

Academic Studies Utilizing Varjo Devices

A comprehensive list of research papers powered by Varjo's virtual and mixed reality

This list was compiled based on research available at the time of publication and includes only English-language studies. If you're aware of a relevant study that's not included, please let us know by contacting marketing@varjo.com.

RACHEL S. AGUSTI, DAVID BROWN, KYLE KOVACIN, AARON SMITH, RACHEL N. HACKENBRUCH, DAVID HESS, CALEB B. SIMMONS, COLIN STEWART

Immersive Visualization Exploration of Crew Station Design for Acquisition Programs (2024)

SAE Technical Paper 2024-01-4104

Keywords: Human factors, Augmented / Virtual Reality, Hand, Simulation

Headset: Varjo XR-3

SUVI ALANKO

Comparing Inside-out and Outside-in Tracking in Virtual Reality (2023)

Metropolia University of Applied Sciences

Keywords: Virtual Reality, Tracking, Inside-out, Outside-in

Headset: Varjo XR-3

JAN ARENSMEYER, BENEDETTA BEDETTI, PHILIPP SCHNORR, JENS BUERMANN, DONATAS ZALEPUGAS, JOACHIM SCHMIDT, PHILIPP FEODOROVICI

A System for Mixed-Reality Holographic Overlays of Real-Time Rendered 3D-Reconstructed Imaging Using a Video Pass-through Head-Mounted Display-A Pathway to Future Navigation in Chest Wall Surgery (2024)

Latest Advances in Thoracic Surgery

Keywords: Mixed reality, Augmented reality, Thoracic Surgery, Navigation, Surgical Planning, Image Reconstruction, Hologram, Head-mounted Display, Volume rendering, Image-guided Surgery

Headset: Varjo XR-3

VERENA BIENER, SNEHANJALI KALAMKAR, NEGAR NOURI, EYAL OFEK, MICHEL PAHUD, JOHN J. DUDLEY, JINGHUI HU, PER OLA KRISTENSSON, MAHESHYA WEERASINGHE, KLEN OPI PUCIHAR, MATJA KLJUN, STEPHAN STREUBER, JENS GRUBERT

Quantifying the Effects of Working in VR for One Week (2022)

arXiv preprint

Keywords: Virtual Reality, Work Environment, Usability

Headset: Varjo VR-2

BOBBY BODENHEIMER, HALEY ADAMS, MIRINDA WHITAKER, JEANINE STEFANUCCI, SARAH CREEM-REGEHR

Perceiving Absolute Distance in Augmented Reality Displays with Realistic and Non-realistic Shadows (2023)

SAP '23: ACM Symposium on Applied Perception 2023

Keywords: Optical See-Through, Video Pass-Through, Depth

Headset: Varjo XR-3

CORY ILO, WAYLON ZHENG, DOUG A. BOWMAN

Virtual Loupes: An Augmented Reality Aid for Microsurgery (2021)

2021 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops

Keywords: Headphones, Three-Dimensional Displays, Conferences, Prototypes, Microsurgery, User Interfaces, Blood Vessels, Augmented Reality, Microsurgery, Gaze-controlled, Interfaces, Video See-Through Headset

Headset: Varjo XR-1

AGNESE BRUNZINI, PAOLO SENESI, MARCO MANDOLINI, MARIO PAGNONI, ALIDA MAZZOLI

Varjo XR-3 vs HoloLens 2 for Maxillofacial Surgery: A Preliminary Comparative Assessment (2024)

Advances in Simulation for Healthcare

Keywords: Mixed Reality, Surgery, Video See-Through

Headset: Varjo XR-3

BYSTRÖM, JESPER

The Use of Mixed Reality in Simulations (2022)

Umeå University

Keywords: Computer Science, Computer Graphics, Oryx, Virtual Reality, Mixed Reality

