BIOGRAPHICAL SKETCH

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NAME: Wahid, Kareem A.

eRA COMMONS USER NAME (credential, e.g., agency login): **kwahid**

POSITION TITLE: Postdoctoral Fellow

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
University of Texas Rio Grande Valley	B.S.	05/2016	Physics & Mathematics
The University of Texas MD Anderson Cancer Center UTHealth Houston Graduate School of Biomedical Sciences	Ph.D.	05/2023	Quantitative Sciences
McGovern Medical School	M.D.	05/2026	Medicine

A. Personal Statement

Medicine is becoming an increasingly quantitative and precise field. With this in mind, I believe there is an emerging research area that has the potential to completely revolutionize the personalized-medicine landscape: artificial intelligence (AI). My long-term goal is a multifaceted approach to implement AI for personalized-medicine clinical decision support tools, with the intention of practicing as a clinician-scientist.

As a mixed-race Hispanic-American raised on the US/Mexico border, I recognized early the importance and utility of viewing problems from different perspectives. My undergraduate education served as an interdisciplinary foundation that allowed me to extract knowledge from varied fields of science, mathematics, and engineering, to apply in research. While in medical school, I gained an interest in the field of medical imaging. I applied machine learning methodology to solve quantitative imaging problems in central nervous system disease pathologies, and presented my findings at prominent international conferences. These projects were structured with the intention of developing personalized-medicine frameworks based on AI. Moreover, by completing my clinical rotations before beginning my PhD I had the opportunity to organically approach hypothesis generation in translational science. Specifically, I learned how my patient interactions could drive my innovations in the lab. Therefore, I am innately cognizant of the lack of robust clinical decision support tools in current practice that I believe can be solved with quantitative approaches.

I utilized my PhD graduate studies as an opportunity to further apply AI to medical imaging with the intention of improving diagnostic and prognostic capabilities of clinicians, particularly in the realm of head and neck cancer radiotherapy. The overarching aim of my graduate work was to develop interpretable AI personalized-medicine solutions that can be readily translated as clinical decision support tools. I have helped develop tools for various facets of the radiotherapy workflow including image processing, segmentation, and outcome prediction. I was fortunate to receive generous support for my graduate work from the NIH through competitive training grants (*TL1TR003169*, *F31DE031502*). I am currently a fellow in a NIH funded two-year post-doctoral training fellowship (*T32CA261856*) which I am pursuing before finishing my final year of medical school. My post-doctoral work is focused on human-machine interaction in AI-based radiotherapy clinical decision support tools. To date, I have published **60 peer-reviewed manuscripts** (18 first author).

Ultimately, it is my ambition to give back to the underserved community I grew up with as a clinician-scientist, gaining inspiration from my patients to influence translational AI innovation that can be applied back to my patients in a cyclical fashion.

Ongoing and recently completed NIH funding that I would like to highlight include:

- **T32CA261856** (MPI, Brock, Fuller, Lai) 05/01/2023 – 05/01/2025
  Image Guided Cancer Therapy Training Program
- **F31DE031502** (PI Wahid) 01/01/2022-05/01/2023
  Multiparametric Magnetic Resonance Imaging Artificial Intelligence Pipeline for Oropharyngeal Cancer Radiotherapy Treatment Guidance
- **TL1TR003169** (MPI Frost, Chandra) 1/01/2020 – 1/01/2022
  NRSA Training Core

B. Positions, Scientific Appointments, and Honors

Positions

2023-2025	Post-doctoral Fellow, NIH IGCT T32 Fellowship, MD Anderson Cancer Center, Houston, TX
2021-2023	Trainee, NIH F31 Fellowship, MD Anderson Cancer Center, Houston, TX
2020-2021	Trainee, CCTS TL1 Fellowship, UTHealth, Houston, TX
2016-2024	Graduate Research Assistant, McGovern Medical School MD/PhD Program, Houston, TX
2014-2016	Undergraduate Research Assistant, HHMI Research Training Program, UTRGV, Edinburg, TX
2015	Summer Researcher, Systems Biology Fellowship, Harvard Medical School, Boston, MA
2013-2015	Undergraduate Research Assistant, C-STEM Student Research Program, UTPA, Edinburg, TX
2014	Intern, NSF Research Experience for Undergraduates, UPenn, Philadelphia, PA

