LIREZA BAHREMANI

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SUMMARY

My research interest is in digitizing shared human experiences. I have worked towards a vision of adaptive experiential frameworks with software-hardware olfactory and tactile frameworks, multi-sensory platforming for XR storytelling, and Al-assisted volumetric multimedia streaming pipelines. Outside of work, I enjoy drawing, reading, rock climbing, and chatting about gaming classics. **EDUCATION |** Arizona State University

•	Ph.D. Computer Engineering, LoA	Focus Area: Volumetric Data Streaming Systems	3.5 GPA	
•	M.S. Computer Engineering, May 2021	Focus Area: Digitized Olfactory and Tactile Sensations in XR	3.8 GPA	
•	B.S. Software Engineering, May 2018	Focus Area: Embedded Systems and Web Applications	3.9 GPA	

TECHNICAL SKILLS

Programming Languages: C, C#, C++, Java, Prolog, Python

Tools, Frameworks, SDKs, and Platforms: 3D Computer Vision (RGBD data, Open3D, OpenCV), ARKit, Unity (ARKit, ARFoundation, MLAPI, Timeline, XR), inter-process communication (RPC, mmap), parallel programming (TPL), network architectures (p2p, server/client), codecs (H264, AV1, etc.), NVIDIA (Cloud XR, Jetson, Omniverse), WebRTC, OpenXR, Azure Kinect, Cloud (Azure, AWS), Numpy, National Instruments MAX, Clang, PyTorch, Microcontrollers, Debuggers, Package Management, Adobe Suite, XCode SELECTED WORK EXPERIENCE

ASU School of Electrical and Computing Engineering, Tempe, AZ: Research Assistant

- Lead researcher for an adaptive volumetric streaming system, responsibilities included characterizing AI models pipelined into a multi-process and multi-threaded system design. This work exposed me to state-of-the-art networking technologies and codecs. Mentored 5+ students, developed API documentation for 2+ research teams to use our system, and consulted with corporate partners for new advancements to our system (AWS, Verizon).
- Led research project and team to build unified olfactory hardware-software frameworks allowing for dynamic control of an olfactory display. Engineered a developer interface to create olfactory spaces for VR/AR environments, conducted system (signal processing) and user studies (perceptual studies), and then open-sourced the system.
- Lead development of mobile applications, such as ASU Dreamscape Learn, utilized by 150+ students per semester as a • complement to introductory ASU Biology courses, and the ASU Fall 2021 Commencement app, facilitating virtual graduation attendance for 5K+ individuals unable to physically attend.

Dreamscape Immersive, Los Angeles, CA: Software Engineering Contractor

- Helped develop experimental cinematic VR experiences and a face-, hand- and body-tracking multi-user interactive movie poster system, requiring collaboration with several teams (art, sound, narrative, and programming).
- Proposed and developed a runtime VR debugging tool allowing developers to inspect code at runtime, invoking methods dynamically, and viewing/editing variables in real-time.

Baltu Technologies and British Standards Institute (BSI), AZ: Software Engineering Contractor

- Developed tool to build XR training applications and a pipeline to adjust quality of dense point cloud scans to render on mobile devices. Presented tools to 3 different corporate teams as a means of automating international audit inspections.
- Lead developer for iPad application, constructing REST API and integrating backend with frontend application.

NASA, Huntsville, AL: XR Software Engineering Intern

- Developed a pipeline and system to import complex CAD models into VR training applications. Consulted and tested with 5+ teams (e.g., Design, Requirements, Mechanical Engineering, System Engineers). Presented work to MSFC board of directors as a means of reducing costs for designing and testing ISS system components.
- Led team of 4 to build a VR training system creator, then utilized that software to create two VR training experiences for astronauts that board the ISS on how to perform maintenance procedures for specific ISS modules.