Headset: Varjo XR-3

ANA COITO, AVANTIKA NAIDU, JULIAN LEHMANN, BRUNO HAUSER, DOMINIK BRÜGGER, MATHIAS ABEGG

Test-Retest Reliability of Gaze Precision of a Novel Virtual Reality-Based Medical Device (2025)

Sec. Virtual Reality in Medicine, Volume 6 - 2025

Keywords: Eye Tracking, Gaze Tracking, Neos, MachineMD, Ophthalmology, Neurology

Headset: Neos (Varjo Aero / MachineMD)

ROBIN DAHLKVIST

An Evaluative Study on the Impact of Immersion and Presence for Flight Simulators in XR (2023)

KTH Royal Institute of Technology

Keywords: Extended Reality, Flight Simulation, Immersion, Presence

Headset: Varjo XR-3

THOMAS DROUET, JEAN-RÉMY CHARDONNET, JAVIER POSSELT, STEPHANE REGNIER

Study of HMD Tracking Systems Accuracy Applied to Short Head Displacements (2023)

Laboratoire d'Ingénierie des Systèmes Physiques Et Numériques (LISPEN)

Keywords: HMD Tracking Accuracy, Varjo XR-3, Vive Pro 2, Vive Focus 3, Hololens 2

Headset: Varjo XR-3

DANIEL ECKHOFF, JAN SCHNUPP, ALVARO CASSINELLI

Temporal Precision and Accuracy of Audio-Visual Stimuli in Mixed Reality Systems (2024)

PLoS ONE 19(1): e0295817

Keywords: Neuroscience, Psychology, Audiovisual Stimuli

Headset: Varjo XR-3

CHRISTIAN EREDIA, VINCENZO CIANNIELLO, DOMENICO D'AURIA, VINCENZO DE CAPRIO, ENRICO CASONE

Virtual And Mixed Reality Tools to Support the Design of Astronomical

Instrumentation in a Concurrent Design Environment (2024)

Modeling, Systems Engineering, and Project Management for Astronomy XI, 130990C

Keywords: Mixed Reality, Workspace Design, Human Factors

Headset: N/A

JOHANNES MARIA ERNST, TIM LAUDIEN, SVEN SCHMERWITZ

Implementation of a Mixed-Reality Flight Simulator: Blending Real and Virtual with a Video-See-Through Head-Mounted Display (2023)

SPIE 12538, Artificial Intelligence and Machine Learning for Multi-Domain Operations Applications

Keywords: Mixed Reality, Flight Simulation, Training

Headset: Varjo XR-3

IHSÂN GRICHI, MINA JABERI, TIAGO H. FALK

Biosensor-Instrumented XR Headsets: A Double-Edged Sword for User Identity and Privacy Management in the Metaverse (2024)

2024 IEEE International Symposium on Mixed and Augmented Reality Adjunct

Keywords: Headphones, Access Control, Privacy, Data Privacy, Metaverse, Electroencephalography, Information Filtering, Biosensors, Biomedical Monitoring, Information Integrity, XR, Biosensors, Identity, Privacy, Anonymization

Headset: OpenBCI / Galea

STEPHANIE G. FUSSELL

A Review of User Experience Requirements for a Procedural Training Task in Virtual Reality (2023)

Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 67(1), 1472-1477

Keywords: Mixed Reality, Aerospace, Human Factors

Headset: Varjo XR-3

STEPHANIE G. FUSSELL

Review of VR Technical Specification Requirements for a Procedural Training Task (2024)

Journal of Aviation/Aerospace Education & Research

Keywords: Virtual Reality, Training, Head-Mounted Displays, Technical Specifications

Headset: Varjo Aero

DAVID GOEDICKE, ALEXANDRA W.D. BREMERS, HIROSHI YASUDA, WENDY JU

XR-OOM: Mixing Virtual Driving Simulation with Real Cars and Environments Safely (2021)

Association for Computing Machinery's CHI 2022 conference

Keywords: Driving Simulator

Headset: Varjo XR-3

JUSSI HAAPASAARI

Using the iMotions Biometric Platform to Compare Biosensor Data from Two Virtual Reality Serious Games (2022)

