Nibraas Khan

+1 615-756-5508 | nnibraas@gmail.com | nibraaskhan.com

Nibraas | Nibraaska

Nashville, TN - 37216, USA

Education

- **Vanderbilt University** — *Dec 2023 - December 2025 Expected*
  Ph.D. Computer Science — Nashville, TN
- **Vanderbilt University** — *May 2020 - Dec 2023*
  M.S. Computer Science — Nashville, TN
- **Middle Tennessee State University** — *Aug 2017 - May 2020*
  B.S. Computer Science — Murfreesboro, TN

Experience

- **Vanderbilt University - Robotics and Autonomous Systems Lab** — *May 2020 - Present*
  Research Assistant — Nashville, TN
  - Architecting a semi-supervised temporal segmentation and clustering pipeline to learn a vocabulary of semantic motion primitives from multivariate IMU data, leveraging custom kernel-based change-point detection and density-based clustering with pairwise constraints to mitigate label scarcity.
  - Developing a model-agnostic, post-hoc hierarchical explainable AI framework for classifiers, generating multi-level explanations by quantifying concept-level feature statistics and modeling temporal concept dependencies to decode black-box model behavior.
  - Architecting an adaptive robotics-VR therapeutic game to counter apathy in older adults, where an agent personalizes cognitive and physical challenges by modeling user engagement states from multimodal VR tracking and physiological data.
  - Engineering a real-time behavioral precursor detection system for autism intervention using multimodal sensor streams (IMU, EDA), employing a prototypical few-show learning optimized with a weighted loss function to balance recall and precision in a high-stakes, imbalanced dataset.
  - Leading a team to develop a biomarker discovery and classification pipeline for mild cognitive impairment, extracting spatio-temporal gait features from IMU data during dual-task paradigms and using ensemble models to identify key biomechanical predictors of cognitive decline.
  - Designing a driver behavior analysis tool for individuals with ASD by adapting autonomous driving perception stacks, involving fine-tuning object detection models for gaze tracking and implementing inverse reinforcement learning to model driver decision-making.
  - Benchmarking semi-supervised and supervised learning models for affect detection from multimodal physiological signals (ECG, EDA), evaluating the generalization performance of deep learning approaches versus traditional models on public and lab-collected datasets.
  - Led and mentored 30+ students across multiple ML research projects, providing technical guidance on hyperparameter tuning for fine-tuning LLMs, implementing deep learning models for kinematic analysis, and developing multimodal fusion techniques for emotion recognition.
  - Technical Proficiencies: Python, C++, C#, PyTorch, TensorFlow, Unity, Git, Docker

- **JumpStart** — *Jan 2023 – Present*
  Co-Founder — Nashville, TN
  - Co-founded JumpStart to provide structured development opportunities for college students, connecting product owners with project managers and developers to create products.
  - Collaborated with multiple clients, including the Wond'ry at Vanderbilt, TRIAD, Freedom Co, and Nexus, delivering tailored solutions and facilitating student-led projects to meet client needs while promoting real-world experience for participants.
  - Recruited 20+ exceptional students from multiple universities, equipping them with a comprehensive framework to design and develop production-ready applications utilizing cutting-edge technologies such as AWS and React.
  - Managed program logistics to enhance operational efficiency and foster better engagement between students and business partners to ensure effective collaboration and project execution.

- **Map the System** *Sep 2024 – Nov 2024*
  Researcher Nashville, TN
  - Leading a team of four in a 10-week systems design project to analyze and map the systemic barriers preventing Nashville-based universities from sourcing from local small to medium-scale farmers.
  - Coordinating comprehensive systems analysis and stakeholder engagement, conducting in-depth interviews with farmers, chefs, university procurement officers, and wholesalers to identify and understand key pain points.
  - Designing strategic solutions and proposing technological platforms to enhance collaboration within the food supply system, aiming to integrate local produce into university supply chains at scale.

- **Social Changemakers** *Jan 2024 – Apr 2024*
  Researcher Nashville, TN
  - Collaborated with a team of 6 to investigate the challenges surrounding sustainable fashion in Nashville, focusing on identifying core issues and potential solutions.
  - Conducted interviews with various stakeholders, including local businesses, consumers, and sustainability advocates, to understand the barriers and lack of interest in sustainable fashion.
  - Applied insights gained from the project to implement sustainable fashion initiatives on Vanderbilt University's campus, promoting greater awareness and engagement with eco-friendly practices.

- **Develop for Good** *Jan 2023 – July 2023*
  Mentor Remote
  - Guided a diverse team of developers, designers, and project managers in creating an educational application for teachers in rural Africa, involving extensive client interaction to identify and address specific educational challenges.
  - Coordinated project phases from conception to development, ensuring alignment with client needs and project objectives.
  - Provided ongoing mentorship to students, assisting with both technical development aspects and client communication strategies.

