BU MATCH FUNDED STUDENTSHIPS 2024
PROJECT DESCRIPTION

PROJECT TITLE

Digital scoring of severity in anterior/posterior circulation strokes

PROJECT SUMMARY

This project involves app development for identification and automatic scoring of severity in anterior/posterior circulation stroke. We aim to study all aspects of stroke symptoms and current standards of objective assessments to explore if this is feasible to use smart phone technologies to make early diagnosis for stroke. For example the vibratory mode of mobile phone can be used for quantifying sensory deficit such as facial palsy, accelerometer and gyros can be used for arm and leg balance/coordination assessment, signal processing techniques can be used for detecting slur in voice and image processing for vision disturbance assessment. Early recognition of posterior circulation stroke may prevent disability and save lives. The history of scores can then be utilized to monitor the effectiveness of treatment methods and quantify a patient's improvement or decline.

ACADEMIC IMPACT

The academic impact of this research will be significant since the proposed research is quite unique that has not been attempted before. The timeliness of this project cannot be overemphasized since the costs to the UK National Health Service of stroke at the moment are estimated to be over £9 billion per year and the cost is expected to rise in real terms by around 30% by the year 2030. The NIHSS score has relatively moderate sensitivity in posterior circulation strokes which are more common in young adults. Since stroke in the younger adult is particularly significant given its tremendous social and economic impact, as patients are left disabled during their peak years of productivity, we must find an effective tool to quantify and monitor stroke severity. As we are exploring in new areas with completely new methodologies which has not been attempted before we anticipate many publications coming out of this project and will create a long-lasting impact case. The history of scores can then be utilized to monitor the effectiveness of treatment methods and quantifying a patient's improvement or decline. This will not only offer an opportunity to make academic impact but also give us a change for downstream funding and commercialisation of the generated IP through this PhD studentship application. Addressing these issues at hardware level in mobile phones will have profound academic impact since these have never been attempted for quantifying severity of stroke digitally.

SOCIETAL IMPACT

Due to a wide range of non-specific presentations there have been several case reports of initial misdiagnosed posterior circulation strokes. This in turn had the implication of failing in prompt interjection of treatment such as within the "time window" for thrombolysis. From an economic standpoint, the burden of stroke on the healthcare system is considerably higher due to the long-term needs of patients left disabled following stroke. This places an on-going commitment on resources for every healthcare system. To date, only limited research efforts have specifically addressed stroke in young adults particularly the diagnosis is difficult to make due to the relative infrequency of stroke in young adults. However, this research will also significantly improve healthcare outcomes from early diagnosis of other stroke presentations and will positively impact on healthcare cost savings and will have long term societal impact by saving productive life of stroke patients.

PGR DEVELOPMENT OPPORTUNITIES

This project will provide an excellent training opportunity to the PGR undertaking this research in the field of app development relating to mechanical, electronic and image/speech processing technologies. It will also allow a wide range of skills and experience to be developed. This will be supported by our recent experience in app development as we aim to tap our expertise in this area to deliver a worthwhile dignosis tool that may directly

benefit NHS operations. The project will further provide opportunity to work closely with clinicians and patient user groups to understand stroke symptoms and implement them digitally thus quantifying stroke severity digitally. Due to the nature of the project it will provide a unique training opportunity in multidisciplinary areas of engineering, graphics, sensing technology and an appreciation of clinical and user interface design.

SUPERVISORY TEAM	
First Supervisor	Prof. Venky Dubey
Additional Supervisors	Dr Kamy Thavanesan, Clare Shearer
Recent publications by supervisors relevant to this project	Manna SK and Dubey VN [2019] "A Portable Elbow Exoskeleton for Three Stages of Rehabilitation" ASME Journal of Mechanisms and Robotics; 11(6): 065002
	Dubey VN, Dave JM, Beavis J, Coppini DV [2020] "Predicting diabetic neuropathy risk level using artificial neural network and clinical parameters of subjects with diabetes", Journal of Diabetes Science and Technology, pp. 1-7. https://doi.org/10.1177/1932296820965583
	Agrawal, S. K., Dubey, V. N., Gangloff Jr., J. J., Brackbill, E., Mao, Y. and Sangwan, V. [2009] "Design and optimization of a cable-driven upper arm exoskeleton" Journal of Medical Devices, September, vol. 3.
	Brackbill, E. A., Mao, Y., Agrawal, S. K., Annapragada, M. and Dubey, V. N. [2009] "Dynamics and Control of a 4-dof Wearable Cable-driven Upper Arm Exoskeleton" IEEE International Conference on Robotics and Automation (ICRA 2009), Kobe, Japan, May 12-17, 2009.
	Dubey, V. N., Klopot, W. and Skupin, P. "Implementation of Virtual Control Strategies for Natural Rehabilitation of Arm with Visual and Force Feedback" IEEE International Conference on Robotics and Biomimetics (ROBIO 2010), Tianjin, China. 14-18 December, 2010.
	Agrawal, S. K., Dubey, V. N., Gangloff Jr., J. J., Brackbill, E., "Upper Arm Wearable Exoskeleton" US 2010/0113987 A1, May 6, 2010. (US patent).

INFORMAL ENQUIRIES
Please contact the lead supervisor on the following email for informal enquiries: vdubey@bournemouth.ac.uk
ELIGIBILITY CRITERIA
The BU PhD and MRes Studentships are open to UK, EU and International students.

Candidates for a PhD Studentship should demonstrate outstanding qualities and be motivated to complete a PhD in 4 years and must demonstrate:

- outstanding academic potential as measured normally by either a 1st class honours degree (or equivalent Grade Point Average (GPA) or a Master's degree with distinction or equivalent
- an IELTS (Academic) score of 6.5 minimum (with a minimum 6.0 in each component, or equivalent) for candidates for whom English is not their first language and this must be evidenced at point of application.

Candidates for an MRes Studentship should demonstrate outstanding qualities and be motivated to complete a MRes in

18 months and must demonstrate:

- outstanding academic potential as measured normally by an upper second class honours degree (or equivalent Grade Point Average (GPA)

- an IELTS (Academic) score of 6.5 minimum (with a minimum 6.0 in each component, or equivalent) for candidates for whom English is not their first language and this must be evidenced at point of application.

HOW TO APPLY

Please complete the online application form by **the deadline on the project webpage.**

Further information on the application process can be found at: www.bournemouth.ac.uk/studentships