Turku University of Applied Sciences

Keywords: Virtual Reality, Biosensors, iMotions, Serious Games, Stress Analysis

Headset: Varjo VR-1

VIOLET YINUO HAN

Building a Bidirectional Bridge Between the Digital and Physical Worlds (2023)

Carnegie Mellon University

Keywords: Mixed Reality

Headset: Varjo XR-3

KAARLO HEIKKILÄ, NIILO PUDAS, SAMULI UKKOLA

Comparing Eye Tracking Technologies (2023)

University of Oulu

Keywords: Eye Tracking, Varjo Aero, SeeTrue Technologies, Gaze Detection

Headset: Varjo Aero

QASIM ALI, ARE DÆHLEN, ILONA HELDAL, CARSTEN GUNNAR HELGESEN

Development of Vision Screening Tool in Virtual Reality: A Usability Assessment Study (2022)

2022 E-Health and Bioengineering Conference (EHB)

Keywords: Virtual Reality, Vision Screening, Eye Tracking, Head-Mounted Display, Functional Vision
Headset: N/A

VÍCTOR MANUEL HIDALGO, CARLOS ANDRÉS BAZAES, JUAN-CARLOS LETELIER

Effects of a Mixed Reality Headset on the Delay of Visually Evoked Potentials (2023)

arXiv:2312.02305

Keywords: Neurons, Cognition
Headset: Varjo XR-3

CHANTAL HIMMELS, JOHANNES LINDNER

Are Head-Mounted Displays Really Not Suitable for Driving Simulation? A Comparison with a Screen-Based Simulator (2023)

2023 IEEE Intelligent Vehicles Symposium (IV)

Keywords: Driving Simulation, Virtual Reality, Head Mounted Display, Simulator Sickness, Presence, Perception
Headset: Varjo VR-3

MIAO HU, XIANZHUO LUO, JIAWEN CHEN, YOUNG CHOON LEE, YIPENG ZHOU, DI WU

Virtual Reality: A Survey of Enabling Technologies and its Applications in IoT (2021)

arXiv:2103.06472

Keywords: Virtual Reality, IOT
Headset: Varjo VR-1

MARKKU KILPELÄINEN, JUKKA HÄKKINEN

An Effective Method for Measuring Text Legibility in XR Devices Reveals Clear Differences Between Three Devices (2023)

Front. Virtual Real. 07 September 2023

Keywords: XR, VR, Legibility, Readability, Psychophysics, Statistical Power

Headset: Varjo VR-2

T.K. ALEVA, WILBERT TABONE, D. DODOU, J.C.F. WINTER

Augmented reality for supporting the interaction between pedestrians and automated vehicles (2024)

Frontiers In Robotics and AI, 11, Article 1324060

Keywords: Automated Vehicles, Pedestrian Interaction, Augmented Reality

Headset: Varjo XR-3

ROSEMARIE FIGUEROA JACINTO, ELIZABETH KAPPLER

A Discussion on Accessibility, Inclusivity, Cultural Design Considerations, and Health & Safety Advisories for Virtual Reality Head Mounted Displays (2022)

Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 66(1), 1706-1710

Keywords: health and safety advisory information

Headset: Varjo XR-3

JARI KANGAS, SRIRAM KISHORE KUMAR, HELENA MEHTONEN, JORMA JÄRNSTEDT, ROOPE RAISAMO

Trade-Off between Task Accuracy, Task Completion Time and Naturalness for Direct Object Manipulation in Virtual Reality (2022)

Multimodal Technol. Interact. 2022

Keywords: 3D Visualization, Virtual Reality, Object Manipulation, Hand Tracking, Controller Interaction

Headset: Varjo VR-2 Pro

JARKKO KANKAANPÄÄ

Comparing The Finnish Defence Forces Indoor Shooting Range Simulator to a Virtual Reality Training Solution (2023)