SELECTED RESEARCH WORKS

"Demo: Adaptive 5G systems for interactive volumetric sports analysis in augmented reality", Wen, J., Bahremand, A., Shaikh, A., Gold, L., Farber, C., LiKamWa, R. In Proc. ACM MobiSys '22

"The Smell Engine A system for artificial odor synthesis in virtual environments", Bahremand, A., Manetta, M., Lai J., Spackman, C., Smith, B.H., Gerkin, R.C., LiKamWa, R. In Proc. IEEE VR '22

"Characterizing real-time dense point cloud capture and streaming on mobile devices", Hu, J., Shaikh, A., Bahremand, A., LiKamWa, R. In Proc. ACM HotEdgeVideo '21

"GLEAM: An Illumination Estimation Framework For Real-Time Photorealistic Augmented Reality On Mobile Devices", Prakash, S., Bahremand, A., Nguyen, L., Likamwa, R. In Proc. ACM MobiSys '19

PATENTS

Method and Apparatus for Simulated Hydrodynamics in Mixed-Reality Fluid Vessels - Robert LiKamWa, Shahabedin Sagheb, Alireza Bahremand, Byron Lahey, Frank W. Liu, Assegid Kidane, 2022, US 11,462,128.

Illumination estimation for captured video data in mixed-reality applications - Siddhant Prakash, Paul Nathan, Linda Nguyen, Robert LiKamWa, Alireza Bahremand, 2021, US 11,043,025.

01/2020 - 08/2021

05/2019 - 08/2019

08/2022 - 12/2022

08/2018-06/2023

Curriculum Vitae – Alireza Bahremand

Personal Information	Alireza Bahremand abahrema@asu.edu alirezabahremand.com
Education	Ph.D. Computer Engineering Arizona State University Advised by Dr. Robert LiKamWa, Leave of Absence
	M.S. Computer Engineering Arizona State University Graduated Spring 2021
	B.S. Software Engineering Arizona State University Graduated May 2018
Professional	2017-2023 Research Assistant
EXPERIENCE	ASU Meteor Studio Researching and engineering novel software-hardware frameworks for multi- sensory digital embodiment.
	 Lead researcher for an adaptive volumetric streaming system, responsibilities included characterizing AI models pipelined into a multi-process and multi- threaded system design. This work exposed me to state-of-the-art networking technologies and codecs. Mentored 5+ students, developed API documenta- tion for 2+ research teams to use our system, and consulted with corporate partners for new advancements to our system (AWS, Verizon).
	- Led research project and team to build unified olfactory hardware-software frameworks allowing for dynamic control of an olfactory display. Engineered a developer interface to create olfactory spaces for VR/AR environments, conducted system (signal processing) and user studies (perceptual studies), and then open-sourced the system.
	 Led development for 6+ projects/applications, including the ASU 2020 Fall Commencement, ASU Dreamscape Learn experiences, ASU Virtual Campus exploration, and planetary data visualization tools.
	2022-Current Independent Contractor
	Dreamscape Immersive
	 Working with teams of professors and students to develop multi-sensory ed- ucational VR experiences for introductory Biology courses which will be de- ployed for use by 1000+ ASU students.
	 Helped develop experimental cinematic VR experiences and a hand- and body-tracking multi-user interactive movie poster system, requiring collabo- ration with art team, sound design team, narrative team, and programming team.
	 Proposed and developed a runtime debugging tool to dramatically reduce downtime, allowing developers to inspect the code for virtual objects, invoke methods dynamically, and view/edit variables in real-time.

2019-2022 | Software Engineer

ASU Meteor Studio, ASU Learning Futures Collaboratory

- Led a team of undergraduates to build an iOS/Android AR application that will be used by ASU Introductory Biology courses in the semesters 2022+.
- Helped develop ASU Fall 2021 Commencement mobile AR application, presented to 500+ students. The application included interactive AR objects in the user's environment and volumetric captures of all commencement speakers.

2020-2021 | Independent Contractor and Consultant

British Standards Institute, Baltu Studios

- Developed a tool for building VR training applications and a pipeline to dynamically adjust resolution of dense point cloud scans and render in VR. Presented these tools to 3 different corporate teams.
- Helped interview and evaluate 10+ international VR/AR telecommunications tools and training applications.
- Lead developer for iPad application, constructing REST API and integrating backend with frontend application.

