## Project Overview

<table>
<thead>
<tr>
<th><strong>Project name</strong></th>
<th>Movement prediction in augmented reality (AR)</th>
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<tr>
<td><strong>TUM Department</strong></td>
<td>Sport- and Health Sciences</td>
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<tr>
<td><strong>TUM Chair / Institute</strong></td>
<td>Human Movement Science</td>
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<td><strong>Research area</strong></td>
<td>Motorcognition and Neurorehabilitation</td>
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<tr>
<td><strong>Student target group</strong> (departments, disciplines)</td>
<td>Informatics, computer vision</td>
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<td><strong>Project supervisor(s) – Name</strong></td>
<td>Waltraud Stadler, Nina Rohrbach, Joachim Hermsdörfer</td>
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**Project supervisor(s) – Contact Details**
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- Phone: +49 (0)89 24511
Project Description

In 2015, Microsoft released the first augmented reality (AR) head-mounted display that is capable of spatially capturing and mapping its environment. At TUM, the device, called the HoloLens, is being studied to enhance the field of neurorehabilitation.

In this project, we are particularly interested in creating an application to test the prediction of the movement of 3D objects in AR / mixed reality space. As we know from previous studies in 2D space, humans are generally capable of precisely predicting movement. Future AR applications could make use of this capability.

More precisely, we are asking whether the conditions examined in earlier 2D studies apply to dynamic 3D AR scenarios. To this aim, we vary different aspects of the moving object (e.g. velocity profiles) and the visual scene (e.g. viewer perspective) and test effects on the users' performance in movement prediction.

Another goal is improving the real-time integration of gestures and motor actions to interact with virtual events.

For a comparison between of AR and virtual reality (VR), we are aiming at creating a similar application for a VR System (HTC Vive Pro) which could optionally be included in the project.

Your tasks will be:
- Exploring literature on human visual perception and psychophysics
- Develop an AR application with Unity for the Microsoft HoloLens headset
- Data collection to assess performance / usability in healthy volunteers

There is space to adapt the project to integrate own interests and ideas.

Working hours per week planned | 30 hours / week, 10 ETCS
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(Mon-Fri, max. 40 hrs.)

Prerequisites

| Level (at the time of arrival) | ☐ Undergraduate (3rd Year) | ☐ Senior Undergraduate (4th Year) or Graduate | ☒ Both |
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Prerequisites – Subject-related
- Programming skills (best: Visual Studio (C# & Unity))
- Basic understanding and interest in empirical research
- Commitment to systematic experimental procedures

Prerequisites – Other
- Interest in augmented / mixed reality applications
- Interest in implementing own ideas as part of the design process
- Interest in working with human research participants