Turku University of Applied Sciences

Keywords: Military Training, Virtual Reality, Training

Headset: Varjo Aero

ELIZABETH KAPPLER, ROSEMARIE FIGUEROA JACINTO, STEVE ARNDT

Evaluation of Visual Acuity and Perceptual Field of View Using the Varjo XR-3 Headset in a Virtual Environment (2022)

Proceedings of the Human Factors and Ergonomics Society Annual Meeting

Keywords: Visual Acuity, Contrast Sensitivity, Virtual Environment

Headset: Varjo XR-3

STEFANOS KAPSORITAKIS

A Comparative Study of Virtual Reality Hand-Tracking and Controllers (2022)

Turku University of Applied Sciences

Keywords: Virtual Reality, Hand-Tracking, Controllers, User Experience

Headset: Varjo XR-3

VILLE KARILAINEN

Creation of 3D Scoreboard in Virtual Reality (2024)

Tampere University of Applied Sciences

Keywords: Virtual Reality, Scoreboard, Unity, Training Simulation

Headset: Varjo XR-3

DANIEL KOCH, ALAN MEDLAR, DOROTA GLOWACKA

Read the Fine Print: Assessing the User Experience of Reading in High Resolution Virtual Reality (2024)

Extended Abstracts of the CHI Conference on Human Factors in Computing Systems Article No.: 279

Keywords: Resolution

Headset: Varjo VR-2 Pro

NICOLAS LEINS, JANA GONNERMANN-MÜLLER, MALTE TEICHMANN

Comparing head-mounted and handheld augmented reality for guided assembly (2024)

Multimodal User Interfaces 18, 313-328

Keywords: Augmented reality · Assembly · Head-mounted display · Handheld display · Cognitive load

Headset: Varjo XR-3

CHRISTIAN K. K., LINDBERG, ROBIN DAHLKVIST, ROBERT RAMBERG, GUILHERME ELCADI, JOUNI LINDBQVIST

Cybersickness Between a Virtual and Mixed Reality Flight Simulator – A Comparative Study (2024)

Conference paper for MODSIM World 2024

Keywords: Cyber Sickness

Headset: Varjo XR-3

CRYSTAL MARAJ, JONATHAN HURTER, JOSEPH PRUITT

Using Head-Mounted Displays for Virtual Reality: Investigating Subjective Reactions to Eye-Tracking Scenarios (2021)

International Conference on Human-Computer Interaction

Keywords: Virtual Reality, Eye-Tracking, Immersion, Simulator Sickness

Headset: Varjo VR-1

LORENZO STACCHIO, GIUSEPPE DI MARIA, GUSTAVO MARFIA

Flying in XR: Bridging Desktop Applications in eXtended Reality through Deep Learning (2024)

2024 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops

Keywords: flight simulation, gaming

Headset: Varjo XR-3

JANSET SHAWASG, NARMEEN MARJI

Virtual Reality in The Study of Daylight for Sustainable Architecture (2023)

The 7th International Conference for Design Education Researchers, 29 November - 1

Keywords: Architectural Design Education, Virtual Reality, Daylight Design, Sustainable Architecture

Headset: Varjo XR-3

TANJA MARTINI

Evaluation of Virtual and Mixed Reality Technologies in Helicopter Simulation (2024)

80th Annual Vertical Flight Society Forum and Technology Display

Keywords: Mixed Reality, Simulation, Helicopter Training, Virtual Reality Headset, Presence, Simulation Sickness

Headset: Varjo XR-3

ANGELA ODAME, JOHANNES TÜMLER

Is Off-The-Shelf VR Software Ready for Medical Teaching? (2022)

International Conference on Human-Computer Interaction

Keywords: Virtual Reality, Cardiac Anatomy, Computer-Generated, 3D-model, Training

Headset: Varjo VR-2

TOBIAS OLSSON, OSCAR ULLBERG

Mixed Reality for Gripen Flight Simulators (2021)