Professional Memberships

2025-	Associate Editor, phiRO
2024-2025	Editorial Board Member, Physics and Imaging in Radiation Oncology (*phiRO*)
2022-2024	Trainee Editorial Board Member, Radiology Artificial Intelligence Trainee Editorial Board (*TEB*)
2019-	Medical Student Member, American Medical Association (*AMA*)
2019-	Trainee Member, Radiological Society of North America (*RSNA*)
2019-	Trainee Member, International Society for Magnetic Resonance in Medicine (*ISMRM*)
2019-	Member, American Society for Radiation Oncology (*ASTRO*)
2018-	Member, American Society of Clinical Oncology (*ASCO*)
2018-2019	Member, Americas Committee for Treatment and Research in Multiple Sclerosis (ACTRIMS)
2014-	Member, Sigma Pi Sigma (*ΣΠΣ*) Physics Honor Society
2013-2016	President, Society of Physics Students (*SPS*) UTRGV Chapter

Honors

2025	RSNA Medical Student Research Grant
2025	MD Anderson Trainee Peer-to-Peer Mentor Award, Houston, TX
2024	RSNA Honored Educator Award
2024	Radiology: AI Editor's Recognition Award - Special Distinction
2022	Presidents' Research Scholarship, Houston TX
2022	Kopchick Fellowship, Houston, TX
2021,22	American Legion Auxiliary Fellowship in Cancer Research, Houston, TX
2020	ISMRM Trainee Educational Stipend, Virtual
2020	Paul and Daisy Soros Fellowship for New Americans Finalist, Los Angeles, CA
2019	ACTRIMS Poster Presentation Finalist, Dallas, TX
2018	ACTRIMS Young Investigator Travel Grant, Dallas, TX
2017	ACTRIMS Young Investigator Travel Grant, San Diego, CA
2016	Excellence Award for Outstanding Honors Thesis, UTRGV, Edinburg, TX
2016	SSPI Under-represented Student Scholarship, Baltimore, MD
2016	Top 5 Presenter, UTRGV Engaged Scholar Symposium, Edinburg, TX
2016	Top Undergraduate Research Poster, APS March Meeting, Baltimore, MD

C. Contributions to Science (***** indicates co-first author)

1. **Sarcopenia-related Clinical Decision Making**: Sarcopenia – the excessive loss of skeletal muscle mass and function – is a common and debilitating phenomenon in cancer patients. Sarcopenia has been strongly

associated with oncologic outcomes such as overall survival and late radiation-induced toxicities. Therefore, sarcopenia prediction is of paramount importance in patients with head and neck cancer. We have generated automated tools to aid in sarcopenia-related clinical decision making and distributed datasets for these purposes.

a. Naser MA, **Wahid KA**, Grossberg AJ, Olson B, Jain R, El-Habashy D, Dede C, Salama V, Abobakr M, Mohamed ASR, He R, Jaskari J, Sahlsten J, Kaski K, Fuller CD. Deep learning auto-segmentation of cervical skeletal muscle for sarcopenia analysis in patients with head and neck cancer. Front Oncol. 2022 Jul 28;12:930432. PMID: 35965493; PMCID: PMC9366009.
b. **Wahid KA**, Olson B, Jain R, Grossberg AJ, El-Habashy D, Dede C, Salama V, Abobakr M, Mohamed ASR, He R, Jaskari J, Sahlsten J, Kaski K, Fuller CD, Naser MA. Muscle and adipose tissue segmentations at the third cervical vertebral level in patients with head and neck cancer. Sci Data. 2022 Aug 2;9(1):470. PMID: 35918336; PMCID: PMC9346108.
c. Ye Z, Saraf A, Ravipati Y, Hoebers F, Zha Y, Zapaishchykova A, Likitlersuang J, Tishler R, Schoenfeld J, Margalit D, Haddad R, Mak R, Naser M, **Wahid KA**, Sahlsten J, Jaskari J, Kaski K, Makitie AA, Fuller C, Aerts H, Kann B. Fully-automated sarcopenia assessment in head and neck cancer: development and external validation of a deep learning pipeline. medRxiv. 2023 Mar. doi: 10.1101/2023.03.01.23286638.

