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Ibrahim Tahmid, Ph.D.

Human-Centered AI | Eye Tracking | XR

https://iatahmid.github.io/portfolio
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- HCI researcher specialized in enhancing immersive data analysis experience with human-centered AI.
- 5+ years of research experience, prototyping and evaluating intelligent XR applications through behavioral studies.
- Published in peer-reviewed conferences and journals and presented findings to cross-disciplinary researchers around the world.

Education

Ph.D., Computer Science, *Virginia Tech, Adv: Doug Bowman & Chris North* — August 2019 — September 2025
Thesis: Toward AI-Mediated Immersive Sensemaking with Gaze-Aware Semantic Interaction
B.Sc., Computer Science, *Bangladesh University of Engineering and Technology (BUET)* — February 2013 — September 2017

Skills

HCI/UX	Statistical Modeling (Python, JMP), Qualitative Coding (Atlas.ti), Figma, Mixed-Methods Studies, Survey Design, Multi-Modal, Semi-Structured Interviews, Think-Aloud, Video Editing (Filmora)
XR Prototyping	Unity, Unreal, MRTK, MetaXR, MagicLeap SDK, OpenXR, C#, Python, AndroidXR

Professional Experience

Graduate Research Assistant, 3D Interaction Group, Virginia Tech — **August 2019 — Present**
Responsibilities: End-to-end project delivery, Stakeholder presentations, Design guidelines, Literature reviews, User studies

Lead, Gaze-Aware Recommendation Agent for AI-Mediated Immersive Sensemaking | IUI 25 (acceptance=26%)
Prototype Demo | *Skills: Unity, C#, Eye-Tracking, OpenXR, Python, Statsmodels, Mixed-Effects Modeling, Qualitative, End-to-end*

- Designed and implemented a **gaze-driven recommendation system** in mixed reality, using eye-tracking to predict user interest and guide information foraging. Developed the XR application from scratch with iterative feedback from stakeholders.
- Conducted a user study (N=26) with Meta Quest Pro to evaluate gaze-aware interaction, showing that gaze-driven predictive cues **made users 28% more efficient**, by avoiding distractions and focusing on relevant information in a cluttered space.
- Developed and **published design guidelines** for gaze-based visual cues for human-centered AI systems in XR analytics.

Lead, Gaze-Aware Annotation Cues for Asynchronous Collaboration | TVCG (under review)
Skills: Unity, C#, Eye-Tracking, OpenXR, Python, Statsmodels, Plotly, Mixed-Effects Modeling, Qualitative, End-to-end

- **Designed and implemented 2 types of gaze-derived annotation techniques** for XR analytics, enabling users to mimic an expert's analysis pattern even without any explicit instructions from the expert.
- **Collaborated with professional analysts at DoD** to collect data and gain understanding of professional analyst's behavior.
- Conducted a multi-session study (N=44), showing how the **smart annotations reduced user's task load** while making them more efficient at synthesizing information in complex dataset.

Lead, Feasibility of Utilizing Gaze to Predict User's Intent for Complex Datasets | ISMAR 23 (acceptance=23%)
Prototype Demo | *Skills: Unity, C#, Eye-Tracking, MRTK, HoloLens 2, AR, Python, Statsmodels, Plotly, Qualitative, End-to-end*

- **Developed GazeScore, a novel gaze-based prediction metric** for AR that anticipates user's interest during data analysis with complex datasets, overcoming frequency bias and length bias.
- **Built and deployed an AR prototype on HoloLens2** with integrated eye and hand tracking, enabling users to browse, annotate, and organize documents in a large space with hand gestures.
- Conducted a user study (N=12) to demonstrate GazeScore's ability to reliably predict user's perception of the dataset with 90% precision, laying down the **foundation for real time intelligent assistant** in AR data analytics.

Lead, Semi-Automated Clustering for Organizing Documents in XR | ISMAR 22 (acceptance=21%)
Prototype Demo | *Skills: Unity, C#, Varjo, VR, Python, Statsmodels, Plotly, Qualitative, End-to-end*

- **Designed and implemented semi-automated clustering techniques** for XR analytics to balance automation with user control.
- Conducted a user study (N=27) comparing 3 levels of automation, showing that **semi-automated clustering was preferred by 70%+ users** for its speed, efficiency, and ease of use.
- Delivered design insights for human-AI collaboration in XR, **highlighting trade-offs between convenience, control, and creativity** while integrating human-centered AI agents in XR workspaces.