Linköping University

Keywords: Mixed Reality, Flight Simulator, Chroma Key, Depth Sensors, Immersion, Latency, Varjo

Headset: Varjo XR-1

ANTTI PEUHKURINEN, TOMMI MIKKONEN

Real-time Human Eye Resolution Ray Tracing in Mixed Reality (2021)

16th Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications

Keywords: Mixed Reality, Human Eye Resolution, Ray Tracing, Real-Time Rendering, Computer and Information Sciences

Headset: Varjo XR-1 Developer Edition

ELEONORA ZODO, KATJA GALLHUBER, SETAREH ZAFARI, JAISON PUTHENKALAM

Unlocking the Potential of Virtual Reality in Human Robot Interaction: Insights for User Studies (2023)

Conference: VAM-HRI 23

Keywords: Human-Machine Interaction, HRI, Subjective Experiment, HMLV

Headset: Varjo XR-3

FLORIAN SALINGA, ANDREA E. M. CASINIA, ANDREAS TREUERA, MARTIAL COSTANTINIA, LEONIE BENSCHA, TOMMY NILSSON, LIONEL FERRAB

Testing and Validation of Innovative Extended Reality Technologies for Astronaut Training in a Partial-Gravity Parabolic Flight Campaign (2024)

75th International Astronautical Congress (IAC), Milan, Italy

Keywords: Virtual Reality, Training, Space Exploration, Human Spaceflight, Parabolic Flights

Headset: Varjo XR-3

ROBIN CONNOR SCHRAMM, GINEVRA FEDRIZZI, MARKUS SASALOVICI, JANN PHILIPP FREIWALD, ULRICH SCHWANECKE

Augmented Journeys: Interactive Points of Interest for In-Car Augmented Reality (2025)

CHI '25, Yokohama, Japan

Keywords: Automotive

Headset: Varjo XR-3

ROBIN CONNOR SCHRAMM, MARKUS SASALOVICI, JANN PHILIPP FREIWALD, MICHAEL OTTO, MELISSA REINELT, ULRICH SCHWANECKE

Blending the Worlds: World-Fixed Visual Appearances in Automotive Augmented Reality (2025)

arXiv preprint

Keywords: Autonomous Vehicles

Headset: Varjo XR-3

ROBIN CONNOR SCHRAMM, MARKUS SASALOVICI, AXEL HILDEBRAND, ULRICH SCHWANECKE

Assessing Augmented Reality Selection Techniques for Passengers in Moving Vehicles: A Real-World User Study (2023)

15th International Conference on Automotive User Interfaces and Interactive Vehicular Applications

Keywords: Automotive, Heads-Up Displays

Headset: Varjo XR-3

CHASE C. SCHULZE, DAVID H. KLYDE AND TYLER WILHELM

Augmented Reality as a Handling Qualities Assessment Tool (2024)

Conference paper, AIAA 2024-2481

Keywords: Handling, Qualities, Flight Evaluation, Runways, Boeing, Precision, Landing, Airspeed, Boeing 777, Airframes, Precision, Approach Path Indicator, Test Pilots

Headset: N/A

MINJA SILVENNOINEN

Simulating Learning Environments in Virtual Reality (2022)

Metropolia University of Applied Sciences

Keywords: Virtual Reality, Training Simulation, Unity, Oculus Quest

Headset: Oculus Quest

RANDALL SPAIN, SHANNON K.T. BAILEY, BENJAMIN GOLDBERG, ROBERT SAIL, KENDALL CARMODY, CHERRISE FICKE, ALLISON BAYRO, HEEJIN JEONG, JIHOON KIM, W. HONG YEO, ROSEMARIE FIGUEROA-JACINTO, ZACHARY PUGH, CHRIS MAYHORN, AARON GLUCK, LT SARAH BEADLE, AND AMANDA BOND

Me and My VE 2022: Human Factors Applications Using Virtual Reality, Mixed Reality, and Virtual Environments (2022)

Proceedings of the Human Factors and Ergonomics Society Annual Meeting

Keywords: Virtual Reality, Mixed Reality, Human Factors, Usability Testing, Medical Training, Aviation Training, Content Validation, Human-Computer Interaction

Headset: N/A

NIKLAS STEIN, DIEDERICK C. NIEHORSTER, MARKUS LAPPE

A Comparison of Eye Tracking Latencies Among Several Commercial Head-Mounted Displays (2021)

I-Perception, 12(1).

