MATRIX AI CONSORTIUM FOR HUMAN WELLBEING

2021 Highlights
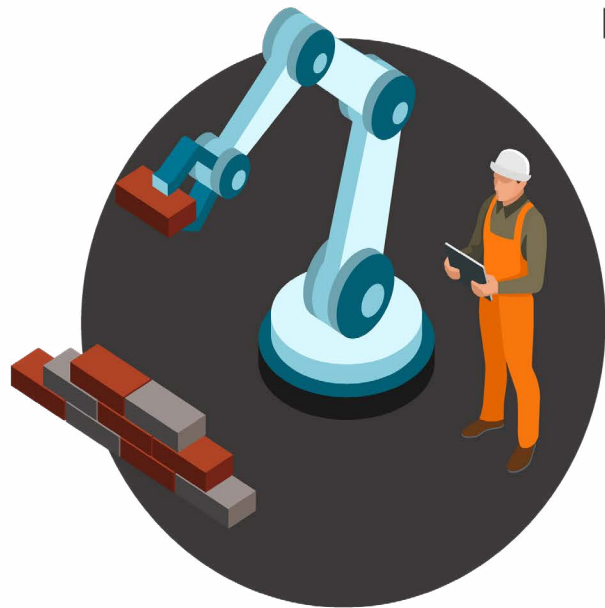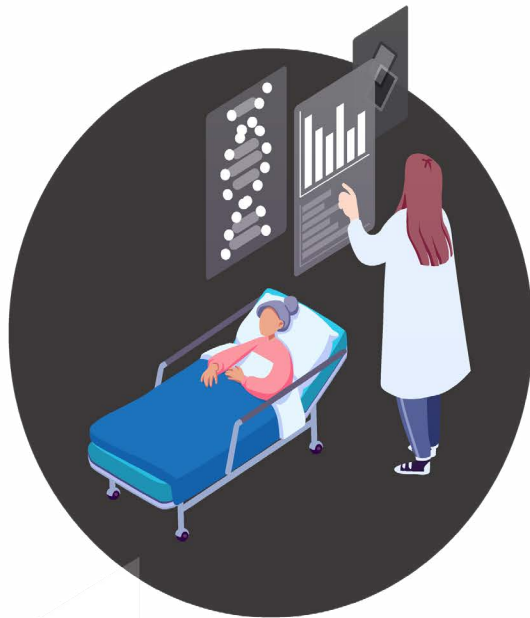
matrix — The UTSA AI Consortium for Human Well-Being

UTSA. CREATING **BOLD** FUTURES.

ABOUT MATRIX

The MATRIX AI Consortium for Human Well-Being is a transdisciplinary multi-stakeholder research enterprise that serves as a central hub for basic and applied AI research housed at UTSA. MATRIX's mission is to conduct transformative research in the design, use, and deployment of AI that enhances human life, and to offer rigorous research training opportunities that transcend disciplinary boundaries.

MATRIX consists of 65 researchers spanning across four collaborating organizations: UTSA, UT Health San Antonio, Southwest Research Institute, and Texas Biomedical Research Institute. MATRIX core researchers are recognized thought leaders.

Human well-being is the foundation of social, economic and political development and an investment in a safer, fairer and more prosperous world for humanity.

MATRIX AI Consortium

DIRECTOR'S NOTE

Dear Friends and Supporters,

MATRIX has recently turned one!

To commemorate our milestone year, we have compiled this annual report that celebrates the people we work with and demonstrates the various ways in which our research team is making a difference.

Over the past year, MATRIX has established several new partnerships that support interdisciplinary research locally, nationally, and internationally. Our core research thrusts are interdependent and we plan to amplify this through research outings, seminars, hands-on workshops, and hackathons. At MATRIX, we place creativity at the heart of everything we do and we see student participation as a crucial part of this innovation process.

Our team has published in flagship AI venues (e.g., IJCAI, ICML, CVPR, AAAI) and secured new research grants that transcend disciplinary boundaries. MATRIX has responded to the cascading and catastrophic effects of the COVID-19 pandemic, participated in AI R&D policymaking, and developed novel AI curricular programming.