Lead, Collaboration in XR Workspace with Synchronous and Asynchronous Awareness | Finalist, ISMAR 23 Design Contest
Prototype Demo | *Skills: Unity, C#, Quest Pro, MR, PUN2, Networking, Azure PlayFab, Python*

- **Designed and developed a cross-reality collaborative system** that integrated AR, VR, and desktop into a shared workspace, supporting synchronous, colocated, remote, and asynchronous collaboration.

- **Implemented networked hand gestures and cross-device interactions** in Unity (PUN2) to improve awareness of collaborator presence and actions across realities.
- Led a mixed-methods user study (N=32), revealing that **collaborators are more active in uniformly shared workspaces** (everyone in VR) than in hybrid AR-VR settings, informing design trade-offs for cross-reality teamwork.

Co-Lead, Optimizing 3D User Interfaces for Multi-Modal Interactions | Under Review

Skills: Unity, C#, Multi-Modal Inputs, Magic Leap 2, Python

- Designed and validated predictive models for 3D interaction performance, enabling data-driven comparison and **optimization of multi-modal (gaze+pinch, controller+blink) input methods** in immersive interfaces.
- Led user studies to benchmark interaction models, achieving **prediction accuracy of up to 94%** and uncovering actionable insights to improve interface design for 3D environments.

Co-Lead, Pointing Ray Techniques for Outdoor Collaboration in AR | TVCG 22 (acceptance=21%)

Skills: Unity, C#, HoloLens2, Networking, Python

- Designed and implemented pointing ray visualization techniques (Double Ray, Parallel Bars) for model-free outdoor collaborative AR on HoloLens 2, addressing challenges of distant object referencing without environment models.
- Developed a synchronization method for wide-area outdoor AR, aligning two users 70 meters apart into a shared spatial frame of reference using Unity, Vuforia, and Photon networking.
- Conducted an ecologically valid user study (N=32) outdoors, revealing trade-offs between pointer workload and observer accuracy, and providing design insights for collaborative AR interaction at scale.

XR UX Designer, Gesture-Based 3D User Interface for Learning Math | Finalist, IEEEVR 3DUI 2024

Prototype Demo | *Skills: Unity, C#, OpenXR, Quest 2, Novel 3D Interaction, Game Development*

- Built The Alchemist, a VR learning experience where children practice math operations through immersive storytelling.
- Developed four custom operator gestures (addition, subtraction, multiplication, division) mapped to controller movements, creating an intuitive embodied interface for fun and engaging arithmetic practice.

XR UX Designer, Authentication in XR with Hook on the Go-Go Technique | Finalist, IEEEVR 3DUI 2023

Prototype Demo | *Skills: Unity, C#, OpenXR, Quest 2, Novel 3D Interaction, Game Development*

- Built an immersive VR authentication system in Unity (OpenXR) that used virtual environment assets as security tokens, enabling personalized and obfuscated authentication sequences.
- Designed and implemented the Hook-On-Go-Go (HOG) interaction technique, combining growing-arm raycasting with heuristic object hooking for efficient and secure token selection.
- Developed a mystery-solving mini-game to showcase the authentication method in an engaging VR experience.

XR UX Designer, Interactive VR Game with Modified Go-G0 and WiM Techniques | Winner, IEEEVR 3DUI 2022 (out of 11 finalists)

Prototype Demo | *Skills: Unity, C#, OpenXR, HTC Vive Pro, User Experience, Storytelling, Game Development*

- Developed an immersive VR game in Unity with gamified mechanics to raise awareness of ocean pollution while showcasing novel 3D interaction techniques.
- Implemented ReX Go-Go, an enhanced Go-Go technique combining X-Ray vision and relative mapping for precise selection of occluded and/or cluttered objects.

XR UX Designer, Interactive VR Storytelling to Explain COVID-19 Vaccine Delivery | Winner, IEEEVR 3DUI 2021 (out of 17 finalists)

Prototype Demo | *Skills: Unity, C#, OpenXR, HTC Vive Pro, User Experience, Storytelling, Game Development*

- Built an interactive VR storytelling application in Unity with custom 3D user interfaces (nanobot navigation, APC identification, vaccine delivery slingshot) to provide an engaging gaming experience while learning complex scientific theories.
- Integrated cinematic techniques into VR by developing dynamic camera view switching (1st and 3rd person).

Engineering Intern, XR Systems, Qualcomm **May 2025 — August 2025**

Skills: C++, ADB, AndroidXR, OpenXR, Eye-Tracking, Foveated Rendering, Python, Qualitative, Study Design

- Analyzing the latency distribution in the life of an eye-tracked frame in AndroidXR and showcasing findings with novel visualization techniques. Streamlined the workflow of optimizing eye-tracked foveation rendering, reducing up to 75% workload.
- Designed and led a study evaluating the effects of inaccuracy, latency, and frequency of ET camera on the foveated image quality.

