

## **Topic: Real-Time Control of Robots in Highly Uncertain Environments**

In this research project, the student will work closely with researchers on the ESPRC funded HARISOM project (EP/T023805/1). The HARISOM project is working to build dynamic models for the movement of industrial robotic arms using the sparse identification of nonlinear dynamical systems. Then integrate these methods with advanced metrology and feedback controllers to improve positional accuracy and thus object manipulation. Where HARISOM considers primarily the modelling and compensation for dynamics in the robot arm, this PhD work considers the further introduction of external forces due to interaction with external objects. Examples could include compensating for the effect of high forces produced during friction welding on compliant robot arms, or improving motion control when handling large, flexible objects such as aerospace panels. The student will gain expertise in the use of machine learning based methods, combined with non-linear control theory to improve motion accuracy in dynamic systems with a focus on robotic arms.

The project will be supervised by Dr David Branson, from the Manufacturing Metrology Team (MMT) and Nottingham Advanced Robotics Laboratory (NARLy). MMT and NARLy are international and diverse teams that thrive on openness and cooperation – students work in teams to achieve joint goals in a friendly but professional cohort.

The position is available for UK candidates, but EU or International applicants who can pay the difference between the Home and International Fees would also be welcome to apply. Candidates must possess or expect to obtain, a high 2:1 or 1<sup>st</sup> class degree in mathematics, science or engineering, or other relevant discipline.

## Supervisor: Dr David Branson



Dr Branson is an Associate Professor of Dynamics and Control and director of the Nottingham Advanced Robotics Laboratory in the Faculty of Engineering, University of Nottingham, UK. He has held research and teaching positions in the United States, United Kingdom and Italy. Providing extensive experience in the design, modelling and control of complex, multi-body, non-linear systems with primary application to robotic and autonomous systems in manufacturing and healthcare environments. Current and previous projects include: PI of the recently funded EPSRC HARISOM project (EP/T023805/1), integrating advanced metrology and machine learning techniques to enhance robot precision; soft robotic continuum surfaces undergoing large actuated deformations (EP/N022505/1); and intelligent production in digital environments on the Chatty Factories project (EP/R021031/1).