Déantús

Advanced Manufacturing
Research Center **Ireland**

DCU

Advanced Manufacturing Research Centre
Fully funded PhD positions
Funding duration: 4 years

Background & Role

Arising from a recent Science Foundation Ireland Research Centre award, the following PhD research positions are now available in Dublin City University. The Déantús Advanced Manufacturing Research Centre has been established by Science Foundation Ireland (SFI) to deliver high-impact, innovative science and engineering research. Déantús - 'manufactured' in Irish - has particular focus on additive manufacturing ('3D printing') combined with advanced digital technologies applied in a precision manufacturing environment, see http://www.deantus.ie/. The Centre brings together a multi-disciplinary team of over 70 PhD and Post-Doc researchers in manufacturing engineering, materials and data science, in a cross-disciplinary and translational research environment. Déantús operates in close collaboration with a global network of companies and collaborators. The main DCU team (Prof. Dermot Brabazon, Prof. Alan Smeaton, Prof. Greg Hughes, and Prof. Patrick McNally) have five PhD positions to be filled as detailed below.

1. **Investigation of metal AM produced thermal field, microstructure and resultant part properties**

Position: PhD – D. Brabazon*, P. McNally, A. Ivankovic (* = lead supervisor)
Project descriptor:
In this project, an advance on previously developed and implemented fundamental models of laser-powder interaction will be examined in order to better predict the actual process thermal fields and gradients. To aid with accurate model development, the powder thermal conductivity and emissivity will be measured. The thermal gradients predicted will be compared to experimentally measured microstructure, residual stress and mechanical properties.
Applicant background required: A first class degree in materials science and engineering, mechanical engineering, or cognate discipline. Thermal or fluid flow modelling experience is preferable.

2. **Re-inforcing nano-particle integration into metal AM and produced part characterisation**
Position: PhD – D. Brabazon*, G. Hughes, Y. Delaure
Project description:
Conventional and commercial currently used matrix composites are produced using micrometer scale metal and reinforcement powders. In this project, reinforcing phases of elements such as SiC, WC and carbon allotropes of nano-scale will be integrated within the metal AM process. Laser ablation for nano-particle production in liquid will be investigated for reinforcing phase production. Processing routes for incorporation of the nano-reinforcing phase within micrometer scaled metal matrix powder will be examined, for example using nebulising technology. Correlation of production parameters and resultant part properties will be examined for process optimisation. Nano-material characterisation techniques including XPS, TEM, and AFM will be utilised to enable a better fundamental understanding of the effects of reinforcement phase.
Applicant background required: Degree in materials science and engineering, mechanical engineering, nanotechnology, or cognate discipline.

3. **Analysis of metal AM process optimisation and control strategies**
Position: PhD – D. Brabazon*
Project descriptor:
This project will involve process mapping, including the testing of produced components. The correlation of production parameters and part measured property data will be investigated for

process optimisation. Input parameters of laser power, process speed, and scan spacing will be varied while output properties of part strength, hardness, microstructure, and dimensional accuracy will be examined. Metal AM control algorithms will thereby be developed and tested for enhanced process control. Other parameters to be considered include thermal field, as well as scan strategy pre- and post-heat treatment.

Applicant background required: Degree in materials science and engineering, mechanical engineering, or cognate discipline.

4. Use of non-invasive photothermal and photoacoustic techniques for SLM process monitoring

Position: PhD – P. McNally*, D. Brabazon
Project descriptor:
We will explore the application of a selection of techniques based on the use of a modulated Selective Laser Melting process laser or a parallel probe laser, which can produce thermal waves in the manufactured component, which in turn lead to the generation of localised acoustic or component thermal deflections. The emphasis will be placed on non-contact with the manufactured component, and photoacoustics, photothermal deflection of sample surfaces and/or spatially resolved acoustic spectroscopy techniques will be explored.

Applicant background required: Degree and/or relevant experience in Physics/Applied Physics/Materials Science, Electronic Engineering, or cognate discipline.

5. Application of recommender systems approaches for interaction between engineer and AM process

Position: PhD – A. Smeaton*
Project descriptor:
As part of the additive manufacturing process there is a critical interaction that takes place between the engineer or designer who has specified the product to be manufactured, and the additive manufacturing process itself, in real time. Manufacturing characteristics can impact the quality of the final outcome in terms of metrology, tensile strengths and other mechanical properties and decisions and trade-offs can often need to be made as the product is being manufactured. Led by Prof Smeaton at DCU, this project will aggregate streams of real-time manufacturing data, analyse and identify important information which will be used as input into a recommender-based decision support system. Interest and/or experience in natural language processing and knowledge engineering would be an advantage.

Applicant background required: Degree and/or relevant experience in Natural Language Processing, knowledge engineering

Minimum Criteria

The team is looking for high performance aspiring applicants with a desire to discovering new knowledge and drive forward advanced manufacturing technologies. Applicants are invited from high achieving graduates with the specific related backgrounds noted above. It is desirable that the candidate would have some previous experience with advanced manufacturing or additive manufacturing. A demonstrated ability of good communication skills will be sought. The level of English required is noted here: http://www4.dcu.ie/registry/english.shtml

Position offers: Tax free stipend of €18,500/year; fees paid - €5,500/year; travel to international conferences and research collaborator visits; research materials coverage; team office.

Application deadline - 23rd August 2017:

Include in subject line of the email "Déantús PhD application" and the number above of the position which you are applying for. Send the expression of interest cover letter with your CV directly to:

Ms Sheila Boughton – Sheila.boughton@dcu.ie