Keywords: Eye Tracking

Headset: Varjo VR-1

B. KATALIN SZABÓ

Using A Virtual Reality Headset in The Simulation of The Control Room of a Nuclear Power Plan (2022)

2022 IEEE 2nd Conference on Information Technology and Data Science

Keywords: Control Room, Simulator, Virtual Reality, Headset, Autofocus

Headset: Varjo VR-1 mentioned

ANGELA ODAME & JOHANNES TÜMLER

Is Off-the-Shelf VR Software Ready for Medical Teaching? (2022)

HCII 2022. Lecture Notes in Computer Science, vol 13317

Keywords: Medical Teaching, Virtual Reality

Headset: Varjo XR-3

JAKOB CARL UHL, HELMUT SCHROM-FEIERTAG, GEORG REGAL, KATJA GALLHUBER, MANFRED TSCHELIGI

Tangible Immersive Trauma Simulation: Is Mixed Reality the next level of medical skills training? (2023)

CHI 23, April 23-28, 2023, Hamburg, Germany

Keywords: Medical Skill Training

Headset: Varjo XR-3

HALEY ADAMS, VANDERBILT UNIVERSITY, JEANINE STEFANUCCI, SARAH CREEM-REGEHR, BOBBY BODENHEIMER

Depth Perception in Augmented Reality: The Effects of Display, Shadow, and

Position (2022)

2022 IEEE Conference on Virtual Reality and 3D User Interfaces

Keywords: OST AR, VST AR, Distance, Perception, Shadow, Depth, Surface Contact

Headset: Varjo XR-3

KAROLIINA VARSO

Improving The Accuracy of Time-Of-Flight Camera -Based Floor Height Estimation in Mixed Reality Head-Mounted Displays (2021)

Lappeenranta–Lahti University of Technology LUT

Keywords: Mixed Reality, Floor Height Estimation, Time-Of-Flight, 3D Point Cloud

Headset: Varjo XR-3

FRANCESCO VONA, JULIA SCHORLEMMER, MICHAEL STERN, NAVID ASHRAFI, MAURIZIO VERGARI, TANJA KOJIC, JAN-NIKLAS VOIGT-ANTONS

Comparing Pass-Through Quality of Mixed Reality Devices: A User Experience Study During Real-World Tasks (2025)

arXiv

Keywords: Pass-Through, Apple Vision Pro, Meta Quest 3, Mixed Reality

Headset: Varjo XR-3

Z. YONGQI, S. CHAN-BORMEI, H. MIRI

Transforming Healthcare with Immersive Visualization: An Analysis of Virtual and Holographic Health Information Platform (2024)

Advances in Haptics and Virtual Reality

Keywords: Healthcare, Medical Training, Mixed Reality

Headset: N/A

NICO FELD, FABIAN POINTECKER, CHRISTOPH ANTHES, DANIEL ZIELASKO

Perceptual Issues in Mixed Reality: A Developer-oriented Perspective on Video See-Through Head-Mounted Displays (2024)

2024 IEEE International Symposium on Mixed and Augmented Reality Adjunct

Keywords: Video Pass-Through

Headset: Varjo XR-3

MICHAEL ZINTL, SHARINA KIMURA AND FLORIAN HOLZAPFEL

A Mixed Reality Research Flight Simulator for Advanced Air Mobility Vehicles (2024)

Conference paper: AIAA 2024-4651, UAS Modeling and Simulation

Keywords: Aerospace, Air Mobility, Flight Simulation

Headset: Varjo XR-3

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