Syed Hammad Hussain Shah

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Education

Norwegian University of Science and Technology–(NTNU)

Norway

PhD Computer Science (Thesis Title: Advanced Interactive Technologies for Promoting Active Healthy Aging and Rehabilitation in Older Adults (Submitted))

2020 - 2024

- Advisor: Prof. Ibrahim A. Hameed

Sejong University

South Korea

MS Computer Science (CGPA: 4.42/4.5 , Percentage: 98.4%)

2018 - 2020

- Advisor: Prof. Jong-Weon Lee

COMSATS University Islamabad (CUI)

Pakistan

BS Software Engineering (CGPA: 3.7/4.0, Percentage: 86.9%)

2013 – 2017

Experience

Doctoral Researcher

Norway

Social Robots Lab, Department of ICT and Natural Sciences, Norwegian University of Science and Technology

2020 - 2024

- Codesigned and developed healthcare technologies based on AI, social robots, and Virtual Reality (VR).
- Developed deep learning-based human activity recognition framework for healthcare applications.
- Designed data collection methods, conducted user studies, and analyzed data to gain insights into users' perceptions.
- Hands-on experience with Oculus Quest, Hololens 2, and humanoid robots such as Pepper and NAO robot.
- Published and presented research in high ranked international conferences and journal.
- **Skills:** C#, .NET, Unity3D Game Engine, Python, Keras, ROS, NumPy, UX design, User research, User-centered design

Lecturer

Norway

Department of ICT and Natural Sciences, Norwegian University of Science and Technology

2020 - 2024

- Designed and taught a master studies course titled '**Computer Graphics**' twice.
- Focused on concepts related to the graphics pipeline, including underlying mathematics and practical implementation with 2D and 3D programming using JavaScript and WebGL.
- Used Unity3D game engine and C# for high-level implementation of graphics-related concepts in a scenario-based application.
- Designed and taught master course titled '**Immersive Technologies**'.
- Focused on background, concepts, applications of XR technology (VR, AR, MR) and user-centered design process.
- Used Unity3D game engine and C# develop XR application based on a case study.
- **Supervised** specialization projects, masters thesis and bachelor thesis focusing the applications of artificial intelligence, robotics, HCI and XR technologies.
- **Skills:** Delivering lectures and practical lab Sessions, C#, .NET, Unity3D Game Engine, Python, Keras, ROS, User-centered design.

Research Assistant

South Korea

Mixed Reality and Interaction Lab, Sejong University

2018 - 2020

- Developed XR (VR, AR, MR) applications focused on sectors of multimedia entertainment and air traffic control.
- Applied user-centered design process involving requirements gathering, software development, and testing for better UX.
- Planned and conducted user studies to evaluate the developed software applications based on qualitative and quantitative data collected from users.
- Performed statistical analysis of the data collected from user studies for better insights into users' behaviors.
- Developed authoring tool for 360° VR entertainment based on salience-based object tracking.
- Published and presented research in high ranked international conferences and journals focused on HCI and expert systems.
- **Skills:** C#, .NET, Unity3D, Python, OpenCV, UX design, User research, HCI research, User statistics, Data analysis

Full-stack Web Developer

Pakistan

Software Department, Comsats University Islamabad (CUI)

Jul. 2017 - Nov. 2017

- Designed and developed web applications as full-stack developer involving backend and frontend development.
- Followed agile software development practices for continuous requirements analysis, user feedback, and usability testing.
- Designed relational databases and implemented them using database management studio.
- **Skills:** Database design and development, C#, .NET, REST APIs, SQL, Entity framework, JavaScript, HTML, CSS, Web Forms, MVC

Projects

Social VR (Metaverse)-based Collaborative Exergame for Elderly Users — *NTNU, Norway*

Immersive Technologies, Human-centered Design & User Research

- Codesigned and developed social VR-based exergame supporting rehabilitation of elderly users.
- **Skills:** XR, VR, C#, Unity3D game engine, Human-centered design, UX design

An Efficient and Lightweight Multiperson Activity Recognition Framework — *NTNU, Norway*

Python, Deep Learning & Robotics

- Developed an LSTM-based deep learning framework for multiperson activity recognition based on visual data for surveillance and robot-assisted healthcare applications.
- **Skills:** Artificial Intelligence, Deep Learning, Python, Keras, LSTM, OpenCV, NumPy, ROS, User research

Multi-agent Robot System to Monitor and Enforce COVID-19 Rules in Large Areas — *NTNU, Norway*

