Aize Cao, PhD
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Last updated: May 31, 2023

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Current Position
Associate Professor, Department of Biomedical Data Science
School of Applied Computational Sciences
Meharry Medical College
Nashville, TN

Education
M.S. in Biostatistics, Middle Tennessee State University, Murfreesboro, TN	2013
Ph.D. in Data Mining and Pattern Recognition, Nanyang Technological University, Singapore	2005
M.S. in Optical and Electronic Engineering, Changchun Institute of Optics and Fine Mechanics, Chinese Academy of Science, Changchun, China	1996
B.S. in Optical and Electronic Engineering, Beijing Institute of Technology, Beijing, China	1993

Academic Appointments
Associate Professor, Department of Biomedical Data Science   2021-
School of Applied Computational Sciences
Meharry Medical College, Nashville, TN

Research Assistant Professor   2016-2020
Department of Biomedical Informatics
Vanderbilt University Medical Center, Nashville, TN

Adjunct Professor in Data Science   2019-2020
College of Computing Technology
Lipscomb University, Nashville, TN

Professional Positions and Experience
Computer Analyst II, Department of Biomedical Informatics   2015-2016
Vanderbilt University Medical Center
Nashville, TN

Computer Analyst II, Vanderbilt Institute for Medicine and Public Health   2013-2015
Vanderbilt University Medical Center
Nashville, TN

Intern   2013
Tennessee Department of Health
Nashville, TN

Neuro-Imaging Analyst, Vanderbilt University Institute of Imaging Science   2008-2012
Vanderbilt University Medical Center
Nashville, TN

Research Associate, Biomedical Modeling Laboratory   2005-2007
Department of Biomedical Engineering

Vanderbilt University
Nashville, TN

Research Assistant, Intelligence Machine Research Lab	2001-2004

School of Electrical and Electronic Engineering
Nanyang Technological University
Singapore

Research Engineer	1996-2001

Tianjin Institute of Technical Physics
Tianjin, China

Professional Development

Observational Health Data Science and Informatics Common Data Model Implementation for National Veteran Affair Healthcare records   2018-2020

Data informatics and predictive modeling for patients with cirrhosis based on nationwide Veterans Healthcare data, including patients' demographics, disease history, lab test, utility use and medication, etc.   2015-2017

Healthcare model evaluation for inpatient care transition and outpatient medical home based on large-scale hospital-wide administrative, clinical and financial data, claim based Medicare data and survey data   2013-2015

Alzheimer study in TN based on State-wide Death Statistical System, Hospital Discharge Data System and population survey data set.   2013

Supporting metal disease studies in neuroimaging program in the Department of Psychiatry
                                    2008-2012

Multi-model image registration in model-updated image-guided neurosurgery system   2005-2007

Professional Memberships and Activities

American Public Health Association	2023-
Academy Health	2023-
Statistics of Eastern North American Region	2023-
American Medical Informatics Association	2021-
Clinical Informatics Research	2019
IEEE Transaction on Biomedical Engineering	2005

Educational Activities

Lecturer, Machine Learning, Advanced Biostatistics	2022-
Lecturer, Statistical Inference, Predictive Modeling, Population Health Informatics	2021-
Lecturer, Principles of Informatics/Principles of Data Science, Graduate/Undergraduate	2020-
Lecturer, Principles of Statistics and Decision Modeling, Graduate	2019-
Lecturer, Predictive Analysis and Data Mining, Graduate	2019-

Grants and Contract Awards

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

HCA CHARGE Consortium COVID Study
Aize Cao (PI).   03/2021 –
Developing Phenotype Adjustment Models for COVID-19 Disease Study

Completed projects that I would like to highlight include:

Veterans Affairs HSR&D 2014-06-009D
Michael Matheny (PI).   2015-2019
Automatic Surveillance and Intervention among Patient with Liver Cirrhosis

VINCI (VA HSR&D RES-13-457)
Scott DuVall (PI). 2016-2020
National Veteran Health Administration (VHA), VINCI (VA Informatics and Computing Infrastructure) OMOP Common Data Model, ETL and QA.

