

School of Computing, Engineering, and Intelligent Systems

**Research & Innovation** 

**Annual Report** 

01 August 2021 - 31 July 2022







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1. Foreword: Professor Damien Coyle Research Director

In presenting the Annual Report for the School of Computing, Engineering and Intelligent Systems (SCEIS) for the academic year 2021-2022, I am pleased to report that we have had one of our most successful years to date in terms of major projects funded and successfully started as well as going from strength to strength in terms of our Research Excellence Framework 2021 (REF2021) results. In addition, there have been many major individual accomplishments by our staff and graduate researchers and substantial progress in our research growth plans at the Intelligent Systems Research Centre (ISRC).

Approximately every 7 years in the UK, subject units in universities are assessed in terms of research excellence across their research outputs (papers), impact and environment through the Research Excellence Framework (REF). In partnership with the School of Computing on the Belfast Campus we are assessed as one unit in Computer Science and Informatics (Unit of Assessment 11). Computer Science and Informatics at Ulster is the only Computer Science and Informatics unit in Northern Ireland that made a UoA11 submission to REF2021 and is the 6th largest Computer Science and Informatics unit in the UK. The unit at Ulster is now ranked 9th in the UK for overall research power in this subject area with an outstanding 92% of our research having been judged as being world-leading or internationally excellent. Moreover, the amount of world-leading or internationally excellent research within Computer Science and Informatics at Ulster has increased by 27% since REF2014 with 100% of our research impact now judged as having outstanding or very considerable impacts in terms of reach and significance. This is an outstanding achievement and is testament to the work and effort of all the colleagues in both schools over the 7 years following REF2014 and puts Computer Science and Informatics research in Northern Ireland in a very strong position in the UK.

Our City Deal activities continues to focus on building capacity in AI, Data Science, Industrial digitisation and robotics through CARL and CIDRA. Implementation of the associated work plan has been accelerated by commencement of the SmartNanoNI project (https://www.smartnanoni.com/) a £42.4m project funded by the UK Research and Innovation's Strength in Places Fund. In this we will play a fundamental role in developing AI, analytics and robotic capability to address automation opportunities in advanced manufacturing at the Seagate technologies facility in Springtown Derry. The CIDRA City deal project has likewise been bolstered by a major £50m investment to establish a data innovation hub at Ulster University to support UK manufacturers to accelerate development of digital technologies. The Innovate UK funded Smart Manufacturing Data Hub (SMDH) will support small and medium size manufacturers to capture and better utilise their data, helping them increase productivity, growth and sustainability (smdh.uk). Businesses in sectors spanning from food and drink, aerospace and many more will be supported to develop, test and adopt the latest data-driven technologies. The programme will be supported across the rest of the UK by 12 delivery partners, including the University of Cambridge Institute for Manufacturing, Industry Wales and Scottish Engineering.

In the reporting period, we have also secured eight notable grants from four of the UK's research councils including the Medical Research Council, Engineering and Physical Sciences Research Council (5 awards), Economic & Social Research Council and the Biotechnology & Biological Sciences Research Council. Securing awards from these prestigious funding bodies which support a variety of research disciplines is a testament to the ongoing excellent interdisciplinary research within the school.

In keeping with our focus on interdisciplinary research and the training of researchers with interdisciplinary research skills this year we launched the Intelligent Systems Research Centre, Computational Neuroscience, Neurotechnology and Neuro-inspired Artificial Intelligence Autumn School (ISRC\_CN3). With excellent talks from staff within the school and a range of distinguished external speakers, along with a packed schedule of activities (running alongside the world-renowned Halloween festivities in Derry) the 100 participants from 18 countries (who attended either virtually or physically) reported an extremely engaging and informative event. Thanks to our sponsors including local industry for financially supporting the event and for the excellent team efforts of many academic and support staff in the school.

Many of the projects that we are involved in create an increasing demand for high performance computing and hence, in partnership with Queen's University Belfast, we continue to onboard and train new high performance computing users at the EPSRC funded Northern Ireland High Performance Computing (NIHPC) Facility (<u>https://www.ni-hpc.ac.uk</u>). This is the second year of the current project and we have secured an additional £0.5m from the EPSRC to deploy the latest HPC resources at the facility. The NIHPC facility can be accessed by anyone in Ulster, and we provide training to support new and experienced users with a focus on increasing HPC adoption across research groups within the university and in Northern Ireland.

