and QDA, AdaBoost*

- Predicted results for the English Premier League from over 5000 games across 18 years. Selected features using mutual information theory and computed rolling/cumulative statistics (Jupyter Notebook; F-1 score, ROC AUC, MSE, recall, precision).

### Algorithmic Trading

Aug – Dec 2021

*Tools: Random Forest, Bag Learner, Sharpe Ratio, Cumulative return, market indicators*

- Developed automated stock market trading algorithm combining three market indicators within a Random Forest model nested in a Bag Learner; created market simulator that performs market history analysis

## Education

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### Cornell University

Dec 2023

*MS, PhD focus on Imaging and Neurotechnology*

- Ford Predoctoral Fellowship: Selected from competitive pool of PhD applicants (5% acceptance rate) for 3 years of funding from National Academies of Sciences, Medicine and Engineering. [Press Release](#). [Personal Interview](#).
- Mong Neurotech Fellowship: Received 1 year of graduate funding from Cornell for neurotechnology development

### Georgia Institute of Technology

Aug 2023

*MS in Analytics, Computational Data Analytics*

- Graduate Courses: Deep Learning, Machine Learning, ML for Trading, High Dimensional Analysis, Discrete Event Simulation, Analytics Modeling, Visual Analytics, Data Structures, Regression Analysis, Applied Mathematics

### University of California, San Diego

June 2018

*BS in Mechanical Engineering*

- Chancellor's Research Excellence Scholarship
- National Action Council for Minorities in Engineering Scholarship

## Selected Publications/Patents

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\*full list on google scholar, other names: Macy Castaneda

1. **M Mora-Antoinette**, M Obaji, A Saffari, KJ Lewis, "Nicotinic Acetylcholine Receptors on Osteocytes Impact Bone Mechanoadaptation in a Sexually Dimorphic Manner," Cold Spring Harbor Laboratory. BioRxiv 2023. doi: <https://doi.org/10.1101/2023.10.01.556129>
2. **M Castaneda**, KM Smith, JC Nixon, CJ Hernandez, and S Rowan, "Alterations to the gut microbiome impair bone tissue strength in aged mice," Bone Reports 2021. doi: [10.1016/j.bonr.2021.101065](https://doi.org/10.1016/j.bonr.2021.101065).
3. CG Traverso, RS Langer, M Verma, N Roxhed, F Eweje, **M Castaneda**. Retrieval Systems and Related Methods. (2019) U.S. Patent Application No.: 16/427,414. <https://patents.google.com/patent/US20190365418A1/en>.