

# Template for advertng PhD project on FindAPhD.com

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<b>Department</b>	School of Engineering and the Built Environment
<b>Supervisors</b>	Professor Hongnian Yu, Dr Pelagia Koufaki and Professor Michael Vassallo
<b>Funding Status</b>	Funded PhD Project (Worldwide)
<b>Application Deadline</b>	14/04/2022
<b>Project Title</b>	Improving the accuracy of an activity recognition system for elderly people in assisted living

## PROJECT DESCRIPTION

The aim of this project is to test wearable sensors that are to be attached onto the dominant wrist and then the ambient sensors will be installed in the environment. When a user performs daily activities at home, their location information will be captured first. At the same time, the information from wearable sensors will be transmitted to the processing centre. In the processing centre, the user's daily activities or some anomalies will be identified. The results can be sent to the community, caregiver or family members. To enhance the practice of the designed system, the data gathering will be conducted in the subjects' homes with less interference and they can perform the activities in any order within their own timeframe. The collected data will be pre-processed to remove the high-frequency noise and other disturbances. Then the optimal window size will be applied to segment the serial data for further analysis. In each window, apart from the common used features new features will be extracted to improve accuracy. Mutual information-based algorithms will be used to select the best feature set. Support Vector Machines (SVM) are a set of supervised learning methods used for classification, regression and outlier detection. The selected set will be used as the input into for SVM algorithms.

This project is supervised by the multidisciplinary team which includes research expertise, clinical experience and the networks of people from Edinburgh Napier University, QueenMargaret University, and Royal Bournemouth Hospital. Building on our previous work, we will implement new methodologies and develop new tools to record and monitor quantity and quality of human movement, incorporating data analysis, with state-of-art wearable devices, to offer novel insights into gait pattern of elderly and frail individuals and the relationship to health and wellbeing outcomes.

### Academic qualifications

A first degree (at least a 2.1) ideally in Computing, or Computing Engineering, or Electronics and electrical engineering, or statistics, or Mathematics or Health and Exercise related disciplines with a good fundamental knowledge of wearable sensors and quantitative data analysis and experience with working with human participants in research or practice settings..

### English language requirement

IELTS score must be at least 6.5 (with not less than 6.0 in each of the four components). Other, equivalent qualifications will be accepted. [Full details of the University's policy](#) are available online.

### Essential attributes:

- Experience of fundamental data analysis, artificial intelligence, data sciences
- Competent in statistics and data modelling
- Knowledge of applied statistics
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

### Desirable attributes:

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<b>Indicative Bibliography</b>	<p>[1]. Yan Wang, Shuang Cang, Hongnian Yu, Mutual Information Inspired Feature Selection Using Kernel Canonical Correlation Analysis, Expert Systems with Applications, Vol. 4, November 2019</p> <p>[2]. Yan Wang, Shuang Cang, Hongnian Yu, A survey on wearable sensor modality centred human activity recognition in health care, Expert Systems with Applications, Volume 137, Pages 167-190, 2019</p> <p>[3]. Arif Reza Anwary, Hongnian Yu and Michael Vassallo, Gait Evaluation using Procrustes and Euclidean Distance Matrix Analysis, IEEE Journal of Biomedical and Health Informatics, 2019</p> <p>[4]. Yan Wang, Shuang Cang, Hongnian Yu, Improving Daily Activity Recognition Accuracy for Older People: Data fusion based on a case study in a Hybrid Sensory Environment, IEEE Sensors Journal, 18(16), pp. 6874 – 6888, 2018</p> <p>[5]. Arif Reza Anwary, Hongnian Yu and Michael Vassallo, Optimal foot location for placing wearable IMU sensors and automatic feature extraction for gait analysis, IEEE Sensors Journal, pp. 2555 – 2567, 18(6), 2018</p> <p>[6]. Saisakul Chernbumroong, Shuang Cang and Hongnian Yu, A practical multi-sensor activity recognition framework for home-based care, Decision Support Systems, 66, pp. 61-70, 2014,</p> <p>[7]. Saisakul Chernbumroong, Shuang Cang, Anthony Atkins, Hongnian Yu, Elderly activities recognition and classification for applications in assisted living, Expert Systems with Applications, 2013</p>
<b>Funding notes</b>	This project may be funded by a scholarship of the School of Engineering and Built and Environment. Please see <a href="https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process">School-funded PhD scholarships - RESEARCH AND INNOVATION (napier.ac.uk)</a> for information on the scholarships and how to apply for them.
<b>Enquiries</b>	For informal enquiries about this PhD project, please contact Professor Hongnian Yu (Email: <a href="mailto:h.yu@napier.ac.uk">h.yu@napier.ac.uk</a> ) or Dr Pelagia Koufaki (Email: <a href="mailto:PKoufaki@qmu.ac.uk">PKoufaki@qmu.ac.uk</a> )
<b>Web page</b>	<a href="https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process">https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process</a>

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