In the coming years, MATRIX will continue to address the knowledge gaps in AI and pursue one of the grand challenges of the field --- i.e. to bridge the gap between natural and artificial intelligence.

Onward and Upward
Dhireesha
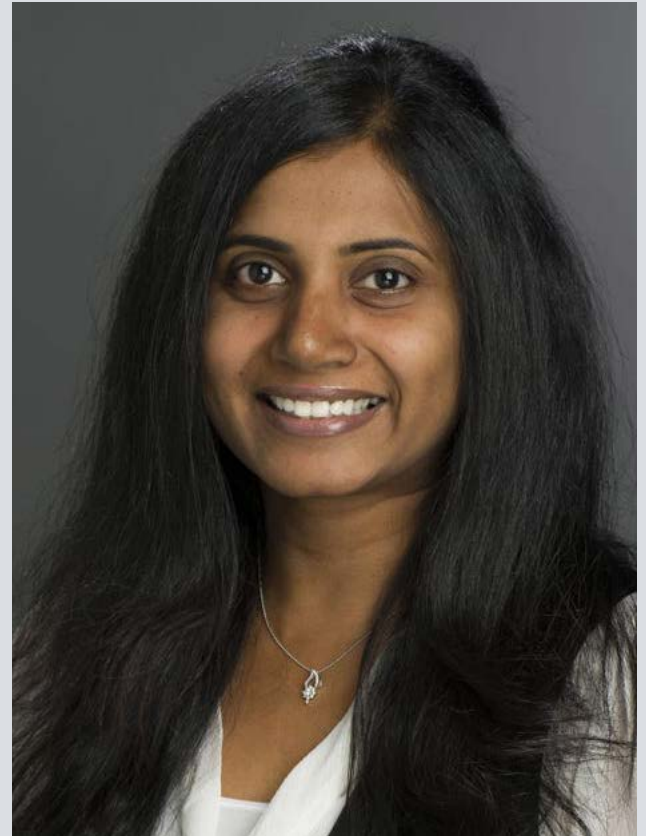
Dhireesha Kudithipudi, Ph.D.
Director of the AI Consortium

MATRIX AI Consortium

STAFF UPDATE

I am thrilled to have joined the MATRIX AI Consortium Team in June 2021. Despite the pandemic, our first year was filled with many action-packed events that elevated our mission. We are excited to share this annual report highlighting the research efforts, programs, and partnerships supported by the consortium.

This next year, we have big plans to continue our efforts and partner with the community as well as other academic institutions, government, and industry partners to advance human well-being. Looking forward to working with each and every one of you!

Adelante,
Stacy Cantu Pawlik

Stacy Cantu Pawlik
Director of Operations, Strategic Engagement, & Outreach Lead

MATRIX OVERVIEW

4
Research Thrusts

- Neuro-Inspired AI
- Augumenting Human Capabilities
- Trustworthy AI
- Machine Learning & Development

65+
Core & Affiliate Members

4
Core Partners

UTSA
The University of Texas at San Antonio™

SwRI®
SOUTHWEST RESEARCH INSTITUTE

TEXAS BIOMEDICAL
RESEARCH INSTITUTE

UT Health
San Antonio

THRUST LEADS

Peter Fox, MD
UT Health San Antonio

Amina Qutub, PhD
UTSA

Murtuza Jadliwala, PhD
UTSA

Ram Krishnan, PhD
UTSA

Fidel Santamaria, PhD
UTSA

Paula Shireman, MD
UT Health San Antonio

Douglas Brooks, PhD
SWRI

Gabriela Ciocarlie, PhD
UTSA

"Leading the Machine Learning and Deployment thrust in the MATRIX AI Institute has been a fantastic experience so far, both personally and professionally. I have made a lot of new friends on campus, and at the same time learnt a lot about the exciting research some of my colleagues are currently doing. Machine learning is a powerful tool to solve important problems and challenges in many different domains, and I am happy that the MATRIX Machine Learning and Deployment thrust is able to provide a collaboration platform to a diverse set of UTSA researchers!"
- Murtuza Jadliwala