- **MTSU's Phillip Lab** *August 2018 – May 2020*
  Research Assistant Murfreesboro, TN
  - Combined the Working Memory and N-task Learning toolkit to create the Partially Observable Non-Observable toolkit.
  - Worked on improving the Partially Observable Non-Observable Working Memory Toolkit by implementing dynamic features and neural network value transfer based on computational neuroscience models.

- **MTSU Mobile Team** *February 2019 – May 2020*
  Android Developer Murfreesboro, TN
  - Used Kotlin, Java, Picasso, Retrofit, and other tools to build the official Middle Tennessee State University android app for over 30,000 users.
  - Implemented Model, View, and View model architecture for modular design.

PUBLICATIONS

C=CONFERENCE, J=JOURNAL, S=IN SUBMISSION, I=IN PRESS, A=ARTICLE, X=ARXIV, M=MANUSCRIPT

[C.S] **Khan, N.**, Wang, D., Ghosh, R., Tauseef, M., Mion, L., Ma, M., Sarkar, N. 2025. *Decoding Human Motion: A Scoping Review of Explainable AI Methods in Movement Analysis*

[M] **Khan, N.**, Cole, K., Sarkar, N. 2025. *Explainable Deep Learning for IADL Activity Prediction in Mild Cognitive Impairment using Wearable Sensors*

[M] **Khan, N.**, Shragge, I., Zilinskaite, G., Plunk, A., Staubitz, J., Rajaraman, A., Weitlauf, A., Sarkar, N. 2025. *Interpretable Deep Few-Shot Learning for Prediction of Precursors to Challenging Behaviors in Individuals with Intellectual and Developmental Disabilities*

[J] Tate, J., Mion, L., Migovich, M., Ghosh, R., **Khan, N.**, Kilpatrick, A., Scharre, D., Newhouse, P., Maxwell, C., Tan, A., Sarkar, N. 2025. *A multi-site randomized clinical trial of socially assistive robots on engaging older adults with cognitive impairment residing in long-term care settings: A protocol paper*

[C] **Khan, N.**, Haan R., Shragge, I., Zilinskaite, G., Plunk, A., Staubitz, J., Rajaraman, A., Weitlauf, A., Sarkar, N. 2025. *A Universal Web-Based Tool for Multimodal Data Synchronization and Labeling*

[J] Tate J., Maxwell, C., Migovich, M., **Khan, N.**, Ghosh, R., Colopietro, K., Kilpatrick, A., Sarkar, N. 2025. *Factors Affecting Implementation of Socially Assistive Robots in Long-Term Care Facilities*

[C.S] Weitlauf, A., **Khan, N.**, Plunk, A., Sargent, A., Staubitz, J., Dieffenderfer, J., Sarkar, N. 2024. *Autistic User Input on Wearable Technology: Preliminary Feedback to Inform System Design*

[J.I] **Khan, N.**, Plunk, A., Zhaobo, Z., Adiani, D., Staubitz, J., Weitlauf, A., Sarkar, N. 2024. *Pilot Study of a Real-time Early Agitation Capture Technology (REACT) for Children with Intellectual and Developmental Disabilities*

[J.S] Ghosh, R., **Khan, N.**, Migovich, M., Tate, J., Maxwell, C., Latshaw, E., Newhouse, P., Scharre, D., Tan, A., Colopietro, K., Mion, L., Sarkar, N. 2024. *User-Centered Design of Socially Assistive Robotic Combined with Non-Immersive Virtual Reality-based Dyadic Activities for Older Adults Residing in Long Term Care Facilities*

[C] Wang, H., **Khan, N.**, Chen, A., Sarkar, N., Wisniewski, P., Ma, M. 2024. *MicroXercise: A Micro-Level Comparative and Explainable System for Remote Physical Therapy*

[C] **Khan, N.**, Tauseef, M., Ghosh, R., Sarkar, N. 2024. *A Novel Loss Function Utilizing Wasserstein Distance to Reduce Subject-Dependent Noise for Generalizable Models in Affective Computing* HCI

[A] Maxwell, C., Ghosh, R., **Khan, N.**, Migovich, M., Tate, J., Latshaw, E., Lorraine, M., Sarkar, N. *User-Centered Design for Socially Assistive Robotic Activities with Older Adults in Long Term Care* Innovation in Aging

[J] Wagner, L., Corona, L., Hooper, M., **Khan, N.**, Dixon, A., Lavanderos, A., Sarkar, N., Zheng, Z., Sarkar, N., Warren, Z. *Development of a Patient-Facing Mobile Health App to Track Family Access and Engagement with Early Intervention Services in Underserved Communities* INSAR

[J] Adiani, D., Breen, M., Migovich, M., Wade, J., Hunt, S., Tauseef, M., **Khan, N.**, Colopietro, K., Lanthier, M., Swanson, A., Vogus, T., Sarkar, N. *Multimodal Job Interview Simulator for Training of Autistic Individuals* RESNA

