MACY MORA-ANTOINETTE, PH.D.

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SENIOR RESEARCH SCIENTIST | R&D ENGINEERING PROFESSIONAL

BIOMEDICAL ENGINEERING | MEDICAL DEVICES | CLINICAL DEVELOPMENT | MACHINE LEARNING | SIGNAL & IMAGE PROCESSING

Translate Complex Biological Systems into Scalable, Data-Backed Engineering Solutions by Integrating Experimental Science, Clinical Insight, and Advanced Analytics to Accelerate Discovery, De-Risk Development, and Deliver Real-World Impact.

Performance-driven and process-focused *Biomedical and Mechanical Engineer* with ***10+ years*** of transferable experience in advancing medical-adjacent and therapeutic technologies from concept through validation by uniting wet-lab research, clinical studies, digital signal/image processing, and machine learning. Translate complex biological, clinical, and engineering insights into scalable, commercially viable product solutions spanning FDA-Cleared, Class II medical devices, and therapeutic technologies. Leverage advanced computational analysis, imaging, and machine learning pipelines to quantify experimental outcomes, optimize design specifications, and guide evidence-based product innovation. Collaborate with clinicians, scientists, product leaders, and legal teams to propel evidence-based decision-making, elevate performance, and bring innovative biomedical solutions to market.

IMMEDIATE VALUE OFFERED

- **Translational R&D Engineering:** Excel in bridging wet-lab discovery, digital analytics, and device performance to accelerate development and de-risk deployment across diagnostics, therapeutics, and medical-adjacent technologies.
- **Clinical Development:** Design and support pilot/clinical studies by integrating experimental design and validation to inform engineering refinements, efficacy claims, and clinical usability across regulated, safety-critical settings.
- **Biomedical Signal & Imaging:** Extract actionable insight from biological signals/imaging datasets using advanced signal processing and machine learning to quantify performance and guide evidence-based decision-making.
- **ML-Enabled Biological Discovery:** Apply ML within biological and translational research contexts, creating feedback loops between experimental data and computational models that refine hypotheses and accelerate discovery.
- **Prototype-to-Validation Execution:** Lead prototype development from concept, testing, and root-cause analysis through validation —delivering accelerated timelines while maintaining rigor, reproducibility, and performance integrity.

CORE COMPETENCIES

Performance Benchmarking & KPI Design
Digital Health/Therapeutic Technologies
Machine Learning for Biological Systems
Prototype Design, Testing & Verification
Quality & Safety-Critical Environments
Large-Scale Data Analytics & Modeling
Biomedical Signal & Image Processing
Experimental Design/Reproducibility
Clinical Development & Validation
Risk Identification & Mitigation
Translational R&D Engineering
Medical Device Development

PROFESSIONAL EXPERIENCE

RESEARCH AND DEVELOPMENT ENGINEER | SHARKNINJA, SHARK BEAUTY — NEEDHAM, MA **2024–PRESENT**

Drive development of medical-adjacent, therapeutic, and digital beauty technologies spanning photobiomodulation, skincare, and personal care devices, fueling $190M in Q3 net sales for the Beauty and Home company sectors. Work with engineering, clinical, marketing, legal, and leadership to translate biological insight, clinical evidence, and user needs into scalable product solutions.

- **Advanced therapeutic device innovation** by contributing to photobiomodulation and red-light and IR therapy programs, characterizing light-system behavior to ensure safety/differentiation in competitive markets.
- **Delivered commercially launched exfoliation device in 18 months,** enabling concept development, KPIs, prototype testing, and validation while completing milestones ahead of schedule and supporting accelerated time-to-market.
- **Co-designed dermatological and pain relief/muscle recovery clinical studies,** translating patient findings into engineering specifications, product KPIs, and insights that inform roadmap prioritization and claims development.
  - **Built and deployed Python-based analytical pipelines** to quantify skin reflectance and treatment response under lighting/usage conditions.
  - **Developed and validated hardware-software prototypes,** including PID-controlled thermoelectric systems while integrating dynamic control logic/real-time sensor data to optimize user safety.

GRADUATE RESEARCH ASSISTANT | CORNELL UNIVERSITY, MEINIG SCHOOL OF BIOMEDICAL ENGINEERING — ITHACA, NY **2018–2024**

Assumed an advanced research role at the intersection of biomedical engineering, mechanobiology, imaging, and computational analysis, driving experimental programs from hypothesis development through publication. Led multi-year research initiatives while managing laboratory operations, securing external funding, and collaborating with stakeholders to advance reproducible discovery.

- **Applied statistical modeling and analysis** to identify clinically relevant effects, including 20% decreased bone strength linked to gut microbiome disruption and 60-90% reduced bone deposition following targeted receptor perturbation.
- **Designed automated 3D reconstruction and analysis workflows** for micro-CT and light-sheet imaging with 300GB+ datasets while accelerating throughput, improving reproducibility, and enabling cross-study comparison.
- **Contributed toward securing $600K+ in research funding from the NSF** as a result of dissemination in high-impact research and clinical channels.
- **Produced six peer-reviewed publications and three podium talks** across national and international levels, including 'World Congress of Biomechanics' while translating biological phenomena into widely adopted scientific insight.
  - **Developed and implemented multimodal imaging/signal-processing pipelines,** enabling quantitative analysis of calcium signaling, electrophysiological behavior, and tissue-level response across large biological datasets (225GB+).
  - **Led and mentored 10 undergraduate and graduate researchers,** providing training and coaching in experimental design, data analysis, and scientific communication while fostering a collaborative, performance-oriented culture.