1C1CMS330979
Robert Dittus (PI), 2013-2015
CMS: My Health Team: Regional Team-Based & Closed Loop Control Innovation Model for Ambulatory Chronic Care Delivery

R01 NS049251, 2005-2007
Michael I Miga (PI), NINDS: Multimodal Registration of the Brain's Cortical Surface, postdoc.

Publications
Refereed Journal Publications

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. 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

4. Fern FitzHenry, Svetlana K. Eden, Jason Denton, Hui Cao, **Aize Cao**, Ruth Reeves, Guanhua Chen, Glenn Gobbel, Nancy Wells, and Michael Matheny, 'Prevalence and Risk Factors for Opioid-Induced Constipation in an Older National Veteran Cohort', *Pain Research and Management*, 2020.

5. Jejo D. Koola, Sam B. Ho, **Aize Cao**, Guanhua Chen, Amy M. Perkins, Sharon E. Davis, Michael Matheny, 'Prediction 30 day hospital readmission risk in a national cohort of patient with cirrhosis', *Digestive Diseases and Sciences*, 2020(65), 1003-1031

6. Kristine E. Lynch, Stephen A. Deppend, Scott L. DuVall, Benjamin Viernes, **Aize Cao**, Daniel park, Elizabeth Henchrow, Kushan Hewa, Michael Matheny, 'Incrementally transforming electronic medical records into the OMOP common data model: A multidimensional quality assurance approach', *Applied Clinical Informatics,* 2019 10(5), 794-803

7. Sunil Kripalani, Guanhua Chen, Philip Ciampa, Cecelia Theobalk, **Aize Cao**, Megan McBride, Robert S. Dittus, 'A transition care coordinator model reduces hospital readmissions and costs', *Contemporary Clinical Trials*, 2019, June, 81:55-61.

8. Joseph Boyle, Ted Speroff, Katie Worley, **Aize Cao**, Kathryn Goggins, Robert S. Dittus, Sunil Kripalani, 'Low health literacy is associated with increased transitional care needs in hospitalized patients', *Journal of Hospital Medicine*, 12(11): 918-924, 2017

9. Jacqueline A. Clauss, April I. Seay, Ross M.Vanderklok, Suzanne N. Avery, **Aize Cao**, Ronald L. Cowan, Margaret M. Benningfield, and Jennifer U. Blackford, 'Structural and functional bases of inhibited temperament', *Social Cognitive and Affective Neuroscience Advance Access,* 9: 2049-2058, 2014.

10. Xulei Yang, **Aize Cao**, Qing Song, Gerald Schaefer, Yi Su, 'Vicinal support vector classifier using supervised kernel-based clustering', *Artificial Intelligence in Medicine*, 60(3): 189-196, 2014.

11. Carissa J Cascio, Jennifer H Foss-Feig, Jessica Heacock, Kimberly B Schauder, Whitney A Loring, Baxter P Rogers, Jennifer R Pryweller, Cassandra R Newsom, Jurnell Cockhren, **Aize Cao**, Scott Bolton, 'Affective neural response to restricted interests in autism spectrum disorders', *Journal Child Psychol Psychiatry,* 2014, 7:55(2): 162-71

12. 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, 'Cannabis cue-induced brain activation correlates with drug craving in limbic and visual salience regions: preliminary results', *Psychiatry Research: Neuroimaging*, 214(2): 122-131, 2013

13. Tristan J Watkins, Vidya Raj, Junghee Lee, Mary S Dietrich, **Aize Cao**, Jennifer U Blackford, Ronald M Salomon, Sohee Park, Margaret M Benningfield, Christina R Di Iorio, Ronald L Cowan, 'Human ecstasy (MDMA) polydrug users have altered brain activation during semantic processing', *Psychopharmacology (Berl)* 2013, 227(1): 41-54.

