



MSc Internship project proposal 2021

“Creating Emotional Memories in Virtual Reality”

Who we are:

Campus Biotech is a Swiss center of excellence in biotechnology and life sciences research focusing on three domains: Neuroscience & Neurotechnology, Digital Health and Global Health.

The Virtual Reality Facility (<https://hnp.fcbg.ch/home/virtual-reality/>) at the Fondation Campus Biotech Geneva (FCBG) is part of the Human Neuroscience Platform and provides researchers with state-of-the-art equipment and expertise in the field of immersive interaction and motion analysis in virtual reality for experimental research and clinical applications (e.g. cognitive and affective assessment, cognitive and behavioral therapy, neurological rehabilitation, gait and upper limb neuro-prostheses).

Project description:

The exhilaration of your first plane ride. The chilling accident you drove by on the highway. Can you remember such emotional events of your life? Very likely you are able to mentally travel back in time and remember these emotional events and the context in which you experienced them. Emotions have a profound impact on what episodes of our lives we keep in memory. However, little is known on how the brain codes these memories. So far, laboratory studies examined how emotion impacts memory using single static stimuli on the computer screen. This approach however ignores that a person's memory for an emotional episode includes several elements (e.g. people, objects) within a spatiotemporal context (time, place) that need to be bound together to create a memory representation for a real-life episode. For this reason, the Emotion and Memory Lab (Prof. Ulrike Rimmele at the FPSE, University of Geneva) aims to employ immersive virtual reality (VR) to build a more ecologically valid and comprehensive model of how emotional memories are constructed in humans.

Experimental Design: Building on and extending conventional desktop emotional memory paradigms (Rimmele et al., 2011; Touryan, Marian, & Shimamura, 2007), participants will walk through distinct VR environments, where they will encounter emotional and neutral stimuli, each embedded in a specific context. Motion, eye movements, pupil dilation and skin conductance, heart rate measures will be assessed to control for attention and physiological arousal. After learning, a memory test will be administered to assess memory for item features of emotional vs. neutral objects, memory for the

contexts as well as associative memory for which object had occurred in which context. In addition, memory for location, spatial layout and time (continuous unfolding of a series of events, as in real-life) will be assessed.

Project planning:

The project requires to:

- Build 3D environment
- Create 3D objects for the memory tasks
- Implement pupil dilatation tracking in a HMD
- Control the luminance of the HMD screen to ensure a good measure of the pupil dilatation
- Develop the memory tasks
- Ensure synchronization of events between the VR application and the physiological measures
- Test the tasks with few participants

Who should apply:

We are looking for excellent candidates with a strong engineering background and interest or initial training in neuroscience. Prior experience in virtual reality and signal processing is recommended. This project will involve software development (C#, Unity3D) and to conduct a behavioral experiment involving signal processing and analysis (Python/MATLAB).

The internship is for MSc level students performing their 5/6-months final research project in 2021. The position is full-time at FCBG in Campus Biotech.

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