"I am very excited to be a leading team member of the Machine Learning and Deployment thrust. My focus and passion are proving novel concepts via prototypes that are ultimately used in deployed solutions. MATRIX is fostering a collaborative environment that embodies multifaceted techniques to enable unique solutions to current and future challenges. As a thrust lead, I look forward to joint development opportunities to improve current Machine Learning approaches as well as discussions about foreseeable challenges that may lead us to innovation."
– Douglas Brooks

"Since joining UTSA in 2021, it has been my pleasure to be part of the MATRIX team and collaborate on bringing together different perspectives on how AI is used and evolved as part of the MATRIX seminar series. In such a short term, I also established new collaborations that are now developing into more concrete research directions toward AI-based cybersecurity and trustworthiness."
– Gabriela Ciocarlie

STUDENT ENGAGEMENT

Dr. Abdullah M. A. Zyarah

Dr. Peter Helfer

Seyed Hamed Fatemi Langroudi

Nicholas Soures

Tej Pandit

Fatima Tuz Zohora

Anurag Reddy Daram

Vedant Karia

Truman Hickock

Zacariah Carmichael

Tiffany Tran

Prativa Hartnett

Taylor Jones

At MATRIX:

We share a common vision to diversify the profession by cultivating a highly competent and inclusive AI workforce.
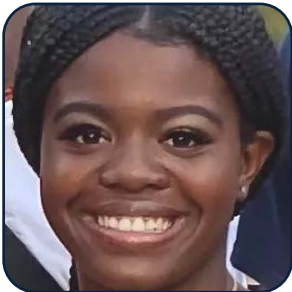
STUDENT ENGAGEMENT

Becky Mashaido

David Rodriguez

Zacharie Maloney

Sean Tritley

Tomisin Adebayo

Grace Polston

Elif Ozdemir Kaynak

Nisha Vinayaga Sureshkanth

Mohd Amjad Sabra

Raveen Wijewickrama

Kavita Kumari

Christian Bargraser

Josh Klopfenstein

The MATRIX mission:

- To conduct transformative research in the design, use, and deployment of AI that enhances human life
- To offer rigorous research training opportunities that transcend disciplinary boundaries.

MATRIX ADVISORY BOARD

Kim Branson, PhD
Senior VP and Global Head of Artificial
Intelligence and Machine Learning, GSK

Brian Dillard
Chief Innovation Officer, City of San
Antonio

Hava Siegelmann, PhD
Professor, UMASS
Ex-Program Manager, DARPA

Matthew Mattina
VP of Machine Learning, Tenstorrent

Michael Snyder, PhD
Director, Center for Genomics and
Personalized Medicine, Stanford

Gustavo Stolovitzky, PhD
Chief Science Officer, Sema4

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NOTABLE PROJECTS

$1M
NEXT GENERATION AI INFRASTRUCTURE
STARS

$1.48M
GENESIS: A NEUROMORPHIC CHIP WITH LIFE LONG LEARNING ON-DEVICE
Air Force Research Lab

$70K
PROJECT LOVELACE
Xilinx

$1.09M
BRAIN PROJECT: HISTORY DEPENDENCE IN THE NERVOUS SYSTEM
NIH

$18M
ADVANCED CAPABILITIES FOR CYBER RESILIENT & ASSURED MISSIONS
US Air Force

$150K
ARNIE: AUTONOMOUS RECONFIGURABLE NEURAL INTELLIGENCE AT THE EDGE
Sandia National Labs