14. Laurie E.Cutting, Amy C.Stephens, K.R.Pugh, Scott Burns, **Aize Cao**, G.J.J.Pekar, Nicole Davis, and Shryl L.Rimrodt, 'Not All Reading Disabilities are Dyslexia: Distinct Neurobiology of Specific Comprehension Deficits', *Brain Connectivity*, 3(2):199-211, 2013.

15. Carissa Cassio, Jennifer Foss Feig, Ronald Cowan, Margaret Benningfield, Baxter Rogers, **Aize Cao**, 'Response of neural reward regions to food cues in autism spectrum disorders', *Journal of Neurodevelopmental Disorders,* 4(1), 2012.

16. Christina R. DiIorio, T.J. Watkins, Mary S. Dietrich, **Aize Cao**, Jennifer U. Blackford, Baxter Rogers, Mohammed S. Ansari, Ronald M. Baldwin, Rui Li, Robert M. Kessler, Ronald M. Salomon, Margaret Benningfield, Ronald Cowan, 'Evidence for Chronically altered serotonin function in the cerebral cortex of femal 3,4-Methylenedioxymethamphetamine polydrug users', *Archives of General Psychiatry*, 69(4): 399-409, 2012.

17. L. Bauernfeind, M.S Dietrich, J.Blackford, E. J. Charboneau, J. G. Lillevig, C.M.Cannistraci, N.D.Woodward, **Aize Cao**, Ronald L. Cowan, 'Human ecstasy use is associated with increased cortical excitability: an fMRI study', *Neuropsychopharmacology,* pp. 1127-1141, 2011.

18. P. Dumpuri, R. C. Thompson, **Aize Cao**, S. Ding, I. Garg, B. M. Dawant, M. I. Miga, 'A fast and efficient method to compensate for brain shift during surgery', *IEEE Trans. On Biomedical Engineering,* Vol.57, No.6, pp. 1285-1296, 2010.

19. X. L. Yang, Q. Song and **Aize Cao**, 'A novel pruning approach for robust data clustering', *Neural Computing and Applications*, Vol. 18, pp 759-768, 2009.
20. S. Ding, M. I. Miga, J. H. Noble, **Aize Cao**, P. Dumpuri, R. C. Thompson, B. M.Dawant, 'Semi-automatic registration of pre- and post-resection laser range scanner images', *IEEE Trans. On Biomedical Engineering (TBME),* Vol. 56, pp 770-780, 2009.
21. **Aize Cao,** R. C. Thompson, P. Dumpuri, B. M. Dawant, S. Ding, and M. I. Miga, 'Laser range scanning for image-guided neurosurgery: Investigation of image-to-physical space registrations', *Medical Physics*, Vol. 35, No. 4, pp. 1593-1605, 2008.
22. **Aize Cao,** Q. Song, and X. L. Yang, 'Robust Information Clustering for Automatic Breast Mass Detection in Digitized Mammograms', *Computer Vision and Image Understanding,* Vol. 109, pp. 86-96, 2008.
23. XuLei Yang, Qing Song, Yue Wang, **Aize Cao**, Yi-Lei Wu, 'A Modified Deterministic Annealing Algorithm for Robust Image Segmentation', *Journal of Mathematical Imaging and Vision*. 01/2008; 30:308-324
24. P. Dumpuri, R. C. Thompson, B. M. Dawant, **Aize Cao,** M. I. Miga, 'An atlas-based method to compensate for brain shift: Preliminary results', *Medical Image Analysis*, Vol.11, No. 2, pp.128-145, 2007
25. X. L. Yang, **Aize Cao**, Q.Song, 'A New Cluster Validity for Data Clustering', *Neural Processing Letters,* , 2007