[A] Lorraine, M., Latshaw, E., Lin, Y., Migovich, M., Ghosh, R., **Khan, N.,** Sarkar N., Tate, J. *Participatory Design: An Essential Process For Socially Assistive Robotic Activities In Long-term Care Settings* Innovation in Aging

[X] **Khan, N.,** Sarkar N. 2022. *Semi-Supervised Learning for Stress Detection Using Physiological Data for Partially Labeled Data*

[C] **Khan, N.**, Ghosh, R., Migovich, M., Johnson, A., Witherow, A., Taylor, C., Schroder, M., Vongpanya, T., Sarkar, M., Sarkar, N. 2022. *Data Collection and Annotation Tool for Asynchronous Multimodal Data.*

[C] Ghosh, R., **Khan, N.**, Migovich, M., Wilson, D., Latshaw, E., Tate, J., Mion, L., Sarkar N. 2022. *Iterative User Centered Design of Robot-Mediated Paired Activities for Older Adults with Mild Cognitive Impairment (MCI).* Human Aspects of IT for the Aged Population. Technology in Everyday Living

[C] Migovich, M., Ghosh, R., **Khan, N.**, Tate, J., Mion, L., Sarkar, N. 2021. *System Architecture and User Interface Design for a Human-Machine Interaction System for Dementia Intervention*

[C] **Khan, N.**, Phillips, J. L. 2020. *Combined Model for Sensory-Based and Feedback-Based Task Switching: Solving Hierarchical Reinforcement Learning Problems Statically and Dynamically with Transfer Learning.*

[X] **Khan, N.**, Haan, R., Boktor, G., McComas, M. and Daneshi,R. 2020. *Steganography GAN: Cracking Steganography With Cycle Generative Adversarial Networks.*

[X] **Khan, N.**, Phillips J. 2020. *Combined Model for Partially-Observable and Non-Observable Task Switching: Solving Hierarchical Reinforcement Learning Problems Statically and Dynamically with Transfer Learning.*

POSTERS

[1] **Khan, N**., Ghosh, R., Migovich, M., Johnson, A., Witherow, A., Taylor, C., Schroder, M., Vongpanya, T., Sarkar, M., Sarkar, N. 2022. *Developing an Asynchronous Multimodal Data Data Collection and Annotation Tool*. Remote

[2] Ghosh, R., **Khan, N**., Migovich, M., Wilson, D., Latshaw, E., Tate, J., Mion, L., Sarkar N. 2022. *Designing Iterative User Centered Design of Robot-Mediated Paired Activities for Older Adults with Mild Cognitive Impairment*. Remote

[3] Migovich, M., Ghosh, R., **Khan, N**., Tate, J., Mion, L., Sarkar, N. 2021. *Dementia Intervention System Architecture and User Interface Design*. Remote

[4] Haan, R., Boktor, G., **Khan, N.**, Barbosa, S. 2020. *CookieBox- Fake News Classifier*. Remote

[5] **Khan, N.** and Phillips J. 2020. *Combined Model for Partially-Observable and Non-Observable Task Switching: Solving Hierarchical Reinforcement Learning Problems Statically and Dynamically with Transfer Learning* . Murfreesboro, TN

[6] **Khan, N.** and Phillips J. 2019. *Working Memory for Fully Autonomous Systems (Combined Model for partially observable and non-observable task switching*. Murfreesboro, TN

PROJECTS

- **Algorithmic Trading** *Aug 2022 - Present*

  Live Trading
  - Developing securities price prediction models by integrating machine learning techniques, including Reinforcement Learning, various networks, and Cuda for optimized performance.
  - Using QuantConnect to backtest and refine algorithms with high-quality data and rigorous statistical analysis.

Skills

- **Programming Languages:** Python, Typescript, Switft, C++, C
- **Data Science & Machine Learning:** Python, TensorFlow, PyTorch, Scikit-learn, Pandas, NumPy
- **Database Systems:** MongoDB, SQLite
- **Cloud Technologies:** AWS, Microsoft Azure, Google Cloud Platform
- **DevOps & Version Control:** Git, Docker, GitHub
- **Specialized Area:** Hardware and Software Integration, LLM Fine-Tuning, Predictive Modeling for Behavioral Health, Wearable Sensor Data Analysis
- **Mathematical & Statistical Tools:** MATLAB, R, Excel, SciPy
- **Other Tools & Technologies:** Xcode, Visual Studio, Jira, Trello, Notion
- **Research Skills:** Data Collection, Statistical Analysis, Machine Learning Model Development, Kinematic Analysis, Literature Review, Mentorship

Additional Information

Languages: Fluent in English, Conversational in Hindi and Urdu
Interests: Cooking, Boxing, Exploring restaurants