Shakiba Davari

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Expertise Area

Intelligent Augmented Reality (AR) Interface Design: My research interest lies in connecting my past research experience in applied machine learning (ML) and my current passion for AR interface design. I am a 3D interaction/interface designer, focusing on intelligent AR interfaces. I concentrate on different aspects of detecting AR user's context and utilizing it to adapt their AR interface. Such context-aware interfaces mitigate the existing challenges of AR, such as real-world occlusion and social intrusiveness, while providing more reliable and efficient information access and interaction in AR.

Education

PhD., Computer Science	**Virginia Tech**	**2018-Present**
Dissertation Topic: Intelligent Augmented Reality Interfaces		*Expected Graduation: May 2024*
MSc., Computer Science		
Specialization: Human Computer Interaction (HCI) *(Degree received)*	**Virginia Tech**	**2018-2020**
Specialization: Computational Perception and Robotics	**Georgia Tech**	**2017-2018**
BSc., Computer Engineering *(Degree received)*	**SBU, Iran**	**2010-2014**

Relevant Research Experience

Graduate Research and Teaching Assistant   **Virginia Tech**   **2018 Aug-Present**

Advisor: Doug A. Bowman

Applied a methodical approach based on a) consideration of end goals, features and challenges of AR, and b) in-depth review and analysis of existing AR interfaces, and context frameworks and taxonomies to:

- Propose a methodology for classification of AR interfaces and introduce Glanceable AR interfaces according to this classification [6].
- Propose a taxonomy of the design dimensions of AR interfaces [1].
- Propose a taxonomy of context, specifically tailored for capturing and inferring the intricacies and features crucial to effective intelligent AR interfaces [2, 4].
- Develop a framework for context-aware inference and adaptation tailored for the creation of intelligent AR interfaces [2, 4].

- Designed and developed a socially intelligent AR interface for HoloLens devices, incorporating face and speech recognition to customize the content and display of the information based on user's needs.
- Designed and conducted a user study on 36 participants to evaluate the effect of AR interfaces and context-awareness on the user experience and information access efficiency compared to mobile phones [3].

  Tools: Python, OpenCV, DNNs, Flask web app development, Unity Game Engine, Photon, MRTK

- Designed and implemented numerous 3D Interaction techniques and communicated results in the winning team of the best 3D User Interface award at the IEEEVR conference for two consecutive years.
- Led a team of 10 graduate and undergraduate students to design an immersive VR experience using passive haptics and everyday proxy objects [5, 7].

Research Scientist Intern   **Adobe Inc.**   **2022 May-Aug**

- Designed and developed 16 different AR interfaces for navigation through a large number of documents on iOS devices.
- Designed and conducted a preliminary survey on 8 participants to explore the effectiveness of these AR interfaces in multiple contexts.
- Utilizing the findings from the survey and iteratively applying the design cycle, selected the most promising candidate interfaces and implemented them for HoloLens devices.
- Designed and conducted a user study on 24 participants to evaluate the effectiveness of two different AR content placement strategies on document navigation in four contexts using a HoloLens2 device.
- Currently, analyzing the quantitative and qualitative data and preparing the manuscript for publication *[1]*.

  Tools: Apple ARKit, Swift, Adobe Aero, Unity Game Engine, MRTK, JMP

Research Intern   **Microsoft Inc.**   **2021 May-Aug**
- Designed and developed a new tool to leverage the potentials of <u>virtual monitors for assisting low-vision users.</u>
- Designed and conducted a <u>user study on 21 low vision participants</u>.
- Derived valuable <u>design suggestions</u> for enhancing the hardware and software aspects of virtual monitors tailored to the needs of the low vision population.   *Tools: Unity Game Engine*

Researcher   **Stanford University**   **2017-2018**
Designed and developed various <u>driving simulation scenarios</u> to gather driver data across diverse situations in a project Investigating the effect of leveraging human actions in autonomous cars.   *Tools: SimVista, SimCreator*

Investigated and developed various algorithms to automate the <u>flight path of *Unmanned Aerial Vehicles* (</u>UAVs) within dynamic construction sites, for efficient image capture *[8], in a project investigating automation of construction progress monitoring.*   *Tools: Python2, OpenCV, Pymunck*