There have been major contributions from individual staff and PhD researchers across the school in securing and managing the projects outlined above and in undertaking new and exciting research activities. Key outcomes of note are the publication of 116 research papers in high impact journals, books and conferences and 5 new PhD graduates over the past year. This along with the funding secured in the past year for 17 projects has placed the school in an excellent position. Congratulations and thanks to everyone for the collective effort in achieving these successes.

As we publish this report, we look forward to another exciting year that will capitalize on the recent funding secured and our strong REF2021 performance to build new high quality research capacity within the school that can positively impact both regionally and globally.



Further details of our REF2021 results can be found at <u>11. Computer</u> <u>Science and Informatics - REF 2021 (ulster.ac.uk)</u>

Further details of our research, facilities, staff profiles and research expertise can be found at <u>Intelligent</u> <u>Systems Research Centre - Ulster University</u>

Or by contacting Louise Gallagher (Academic Excellence Executive Assistant) at Email: <u>l.gallagher@ulster.ac.uk</u>; Ph: <u>+44 28 7167 5148</u>.

Professor Damien Coyle Research Director, School of Computing, Engineering and Intelligent Systems.

# Research Students

The following research students were registered on research degree programmes during 2021-22.



### 2. Research Students

Name	Project Title	
-, Nishath Ansari	Robotics and AI Technologies for Heart Health Screening	
Ahmed, Salman	Natural Language Processing for Speech Tagging, Sentiment analysis and Predictive analytics	
Burns, Kelli	The impact of the analytical performance of laboratory tests on clinical decision making	
Chavan Savali	Computer vision for advertising analytics	
	Data Analytics: Deep learning – Combining Reinforcement Learning and	
Cichy, Przemyslaw	Evolutionary Strategies	
Cooley, Christopher	Bio-KIP: Bio-inspired Kinect Image Processing	
Devlin, Sophia	Bobotics and Al Technologies for Heart Health Screening	
	Personalised medicine for acute kidney injury - derivation of computational	
Doherty, Gary	models	
Doherty, John	Autonomous Object Recognition for Robots	
Gillesnie James	Learning of hio-inspired movement in highly noisy environments	
	Litilizing multivariate high frequency time series datasets for real-time	
Gorman, Mark	decision making applications	
	Exploiting Brain Inspired Information Processing in Hardware to Develop	
Hamilton, Natasha	Highly Reliable Always-on Smart Sensor Systems	
Harkin David	Al-based Algorithms for Medical Image Processing	
	Automated Classification of Autism Spectrum Disorder in Children using	
Henderson, Benn	Gait Analysis	
Henderson Jeffrey	Artificial Intelligence for Smart Sensing to facilitate better bealth	
laved Agib	Intelligent hot-spot prediction in networks-on-chin (NoC)	
	A Licer Experience Methodological Framework and Dashboard for the	
Johnston Vivion	A oser Experience Methodological Harnework and Dashboard for the	
Johnston, vivien	Software Solution with Recommendations for Enhancement	
Khodadadaadeh	Intelligent data analytics	
Massoud		
Lenfesty Brendan	Computational Modelling and Machine Learning in Decision Neuroscience	
	Intelligent Data Analytics - novelty detection in critical systems	
Madden Kyle	Secure Networks-on-Chin (NoC) for cyber-physical systems	
McBrearty Shaun	Result ranking for searchable symmetric encryption	
Weblearty, Shaun	Data analytics and modelling in dementia (CPM-CUNICAL Decision Making	
McCombe, Niamh	Project)	
	VR/AR Upper Arm Rehabilation: Personalised Upper Arm Rehabilitation	
McKinney, Joseph	within Virtual and Augmented Reality	
McShane, Niall	Augmented Reality Brain-computer Interface	
	Machine Learning and Environmental DNA Metagenomics for Advanced	
Melaugh, Melissa	Forest Health Surveillance	
Millar Christopher	Kinaesthetic learning for robotic object manipulation	
	Creating opportunities for growth within the circular economy - predicting	
Murray, Cathal	and minimising food waste	
	Correlation between Synchronised Neuronal Burst Firing and Brain Seizures:	
Poshtkohi, Alireza	A Biophysical Model	
	EveSee: A Fast and energy-efficient deen learning model for semantic	
Qiu, Senhui	segmentation in self-driving cars	
Reid, Shane	Computational analysis of visual social signals	

