Shakiba Davari

Email: sdavari@vt.edu Website: s-davari.github.io Green Card Holder

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**

MSc., Computer Science
Specialization: Human-Computer Interaction *(Degree received)* **Virginia Tech** **2018-2020**
Specialization: Computational Perception and Robotics **Georgia Tech** **2017-2018**

BSc., Computer Engineering
Major: Computer Hardware (Degree received) **Shahid Beheshti University, Iran** **2010-2014**

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

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Researcher **Stanford University** **2017-2018**

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, Pymunck

Researcher **University of Toronto** **2015-2016**

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.**

- Advanced programming projects

Tools: C++ and C# Programming

Teaching Experience

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

Department of Computer Science

- 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**

- Advanced programming workshops: C++, Python, VHDL, Verilog, C#

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Instructor **Science and Technology Centre, Isfahan, Iran** **2008-2010**

- 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

  Ghalamchi 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**
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
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

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[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, ER 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]

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[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

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