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 Carl Strathearn (Email: c.strathearn@napier.ac.uk)
- 2ND SUPERVISOR: Dr Emilia Sobolewska

Subject Group: Computer Science

Research Areas: Computer Science, AI

Project Title: A Personality Orientated Spoken Dialogue System for Realistic Humanoid Robots

Project description:
Realistic humanoid robots (RHRs) with embodied artificial intelligence (EAI) provide a unique opportunity for broadening communication between humans and technology that can be highly accessible, natural and engaging. However, most social robots used in HRI research are platform systems such as Pepper, Nao and Furhat, which are costly, difficult to adapt (preconfigured) and use licenced development software. This paradigm has created a bottleneck in HRI for developing more novel human-like, impactful, cost-effective social robots for HRI research [1].

Unlike previous generalised spoken dialogue systems (SDSs) for social robots, this project will focus on developing a 'personality orientated' SDS for a bespoke elderly-looking RHR called Euclid [2]. By taking insights from psychology models such as Gardner's Theory of Multiple Intelligences [3] and the 5-factor model of personality [4], we will develop a detailed personality for

the robot incorporating elements such as a backstory/experiences, emotions, knowledge and lifestyle for more sustained and humanlike HRI. Using this data, we will develop an appropriate NLP pipeline to manage the dialogue flexibly i.e. generative and rule-based methodologies. We will then conduct a series of HRI experiments to evaluate the SDS in different conversational scenarios. The impact of this research is a developmental SDS framework for more humanlike EAI personalities that can be applied to bespoke social robots in domains such as social companions and healthcare.

References:
1. Strathearn C, Ma M. Modelling User Preference for Embodied Artificial Intelligence and Appearance in Realistic Humanoid Robots. Informatics. 2020; 7(3):28. https://doi.org/10.3390/informatics7030028
2. https://www.carlstrathearn.co.uk/
3. Main, P (2023, February 14). Multiple Intelligences - Howard Gardner. Retrieved from https://www.structural-learning.com/post/multiple-intelligences-howard-gardner
4. Marsh, H. W., Nagengast, B., & Morin, A. J. (2013). Measurement invariance of big-five factors over the life span: ESEM tests of gender, age, plasticity, maturity, and la dolce vita effects. Developmental psychology, 49 (6), 1194.

Candidate characteristics

Education:
A first-class honours degree, or a distinction at master level, or equivalent achievements in Human-Robot Interaction, Conversational AI, or Social Robotics (assuming a good level of programming skills).

Subject knowledge:
Technical: Python or Java and solid data management/processing background
Non-technical: HRI development and evaluation approaches

Essential attributes:
- Candidate must have hands-on experience working with social robots and a good understanding of NLP pipelines and dialogue management frameworks

Desirable attributes:
- Experience working with LLMs and rule-based dialogue systems, dialogue modelling, database curation and practical HRI evaluations