2. **Tumor Auto-Segmentation**: Segmentation (also termed contouring) of the gross tumor volume (primary tumor and lymph nodes) on radiologic imaging is necessary for the radiotherapy workflows. The gross tumor volume acts as a target volume to deliver the radiotherapy dose. Consequently, inadequate gross tumor volume definition may cause under-dosage of the tumor or over-dosage of surrounding normal tissues. However, the current clinical standard is manual segmentation by physician experts, which is labor-intensive and subject to high inter-observer variation. This is particularly true for head and neck cancers, which demonstrate some of the highest tumor interobserver variability. Therefore, an auto-segmentation tool would be a promising alternative to the current manual standard in head and neck cancer radiotherapy workflows. Using deep learning approaches, we have developed tumor segmentation tools for a variety of image modalities with great success.
    a. **Wahid KA**, Ahmed S, He R, van Dijk LV, Teuwen J, McDonald BA, Salama V, Mohamed ASR, Salzillo T, Dede C, Others. Evaluation of deep learning-based multiparametric MRI oropharyngeal primary tumor auto-segmentation and investigation of input channel effects: Results from a prospective imaging registry. Clinical and translational radiation oncology. Elsevier; 2022;32:6–14. PMID: 34765748; PMCID: PMC8570930.
    b. Taku N, **Wahid KA**, van Dijk LV, Sahlsten J, Jaskari J, Kaski K, Fuller CD, Naser MA. Auto-detection and segmentation of involved lymph nodes in HPV-associated oropharyngeal cancer using a convolutional deep learning neural network. Clin Transl Radiat Oncol. 2022 Sep;36:47–55. PMID: 35782963; PMCID: PMC9240370.
    c. Naser MA, **Wahid KA**, van Dijk LV, He R, Abdelaal MA, Dede C, Mohamed ASR, Fuller CD. Head and Neck Cancer Primary Tumor Auto Segmentation Using Model Ensembling of Deep Learning in PET/CT Images. Head Neck Tumor Segm Chall (2021). 2022 Mar 13;13209:121–132. PMID: 35399869; PMCID: PMC8991449.
    d. Sahlsten J, Jaskari J, **Wahid KA**, Ahmed S, Gelerean E, He Renjie, Kann B, Makitie AA, Fuller CD, Naser MA, Kaski K, Application of simultaneous uncertainty quantification for image segmentation with probabilistic deep learning: Performance benchmarking of oropharyngeal cancer target delineation as a use-case. medRxiv, 2023 Feb. doi: 10.1101/2023.02.20.23286188.

3. **Prognostic Modeling Using Imaging Data**: Head and neck cancers are among the most prevalent cancers in the world. While prognostic outcomes for head and neck cancers, have improved over recent years, patients still have a significant probability of disease recurrence, death, or other negative prognostic outcomes. Determination of prognostic outcomes in HNSCC is a highly challenging task since the ultimate healthcare outcomes of patients are driven by complex interactions between a large number of variables, including clinical demographics, treatment approaches, and underlying disease physiology. While risk prediction models based on clinical demographics for head and neck cancer have been developed in the past, these methods may lack prediction potential due to their use of a small number of simple variables or linear nature. Imaging data coupled to machine learning approaches, such as deep learning, are a promising method to accurately predict outcomes and patient prognosis. Subsequently, we have developed

a variety of tools on large image datasets to aid in developing prognostic models to help guide therapeutic interventions.

a. **Wahid KA**, He R, Dede C, Mohamed ASR, Abdelaal MA, van Dijk LV, Fuller CD, Naser MA. Combining Tumor Segmentation Masks with PET/CT Images and Clinical Data in a Deep Learning Framework for Improved Prognostic Prediction in Head and Neck Squamous Cell Carcinoma. Head and Neck Tumor Segmentation and Outcome Prediction. Springer International Publishing; 2022. p. 300–307. PMID: 35399870; PMCID: PMC8991448.
b. Naser MA, **Wahid KA**, Mohamed ASR, Abdelaal MA, He R, Dede C, van Dijk LV, Fuller CD. Progression Free Survival Prediction for Head and Neck Cancer Using Deep Learning Based on Clinical and PET/CT Imaging Data. Head Neck Tumor Segm Chall (2021). 2022 Mar 13;13209:287–299. PMID: 35399868; PMCID: PMC8991450.
c. van Dijk LV, Mohamed ASR, Ahmed S, Nipu N, Marai GE, **Wahid KA**, Sijtsema NM, Gunn B, Garden AS, Moreno A, Hope AJ, Langendijk JA, Fuller CD. Head and Neck Cancer Predictive Risk Estimator to Determine Control and Therapeutic Outcomes of Radiotherapy (HNC-PREDICTOR): Development, international multi-institutional validation, and web-implementation of clinic-ready model-based risk stratification for head and neck cancer. Eur J Cancer. Elsevier BV; 2022 Oct 1;178:150–161. PMID: 36442460; PMCID: PMC9853413.
d. **Wahid KA**, Glerean E, Sahlsten J, Jaskari J, Kaski K, Naser MA, He R, Mohamed ASR, Fuller CD. Artificial Intelligence for Radiation Oncology Applications Using Public Datasets. Semin Radiat Oncol. 2022 Oct;32(4):400–414. PMID: 36202442; PMCID: PMC9587532.

