School of Computing, Engineering, and the Built Environment
Edinburgh Napier University

PHD STUDENT PROJECT

Application instructions:
Detailed instructions are available at :
https://www.napier.ac.uk/research-and-innovation/doctoral-college/how-to-apply

Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.

Project details

Supervisory Team:
- DIRECTOR OF STUDY: Dr John McGowan (Email: j.mcgowan@napier.ac.uk)
- 2ND SUPERVISOR: Dr Iain McGregor

Subject Group: Applied Informatics

Research Areas: Human Computer Interaction

Project Title: Multimodal Applications for Cognitive Differences

Project description:
Technological interventions have been created to attempt to counter symptoms of stress, through improving cognition and functioning of target users. Mobile devices, virtual reality (VR) and augmented reality (AR) applications have demonstrated the ability to support and improve clinical practices through sensory based technologies. The aim of the proposed research is to develop an assistive application for high functioning autistic (HFA) adults, by managing levels of stress in a variety of daily scenarios. This will lead to a further participatory design process, where the data will be used as a basis to develop and facilitate the initial designs of an application to test audio-visual entrainment, with the aim of helping to manage stress in autistic people in their chosen environments. Previous studies 1,2 have demonstrated physiological as well as psychological benefits of interactive multimodal systems. Further development of accessible applications for people with cognitive differences could encourage experiences with friends and family, increasing their effective therapeutic capabilities, whilst helping to manage stress. This PhD project will employ a User Experience, Interaction Design and

Grounded approach to investigate, develop, and evaluate interactive multi-modal applications, including vocalisation and gestural parameters. This work aims to build on the expertise of staff at ENU School of Computing, Engineering, and the Built Environment. Qualitative and quantitative approaches to capturing data will be employed. This may include participatory design with the target population, single case study design, semi-structured interviews, surveys, and questionnaires. Observational approaches using appropriate design methods may also be employed to gather participant data. Candidate knowledge and application of ethical processes will be required throughout the PhD. Analysis of requirements analysis data will lead to the development of a series of multi-modal prototype applications. Audio, visual, and haptic development may include exploration of different metrics. For example, heartbeat, breathing, head movement, eye movement, use of recorded imagery, colour choice, and animation. Platform development and testing aims to employ mobile and wearable devices. Potential software could include the use of game engine technologies, scripting languages, and audio middleware. Evaluation methods will include using a Ground Theory approach, where appropriate software (for example, NVivo) will be used to code and analyse qualitative data. Statistical methods and related software (for example, SPSS) may also be employed to analyse quantitative data to be presented in appropriate formats for publication. Prospective applicants are encouraged to contact the Supervisor before submitting their applications. Applications should make it clear the project you are applying for and the name of the supervisors.

References:
[1] Peppé S, McCann J, Gibbon F, O'Hare A, Rutherford M. Receptive and Expressive Prosodic Ability in Children With High-Functioning Autism. Journal of Speech, Language, and Hearing Research. 2007 Aug;50(4):1015–28. 2.
[2] Lipkin P, Law J, Marvin A, Rubenstein E, Toroney J. Auditory hypersensitivity issues in children with autism spectrum disorders (ASD): Characteristics and burden. Ann Neurol. 2016;80:S392. 3.
[3] Dawson G, Meltzoff AN, Osterling J, Rinaldi J, Brown E. Children with autism fail to orient to naturally occurring social stimuli. J Autism Dev Disord. 1998;28(6):479–85. 4.
[4] Hirvikoski T, Blomqvist M. High self-perceived stress and poor coping in intellectually able adults with autism spectrum disorder. Autism. 2015;19(6):752–7. 5.
[5] Baron MG, Groden J, Groden G, Lipsitt LP. Stress and Coping in Autism. Stress and Coping in Autism. Oxford University Press; 2016. 6.
[6] Bishop-Fitzpatrick L, Mazefsky CA, Minshew NJ, Eack SM. The Relationship Between Stress and Social Functioning in Adults With Autism Spectrum Disorder and Without Intellectual Disability. Autism Research. 2015 Apr;8(2):164–73. 7.
[7] Bauer V, Bouchara T, Bourdot P. Extended Reality Guidelines for Supporting Autism Interventions Based on Stakeholders' Needs. J Autism Dev Disord. 2022 Mar 4;(0123456789).

Candidate characteristics

Education:
A first-class honours degree, or a distinction at master level, or equivalent achievements in Computer Science, or similar.

Subject knowledge:
- Interaction Design.

Essential attributes:
- Experience of fundamental computing.
- Competent in Multi-Modal Interaction Design and User Experience.
- Knowledge of working with groups with additional support needs.
- Good written and oral communication skills.
- Strong motivation, with evidence of independent research skills relevant to the project.
- Good time management.

Desirable attributes:
- Knowledge of Game Engine technology.
- Mixed-Reality.
- Max or Pure Data.
- Prior research experience.