

# DVXR LAB (ROOM G152)

## HARDWARE

- WorldViz Projection VR Power Wall Pro
- 3D ultra-short throw laser projector
- Active optical motion tracking system
- Active 3D Glasses, WorldViz PPT-Eyes
- Head Mounted Displays (HMDs)
  - Microsoft HoloLens 2
  - Apple Vision Pro
  - Meta Quest 3, Quest 2, Quest Pro
  - Magic Leap 2
  - VIVE Pro 2 Full Kit
  - VIVE Focus 3
  - VIVE Focus 3 Facial Tracker & Eye Tracker
  - Oculus Rift S
- Specialized Devices
  - Galea (multimodal neural and physiological interface)
  - Emotive (EEG-based HMD integration)
  - MARA (augmented reality platform)
- VR Gloves
  - 5DT Data Glove 5 Ultra, RH
  - 5DT Data Glove 5 Ultra, LH
- Motion Detection
  - Virtual Cube Head Tracker
  - Microsoft Kinect
  - Wireless 6DOF tracked hand wand
- 3D Gaming Desktops
  - Alienware Aurora-R16 Gaming
  - NVIDIA® GeForce RTX™ 4070Ti SUPER, 16GB GDDR6X



Galea headset



Meta Quest3



Emotive



Hololense



Magicleap

## SOFTWARE

- Modeling & Animation
  - 3D Studio Max, Maya, Soft Image, Mudbox, SketchUp, Motion Builder, Blender
- VR Programming
  - Vizard 7, Unity 3D, Unreal, OpenGL
  - Microsoft Visual Studio
  - SteamVR
  - Varjo Base
- Game Programming
  - Game Maker Studio, JCreator, Eclipse
- OpenCBI



## GOAL

DVXR Lab advances innovative, impactful research in data visualization and XR (VR/AR/MR) by developing interactive systems, tools, and applications for education, games, and real-world domains such as healthcare, emergency response, and simulation. We foster interdisciplinary collaboration and introduce students to XR hardware and software, empowering them to apply these technologies in solving complex problems.

## MISSION

Our mission is to advance knowledge and innovation through the integration of immersive technologies, artificial intelligence, and data-driven methodologies. We develop XR-based simulations, digital twins, interactive analytics, and intelligent virtual agents to enhance education, professional training, and healthcare outcomes. Through interdisciplinary research and human-centered design, we strive to create transformative solutions that address complex real-world challenges & contribute to the future of learning and discovery.



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## CONTACT

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# DATA VISUALIZATION & EXTENDED REALITY LABORATORY



**Location: Room G152**

**DVXR LAB Website: <https://dvxr.unt.edu>**

## Research Areas

**Virtual Reality (VR) , Augmented Reality (AR)**

**Mixed Reality (MR), Extended Reality (XR)**

**Digital Twin (DT), Software Engineering (SE)**

**Data Science (DS), Data Visualization (DV)**

**Artificial Intelligence (AI), Virtual AI Tutor / AI Assistant**

**Health Informatics (HI), Brain Computer Interface (BCI)**

# RESEARCH PROJECTS

## AUGMENTED REALITY

### MOBILE AUGMENTED REALITY APPLICATION (MARA) FOR EMERGENCY RESPONSE AND EVACUATION

This research develops the science needed to enhance mobile augmented reality applications with (a) Situational awareness, (b) Navigation, (c) Evacuation, and (d) Emergency response. It promotes contextualized 3D visualizations, spatial knowledge acquisition and cognitive mapping by enhancing situational awareness.



### HOLOLENS APPLICATIONS FOR SPATIAL ANALYSIS, BUILDING EVACUATION, AND EMERGENCIES

Goal is to develop an interactive HoloLens-based training and simulation tool that models and guides optimal building evacuation procedures using real-time spatial awareness and pathfinding by overlaying 3D geospatial information.



## DIGITAL TWIN

### REAL-TIME INDOOR NAVIGATION USING AR FOUNDATION & FEATURE EXTRACTION (MARKER)

To integrate MR, AR, and Digital Twin technologies to create intelligent, context-aware systems that enhance situational awareness, improve safety, and support data-driven decision-making in immersive 3D environments.

### HUMAN BIOMECHANICS AND SQUAT ANALYSIS FOR REHABILITATION AND TRAINING.

Goal is to create a human digital twin using sensor data and machine learning for real-time biomechanics monitoring and feedback to improve exercise technique and reduce injury risk.



## VIRTUAL REALITY

### ACTIVE SHOOTER RESPONSE VR MODULES FOR TRAINING AND DECISION MAKING

An immersive Collaborative Virtual Environment (CVE) was developed for campus emergency response training, integrating computer-simulated AI agents with user-controlled autonomous agents. The system supports corner cave, head-mounted, and mobile platforms to provide realistic, interactive training for security personnel and occupants



### VIRTUAL AI TUTOR/ASSISTANT USING LLM

The goal of this project is to develop and evaluate an AI virtual tutor using generative AI for education, health assistance, evacuation, and navigation.



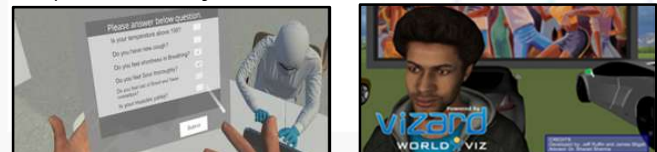
### MULTI-USER VIRTUAL REALITY ENVIRONMENTS FOR EMERGENCY EVACUATION DRILLS

This project develops CVE for conducting safe, realistic evacuation drills across diverse scenarios—including subway, airplane, school bus, night club, building, university campus, and MegaCity evacuations, as well as a fully simulated VR city.



### VIRTUAL REALITY INSTRUCTIONAL (VRI) MODULES FOR TEACHING, TRAINING, IMPROVING QUALITY OF CARE, AND PATIENT SAFETY

The goal of this project is to develop Virtual Reality Instructional (VRI) modules for teaching complex topics and providing training that enhances quality of care and patient safety.



## HEALTH INFORMATICS

### ENHANCING MENTAL HEALTH USING BRAIN COMPUTER INTERFACE (BCI) AND VR/AR

This project uses EEG-based neurotechnology from Galea and EMOTIV to develop real-time, personalized interventions for managing stress, anxiety, and depression. By combining machine learning with immersive VR/AR environments, it maps neural activity to emotional and cognitive states, enabling responsive mental health support.



### MANAGING STRESS AND ANXIETY FOR MENTAL HEALTH USING GENERATIVE AI

The project aims to develop a VRI training environment in Unity featuring generative AI-powered avatars for mental health support. It simulate mental health support, provide therapeutic guidance, and conduct mindfulness and cognitive behavioral exercises to improve realism and accessibility in mental health training.



## SOFTWARE ENGINEERING (SE)

### MODELLING AND SIMULATION OF HUMAN BEHAVIOR IN A MULTI AGENT SYSTEM

Two MAS and models are developed and evaluated namely AvatarSim and AvatarSim2. The AvatarSim model simulates building evacuation, airplane evacuation, and battlefield scenarios. Fuzzy logic is used in refining human emotional behavior.

### MOBILE APPLICATIONS FOR MENTAL HEALTH CARE MANAGEMENT AND YOGA-BASED EXERCISES