4. **Imaging Quality Assurance and Pre-Processing**: Standardization of data is crucial to optimize machine learning workflows in radiation oncology. I have participated in a variety of projects that seek to standardize and evaluate image processing and analysis tools that funnels directly into my goals for predictive modeling of clinically relevant problems. We have helped develop tools and methodologies that can benefit a variety of imaging modalities and modeling approaches, with a particular emphasis on MRI.
    a. **Wahid KA**, He R, McDonald BA, Anderson BM, Salzillo T, Mulder S, Wang J, Sharafi CS, McCoy LA, Naser MA, Ahmed S, Sanders KL, Mohamed ASR, Ding Y, Wang J, Hutcheson K, Lai SY, Fuller CD, van Dijk LV. Intensity standardization methods in magnetic resonance imaging of head and neck cancer. Phys Imaging Radiat Oncol. 2021 Oct;20:88–93. PMID: 34849414; PMCID: PMC8607477.
    b. **Wahid KA***, Naser MA*, Ahmed S, Salama V, Dede C, Edwards BW, Lin R, McDonald B, Salzillo TC, He R, Ding Y, Abdelaal MA, Thill D, O'Connell N, Willcut V, Christodouleas JP, Lai SY, Fuller CD, Mohamed ASR. Quality assurance assessment of intra-acquisition diffusion-weighted and T2-weighted magnetic resonance imaging registration and contour propagation for head and neck cancer radiotherapy. Med Phys. 2022 Dec 15; PMID: 36519973.
    c. **Wahid KA**, Xu J, El-Habashy D, Khamis Y, Abobakr M, McDonald B, O' Connell N, Thill D, Ahmed S, Sharafi CS, Preston K, Salzillo TC, Mohamed ASR, He R, Cho N, Christodouleas J, Fuller CD, Naser MA. Deep-learning-based generation of synthetic 6-minute MRI from 2-minute MRI for use in head and neck cancer radiotherapy. Front Oncol. 2022 Nov 8;12:975902. doi: 10.3389/fonc.2022.975902. PMID: 36425548; PMCID: PMC9679225.
    d. Sahlsten J, **Wahid KA**, Glerean E, Jaskari J, Naser M, He R, Makitie A, Kann B, Fuller C, Kaski K. Segmentation stability of human head and neck medical images for radiotherapy applications under de-identification conditions: benchmarking for data sharing and artificial intelligence use-cases. Front Oncol, 2023. PubMed PMID: 36925936; PMCID: PMC10011442.

5. **Crowdsourced Segmentation:** A significant challenge in artificial intelligence development has been the relative paucity of curated multi-expert observer datasets sufficiently large to train machine learning models. As such, our team developed the Contouring Collaborative for Consensus in Radiation Oncology (C3RO), a public crowdsourced challenge to engage radiation oncologists across various expertise levels in cloud-based image-segmentation in multiple disease sites. Through this collaboration, we have developed methods to investigate large-scale segmentation data across an unprecedented number of observers and publicly distributed these important datasets.
    a. **Wahid KA***, Lin D*, Nelms BE, He R, Naser MA, Duke S, Sherer MV, Christodouleas JP, Mohamed ASR, Cislo M, Murphy JD, Fuller CD, Gillespie EF. *E pluribus unum:* prospective acceptability

benchmarking from the Contouring Collaborative for Consensus in Radiation Oncology crowdsourced initiative for multiobserver segmentation. J Med Imaging (Bellingham). 2023 Feb;10(Suppl 1):S11903. doi: 10.1117/1.JMI.10.S1.S11903. Epub 2023 Feb 8. PMID: 36761036; PMCID: PMC9907021.

b. **Wahid KA**, Sahin O, Kundu S, Lin D, Alanis A, Tehami S, Kamel S, Duke S, Sherer MV, Rasmussen M, Korreman S, Fuentes D, Cislo M, Nelms BE, Christodouleas JP, Murphy JD, Mohamed ASR, He R, Naser MA, Gillespie EF, Fuller CD. Determining The Role Of Radiation Oncologist Demographic Factors On Segmentation Quality: Insights From A Crowd-Sourced Challenge Using Bayesian Estimation. medRxiv [Preprint]. 2023 Sep 5:2023.08.30.23294786. doi: 10.1101/2023.08.30.23294786. PMID: 37693394; PMCID: PMC10491357.

c. **Wahid KA***, Lin D*, Nelms BE, He R, Naser MA, Duke S, Sherer MV, Christodouleas JP, Mohamed ASR, Cislo M, Murphy JD, Fuller CD, Gillespie EF. E pluribus unum: prospective acceptability benchmarking from the Contouring Collaborative for Consensus in Radiation Oncology crowdsourced initiative for multiobserver segmentation. J Med Imaging (Bellingham). 2023 Feb;10(Suppl 1):S11903. PMID: 36761036; PMCID: PMC9907021.