2019 | XR Software Engineer Intern

NASA

- Developed a pipeline and system to import complex CAD models into VR training applications. Consulted and tested with 5+ teams (e.g., Design, Requirements, Mechanical Engineering, System Engineers). Presented work to MSFC board of directors as a means of reducing costs for designing and testing ISS system components.
- Led team of 4 to build a VR training system creator, then utilized that software to create two VR training experiences for astronauts that board the ISS on how to perform maintenance procedures for specific ISS modules.
- Contributed to development of a Mars Habitat simulation at the NASA 50th Apollo 11 celebration in Washington D.C. Presented experience to 300+ people (e.g., families, various NASA agents).

2016-2018 | Undergraduate Teaching Assistant | Computer Support ASU

- Wrote in-class assignments for SER334: Operating Systems & Networks and SER250: Microarchitecture & Computer Architecture.
- Provided technical support to 100+ ASU students and faculty for hardware and software issues.

Method and Apparatus for Simulated Hydrodynamics in Mixed-Reality Fluid Vessels - Robert LiKamWa,Shahabedin Sagheb, Alireza Bahremand, Byron Lahey, Frank W. Liu, Assegid Kidane, 2022, US 11,462,128.

Illumination estimation for captured video data in mixed-reality applications - Siddhant Prakash, Paul Nathan, Linda Nguyen, Robert LiKamWa, Alireza Bahremand, 2021, US 11,043,025.

Patents

Publications

"Design and evaluation techniques for odor mixing"

Jessica Lai, Mason Manetta, **Alireza Bahremand**, Christy Spackman, Richard C Gerkin, Brian H Smith, Robert LiKamWa

In Proc. ACM CHI Smell, Taste, Touch, Temperature 2023

"Demo: Adaptive 5G systems for interactive volumetric sports analysis in augmented reality"

Jiqing Wen, **Alireza Bahremand**, Aashiq Shaikh, Lauren Gold, Charmaine Farber, Robert LiKamWa

In Proc. ACM MobiSys 2022

"The Smell Engine A system for artificial odor synthesis in virtual environments" Alireza Bahremand, Mason Manetta, Jessica Lai, Christy Spackman, Byron Lahey, Brian H Smith, Richard C Gerkin, Robert LiKamWa In Proc. IEEE VR 2022

"Characterizing real-time dense point cloud capture and streaming on mobile devices"

Jinhan Hu, Aashiq Shaikh, **Alireza Bahremand**, Robert LiKamWa In Proc. ACM Hot Topics in Video Analytics and Intelligent Edges 2021

"Virtually composing and dynamically mixing complex odors"

Alireza Bahremand, Christy Spackman, Richard C Gerkin, Brian H Smith, Robert LiKamWa

In Proc. ACM CHI Smell, Taste, Touch, Temperature 2021

"Visualizing Planetary Spectroscopy through Immersive On-site Rendering" Lauren Gold, **Alireza Bahremand**, Connor Richards, Kyle Sese, Kathryn Powell, Scott Dickenshied, Christopher Scott Edwards, Robert LiKamWa In Proc. IEEE VR 2021

"Virtual & Augmented Reality Tools for Planetary Scientific Analysis Public Engagement"

Alireza Bahremand, Lauren Gold, Connor Richards, Kyle Sese, Kathryn Powell, Scott Dickenshied, Christopher Scott Edwards, Robert LiKamWa In Proc. LPSC 2020

"Coordinate: A Spreadsheet-Programmable Augmented Reality Framework for Immersive Map-Based Visualizations"

Aashiq Shaikh, Linda Nguyen, **Alireza Bahremand**, Hannah Bartolomea, Frank Liu, Van Nguyen, Derrick Anderson, Robert LiKamWa Proc. ACM AIVR 2019

"HoloLucination: A Framework for Live Augmented Reality Presentations Across Mobile Devices,"

Alireza Bahremand, Linda Nguyen, Tanya Harrison, Robert LiKamWa Demo ACM AIVR 2019

"SWISH: A shifting-weight interface of simulated hydrodynamics for haptic perception of virtual fluid vessels"

Shahabegin Sagheb, Frank Liu, **Alireza Bahremand**, Assegid Kidane, Robert LiKamWa

In Proc. ACM UIST 2019

"GLEAM: Global Light Estimation Across Mixed Reality Devices" Siddhant Prakash, Alireza Bahremand, Linda Nguyen, Robert LiKamWa In Proc. ACM MobiSys 2019 "An Integrated Environment for Visualizing In-Situ and Orbital Planetary Data" Kathryn Powell, **Alireza Bahremand**, Alec Gonzalez, Robert LiKamWa, Chris Edwards

In Proc. LPSC 2019.