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PROFESSIONAL EXPERIENCE *CONTINUED…*

DATA SCIENCE INTERN | TWITTER (X) — NEW YORK, NY **2022**

Served in an enterprise-scale data science environment, applying machine learning, statistical modeling, and large-scale analytics to diagnose system inefficiencies. Strategically partnered with engineering and product stakeholders to translate complex datasets into actionable insights that improved workflow efficiency and organizational performance.

- **Identified and resolved systemic bottlenecks to reduce productivity loss 20%** while quantifying operational friction across end-to-end engineering pipelines and surfacing actionable recommendations for leadership intervention.
- **Distilled statistical analyses into data-backed insights** that directly influenced product tooling prioritization.

RESEARCH INTERN | MIT, KOCH INSTITUTE FOR INTEGRATIVE CANCER RESEARCH — CAMBRIDGE, MA **2016 & 2017**

Selected for a highly competitive research program focused on impactful translational biomedical technologies, enabling design, validation, and testing of implantable and retrievable drug-delivery systems. Served within a multidisciplinary research environment spanning mechanical engineering, materials science, embedded systems, and translational medicine.

- **Supported *in vivo* validation using a large-animal (porcine) model,** directly contributing to translational readiness, de-risking clinical feasibility, and advancing preclinical evidence to facilitate downstream clinical application.
- **Designed mechanical/chemical validation testing,** including Instron tensile testing/acid-resistance evaluations.

RESEARCH SCHOLAR | UC SAN DIEGO, SHU CHIEN-GENE LAY DEPT OF BIOENGINEERING — LA JOLLA, CA **2015–2018**

Operated in a multidisciplinary biomedical research environment focused on cardiovascular engineering, stem cell biology, and tissue mechanobiology, contributing to translational research programs. Collaborated with faculty researchers to advance reproducible, data-backed discovery while implementing wet-lab experimentation, signal analysis, and data interpretation.

- **Conducted cardiovascular and stem cell engineering research,** developing *in vitro* cardiac tissue platforms that applied cyclic mechanical stretch to simulate physiological heart contractions and disease-relevant loading conditions.
- **Selected to present findings at three national conferences and a university-wide symposium,** demonstrating exceptional research acumen, persuasive communication, and ability to translate complex data into actionable insights.
- **Secured competitive research funding, including a $3,000 grant,** reflecting recognized scientific excellence, strategic project leadership, and tangible translational impact in advancing long-term research goals and objectives.

MACHINE LEARNING PROJECTS

ADS RECOMMENDATION (PRACTICUM WITH BEST BUY) **2022**

- **Designed machine learning–driven recommendation models** across 2M customers, 120 product categories, and 240M observations —applying logistic regression and hybrid collaborative/content-based filtering approaches.
- **Translated model outputs into optimization insights** —supporting $14B+ in annual e-commerce operations.

HUMAN MOTION PREDICTION **2021**

- **Built and benchmarked deep learning architectures** (Temporal Convolutional Networks, RNNs, Transformer Encoders) using the largest Archive of Motion Capture as Surface Shapes to predict complex human motion dynamics.
- **Achieved 95% error reduction** using Temporal Convolutional Networks versus RNN and Transformer baselines.

PREDICTIVE SPORTS ANALYTICS **2020**

- **Developed and integrated predictive models** using SVM, Random Forest, Logistic Regression, KNN, Naive Bayes, and QDA algorithms to forecast English Premier League match outcomes and support data-backed performance insights.
- **Accurately predicted top-five team rankings** by analyzing 6,800 historical games spanning 18 seasons.

ALGORITHMIC TRADING **2020**

- **Achieved a 49% normalized ROI via rigorous two-year back-testing,** exhibiting disciplined quantitative model validation, strong risk management judgment, and performance benchmarking against relevant market indicators.
- **Engineered and deployed a Random Forest–based time-series forecasting framework** to integrate market indicators.

EDUCATION QUALIFICATIONS

DOCTOR OF PHILOSOPHY (PH.D.) | CORNELL UNIVERSITY — ITHACA, NY **2024**

MASTER OF SCIENCE (M.S.) MECHANICAL ENGINEERING | CORNELL UNIVERSITY — ITHACA, NY **2024**

MASTER OF SCIENCE (M.S.) ANALYTICS | GEORGIA INSTITUTE OF TECHNOLOGY — ATLANTA, GA **2023**

BACHELOR OF SCIENCE (B.S.) MECHANICAL ENGINEERING | UNIVERSITY OF CALIFORNIA — SAN DIEGO, CA **2018**

TECHNOLOGY PROFICIENCY

PROGRAMMING & TOOLS: PYTHON (OPENCV, NUMPY, PANDAS, SCIKIT-LEARN, PYVISTA, MATPLOTLIB), MATLAB, R

IMAGING & SIGNAL PROCESSING: IMAGE STITCHING, FILTERING, SEGMENTATION, FORECASTING, FEATURE EXTRACTION, FOURIER ANALYSIS | IMAGEJ/FIJI, IMARIS, MICRO-CT, LIGHT-SHEET MICROSCOPY, INTRAVITAL IMAGING

STATISTICS & MACHINE LEARNING: REGRESSION MODELS, K-MEANS, KNN, SVM, PCA | DEEP LEARNING (CNN, RNN), A/B TESTING

SELECTED PUBLICATIONS | PROFESSIONAL AFFILIATIONS

SCIENCE ADVANCES (FIRST AUTHOR): CHOLINERGIC REGULATION OF OSTEOCYTE MECHANOBIOLOGY (2025)