Robinson, Tony	FPGA Computational Acceleration in Genomics – bringing personalised medicine closer to clinical practice for healthy communities
Saranirad, Vahid	George Moore PhD scholarship in Intelligent Data Analytics : Enhancing biological plausability of deep learning for computer vision
Sharma, Pratikshya	Spontaneous facial micro expression recognition and analysis
Simpson, David	Brain-inspired Autonomous Learning for Resilient Electronic Systems
Sweeney, Terence	Machine vision for automated inspection of hard drive components CAST.
Tahernezhadjavazm,	Evolutionary strategies for optimising signal and text classification
Farajollah	
Toman, Marinus	A Computational Model of Regulating Neuronal Excitability by GABA Neurons.

### **Graduated December 2021**

Name	Thesis Title
Ahmad, Bilal	Resource optimisation for cloud-based digital gaming
Cooney, Ciaran	Paradigm and AI Design Choices for Decoding Imagined Speech from
	Electroencephalography

### Graduated July 2022

Name	Thesis Title
Dhakan, Paresh	Open-Ended Continuous Reinforcement Learning For Mobile Robots
McHugh, Catherine	Algorithmic Approaches to Energy Market Price Prediction
Roy, Sujit	Advancing MEG- and EEG-Based Decoding of Motor Imagery for Practical
	Brain-Computer Interfaces for Neuro-Rehabilitation

### Publications

Details of all Publications by the School of Computing, Engineering, and Intelligent Systems are on the Ulster University's Institutional Repository-PURE



### 3. Publications

This section reports those outputs published over the period of this report and classified as either journal articles, books/chapters in books, research reports and published conference papers. <a href="https://pure.ulster.ac.uk/">https://pure.ulster.ac.uk/</a>.

### 3.1 Journal Articles

Anand, A, Rani, S, Anand, D, Aljahdali, HM & Kerr, D 2021, 'An Efficient CNN-Based Deep Learning Model to Detect Malware Attacks (CNN-DMA) in 5G-IoT Healthcare Applications', Sensors, vol. 21, no. 19, 6346, pp. e6346. <u>https://doi.org/10.3390/s21196346</u>

Bhattacharyya, S & Hayashibe, M 2021, 'An Optimal Transport Based Transferable System for Detection of Erroneous Somato-Sensory Feedback from Neural Signals', Brain Sciences, vol. 11, no. 11, 1393. https://doi.org/10.3390/brainsci11111393

Bhattacharyya, S, Valeriani, D, Cinel, C, Citi, L & Poli, R 2021, 'Anytime collaborative brain–computer interfaces for enhancing perceptual group decision-making', Scientific Reports. <u>https://doi.org/10.1038/s41598-021-96434-0</u>

Booth, FG, R Bond, R, D Mulvenna, M, Cleland, B, McGlade, K, Rankin, D, Wallace, J & Black, M 2021, 'Discovering and comparing types of general practitioner practices using geolocational features and prescribing behaviours by means of K-means clustering: A Comparison of Prescribing Behaviours Between Practice Types', Scientific Reports, vol. 11, no. 1, 18289, pp. 1-15. <u>https://doi.org/10.1038/s41598-021-</u> <u>97716-3</u>

Bucholc, M, Bauermeister, S, Kaur, D, McClean, PL & Todd, S 2022, 'The impact of hearing impairment and hearing aid use on progression to mild cognitive impairment in cognitively healthy adults: An observational cohort study', Alzheimer's and Dementia: Translational Research and Clinical Interventions, vol. 8, no. 1, e12248. <u>https://doi.org/10.1002/trc2.12248</u>

Cao, Z, Zhang, Y, Tian, R, Ma, R, Hu, X, Coleman, S & Kerr, D 2022, 'Object-Aware SLAM Based on Efficient Quadric Initialization and Joint Data Association', IEEE Robotics and Automation Letters, pp. 1-8. https://doi.org/10.1109/lra.2022.3190622

Chen, P, Zhou, S, Zhang, Q & Kasabov, N 2022, 'A meta-inspired termite queen algorithm for global optimization and engineering design problems', Engineering Applications of Artificial Intelligence, vol. 111, 104805, pp. 1-12. <u>https://doi.org/10.1016/j.engappai.2022.104805</u>