$136K
NEXT-GENERATION SPARSE NEUROMORPHIC ARCHITEXTURES FOR THE EDGE
Seagate

NOTABLE SCHOLARSHIP

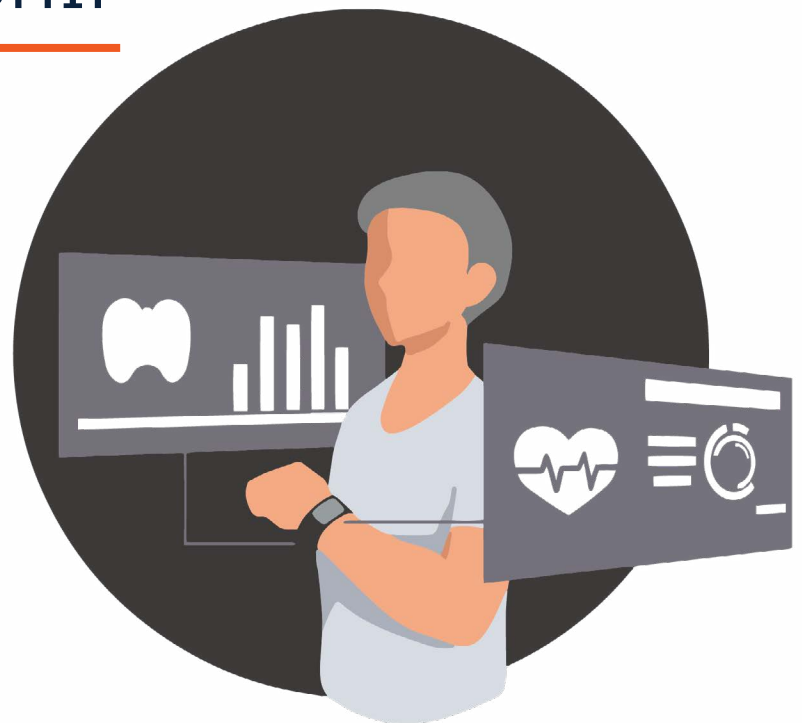**PUBLICATIONS AT PREMIUM AI VENUES (AY 2020)**
CVPR-W, ICML-W, IJCAI-W, IEEE Signal Processing, AAAI

INVITED PRESENTATIONS
DOE AMO, DOD, AFOSR, NRL, AI2C, ARL,DHS, Intel, Keck Foundation, NSF, AFOSR, DARPA

STUDENT MENTORING & ENGAGEMENT
ACM, ACM-W, IEEE, LatinX in AI Outreach

AI AS AN INCLUSIVE FIELD

"At MATRIX, we believe the AI workforce should mirror the rich diversity we have in society."

The AI designers we are training should mirror the rich diversity we have in the society. However, only 5% of the current AI workforce is from underrepresented groups.

MATRIX has a unique responsibility to shape the field, with > 65% of our student cohorts coming from underrepresented groups

UTSA. CREATING **BOLD** FUTURES.
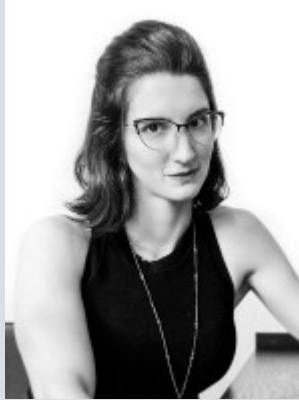
- Tomisin Adebayo | Advisor: Dr. Amina Qutub, Biomedical Engineering
- Nour Alharki | Advisor: Dr. Amina Qutub, Biomedical Engineering
- Raquel Britto | Advisor: Dr. Jiannan Cai, Construction Science
- Jenelle Millison | Advisor: Dr. Amanda Fernandez, Computer Science
- Lilianna Gutierrez | Advisor: Dr. Debaditya Chakraborty, Construction Science
- Van Ngo | Advisor: Dr. Yongcan Cao, Electrical and Computer Engineering
- Tiffany Tran | Advisor: Dr. Dhireesha Kudithipudi, Electrical and Computer Engineering

AI AS AN INCLUSIVE FIELD

Since the inception, in Spring 2021, Project Lovelace is offering young women in STEM fields to engage in AI related research and curricular activities.

