BIOGRAPHICAL SKETCH

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NAME: Wu, Anthony Taolun

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POSITION TITLE: MSTP student

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Washington University in St. Louis	B.S.	05/2021	Biomedical Engineering (1st major); Computer Science (2nd major)
University of California, Irvine	Ph.D.	05/2027 (Expected)	Computer Science
University of California, Irvine School of Medicine	M.D.	05/2030 (Expected)	Medicine

A. Personal Statement

I am an MD/PhD student with a background in computer science (CS) focused in applied artificial intelligence (AI) and biomedical engineering (BME). My interest in research in medicine first started as a curiosity, but then quickly became personal. I have seen many loved ones endure metastatic cancer, undergo multiple surgeries as a result, and survive their associated complications. I have witnessed the effects of chemo/radiation therapy on their quality of life and felt powerlessness in the face of a disease that kept coming back.

B. Positions, Scientific Appointments, and Honors

Start	End	Position Titles	Location
2022	Ps.	PhD Student Researcher	University of California, Irvine, Computer Science
2022	Ps.	AI Workgroup Computation Lead, Radiology	University of California, Irvine, Radiological Sciences
2018	2022	Research Technician II (Machine Learning and AI systems), Radiology	Washington University in St. Louis, Mallinckrodt Institute of Radiology
2019	2019	Research Associate, Radiology (May-August)	Washington University in St. Louis, Mallinckrodt Institute of Radiology

Year	Month	Honors
2023	September	UCI Radiology Medical Trainee Research Grant
2023	June	Radiological Society of North America Medical Student Research Award
2023	June	T35 NIDDK Short-Term National Research Service Award
2021	May	Honors Thesis in Computer Science and Engineering, Graduation Honors
2021	May	Summa Cum Laude, Graduation Honors
2021	March	Alpha Eta Mu Beta Inductee, Biomedical Engineering Honors Society
2021	February	Tau Beta Pi Inductee, Engineering Honors Society
2019	May	Mallinckrodt Institute of Radiology Summer Research Program (May-August)
2017-2023	May	Christie Foundation Health Education Scholarship (renewed each year)
2017	August	Scholars in Engineering Program

C. Contributions to Science

1. Development of Deep learning algorithms for Diffusion Basis Spectrum Imaging.

   Diffusion Tensor Imaging (DTI) has provided physicians much more detailed information on various brain pathologies than conventional MRI (cMRI). Such pathologies include but are not limited to multiple sclerosis, glioblastomas (GBMs), and ischemic/hemorrhagic strokes. However, the nature of DTI calculates anisotropic and isotropic voxel components as a single tensor, thereby muddling the diagnostic ability for pathologies with specific anisotropic and isotropic properties.

   My undergraduate and honors thesis research involved developing Deep Neuronal Networks (DNNs) to interpret a novel diffusion basis spectrum imaging (DBSI) method. DBSI at the basic level is a deconvoluted form of DTI; that is, the anisotropic and isotropic components for each voxel are separated using matrices derived from multiple MRI sequences and solved by a loss function. My goal was to develop and optimize DNNs on DBSI data to classify multiple sclerosis lesions, GBM pathologies, and pediatric brain tumor histologies (DBSI-DNNs). I compared DBSI-DNNs to DNNs developed and optimized to interpret conventional imaging data (such as cMRI, DTI, and MTR). I showed that DBSI-DNNs classified the pathologies listed above with higher sensitivity, specificity, and F1-scores than DNNs trained on conventional imaging data. Finally, I created a framework to develop and optimize DNN to systematically and reliably interpret DBSI sequence data. Publications related to this work are as follows:

   a) Ye Z, George A, **Wu AT**, Niu X, Lin J, Adusumilli G, Naismith RT, Cross AH, Sun P, Song SK. Deep learning with diffusion basis spectrum imaging for classification of multiple sclerosis lesions. *Ann Clin Transl Neurol.* 2020 May; 7(5):695-706. doi: 10.1002/acn3.51037.
   b) Ye Z, Price RL, Liu X, Lin J, Yang Q, Sun P, **Wu AT**, Wang L, Han RH, Song C, Yang R, Gary SE, Mao DD, Wallendorf M, Campian JL, Li JS, Dahiya S, Kim AH, Song SK. Diffusion Histology Imaging Combining Diffusion Basis Spectrum Imaging (DBSI) and Machine Learning Improves Detection and Classification of Glioblastoma Pathology. *Clin Cancer Res.* 2020 Oct 15;26(20):5388-5399. doi: 10.1158/1078-0432.CCR-20-0736.
   c) Ye Z, Srinivasa K, Meyer A, Sun P, Lin J, Viox JD, Song C, **Wu AT**, Song SK, Dahiya S, Rubin JB. Diffusion histology imaging differentiates distinct pediatric brain tumor histology. Sci Rep. 2021 Feb 26;11(1):4749. doi: 10.1038/s41598-021-84252-3.

d) **Wu, A.** Modular Neural Network and Clustering using Diffusion Basis Spectrum Imaging (DBSI) metrics improves Prostate Cancer Grading. Senior Honors Papers / Undergraduate Theses. 36 (2021). https://openscholarship.wustl.edu/undergrad_etd/36
e) Rahmani F, Ghezzi L, Tosti V, Liu J, Song S, **Wu AT**, Rajamanickam J, Obert K, Benzinger T, Mittendorfer B, Piccio L, Raji, C. Twelve weeks of intermittent caloric restriction diet mitigates neuroinflammation in midlife individuals with multiple sclerosis: A pilot study with implications for prevention of alzheimer's disease. *Journal of Alzheimer's Disease*. 2023;93(1):263-273. doi:10.3233/jad-221007

2. Reviewing the current state of Machine Learning in Radiology and applying them in emergency settings.

The state of machine learning in medicine is moving very quickly, so much that it is difficult for clinicians and students to stay up to date. Here, I've led multiple students in reviewing the current literature of its influence in medicine, especially in emergency radiology where split-second decisions are commonplace. I've also led students in developing ML projects of their own and provided computational and study design support whenever needed.

a) Shu G, **Wu AT**, Chang P, Houshyar R. Advancement of Artificial Intelligence and Machine Learning in 4-Dimensional Flow Magnetic Resonance Imaging. *2024 Society of Imaging Informatics in Medicine Annual Meeting*. 2024.
b) **Wu AT**, Park S, Jung J, Spina A, Law K, Hassani P, Houshyar R. Cracking the Ionizing Radiation Paradox: Using AI to Enhance the Clinical Utility of Computed Tomography at a Reduced Radiation Cost. *2024 American Roentgen Ray Society Annual Meeting*. 2024.
c) Park S, Duong T, **Wu AT**, Andalib S, Chang S, Houshyar R, Golshan M. Skeletal Surprises: Cracking the Case of Non-Traumatic Musculoskeletal Emergencies. *2024 American Roentgen Ray Society Annual Meeting*. 2024.
d) Danza C, Cortes G, Chantaduly C, **Wu AT**, Sabour R, Jung J, Shu G, Ho E, Law K, Chang P, Houshyar R. Comparison of a Novel Generalized Deep Learning Model to a Traditional Supervised Model for Liver and Spleen Segmentation on Abdomen and Pelvis Computed Tomography. *2024 Western Medical Research Conference*. 2024.
e) **Wu AT**, Lopez S, Kharabaf S, Spina A, Andalib S, Bansal R, Jung J, Houshyar R, Soun J. Beyond the Platinum 30: empowering Emergency Radiologists with AI-driven Stroke Imaging. *2023 American Society of Emergency Radiology Annual Meeting*. 2023.

3. Analyzing stressors and protective factors in physician marriages.

Physician marriage is a valuable indicator of how vocational factors (e.g. work hours, stressors) impact satisfaction in relationships and physician wellness overall. Previous studies suggest that gender and specialty influence marriage satisfaction for physicians, though these often come from limited, local, cohorts. We designed a cross-sectional survey was designed and distributed to publicly available email addresses representing academic and private practice physician organizations across the United States and received 321 responses. I analyzed and presented this data and elucidated sex and specialty differences in marital satisfaction factors, in addition to determining stressing and protective factors.

a) **Dutta, R.R.* and Wu, A.T.***, Picton, B. et al. Physician marriage survey reveals sex and specialty differences in marital satisfaction factors. Sci Rep 14, 5159 (2024). https://doi.org/10.1038/s41598-024-55437-3

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