Chen, W, Jia, Z, Yang, J & Kasabov, N 2022, 'Multispectral Image Enhancement Based on the Dark Channel Prior and Bilateral Fractional Differential Model', remote sensing, vol. 14, no. 1, 233, pp. 1-25. <u>https://doi.org/10.3390/rs14010233</u>

Chowdary, J, Yogarajah, P, Chaurasiaa, P & Guriviah, V 2022, 'A Multi-Task Learning Framework for Automated Segmentation and Classification of Breast Tumors From Ultrasound Images', Ultrasonic Imaging. <u>https://doi.org/10.1177%2F01617346221075769</u>

Connolly, J, Condell, J, Curran, K & Gardiner, P 2022, 'Improving Data Glove Accuracy and Usability Using a Neural Network When Measuring Finger Joint Range of Motion', Sensors, vol. 22, no. 6, 2228. https://doi.org/10.3390/s22062228 Cooney, C, Folli, R & Coyle, D 2022, 'A bimodal deep learning architecture for EEGfNIRS decoding of overt and imagined speech', IEEE Transactions on Biomedical Engineering, vol. 69, no. 6, pp. 1983-1994. https://doi.org/10.1109/TBME.2021.3132861

Cooney, C, Folli, R & Coyle, D 2022, 'Opportunities, pitfalls and trade-offs in designing protocols for measuring the neural correlates of speech', Neuroscience and Biobehavioral Reviews, vol. 140, 104783.

Devine, P, O'Kane, M & Bucholc, M 2021, 'Trends, Variation, and Factors Influencing Antibiotic Prescribing: A Longitudinal Study in Primary Care Using a Multilevel Modelling Approach', Antibiotics, vol. 11, no. 1, 17, pp. 1-11. <u>https://doi.org/10.3390/antibiotics11010017</u>

Doborjeh, M, Doborjeh, Z, Merkin, A, Bahrami, H, Sumich, A, Krishnamurthi, R, Medvedev, ON, Crook-Rumsey, M, Morgan, C & Kirk, I et al. 2021, 'Personalised predictive modelling with brain-inspired spiking neural networks of longitudinal MRI neuroimaging data and the case study of dementia', Neural Networks, vol. 144, pp. 522-539. <u>https://doi.org/10.1016/j.neunet.2021.09.013</u>

Doborjeh, M, Doborjeh, Z, Merkin, A, Krishnamurthi, R, Enayatollahi, R, Feigin, V & Kasabov, N 2021, 'Personalised Spiking Neural Network Models of Clinical and Environmental Factors to Predict Stroke', Cognitive Computation, pp. 1-32.

Doborjeh, Z, Hemmington, N, Doborjeh, M & Kasabov, N 2021, 'Artificial intelligence: a systematic review of methods and applications in hospitality and tourism', International Journal of Contemporary Hospitality Management, pp. 1-23. <u>https://doi.org/10.1108/IJCHM-06-2021-0767</u>

Dong, Q, Zhou, S, Zhang, Q & Kasabov, N 2022, 'A class of 5D Hamiltonian conservative hyperchaotic systems with symmetry and multistability', Nonlinear Dynamics, pp. 1-24.

Dora, S & Kasabov, N 2021, 'Spiking Neural Networks for Computational Intelligence: An Overview', Big Data and Cognitive Computing , vol. 5, no. 4, e67, pp. 1-12. <u>https://doi.org/10.3390/bdcc5040067</u>

Du Bois, N, Bigirimana, AD, Korik, A, Gaju Kéthina, L, Rutembesa, E, Mutabaruka, J, Mutesa, L, Prasad, G, Jansen, S & Coyle, D 2021, 'Neurofeedback with low-cost, wearable electroencephalography (EEG) reduces symptoms in chronic Post-Traumatic Stress Disorder', Journal of Affective Disorders, vol. 295, pp. 1319-1334. <u>https://doi.org/10.1016/j.jad.2021.08.071</u>

Du Bois, N, Bigirimana, AD, Korik, A, Gaju Kéthina, L, Rutembesa, E, Mutabaruka, J, Mutesa, L, Prasad, G, Jansen, S & Coyle, D 2022, 'Electroencephalography and psychological assessment datasets to determine the efficacy of a low-cost, wearable neurotechnology intervention for reducing Post-Traumatic Stress Disorder symptom severity', Data in Brief, Elsevier, vol. 42, 108066, pp. 1-15. https://doi.org/10.1016/j.dib.2022.108066