The faculty advisors are from four different departments. The fellows are participating in a variety of programming, including the MATRIX AI seminar series and workshops intended to build collaborative mentorship relationships with female AI scientists (Tinker with an AI Scientist), as well as AI Hacks & Seminars with ACM & ACM-W.

In addition to these activities, fellows are completing an AI related research immersion experience within a MATRIX core faculty research lab. A list of fellows selected for Spring 2021 and their research mentors (affiliations) are provided left.

EDUCATIONAL ACTIVITIES

Seminar Series

MATRIX AI Consortium seminar is held every Fall & Spring. It features seminars by distinguished leaders in AI, representing subfields of —– algorithms, theory, systems, autonomy, medical AI, and accelerators. Notable past speakers include Dr. Farinaz Koushanfar, Dr. Ehsan Hoque, Dr. Pradeep Ravikumar, and our alumni Roland Green.

AI Bits & Bytes

Create custom hands-on AI learning modules with focus on societal impact, in collaboration with colleges.

Tinker with an AI Scientist

Pair industry/academic scientists with students for career-fitness.

AI & Quantum Symposium

Artificial Intelligence (AI) and Quantum Computing are transformational technologies that will fundamentally change how we observe, interpret, and interact with the world of data that surrounds us every day. MATRIX in partnership with MISI Dreamport and BigBear.ai, held a two day immersive symposium on the convergence of these two transformational technologies.
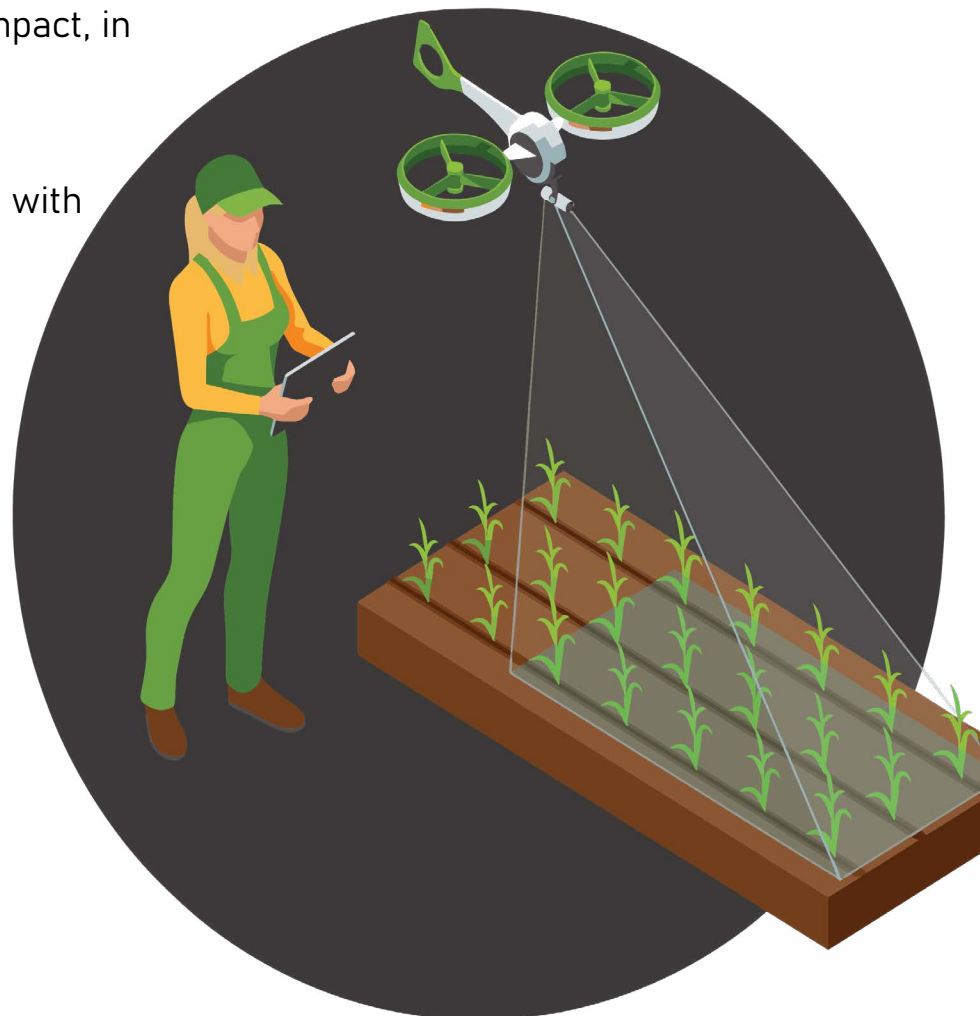
PARTNERSHIPS & COMMUNITY

