BIOGRAPHICAL SKETCH

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NAME: Cao, Aize

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

POSITION TITLE: Associate Professor of Biomedical Data Science

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
Beijing Institute of Technology	B.S	07/1993	Electronic and Optical Engineering
Changchun Institute and Optics and Fine Mechanics, Chinese Academy of Science	M.S	03/1996	Electronic and Optical Engineering
Middle Tennessee State University	M.S	05/2013	Biostatistics
Nanyang Technological University, Singapore	Ph.D.	12/2005	Machine Learning
Vanderbilt University	Postdoctoral	12/2007	Biomedical Engineering

A. Personal Statement

I am a data scientist and population health informatician, my research focuses on health disparities studies and health outcome prediction through machine learning and multimodal data analysis. My lab is studying social determinant of health, clinical characteristics, and neuroimaging biomarkers to pinpoint risk factors for adverse health outcomes, with particularly emphasis on maternal health, substance use and mental health disorders in underserved populations. My career is built on extensive training in data science, specifically in health informatics and machine learning. After completing my postdoctoral training, I took training in biostatistics and neuroimaging data analyses. I then took more in-depth training in health informatics and using large scale Electronic Health Records (EHR).

Currently, I am the principal investigator (PI) of a couple active grants, including an Health Resources and Services Administration (HRSA) grant focusing on maternal health and substance use disorders, an National Science Foundation (NSF) major instrument research grant in acquisition of a high-performance computer system to support research and training in computational biology and data science at Meharry, an NIH RCMI (Research Centers in Minority Institutions) supplemental grant and two pilot studies. I lead and manage these grants, developed skills and have deep understanding of the criticality of team communication, realistic research plan, adherence to timeline, and budget management. My previous work was supported by NIH/VA grants on studies of chronic disease inpatient discharge and outpatient medical home, cirrhosis inpatient risk predictions, and mental health through neuroimaging technologies. As a result of these experiences, I am confident that my team is well-prepared and equipped to successfully complete the outlined work in our proposed agenda.

I am also committed to enhancing education in data science and health informatics for students at the School of Applied Computational Sciences (SACS) at Meharry Medical College, a Historical Black College/University in Nashville, TN. As an HBCU and Minority Serving Institution, Meharry has a rich legacy of producing Black physicians and scientists and serving Black and underserved communities. SACS, launched in 2021, offers graduate programs in data science and biomedical data science targeting Black and minority communities. By integrating my research with teaching, I aim to provide students with insights into how data science can address health disparities and improve patient health outcomes, helping them in their career development and potentially benefit underserved and disadvantaged groups.

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

Ongoing Projects:
HRSA UR6MC50342-01-00
Aize Cao (PI), Lloyda Williamson (co-PI), 9/2023-8/2028
Developing a Comprehensive Data Infrastructure Model to Support Maternal Healthcare for Underserved Women with Substance Use Disorders

NIH RCMI 3U54MD007586-37S1 Supplemental
Samuel Adunyah (PI), Aize Cao (supplemental PI), 5/2023-5/2025
Develop Natural Language Processing Pipeline for Social Determinant of Health Identification

NIH P50MD017347-01 Pilot study
Aize Cao (pilot PI), 8/2023-7/2024
Social Determinant of Health on Cardiovascular Disease Among Black Woman with Substance Use Disorders

NSF EIR 2302637
Bishnu Sarker (PI), Aize Cao (Co-PI), 8/2023-7/2026
Excellence in Research: Developing a Knowledge Graph Driven Integrative Framework for Explainable Protein Function Prediction via Generative Deep Learning

NSF MRI 2117282
Aize Cao (PI), Qingguo Wang (co-PI). 08/2021 – 07/2024
Acquisition of a High-Performance Computer System to Support Research and Training in Computational Biology and Data Science at Meharry Medical College

Meharry Internal COVID pilot (MRI) grant
Aize Cao (PI), Lloyda Williamson (co-PI). 08/2021 – 03/2024
Developing Risk Prediction Models for Patients with Comorbid Substance Use Disorder before and Among COVID-19

Completed Projects:
NIH U54MD007586 Sponsored Pilot Grant
Aize Cao (PI), Shawn Goodwin (co-PI).
4/2022 – 5/2023
A retrospective study to examine the correlation between high cholesterol and substance use disorder