Researcher   **University of Toronto**   **2015-2016**
Combined various <u>ML classification models</u> and developed a robust system to categorize construction site images into one of the five states indicative of the construction progress *[9], in a project investigating automation of construction progress monitoring*   *Tools: Python2, OpenCV*

Selected Honors & Awards

Invited Talk: "Context Aware Inference and Adaptation in Intelligent AR Interfaces"   [PERCxR* @ISMAR** 2022]
Best 3DUI Award   [IEEEVR 2020 & IEEEVR 2021]
Departmental Service Award   [CS Department @Virginia Tech 2020]
Grace Hopper Celebration of Women in Computing Scholarship   [Virginia Tech 2022] – [Virginia Tech 2021]
Inclusion, Diversity, and Accessibility Scholarship   [IEEEVR 2022]
ACM Capital Region Celebration of Women in Computing Scholarship   [Virginia Tech 2020]
Tapia Celebration of Diversity in Computing Scholarship   [Tapia Foundation 2020] – [Virginia Tech 2019] – [Georgia Tech-2017]

Selected Service Activities

Poster Chair   [ACM Spatial User Interaction (SUI) 2024]
Reviewer   [CHI 2021 & 2023] – [IEEEVR 2021 & 2022] – [ISMAR 2020 & 2021 & 2022] – [UIST*** 2022] – [AutomativeUI 2020]
President   [Virginia Tech Graduate Student Council 2020]
Vice President   [Virginia Tech Graduate Student Council 2019] – [Iranian Society at Virginia Tech 2018 to 2021]
Mentoring and Advising   [Danny Stover 2022-2023]

Selected Publications

[1] A taxonomy of AR design dimensions, and exploring the effect of AR content placement on document navigation, <u>S. Davari</u>, S. Petrangili, J. Hofswell, DA Bowman (<u>In-preparation for ISMAR 2024</u>)

[2] Intelligent AR: A Taxonomy of Context and a Design Framework, <u>S. Davari</u>, DA. Bowman (<u>In-preparation for ISMAR 2024</u>)

[3] <u>Validating the Benefits of Glanceable and Context-Aware Augmented Reality for Everyday Information Access Tasks</u>, <u>S. Davari</u>, F. Lu, and DA. Bowman, IEEEVR 2022, New Zealand, pp. 436-444

[4] <u>[DC] Context-Aware Inference and Adaptation in AR</u>, <u>S. Davari</u>, IEEEVR 2022, New Zealand, pp. 938-939

[5] <u>Integrating Everyday Proxy Objects in Multi-Sensory Virtual Reality Storytelling</u>, <u>S. Davari</u>, F. Lu, Y. Li, L. Zhang, L. Lisle, X. Feng, L. Blustein and DA. Bowman, Everyday Proxy Objects for Virtual Reality (EPO4VR) Workshop @ ACM CHI 2021

[6] <u>Occlusion Management Techniques for Everyday Glanceable AR Interfaces</u>, <u>S. Davari</u>, F. Lu, and DA. Bowman, WEVR @ IEEEVR 2020, USA, pp. 324-330

[7] <u>Save the Space Elevator: An Escape Room Scenario Involving Passive Haptics in Mixed Reality</u>, <u>S. Davari</u>, Y. Li, L. Lisle, F. Lu, L. Zhang, L. Blustein, X. Feng, B. Gabaldon, M. Kwiatkowski, D. A. Bowman, 2019 IEEEVR, Japan, pp. 1405-1406

[8] <u>UAV Mission Planning Using Swarm Intelligence and 4D BIMs in Support of Vision-based Construction Progress Monitoring and As-Built Modeling</u>, H. Hamledari, <u>S. Davari</u>, O. Sajedi, P. Zangeneh, B. McCabe, M. Fischer, Construction Research Congress 2018, USA, pp. 43-53

[9] <u>Automated computer vision-based detection of components of under-construction indoor partitions</u>, H. Hamledari, B. McCabe, <u>S. Davari</u>, Automation in Construction 2017, Vol 74, pp. 78-94

* PERCxR: Workshop on Perceptual and Cognitive Issues in xR   *** ACM Symposium on User Interface Software and Technology
** ISMAR: IEEE International Symposium on Mixed and Augmented Reality