Scholar Intern, Lawrence Livermore National Lab **June 2022 — August 2022**
Skills: Unreal, Digital Twins, XR Collaboration, 3D Visualization Techniques

- Spearheaded a cross-disciplinary initiative to prototype XR workflows in Unreal Engine for collaborative defect detection in additive-manufacturing models.
- Devised and implemented three research-backed visualization/interaction paradigms (selective occlusion culling, layered transparency, and spatial annotations) that enable both synchronous and asynchronous inspection of 3D-printed models; tested the system with manufacturing engineers and presented results to executive stakeholders, paving the way for a multi-year research grant in partnership with Virginia Tech.

Full Stack Software Developer, Reve Systems **November 2017 — July 2019**
Skills: Android, Java, MySQL, Python, Spring Framework, PHP, JavaScript, CSS, Front-End, Web Development

- Led a cross-functional team in modernizing the legacy Android app experience with 1M+ downloads and 20K+ concurrent users; combined heuristic audits and in-app telemetry to drive design iterations that increased daily retention by 18%.
- Architected and optimized a MySQL data pipeline ingesting 50M+ user-interaction events per week, delivering real-time behavioral dashboards that fueled A/B experiments, cohort analyses, and evidence-based UX road-map decisions.

Teaching Experience

Teaching Assistant, *CS 3704: Intermediate Software Design and Engineering* Spring 2020, Fall 2020, Spring 2021
Teaching Assistant, *CS 3114: Data Structures and Algorithms* Fall 2019, Summer 2021, Fall 2021
Mentor, *Rehnuma Taskin (Undergrad), Ayush Roy (Ph.D.), Tanya Dinesh (Masters)* 2024-Present

Professional Service

Reviewer, *IEEE Virtual Reality, IEEE ISMAR, IEEE VIS, CHI, IUI* 2022-Present
Student Member, *Center for Human-Computer Interaction at Virginia Tech* 2020-2025
Student Member, *Sanghani Center for Artificial Intelligence & Data Analytics* 2020-2025
Poster Committee Member, *IEEE Virtual Reality* 2025
Technical Committee Member, *Artificial Intelligence and Virtual Reality* 2025
Consultant, *Cranwell International Center* May 2024 — May 2025
Ambassador, *Cranwell International Center* May 2023 — April 2024
Vice President, *Association for Bangladeshi Students* May 2022 — April 2023
President, *BUET Photographic Society* November 2016 — October 2017

Talks

Teaching the Fundamentals of Photography to the Community Virginia, March 2025
'Home Beyond Home' Photography Workshop organized by Cranwell International Center
Enhancing Immersive Sensemaking with Gaze-Driven Recommendation Cues Online, March 2025
30th International Conference on Intelligent User Interface, Cagliari, Italy.
Feasibility of Predicting Information Relevance During Sensemaking with Eye Gaze Data Sydney, October 2023
2023 IEEE International Symposium on Mixed and Augmented Reality
Enhancing Immersive Collaboration Across the Reality-Virtuality Continuum Sydney, October 2023
2023 IEEE International Symposium on Mixed and Augmented Reality
Evaluating Pointing Ray Techniques for Object Referencing in Model-Free Outdoor Collaborative AR Singapore, September 2022
Invited TVCG Talk at 2022 IEEE International Symposium on Mixed and Augmented Reality
Evaluating the Benefits of Explicit and Semi-Automated Clusters for Immersive Sensemaking Singapore, September 2022
2022 IEEE International Symposium on Mixed and Augmented Reality

Awards and Honors

Big Idea Winner VT CHCI Workshop, 2025
for proposing a detailed research pathway to ubiquitous context-aware XR
Funded by NSF Research Grant NSF SHREC, 2021-2025
for pursuing research on enhancing immersive sensemaking with rich semantic interaction
Aspire Winner Virginia Tech, 2024
for pursuit of building common ground through creative, thoughtful, and impactful projects

Pratt Fellowship Scholar Virginia Tech, 2024-25
fellowship for high-achieving Ph.D. candidates
Outstanding Event of the Year Virginia Tech, 2023
International Mother Language Day: Celebrating Linguistic Diversity with Innovative Initiatives Across the Campus
Best Contest Entry IEEE VR 2022
"Clean the ocean: An Immersive VR Experience Proposing New Modifications to Go-Go and WiM Techniques"
Best Contest Entry IEEE VR 2021
"Fantastic Voyage: Using Interactive VR Storytelling to Explain Targeted COVID-19 Vaccine Delivery"

Publications

Please see my Google Scholar page.