

Shakiba Davari

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Research Interest

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 interfaces. 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

Dissertation Topic: Intelligent Augmented Reality Interfaces	Virginia Tech	2018-May 2024
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MSc., Computer Science

Specialization: Human Computer Interaction (<i>Degree received</i>)	Virginia Tech	2018-2020
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Specialization: Computational Perception and Robotics	Georgia Tech	2017-2018
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BSc., Computer Engineering

Major: Computer Hardware (<i>Degree received</i>)	Shahid Beheshti University, Iran	2010-2014
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Research Experience

Graduate Research Assistant

Virginia Tech

2018 Aug-Present

[Advisor: Doug A. Bowman](#)

Conceptual Framework Research:

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].

Socially Intelligent AR Interfaces:

- 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

Teamwork:

- Led a team of 10 graduate and undergraduate students to design an immersive VR experience using passive haptics and everyday proxy objects [5, 7].
- 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.
- Drill-AR: Facilitating drilling task at the Boeing Aircraft Company assembly line. Using Microsoft HoloLens, Drill-AR provided a simple AR UI that displays the drilling sequence on top of reality, speeding up the drilling process.
- OS-Level AR Interface: Designed and implemented a prototype of an AR Operating System Interface.

Research Scientist Intern

Adobe Inc.

2022 May-Aug

Intelligent AR Interfaces for Document Navigation:

- 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

Exploring the Benefits of Virtual Monitors for Low-vision Population:

- Designed and developed a new tool to leverage the potentials of virtual monitors for assisting low-vision users.
- Designed and conducted a user study on 21 low vision participants.
- Derived valuable design suggestions for enhancing the hardware and software aspects of virtual monitors tailored to the needs of the low vision population.

Tools: Unity Game Engine

* 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

Researcher	Stanford University	2017-2018
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Investigating the Effect of Leveraging Human Actions in Autonomous Cars:

Designed and developed various driving simulation scenarios to gather driver data across diverse situations.

Tools: SimVista, SimCreator

Exploring Automation of Construction Progress Monitoring Using UAVs:

Investigated and developed various algorithms to automate the flight path of Unmanned Aerial Vehicles (UAVs) within dynamic construction sites, for efficient image capture [8].

Tools: Python2, OpenCV, Pymunk

Researcher	University of Toronto	2015-2016
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Exploring Automation of Construction Progress Monitoring Using UAVs:

- Combined various ML classification models and developed a robust system to categorize construction site images into one of the five states indicative of the construction progress [9].

Tools: Python2, OpenCV

Online Assistive Technology Rating System for Caregivers:

- Automated web crawl and data extraction of target websites.

Tools: Selenium, Apache Nutch

Undergraduate Intern	ZIEP Technical Company, Isfahan, Iran	2013 Aug.-Jun.
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- Advanced programming projects

Tools: C++ and C# Programming

Teaching Experience

Graduate Teaching Assistant	Virginia Tech	2018 Aug-Present
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Department of Computer Science

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| • Introduction to Artificial Intelligence | Fall 2022 |
| • Introduction to Human-Computer Interaction and Usability Engineering | Spring 2021 |
| • Introduction to Artificial Intelligence | Fall 2020 |
| • Professionalism in Computing | Summer 2020 |
| • Professionalism in Computing | Spring 2020 |
| • Introduction to Artificial Intelligence | Fall 2018 |

Instructor	Shakhes Institute, Isfahan, Iran	2010-2012
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- Advanced programming workshops: C++, Python, VHDL, Verilog, C#

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Instructor	Science and Technology Centre, Isfahan, Iran	2008-2010
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- C++ programming
- RoboCup workshops

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 Exceptionally Talented Student in the Department of Engineering
SBU, Iran 2010-2014
- Fellowship in support of preparation for Iran's National University Entrance Exam
Ghavamchi Foundation, Iran 2006-2010
- Ranked 1st in Nationwide Programming Exam
Nationwide Sama High School, Iran 2009
- Ranked 3rd in Nationwide Math Exam
Nationwide Sama High School, Iran 2008
- Fellowship in Support of High School Education
Sama private High School, Iran 2006-2010

Service Activities

- Poster Chair
ACM Spatial User Interaction (SUI) 2024
- Reviewer
CHI 2021 & 2023
IEEEVR 2021 & 2022

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ISMAR 2020 & 2021 & 2022

UIST*** 2022

AutomotiveUI 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

Alexander Giovanelli 2021-2022

Daniel Manesh 2021-2022

- Judge, System Software and Intelligent Systems

Virginia State Science and Engineering Fair 2020

Virginia State Science and Engineering Fair 2022

- Member, The Association for Computing Machinery (ACM)