NIH U54MD007586 Supplemental
Aize Cao (co-Investigator), Samuel Adunyah, Qingguo Wang (PI).
7/2021 – 7/2023
The RCMI Program in Health Disparities Research at Meharry Medical College, Supplemental on Data Science Capacity

B. Positions, Scientific Appointments, and Honors
Positions and Scientific Appointments

2021-	Associate Professor of Biomedical Data Science, Meharry Medical College, TN
2019-2020	Adjunct Faculty in Date Science, College of Computing Technology, Lipscomb University, TN
2016-2020	Research Assistant Professor, Department of Biomedical Informatics, Vanderbilt (VUMC), TN
2013-2016	Computer System Analyst II, the Institute for Medicine and Public Health, Vanderbilt (VUMC), TN
2013	Intern, Division of Policy, Planning and Assessment, Tennessee Department of Health, TN
2008-2012	Neuro-Imaging Analyst, Vanderbilt University Institute of Imaging Science, VUMC, TN
2005-2007	Research Associate, Department of Biomedical Engineering, Vanderbilt University, TN
2001-2004	Research Assistant, Nanyang Technological University, Singapore
1996-2001	Research engineer, Tianjin Institute of Technical Physics, Tianjin, China

Other Assignments and Professional Memberships:

2023-	Member and conference reviewer, Academy Health

2023- Member, American Public Health Association
2022- Vice Chair, Meharry IRB committee
2022 Reviewer for NSF MRI grant
2021- Member and Reviewer, American Medical Informatics Association
2019- Reviewer for Applied Clinical Informatics
2016 Reviewer for Journal of Biomedical and Health Informatics
2007-2008 Reviewer for IEEE Transaction on Medical Imaging
2005-2006 Reviewer for IEEE Transaction on Biomedical Engineering

Honors

2001-2004 Research Scholarship from Nanyang Technological University, Singapore
1992 Scholarship from Beijing Institute of Technology, Beijing, China

C. Contributions to Science

1. Contribution to medical image analysis

My early publications were focused on medical image related studies, including x-ray mammograms image processing, pattern recognition, physical to image space registration, and brain functional activities. It covered the work of my Ph.D., postdoctoral and early career at Vanderbilt University Institute of Imaging Science. These publications document the emerging problem in breast tumor detection, image guided neurosurgery, and mental health that provided clinical evidence for decision support.

1. **Aize Cao**, Q. Song, and X. L. Yang, (2008). Robust Information Clustering for Automatic Breast Mass Detection in Digitized Mammograms. *Computer Vision and Image Understanding,* Vol. 109, pp. 86-96
2. **Aize Cao**, R. C. Thompson, P. Dumpuri, B. M. Dawant, S. Ding, and M. I. Miga, (2008). Laser range scanning for image-guided neurosurgery: Investigation of image-to-physical space registrations. Medical Physics, Vol. 35, No. 4, pp. 1593-1605.
3. P. Dumpuri, R. C. Thompson, **Aize Cao**, S. Ding, I. Garg, B. M. Dawant, M. I. Miga, (2010). A fast and efficient method to compensate for brain shift during surgery. IEEE Trans. On Biomedical Engineering, Vol.57, No.6, pp. 1285-1296.
4. L. Bauernfeind, M.S Dietrich, J.Blackford, E. J. Charboneau, J. G. Lillevig, C.M.Cannistraci, N.D.Woodward, **Aize Cao**, Ronald L. Cowan, (2011). Human ecstasy use is associated with increased cortical excitability: an fMRI study. Neuropsychopharmacology, pp. 1127-1141.
5. Carissa Cassio, Jennifer Foss Feig, Ronald Cowan, Margaret Benningfield, Baxter Rogers, **Aize Cao**, (2012). Response of neural reward regions to food cues in autism spectrum disorders. Journal of Neurodevelopmental Disorders, 4(1).
6. Evonne J. Charboneau, Mary S. Dietrich, S. Park, **Aize Cao**, Tristan J. Watkins, Jennifer U. Blackford, Margaret M. Benningfield, Peter R. Martin, Maciej S. Buchowski, Ronald L. Cowan, (2013). Cannabis cue-induced brain activation correlates with drug craving in limbic and visual salience regions: preliminary results. Psychiatry Research: Neuroimaging, 214(2): 122-131.
7. Jacqueline A. Clauss, April I. Seay, Ross M.Vanderklok, Suzanne N. Avery, **Aize Cao**, Ronald L. Cowan, Margaret M. Benningfield, and Jennifer U. Blackford, (2014). Structural and functional bases of inhibited temperament. Social Cognitive and Affective Neuroscience Advance Access, 9: 2049-2058.