MATRIX AI Sponsors
ACADEMIC + INDUSTRY + GOVERNMENT

MATRIX collaborates with many partners including ORNL, USAA, Dell, BigBearAI, MITRE, City of San Antonio, to advance our mission.

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ENGAGEMENT

- The Machine Learning & Deployment Thrust held a virtual get-together on July 9th, 2021 to discuss current goals and the overall vision of the thrust.

- MATRIX held its first Open House on November 5, 2021 where we showcased our transdisciplinary multi-stakeholder research enterprise that serves as a central hub for basic and applied AI research housed at UTSA.

- MATRIX members Paula Kay Shireman, Amina Qutub, Dhireesha Kudithipudi, and Mohamad Habes presented on Emerging AI Technologies for Inclusion of Underserved Populations at the Academic Data Science Alliance Virtual Meeting.

ACCOLADES & AWARDS

Kevin Desai | Computer Science | Awarded NSF CRII

Murtuza Jadliwala | Computer Science | Promoted to Associate Professor

Ram Krishnan | Electrical and Computer Engineering | Promoted to Associate Professor

Ethan Ahn | Electrical and Computer Engineering | Promoted to Associate Professor

Jiannan Cai | Construction Science | Awarded NSF ERI

Yanmin Gong | Electrical and Computer Engineering | Awarded NSF Career Award

CORE & AFFILIATE MEMBERS

CORE MEMBERS

Byron Hepburn, M.D.
UTHSCSA, School of Medicine,
Military Health Institute

Brian Kelley, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

John Quarles, Ph.D.
UTSA, COS, Computer Science

Pankil K Shah, M.D., MSPH, Ph.D.
UTHSCSA, Urology, Infectious
Diseases

Ian Caine, Ph.D.
UTSA, CACP, Urban Planning

Hakima Ibaroudene, M.S.
SwRI, Group Leader – R&D

Neda Norouzi, Ph.D.
UTSA, CACP, Architecture

Michael Rushforth, Ph.D.
UTSA, COLFA, Modern Languages
and Literatures

Jing Wang, Ph.D.
UTHSCSA, School of Nursing,
Nursing

David Akopian, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Ian Caine, Ph.D.
UTSA, CACP, Urban Planning

Joseph Houpt, Ph.D.
UTSA, HCaP, PsychologyDebaditya

Chakraborty, Ph.D.
UTSA, CACP, Construction Science

Adel Alaeddini, Ph.D.
UTSA, CEID, Mechanical
Engineering

Miltos Alamaniotis, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Taposh Banerjee, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Kiran Bhaganagar, Ph.D.
UTSA, CEID, Mechanical
Engineering

Yongcan Cao, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

David Chambers, M.S
SwRI, Principal Engineer

Diako Ebrahimi, Ph.D.
Texas Biomed, Host Pathogen
Interaction, Population Health

Juan Gutierrez, Ph.D.
UTSA, COS, Mathematics

Jaime Hincapie, Ph.D.
UTSA, COS, Geological Sciences

Yufang Jin, Ph.D.UTSA, CEID,
Electrical and Computer
Engineering

Max Kilger, Ph.D.
UTSA, COB, Data Analytics

Sushil Prasad, Ph.D.
UTSA, COS, Computer Science

Jeff Prevost, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Chunjiang CJ Qian, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Anthony Rios, Ph.D.
UTSA, COB, Information Systems
and Cybersecurity