Guo, LI, Jia, Z, Yang, J & Kasabov, N 2021, 'Detail Preserving Low Illumination Image and Video Enhancement Algorithm Based on Dark Channel Prior', Sensors, vol. 22, no. 1, 85, pp. 1-20. https://doi.org/10.3390/s22010085

Haribabu, M, Guriviah, V & Yogarajah, P 2022, 'Recent Advancements in Multimodal Medical Image Fusion Techniques for Better Diagnosis: An overview', Current Medical Imaging Formerly Current Medical Imaging Reviews, vol. 18. <u>https://doi.org/10.2174/1573405618666220606161137</u>

Harkin, R, Wu, H, Nikam, S, Yin, S, Lupoi, R, McKay, W, Walls, P, Quinn, J & McFadden, S 2022, 'Powder Reuse in Laser-Based Powder Bed Fusion of Ti6Al4V—Changes in Mechanical Properties during a Powder Top-Up Regime', Materials, vol. 15, no. 6, 2238. <u>https://doi.org/10.3390/ma15062238</u> Hernandez, M, Epelde, G, Alberdi, A, Cilla, R & Rankin, D 2022, 'Synthetic data generation for tabular health records: A systematic review', Neurocomputing, vol. 493, pp. 28-45. https://doi.org/10.1016/j.neucom.2022.04.053

Humphries, R, Mellor, J & O'Donnell, C 2021, 'Acetylcholine boosts dendritic NMDA spikes in a CA3 pyramidal neuron model', Neuroscience. <u>https://doi.org/10.1016/j.neuroscience.2021.11.014</u>

Joshi, A, Todd, S, Finn, D, McClean, P & Wong-Lin, K 2022, 'Multi-dimensional relationships among dementia, depression and prescribed drugs in England and Wales hospitals', BMC Medical Informatics and Decision Making.

Kelly, D, Condell, J, Gillespie, J, Munoz Esquivel, K, Nordström, A, Barton, J & Alamaki, A 2022, 'Improved Screening of Fall Risk using Free-Living based Accelerometer Data', Journal of Biomedical Informatics, vol. 131, 104116, pp. 1-13. <u>https://doi.org/10.1016/j.jbi.2022.104116</u>

Kelly, D, Vavasour, G, Giggins, O & Doyle, J 2021, 'How wearable sensors have been utilised to evaluate frailty in older adults: a systematic review', Journal of NeuroEngineering and Rehabilitation, vol. 18, no. 1, 112. <u>https://doi.org/10.1186/s12984-021-00909-0</u>

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Knoery, C, Bloe, C, Iftikhar, A, Bond, RR, Manktelow, M, McGilligan, VE, Rjoob, K, Peace, A, McShane, A & Heaton, J et al. 2022, 'A nurse-led pre-hospital triage service for identifying patients with occlusive myocardial infarction: a service evaluation: a service evaluation', British Journal of Cardiac Nursing, vol. 17, no. 4, pp. 1-10. <u>https://doi.org/10.12968/bjca.2021.0082</u>

Knoery, C, Bloe, C, Iftikhar, A, Bond, RR, Manktelow, M, McGilligan, VE, Rjoob, K, Peace, A, McShane, A & Heaton, J et al. 2022, 'A nurse-led pre-hospital triage service for identifying patients with occlusive myocardial infarction: a service evaluation: a service evaluation', British Journal of Cardiac Nursing, vol. 17, no. 4, pp. 1-10. <u>https://doi.org/10.12968/bjca.2021.0082</u>

Knoery, C, McEwan, KA, Manktelow, M, Watt, J, Smith, J, Iftikhar, A, Rjoob, K, Bond, RR, McGilligan, VE & Peace, A et al. 2022, 'Using latent class analysis to identify clinical features of patients with occlusive myocardial infarction: pre-angiogram prediction remains difficult', Clinical Cardiology, vol. 45, no. 2, pp. 231-238. <u>https://doi.org/10.1002/clc.23755</u>