2. Contributions to Patient Health Outcome Disparities and Predictions

My publications on patient healthcare focused on healthcare transition and chronic disease management, as well as risk adjusted modeling for automatic surveillance of liver cirrhosis. These publications illustrated novel healthcare models and risk factors that contributed to health quality improvement and cost reduction.

1. Qingguo Wang, Vibhuti Gupta, **Aize Cao**, Ashutosh Singhal, Todd Gary, and Samuel E. Adunyah, (2023). A case study of enhancing the data science capacity of an RCMI program at a historically black medical college. International Journal of Environmental Research and Public Health, 20, 4775.
2. Bing-Yan Wang, **Aize Cao**, Meng-Hsuan Ho, Derek Wilus, Sally Sheng, Hsiu-Wan Meng, Elissa Guerra, Jianming Hong, and Hua Xie, (2023). Identification of microbiological factors associated with periodontal health disparities, Feb 16, 13:1137067
3. Joseph Boyle, Ted Speroff, Katie Worley, **Aize Cao**, Kathryn Goggins, Robert S. Dittus, Sunil Kripalani, (2017). Low health literacy is associated with increased transitional care needs in hospitalized patients. Journal of Hospital Medicine, 12(11): 918-924.
4. Jejo D. Koola, Sam B. Ho, Guanhua Chen, Amy M Perkins, **Aize Cao**, Sharon E. Davis, Michael Matheny, (2019). Development of a national Department of Veterans Affairs mortality risk prediction model among patients with cirrhosis. BMJ Open Gastroenterology, Vol.6

5. Sunil Kripalani, Guanhua Chen, Philip Ciampa, Cecelia Theobalk, **Aize Cao**, Megan McBride, Robert S. Dittus, (2019). A transition care coordinator model reduces hospital readmissions and costs. Contemporary Clinical Trials, June, 81:55-61.
6. Jejo D. Koola, Sam B. Ho, **Aize Cao**, Guanhua Chen, Amy M. Perkins, Sharon E. Davis, Michael Matheny, (2020). Prediction 30 day hospital readmission risk in a national cohort of patient with cirrhosis. Digestive Diseases and Sciences, (65), 1003-1031

3. Contributions to Common Data Model

In the most recent years, I have been an active member in Observational Health Data Sciences and Informatics (OHDSI) community working on its OMOP common data model transformation for nation-wide Veterans Affairs (VA) electronic healthcare records. The VA OMOP data boost VA research opportunities for nationwide/international network study to support clinical decision-making and advance the methodology within this field.

1. **Aize Cao**, Liam Rose, Todd H. Wagner, Sharidan K. Parr, Kristine E. Lynch, Scott L. DuVall, Michael E. Matheny, 'Conversion of National Veteran Affair Health Cost Data into the OMOP CDM: Preliminary Transformation', *OHDSI*, 2020
2. Kristin de Groot, **Aize Cao**, Qiuying Lucy Zhang, Denis M. Hynes, Donghui Kan, Amanda Talor, Linda Kok, Fern FitzHenry, Scott L. DuVall, Mari Souden, Michael Matheny, 'Transforming Medicare Research Identifiable Files (RIF) into the OMOP Common Data Model', *OHDSI*, 2018
3. **Aize Cao**, Margaret Gonsoulin, Kristin de Groot, Elizabeth Hanchrow, Daniel Park, Kristine Lynch, Denise Hynes, Scott L. DuVall, Michael E. Matheny, Stephen A. Deppen, 'Quality assurance of demographics consistency between Veterans Affairs and Medicare data', *OHDSI*, 2017

Complete List of Published Work in MyBibliography:
https://www.ncbi.nlm.nih.gov/myncbi/aize.cao.2/bibliography/public/