Python, Deep Learning & Robotics

- Developed a multi-agent system based on multiple CCTV cameras and robots that monitor and enforce physical distancing constraints in large areas to combat COVID-19.
- **Skills:** Artificial Intelligence, Deep Learning, Python, Keras, YOLO, OpenCV, NumPy, ROS

Intelligent Holographic Mixed Reality-based System for Health Data Management — *NTNU, Norway*

Immersive Technologies, Python, Computer Vision & User Research

- Designed and developed a mixed reality-based system that leverages Microsoft Hololens for work practices in nursing homes.
- **Skills:** XR, VR, C#, Unity3D game engine, Hololens, Human-centered design, UX design, User research

A Holographic Mixed Reality (MR) system for air traffic control and management — *Sejong University, South Korea*

Immersive Technologies, Human-centered Design & User Research

- Codesigned and developed holographic MR-based application to improve productivity in tasks performed at air traffic control towers.
- **Skills:** XR, MR, C#, Unity3D game engine, Hololens, Human-centered design, UX design, User research

VR Authoring Tool for 360° Entertainment — *Sejong University, South Korea*

Immersive Technologies, Python, Computer Vision & User Research

- Developed an authoring tool supporting the production of multiple VR experiences of a 360° video based on tracking and sharing of users' experiences in VR, or salience-based object tracking in 360° video.
- **Skills:** XR, VR, C#, Unity3D game engine, Python, OpenCV, Object tracking, User research

Web-based Student Application Management System — *CUI, Pakistan*

Web

- Developed web application for student application management that allows university students to submit applications online, which go through an online verification process by the concerned departments, i.e., exams, finance, etc., reaching a final decision.
- **Skills:** C#, ASP.NET, HTML, CSS, JavaScript, SQL, NoSQL, Entity Framework

Skills

- **Programming**: C# (.NET) including ASP.NET MVC framework, PYTHON, C++, Javascript, HTML, CSS
- **Public Libraries**: Tensorflow/Keras, OpenCV, Pandas, NumPy, Mixed Reality Toolkit (MRTK)
- **Databases**: MySQL, Entity Framework, Relational Database Design
- **CI/CD Tools**: Azure DevOps
- **Environments & IDE**: Unity3D game engine, Visual Studio & VSCode, ROS, Windows, Linux
- **Software Development**: Software Development Lifecycle (SDLC), Agile Methodology
- **User Experience (UX) Design**: Human-centered Design, Codesign and Development, User Research
- **Research**: Quantitative/Qualitative Data Analysis, Writing and Reviewing, Team Collaboration
- **Languages**: English (fluent), Norwegian (basic), Urdu (native)
- **Pedagogical**: Curriculum Design, Preparing and Delivering Lectures, Conducting Practical Lab Sessions, Preparing and Conducting Examinations, Supervising Students in Industry and Research-oriented projects.

