

PhD Projects at Northumbria University

Title: Intelligent Pathological Testing for Diagnosis using Smart Phone (NU_PHD1)

Contact Person:

The increasing popularity of smart phones with sensing capability is giving researchers the opportunity to design and develop mobile applications. Particularly, mobile technologies are creating new value in healthcare domain. Handheld devices and mobiles have been regarded as promising platforms to provide affordable solutions, scalable approaches to widespread care, and ultimately better patient health outcomes due to mobility. This research will investigate into an innovative development of a low cost smartphone based intelligent system integrated with microscopic lens that allows pathological testing in remote areas, poor and developing countries for regular diagnosis. Hybrid AI (artificial intelligence) algorithm will be used for pathological diagnosis with a particular focus to blood testing to identify the diseases for diagnosis.

Title: Intelligent Mobile based Decision Support System for Automatic Drug Identification (NU_PHD2)

Contact Person:

The increasing popularity of smart phones with sensing capability is giving researchers the opportunity to design and develop mobile applications. Handheld devices and mobiles have been regarded as promising platforms to provide affordable solutions and scalable approaches due to their availability and accessibility. This research will investigate into an innovative development of a low cost smartphone based intelligent system integrated with microscopic lens that allows drug testing in remote areas and at any time. Hybrid AI (artificial intelligence) algorithm with crystal pattern recognition technique will be used to identify the type of the drug.

Title: An Intelligent Decision Support System to Improve the Treatment for very Low Birth Weight Premature Babies (NU_PHD3)

Contact Person:

In preterm infants, policy and practice affects exposure to breast milk, antibiotics and probiotics which in turn are likely to have significant effects on gut microbial communities colonisation and dynamics. Clinical collaborators have recently

commenced a large scale clinical trial to study whether supplementing infant feed with bovine lactoferrin has a significant impact in reducing necrotising enterocolitis (NEC) in premature very low birth weight babies, as has been previously claimed in the literature. In this study the aims are to identify the impact of these exposures on the development of the gut microbial community and subsequent prevalence of NEC and sepsis. This research will investigate into the modelling for therapeutic intervention, typically with a combination of antibiotics affects the development and dynamics of the gut community and subsequent clinical outcomes for the infants. Combining clinical, demographic and microbial data will provide a framework for developing a decision based tool to improve the treatment and outcomes for very low birth weight premature babies. To achieve this aim, a data warehouse for the patient's history and a knowledge based decision support scheme using artificial intelligence will be developed.

Title: Intelligent Rapport Agents with Autonomy and Adaptability in Educational Games(NU_PHD4)

Contact Person: Dr. Li Zhang

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This PhD project aims to develop an intelligent system with advanced functionalities in natural human-robot/agent interaction and robot-robot/agent cooperation to benefit users. It will employ intelligent agents embodied either in a humanoid robot or handheld devices. The intelligent agents will be capable of performing affect sensing from multimodal interactions and will also be equipped to express empathy in their dialogue, tone of voice and body language. Advanced machine learning algorithms will be explored for the above developments. The PhD candidate is required to hold a good master degree from Computer Science or Engineering with excellent C++/Java/Python programming and English communication skills.

Title: Wireless Sensor Networks for Healthcare (NU_PHD5)

Contact Person: Dr. Nauman Aslam

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Applications are invited from those interested in pursuing a PhD in Wireless Sensor Networks at Northumbria University, UK. The selected candidate will pursue research in health care application of WSNs focusing on security, and quality of service aspects of sensed medical data. The research will be aimed at developing intelligent algorithms and protocols (based on artificial intelligence, adaptive learning, optimization etc.) to optimize end-to-end QoS. The research will also include development of novel analytical formulations to investigate QoS aware scheduling and routing strategies for large-scale WSN deployments in healthcare.

Title: User Experience of Enterprise for the Improvement of Employee Productivity (NU_PHD6)

Contact Person: Dr. Honglei Li

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The PhD applicant would be expected to have experience in ERP systems and have skills in business process management. The industry experience with ERP system, especially with SAP ERP systems are most appreciated. The research area would focus on business process management, specifically, user experience of enterprise systems, process innovation, business process for SMEs, and ERP systems for SMEs are preferred.

Title: Visible light Communications (NU_PHD7)

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In recent years there are increasing interests in visible light communications (VLC) for indoor wireless communications. It is envisaged that VLC will be widely adopted for various communication applications in home and office environment. In this work we would like to investigate the mobility model of VLC system and also integrate VLC features to existing handheld appliances/devices or Smartphone. Theoretical work and practical demonstration are required for evaluation. The person is expected to have knowledge in telecommunications and optical communications. It is desirable if the candidate has practical experience and good programming skills.

Title: Musculoskeletal Analysis and Simulation of Human Motion (NU_PHD8)

Contact Person: Dr. Hubert Shum

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Since human movements are driven by muscles and the underlying bone structure, a deflected movement usually indicates problems in the musculoskeletal system. As motion capture devices have become more popular, experts from the medical sections have shown increasing interests to analyze captured motion from patients suffering from injury or movement-related sickness. In this research, an algorithm will be designed to analyze captured motion and identify possible muscle weakness or damage. Simulation will be conducted to predict the possible results after the improvement of muscle condition during training or treatment. With the detailed analysis, it is expected that the effectiveness of physical rehabilitation and sport training can be improved.

with notions of the social choice theory to define new behavior, favoring the efficiency of the humanitarian operations from a global point, sometimes to the detriment of the local efficiency. Moreover, information available at this local scale are very limited and the decision-making of each actor must be based only these poor information, but still with the incentive of favoring the efficiency of the whole humanitarian supply chain.

Multi-agent system is also a suitable tool to study dynamic systems. It will be an essential characteristic to evaluate the significance of the decision-making criterion (of each entity) when humanitarian supply chain will be submitted to simultaneous crisis. Re-organization of support operations at a local scale may be required to optimize the distribution of humanitarian aid at a global scale.

Data from humanitarian organizations have already been gathered and many scenarios based on these real data have been established. They will be used to evaluate the new behavior suggested to all communities and actors of the humanitarian supply chain. Thus, we will demonstrate the impact of human behavior in this issue, and propose some trade-offs to improve the situation.

Keywords (3 to 5): Multi-Agent System, Simulation, Supply Chain Management, Optimization, Decision Support Systems,

Publications related to the subject (2 to 3 references):

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