TECHNICAL SKILLS **Research Interests** Multi-sensory Systems, Edge-Assisted Devices, Wearables, Volumetric Streaming, Storytelling Tools

Programming Languages C, C#, C++, Java, JavaScript, Prolog, Python

Tools, Frameworks, Technologies Adobe Suite, Arduino, AWS, Azure (Cloud, Kinect, Remote Rendering, Spatial Anchors), Clang, Git, MATLAB, Node.JS, .NET, NVIDIA (Cloud XR, Jetson), NI MAX, Open3D, OpenCV, Raspberry Pi, Sockets, Task Parallel Library, Unity3D (MLAPI, Photon, ARFoundation, MRTK, Timeline, XR), Visual Studio, Xcode

SPOKEN LANGUAGES English (primary), Farsi (proficient).

Extracurriculars 2022 | Teacher

Digital Culture Summer Institute at ASU

Designed a project assignment and Unity template for building multiplayer games. Adapted to work on laptops, mobile devices, and VR. Had 20+ students (middle school and high school) develop custom multiplayer experiences and present them at showcase.

2017-2021 | Mentor, Judge, and Organizer

$SunHacks \ Hackathon \ at \ ASU$

Designed a hybrid (online and in-person) workshop and Unity template for building multiplayer games and cross-platform AR experiences. Presented at 3 ASU hackathons to over 150+ students total. Additionally helped organize and market the largest ASU Hackathon.

2019 | Vice President

TEDxASU

Helped organized one of the largest student-led events at ASU Gammage Theater, resulting in 54000 in revenue and 1500+ attendees. Contributed to interview/recruitment of 30+ students across multiple academic disciplines for roles such as marketing, research and development, stage design, and graphic design. Assisted with speaker coaching sessions, routinely meeting with 8+ speakers. Led development of website, digital services, and custom AR-application for event.

2015-2018 | President

Computer Science Club at ASU

Helped found and expand Computer Science Club at ASU, resulting in 100+ students (online and in-person) across two campus and various engineering majors (e.g., Aerospace, Mechanical, Electrical, Software). Coordinated biweekly workshops, guest lectures, and social events for engineering students for 6 semesters.

Talks	2022 - Building Multiplayer Experiences ASU DC Summer Institute	
	2022 - Game Development & Research Mesa Public Schools	
	2021 - The Smell Engine ACM CHI Smell, Taste, Touch Workshop	
	2018-20 - XR Software Development, ASU Hackathons	
	2019 - XR Software Development, NASA	
	2018 - The Art Within AR/VR, TEDxASU	
Scholarships and	2023 - ECEE Student Travel Award, ASU	
Awards	2022 - Best Demo Award, ACM MobiSys	
	2021 - Best Hack Nomination, XR Brain Jam	
	2020 - Top 5 Nomination, MIT Reality Hacks	
	2019 - University Graduate Fellowship, ASU	
	2019 - University Engineering Fellowship, ASU	
	2019 - Best Demo Runner Up, ACM MobiSys	
	2019 - Student Travel Award, ACM MobiSys	
	2018 - Convocational Speaker Faculty Nomination, ASU	
	2018 - Outstanding Software Engineer Faculty Nomination, ASU	
	2018 - Blowers Engineering Scholarship, ASU	
	2017 - First Place PayPal Opportunity Hacks Hackathon	
	2017 - First Place AZ Desert Hacks Hackathon	
	2016 - Best Embedded Hack Nomination PennApps Hackathon	
	2010 - Second Degree Black Belt American Karate Association	