PhD Project 2021-22

Data mining of certification test data for enhanced manufacturing metrology

Advanced Composites Laboratory

Project Aim:

Bayesian network provide a mechanism for combining probabilities and graphical representations to represent complex data in a compact format. Their suitability for representing structure in industrial data has been used successfully within the University for revealing some process relationships for a commercial semiconductor manufacturing application. Its part is that it allows relationships to be identified in large data sets and will be applicable to the Spirit AS issues where they have a lot of dimensional control data and a lot of affects resulting from the manufacturing process.

Aim: The analysis of data from non-destructive testing and dimensional / surface measurements generated over a number of years for products, and part features may provide insights that are not apparent by observing a small sample of data. This could link to process parameters setting and inform how variation of production relates to product characteristics and processing methods.

Objectives:

➢ Review state of the art in data mining and identify best practice in NDT and industrial metrology

➢ Identify a range of products and processes and study the testing and measurement data (NDT, dimensional and surface) that are available, characterise the uncertainty of measurements and data collected and provide a framework for relating design key characteristics to measurements collected

➢ Apply Bayesian network techniques to the datasets and analyse the representations obtained, seeking to identify relationships between data results and design parameters of key characteristics and/or the process parameters

➢ Depending on the outcomes of the data mining exercise, a series of experiments will be set up to apply and verify in practice the relationships of product-process-measurement and in this way establish more coherent control of product characteristics variation and of process parameters setting, leading to faster and more reliable manufacturing certification.

Advanced Composites Research Group

Key skills required for the post:	
Candidate should demonstrate knowledge/experience/skills in at least one of the following areas:	
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Key transferable skills that will be developed during the PhD:
These will include an ability to effectively communicate research outcomes to academic peers and industry, independent analytical thinking and problem solving, time management, and leadership.

Lead supervisor:	Prof Roger Woods School of Electronics, Electrical Engineering and Computer Science r.woods@qub.ac.uk
Other supervisors:	Prof Brian G. Falzon CEng FRAeS Professor of Composite Materials and Aerostructures Head of School, b.falzon@qub.ac.uk Prof Paul Maropouos Professor of Advanced Manufacturing AMIC Director, p.maropoulos@qub.ac.uk
Funding mechanism:	UK nationals only.
Application closing date:	31st July 2021
Guaranteed stipend	£15,285 tax free.
PhD students in the School may have the opportunity to apply to be demonstrators on undergraduate modules. Compensation for this can amount to in excess of £2,400 per year.	

Queens University Belfast is a diverse and international institution which is strongly committed to equality and diversity, and to selection on merit. Currently women are under-represented in research positions in the School and accordingly applications from women are particularly welcome.