Published Abstracts and Presentations
1. **Aize Cao**, Arielle Fisher, Russell Poland, Todd Gary. (2022**)** Developing a Risk Prediction Model for 30-Day Readmission after Hospitalization from COVID-19**.** AMIA Annual Symposium.
2. **Aize Cao**, Arielle Fisher, Russell Poland, Todd Gary. (2022) Influence of race/ethnicity and a substance use disorder on 30-day readmission rates in patients hospitalized with COVID-19**.** IAPHS conference, panel discussion.
3. **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
4. 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
5. **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
6. Jejo Koola, **Aize Cao**, G. Chen, Amy Perkins, Samuel B. Ho, Sharon Davis, Michael Matheny, 'Machine Learning Models to Predict Readmission for Patients with Cirrhosis', *AMIA*, 2017
7. Jejo Koola, G. Chen, Amy Perkins, **Aize Cao**, John Denver, Michael Matheny, Samuel B. Ho, 'Algorithm for identification of patients at high risk for cirrhosis from administrative data', *AASLD*, 2017
8. Jejo Koola, **Aize Cao**, Amy M. Perkins, Guanhua Chen, Samuel B. Ho, Michael E. Matheny, 'Post-discharge mortality in a national cohort of Veterans Affairs patients with cirrhosis', *American Association for the Study of Liver Disease*, Boston, 2016
9. Fern Fitzhenry, Svetlana K. Eden, Jason Denton, Robert J. LoCasale, Hui Cao, **Aize Cao**, Ruth Reeves, Nancy Wells, Michael Matheny, 'Informatics challenges in working with "big data" – a use case in identifying predictors of constipation', *AMIA*, Pittsburgh, 2016
10. **A. Cao**, M. I. Miga, P. Dumpuri, S. Ding, B. M. Dawant, R. C. Thompson, 'Target error for image-to-physical space registration: Preliminary clinical results using laser range scanning', *Medical Imaging 2007: Visualization and Image-Guided Procedures: Proc. of SPIE*, 2007
11. **A. Cao**, P. Dumpuri, and M. I. Miga, 'Tracking cortical surface deformations based on vessel structure using a laser range scanner', *International Symposium on Biomedical Imaging*, 2006
12. XuLei Yang, **Aize Cao**, Qing Song: Image Segmentation by Deterministic Annealing Algorithm with Adaptive Spatial Constraints. ISNN (2) 2006: 504-510

13. XuLei Yang, Qing Song, **Aize Cao**, Sheng Liu, Chengyi Guo:Robust c-shells based deterministic annealing clustering algorithm. *FUZZ-IEEE* 2004: 1413-1417
14. **Aize Cao**, Qing Song, XuLei Yang, Lei Wang:Breast Mass Segmentation based on Information Theory. *ICPR (3)* 2004: 758-761
15. **Aize Cao**, Qing Song, XuLei Yang, Sheng Liu:Breast Mass Segmentation on Digital mammograms by a Combined Deterministic Annealing Method. *ISBI* 2004: 1303-1306

Oral Presentations

Institutional review board, Meharry Annual Regulatory Affairs Research Symposium   11/2023
Racial differences among pregnant and postpartum women with substance use disorders in residential treatment at a HBCU academic mental health center, Black Psychiatrists of America   3/2023
Evidence based racial and ethnic disparity studies, UTHSC CBMI Lecture Series in Population and Precision Health   1/2023
Amygdala volume and shape, VUIIS Neuroimaging Seminar   4/2011
Reducing head movement during fMRI using real-time feedback training in the mock scanner, Neuroimaging Seminar, VUMC VUIIS   10/2010
Target error for image-to-physical space registration: Preliminary clinical results using laser range scanning', *SPIE*
          2007

Professional Community Activities

Reviewer for American Medical Informatics Summit   2023-
Reviewer for American Medical Informatics Annual Conference   2022-
Reviewer for Applied Clinical Informatics   2019-2020
Reviewer for Journal of Biomedical and Health Informatics   2016
Reviewer for IEEE Transaction on Medical Imaging   2007-2008
Reviewer for IEEE Transaction on Biomedical Engineering   2005-2006