Tulio Sulbaran, Ph.D.
UTSA, CACP, Construction Science

Eric Schlegel, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Hongjie Xie, Ph.D.
UTSA, COS, Geological Sciences

Mimi Xie, Ph.D.
UTSA, COS, Computer Science

Dakai Zhu, Ph.D.
UTSA, COS, Computer Science

Hongyi Zhu, Ph.D.
UTSA, COS, Geological Sciences

Jiannan Cai, Ph.D.
UTSA, CACP, Construction Science

Ethan Ahn, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Alfonso Apicella, Ph.D.
UTSA, COS, Biology

Erick Orlando Olivares Bravo,Ph.D.
UTSA, COS, Biology

Yidong Chen, Ph.D.
UTHSCSA, Biomedical Sciences,
Epidemiology & Biostatics

Kal Clark, M.D.
UTHSCSA, MARC, Radiology

Edward Golob, Ph.D.
UTSA, HCaP, Psychology

Mohamad Habes, Ph.D.
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Research Imaging Ctr

Jenny Hsieh, Ph.D.
UTSA, COS, Biology

Kevin Desai, PhD, UTSA, COS,
Computer Science

Leslie Neely, Ph.D.
UTSA, COEHD, Educational
Psychology)** ** Research Interest
in Augmenting Human Capabilities
and Neuro-inspired AI

Jeremy Nelson, Ph.D.
UTHSCSA, Military Health Institute

Jianhua Ruan, Ph.D.
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Francesco Savelli, Ph.D.
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Research Imaging Ctr

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Division of Pulmonary Diseases

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and Cyber Security

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Computer Engineering

Raghav Rao, Ph.D.
UTSA, COB, Information Systems
and Cyber Security

Paul Rad, Ph.D.
UTSA, COB, Information Systems
and Cyber Security

Ravi Sandhu, Ph.D.
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Wenbo Wu, Ph.D.
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and Cyber Security

Min Wang, Ph.D.
UTSA, COB, Management Science
and Statistics

Hongyi Zhu, Ph.D.
UTSA, COB, Information Systems
and Cyber Security

Guy Walsh
UTSA, NSCC

Claire Walton, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering / Math

AFFILIATE MEMBERS

Nicholas Asher, Ph.D
Toulouse, ANITI

Patrick Benavidez, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Rajendra Boppana, Ph.D.
UTSA, COS, Computer Science

Guneveve Chen, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Robert A. Clark, M.D.
UTHSCSA, Medicine, Microbiology,
Immunology & Molecular Genetics

Mario Flores, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Mo Jamshidi, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Mohamed Kaaniche, Ph.D.
Toulouse, ANITI
Kristian Kersting, Ph.D.
TU-Darmstadt, Department and
Centre for Cognitive Science

Nikita Ruparel, DDS, Ph.D.
UTHSCSA, Dental School,
Endodontics

Sudha Seshadri, M.D.
UTHSCSA, MARC, Neurology

Weiming Lin, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Michelle Zhang, Ph.D.
UTSA, CEID, Electrical and
Computer Engineering

Meredith Zozus, Ph.D., CCDM
UTHSCSA, Medicine, Clinical
Informatics

Jeffrey Howard, Ph.D.
Public Health UTSA

Max Kilger, Ph.D.
UTSA, COB, Information Systems
and Cyber Security, Marketing

MOVING FORWARD

MATRIX is joining forces with the City of San Antonio Research & Development League to collaborate on projects that have a clear benefit to the San Antonio community.

MATRIX will strengthen strategic partnerships with internal and external constituents.

Our vision is to strive for scientific excellence in AI research and develop holistic solutions that promote human well-being.

STAY IN TOUCH!

INTERESTED IN LEARNING MORE?
CHECK OUT OUR RESOURCES BELOW

AI.UTSA.EDU

@AI_UTSA

BIT.LY/MATRIXON
YOUTUBE