Publications

Journal and Conference

- **Shah, S. H. H.,** Karlsen, A. S. T., Solberg, M., & Hameed, I. A. (2024). Social VR and humanoid social robots for gamified physical exercise: Comparative evaluations by elderly users. Computers in Human Behavior. (**IF: 9.9**) – Under Review
- **Shah, S. H. H.,** Karlsen, A. S. T., Solberg, M., & Hameed, I. A. (2024). An efficient and lightweight multiperson activity recognition framework for robot-assisted healthcare applications. Expert Systems with Applications, 241, 122482. (**IF: 8.5**)
- **Shah, S. H. H.,** Karlsen, A. S. T., Solberg, M., & Hameed, I. A. (2023). A social VR-based collaborative exergame for rehabilitation: codesign, development and user study. Virtual Reality, 27(4), 3403-3420. (**IF: 4.2**)
- **Shah, S. H. H.,** Steinnes, O. M. H., Gustafsson, E. G., & Hameed, I. A. (2021). Multi-agent robot system to monitor and enforce physical distancing constraints in large areas to combat covid-19 and future pandemics. Applied Sciences, 11(16), 7200. (**IF: 2.7**)
- **Shah, S. H. H.,** Han, K., & Lee, J. W. (2020). Real-Time Application for Generating Multiple Experiences from 360° Panoramic Video by Tracking Arbitrary Objects and Viewer's Orientations. Applied Sciences, 10(7), 2248. (**IF: 2.7**)
- Han, K., **Shah, S. H. H.,** & Lee, J. W. (2019). Holographic mixed reality system for air traffic control and management. Applied Sciences, 9(16), 3370. (**IF: 2.7**)
- **Shah, S. H. H.,** Badawy, A., Jamil, F., Alsboui, T., Hameed, I.A. (2024, June). Toward Intelligent Telepresence Robotics for Enhancing Elderly Healthcare in Smart Care Home. In International conference on human-computer interaction (pp. 180-195). Cham: Springer International Publishing.
- **Shah, S. H. H.,** Hameed, I. A., Karlsen, A. S. T., & Solberg, M. (2022, June). Towards a social vr-based exergame for elderly users: An exploratory study of acceptance, experiences and design principles. In International conference on human-computer interaction (pp. 495-504). Cham: Springer International Publishing.
- **Shah, S. H. H.,** Steinnes, O. M., Gustafsson, E. G., & Hameed, I. A. (2021, April). Multi-Agent System Based Mobile Help Desk and Monitoring of Safety Measures to Combat COVID-19 and Future Pandemics. In 2021 International Conference on Artificial Intelligence (ICAI) (pp. 80-85). IEEE.
- **Shah, S. H. H.,** Longva, B., Hameed, I. A., Solberg, M., & Susanne T. Karlsen, A. (2021). Health Data Management for Nursing Practice: An Intelligent, Holographic Mixed-Reality System. In HCI International 2021-Posters: 23rd HCI International Conference, HCII 2021, Virtual Event, July 24–29, 2021, Proceedings, Part II 23 (pp. 329-336). Springer International Publishing.
- Aftab, H., **Shah, S. H. H.,** & Habli, I. (2021). Classification of failures in the perception of conversational agents (CAs) and their implications on patient safety.
- **Shah, S. H. H.,** Han, K., & Lee, J. W. (2019). Interaction paradigms for air traffic control and management in mixed reality. In Virtual, Augmented and Mixed Reality. Applications and Case Studies: 11th International Conference, VAMR 2019, Held as Part of the 21st HCI International Conference, HCII 2019, Orlando, FL, USA, July 26–31, 2019, Proceedings, Part II 21 (pp. 547-556). Springer International Publishing.
- **Shah, S. H. H.,** & Lee, J. W. (2020). Authoring Tool for Generating Multiple Experiences of 360° Virtual Reality. In Advances in Computer Science and Ubiquitous Computing: CSA-CUTE 2018 (pp. 73-78). Springer. Malaysia.

Honors & Awards

2020-2024 **PhD Fellowship**, Norwegian University of Science and Technology–(NTNU) *Norway*

2018-2020 **Fully Funded Scholarship for Masters Studies**, Sejong University *Seoul, South Korea*

2017 **Silver Medal awarded for academic excellence and securing second position in bachelor**, COMSATS University Islamabad (CUI) *Pakistan*

Presentation

Attended 32nd IEEE International Conference on Robot and Human Interactive Communication (IEEE RO-MAN 2023), Busan, South Korea.

Attended 21st IEEE International Symposium on Mixed and Augmented Reality (ISMAR 2022), Singapore.

Delivered Oral Presentation at 25th International Conference on Human-Computer Interaction International (HCII 2023), Copenhagen, Denmark.

Delivered Oral Presentation at 23rd International Conference on Human-Computer Interaction International (HCII 2021), Washington DC, USA.

Delivered Oral Presentation at 21st International Conference on Human-Computer Interaction International (HCII 2019), Orlando, Florida, USA.

Delivered Oral Presentation at 10th International Conference on Computer Science and its Applications (CSA 2018), Kuala Lumpur, Malaysia.

Mentoring

- 2020-2021 **Bjørnar Longva, Ole-Martin Hagen Steinnes, Eirik Gribbestad Gustafsson, and Sushanth Sachidananda Kotyan**, Master Students, NTNU.
- 2021-2022 **Gustav Strengen Bigseth**, Bachelor Student, NTNU.
- 2019-2020 **Syeda Aqsa Fatima Rizvi and Mahnoor Javaid**, Bachelor Students, CUI, Pakistan.

References

Prof. Ibrahim A. Hameed, PhD Advisor (NTNU i Ålesund), **Phone No.:** +47 413 15 695, **Email:** ibib@ntnu.no

Rune Volden, Department Head (NTNU i Ålesund), **Phone No.:** +47 928 87 753, **Email:** rune.volden@ntnu.no

Prof. Irfan Mehmood, Academic Advisor (University of Bradford), **Phone No.:** +44 1274 232646, **Email:** i.mehmood4@bradford.ac.uk