JACKSON CARRION
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EDUCATION

Massachusetts Institute of Technology **Cambridge, MA**
PhD in Computational & Systems Biology Current

Arizona State University **Tempe, AZ**
Master of Science (Biomedical Informatics - Accelerated) GPA: 3.9/4.0
- SAS Certified

Arizona State University **Tempe, AZ**
Bachelor of Science (Biomedical Informatics) GPA: 4.0/4.0

TECHNICAL SKILLS

Python PyTorch NAMD VMD R Java SAS SQL

WET-LAB TECHNIQUES

Cryogenic Electron Microscopy X-ray Crystallography X-ray emission spectroscopy FPLC

EXPERIENCE

Massachusetts Institute of Technology, PhD Student **Cambridge, MA**
Joey Davis (Software for CryoEM & Protein Dynamics) Current
- Develop new CryoEM tomography particle picking software
- Utilize deep learning models to explore CryoEM time-resolved density fitting
- Validate and explore new CryoEM time-resolved and tomography workflows

Biodesign Institute Center for Applied Structural Discovery **Tempe, AZ**
Petra Fromme Lab (Structural Biology & Biophysics) 02/20 – 07/23
- Perform grid screening and crystal condition screening for various EM and XFEL experiments
- Design large-scale processing and visualization programs for raw X-ray emission spectroscopy data
- Utilize HPC clusters to process large biophysics/Structural datasets (SFX, XFEL, XES, Cryo-EM, MD sims)
- Explore Steered MD simulations and flexible-fitting algorithms to refine Cryo-EM structures

Biodesign Institute Center for Personalized Diagnostics **Tempe, AZ**
Valentin Dinu Lab (ML & Bioinformatics) 02/22 – 07/23
- Develop multimodal data-fusion and deep learning methods to identify dyslexia from multi-omics datasets (Genomics/whole-exome, metabolomics, phenotypic/clinical datasets)
- Utilize and analyze various fusion/deep learning classifiers to assist in diagnosing patients with dyslexia (stacking/voting, AdaBoost/XGBoost, CNN, transformers, etc.)

PUBLICATIONS

Modular Droplet Injector for Sample Conservation Providing New Structural Insight for the Conformational Heterogeneity in the Disease-Associated NQO1 Enzyme

Doppler, D., Sonker, M., Egatz-Gomez, A., Grieco, A., Zaare, S., Jernigan, R., Meza-Aguilar, J. D., Rabbani, M. T., Manna, A., Alvarez, R. C., Karpos, K., Cruz Villarreal, J., Nelson, G., Yang, J.-H., **Carrion, J.**, Morin, K., Ketawala, G. K., Pey, A. L., Ruiz-Fresneda, M. A., … Ros, A.. (2023). Modular droplet injector for sample conservation providing new structural insight for the conformational heterogeneity in the disease-associated NQO1 enzyme. *Lab Chip*, *23*(13), 3016–3033. https://doi.org/10.1039/d3lc00176h

CryoJAM: Automating Protein Homolog Fitting in Medium Resolution Cryo-EM Density Maps

Carrion J, Manjrekar M, Mikulevica. CryoJam: Automating Protein Homolog Fitting in Medium Resolution Cryo-EM Density Maps. bioRxiv [Preprint]. 2024 Jul 10:2024.07.10:602952. doi: 10.1101/2024.07.10.602952. https://doi.org/10.1101/2024.07.10.602952

A Data-fusion approach for diagnosing developmental dyslexia with multi-omics datasets

Carrion J, Nandakumar R, Shi X, Gu H, Kim Y, Raskind WH, Peter B, Dinu V. A data-fusion approach to identifying developmental dyslexia from multi-omics datasets. bioRxiv [Preprint]. 2023 Feb 27:2023.02.27.530280. doi: 10.1101/2023.02.27.530280. PMID: 36909570; PMCID: PMC10002702. https://doi.org/10.1101/2023.02.27.530280

STRUCTURAL BIOLOGY RESEARCH

Structural basis of the Cyclic Electron Flow regulation in the photosynthetic PSI-LHCI-Cyt b6f supercomplex of photopsychrophile *Chlamydomonas sp.* UWO241

- Methodology: Solubilize and purify the supercomplex utilizing SMALPs to keep native structure
- Current State: Cryo-EM reconstructions suggest a possible Ferredoxin binding site & association

Water splitting in Photosystem II in the transient S4 to S0 transition studied by time resolved XES and SFX with femtosecond pulse duration

- Methodology: Serial femtosecond X-ray crystallography paired with time-resolved X-ray emission spectroscopy data was collected at various international labs (SLAC National Accelerator Laboratory hosted by Stanford & European XFEL hosted by DESY in Germany)
- Current State: Diffraction patterns reaching ~2.3Å and ~3.5Å for the PSII S0 and S4 state respectively

SOFTWARE DEVELOPMENT

Development of serial femtosecond X-ray emission spectroscopy & X-ray crystallography data pipeline (Python)

- Methodology: Combine SFX diffraction data with XES data at the femtosecond time scale and visualize the structural and quantum state of metalloproteins during enzymatic reactions
- Current State: Using the pipeline to explore the transient S4 state in PSII during photo-oxidation from data collected at SLAC National Accelerator Laboratory

Designed a GUI capable of assisting providers in identifying & segmenting polyps in colonoscopy images (Python)

- Methodology: The team is implementing various UNet models into a GUI that can allow providers to upload a screenshot of a colonoscopy and output the image with the questionable polyp(s) highlighted and segmented
- Current State: U-Net models are achieving an IoU >0.95

Development and evaluation of ML models in classifying malignant vs benign breast cancer tumor cells (R)

- Methodology: PCA was utilized to identify two distinct clusters and then we developed an array of ML classification models (Decision tree, KNN, Neural networks, Random forests).
- Current State: Decision tree models achieved 0.93 AUC values.

The Mayo Clinic Hack for Health Innovation Hackathon (Java)

- Methodology: Develop a social media application that can allow providers and traveling nursers to easily find new opportunities, helping combat the 'nurse/physician burnout' pandemic that is occurring after Covid-19

POSTER PRESENTATIONS

32nd Western Photosynthesis Conference – 01/2023
The Protein Society Annual Symposium – 07/2022
College of Health Solutions Graduate Expo – 04/2022
Photosynthetic Systems PI Conference – 11/2021

AWARDS

32nd Western Photosynthesis Conference Travel Award ($500) – 01/2023
ASU GPSA Individual Travel Grant ($1000) – 05/2022
ASU GRSP Research Grant ($2000) – 01/2022
ASU Student Travel Grant ($500) – 09/2021

LEADERSHIP EXPERIENCE

Director of Communications for The Students of Biomedical Informatics (SoBMI) Club 08/21 – 8/23

- Organize and schedule info-sessions, social/networking events, and general meetings with students, faculty, and various labs/companies in the Phoenix Area (TGen, Honeywelll, CVS, etc.)
- Co-founded the new SoBMI mentorship program for undergrad & graduate students interested in BMI

SoBMI Mentor

- Assist undergrad students who are interested in the 4+1 master's program (pick classes, find research, apply)