2019-Present

- Member, ACM's Council on Women in Computing

2019-Present

- Member, IEEE Computer Society

2019-Present

- Member, IEEE Young Professionals

2019-Present

- Member, Inspiring Women in Lifelong Leadership (I-WILL), Virginia Tech

2019-Present

- Member, Iranian Women in Computing (IranWiC), USA

2019-Present

Publications

Journal:

- [1] [A taxonomy of AR design dimensions, and exploring the effect of AR content placement on document navigation](#), S. Davari, S. Petrangili, J. Hofswell, DA Bowman (In-preparation for ISMAR 2024)
- [2] [Intelligent AR: A Taxonomy of Context and a Design Framework](#), S. Davari, DA. Bowman (In-preparation for ISMAR 2024)
- [3] [Automated computer vision-based detection of components of under-construction indoor partitions](#), H. Hamledari, B. McCabe, S. Davari, 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

- [4] [Automated Schedule and Progress Updating of IFC-Based 4D BIMs](#), H. Hamledari, B. McCabe, S. Davari, A. Shahi, Journal of Computing in Civil Engineering 2017, Vol 31, Issue 4. pp. 04017012:1-16

Conference:

- [5] [Validating the Benefits of Glanceable and Context-Aware Augmented Reality for Everyday Information Access Tasks](#), S. Davari, F. Lu, and DA. Bowman, IEEEVR 2022, New Zealand, pp. 436-444
- [6] [Exploration of Techniques for Rapid Activation of Glanceable Information in Head-Worn Augmented Reality](#), F. Lu, S. Davari, and DA. Bowman, in the ACM Symposium on Spatial User Interaction (SUI) 2021, 11 pages
- [7] [Glanceable AR: Evaluating Information Access Methods for Head-Worn Augmented Reality](#), F. Lu, S. Davari, L. Lisle, Y. Li and DA. Bowman, IEEEVR 2020, Atlanta, GA, USA. pp. 930-938
- [8] [UAV Mission Planning Using Swarm Intelligence and 4D BIMs in Support of Vision-based Construction Progress Monitoring and As-Built Modeling](#), H. Hamledari, S. Davari, O. Sajedi, P. Zangeneh, B. McCabe, M. Fischer, Construction Research Congress 2018, USA, pp. 43-53
- [9] [UAV-Enabled Site-to-BIM Automation: Aerial Robotic and Computer Vision-based Development of As-Built/As-is BIMs and Quality Control](#), H. Hamledari, S. Davari, E. Azar, B. McCabe, F. Flager, M. Fischer, Construction Research Congress 2018, Louisiana, USA, pp. 336-346
- [10] [Evaluation of computer vision-and 4D BIM-based construction progress tracking on a UAV platform](#), H. Hamledari, B. McCabe, S. Davari, A. Shahi, E. Azar, F. Flager, Proc., 6TH CSCE/ASCE/CRC International Construction Specialty Conference 2017, Vancouver, Canada, pp. CON106:1-10

Other (Workshop, Demo papers):

- [11] [\[DC\] Context-Aware Inference and Adaptation in AR](#), S. Davari, IEEEVR 2022, New Zealand, pp. 938-939
- [12] [Clean the Ocean: An Immersive VR Experience Proposing New Modifications to Go-Go and WiM Techniques](#), L. Lisle, F. Lu, S. Davari, I. A. Tahmid, A. Giovannelli, C. Ilo, L. Pavanatto, L. Zhang, L. Schlueter, DA. Bowman, IEEEVR 2022, Christchurch, New Zealand [Winner of the Best 3DUI Award]
- [13] [Fantastic Voyage 2021: Using Interactive VR Storytelling to Explain Targeted COVID-19 Vaccine Delivery to Antigen-presenting Cells](#), L. Zhang, F. Lu, I. A. Tahmid, S. Davari, L. Lisle, N. Gutkowski, L. Schlueter, DA. Bowman, IEEEVR 2021, Lisbon, Portugal [Winner of the Best 3DUI Award]

- [14] [Integrating Everyday Proxy Objects in Multi-Sensory Virtual Reality Storytelling](#), S. Davari, 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, 4 pages
- [15] [Occlusion Management Techniques for Everyday Glanceable AR Interfaces](#), S. Davari, F. Lu, and DA. Bowman, WEVR @ IEEEVR 2020, USA, pp. 324-330
- [16] [Get the job! An Immersive Simulation of Sensory Overload](#), L. Pavanatto, F. Lu, S. Davari, E. Harris, A. Folino, S. Imamov, S. Chekuri, L. Blustein, WS. Lages, DA. Bowman, IEEEVR 2020, Atlanta, GA, USA. pp. 509-510
- [17] [Save the Space Elevator: An Escape Room Scenario Involving Passive Haptics in Mixed Reality](#), S. Davari, Y. Li, L. Lisle, F. Lu, L. Zhang, L. Blustein, X. Feng, B. Gabaldon, M. Kwiatkowski, D. A. Bowman, IEEEVR 2019, Japan, pp. 1405-1406