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Li, Y, Wu, R, Jia, Z, Yang, J & Kasabov, N 2021, 'Video Desnowing and Deraining via Saliency and Dual Adaptive Spatiotemporal Filtering', Sensors, vol. 21, no. 22, 7610, pp. 1-18. https://doi.org/10.3390/s21227610 Liu, J, Hua, Y, Yang, R, Luo, Y, Lu, H, Wang, Y, Yang, S, Ding, X & Liu, J 2022, 'Bio-Inspired Autonomous Learning Algorithm With Application to Mobile Robot Obstacle Avoidance', Frontiers in Neuroscience, vol. 16, 905596, pp. 1-13. <u>https://doi.org/10.3389/fnins.2022.905596</u>

Liu, S, Cao, Y, Liu, J, Ding, X & Coyle, D 2022, 'A Novelty Detection Approach to Effectively Predict Conversion from Mild Cognitive Impairment to Alzheimer's Disease', International Journal of Machine Learning and Cybernetics. <u>https://doi.org/10.1007/s13042-022-01570-2</u>

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Mahdi, AA, Ansari, JA, Chaurasiaa, P, Ahmad, MK, Kunwar, S, McClean, SI & Yogarajah, P 2022, 'A Study of Maternal and Umbilical Cord Blood Lead Levels in Pregnant Women', Indian Journal of Clinical Biochemistry. <u>https://doi.org/10.1007/s12291-022-01040-0</u>

Mannion, J, Hamed, MK, Negi, R, Johnston, A, Bucholc, M & Sugrue, M 2021, 'Umbilical hernia repair and recurrence: need for a clinical trial?', BMC Surgery, vol. 21, no. 1, 365. <u>https://doi.org/10.1186/s12893-021-01358-1</u>

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Mc Hugh, C, Coleman, S & Kerr, D 2021, 'Technical indicators for energy market trading', Machine Learning with Applications, vol. 6, 100182, pp. 1-9. <u>https://doi.org/10.1016/j.mlwa.2021.100182</u>

McCombe, N, Ding, X, Prasad, G, Gillespie, P, Finn, D, Todd, S, McClean, P & Wong-Lin, K 2022, 'Alzheimer's disease assessments optimised for diagnostic accuracy and administration time', IEEE Journal of Translational Engineering in Health and Medicine. <u>https://doi.org/10.1109/JTEHM.2022.3164806</u>

Melly, C, McGeehan, G, O'Connor, N, Johnston, A, Bass, G, Mohseni, S, Donohoe, C, Bucholc, M & Sugrue, M 2022, 'Patient-reported outcome measures (PROMs) after laparoscopic cholecystectomy: systematic review', BJS Open, vol. 6, no. 3, zrac062, pp. 1-11. <u>https://doi.org/10.1093/bjsopen/zrac062</u>

Millar, C, Kerr, E & Siddique, N 2022, 'LSTM Network Classification of Dexterous Individual Finger Movements', Journal of Advanced Computational Intelligence and Intelligent Informatics, vol. 26, no. 2, pp. 113-124. <u>https://www.fujipress.jp/jaciii/jc/jacii002600020113/</u>

Miller, S, Curran, K & Lunney, T 2021, 'Detection of Anonymising Proxies Using Machine Learning', International Journal of Digital Crime and Forensics, vol. 13, no. 6, pp. 1-17. <u>https://doi.org/10.4018/ijdcf.286756</u> Miller, S, Curran, K & Lunney, T 2021, 'Identifying the Use of Anonymising Proxies to Conceal Source IP Addresses', International Journal of Digital Crime and Forensics, vol. 13, no. 6, pp. 1-20. https://doi.org/10.4018/ijdcf.20211101.oa8

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### Research Funding

**Ongoing and Active Research Projects** 







### 4. Research Funding

Ongoing a	nd Active	Research	Proie	cts. n	otably:	

Unit of Assessment Member	Title of Award	Funding Body	Value	Project Dates
Prof D Coyle	AI for Intelligent Neurotechnology and Human-Machine Symbiosis	UKRI EPSRC Turing AI Acceleration Fellow	£1,807,387	01/01/21- 31/12/25
Prof D Coyle Prof V Molkov Prof JAD McLaughlin Prof AJ Bjourson Mr S Orr, Catalyst Inc Mr S Trotter, Dell Corporation Ltd Prof R Woods, QUB	Northern Ireland HPC - Kelvin-2	EPSRC	£494,698	01/01/20 – 31/12/23
Dr JV Condell Prof E Ramsey Dr B Gardiner Dr D Kelly	REAMIT -Improving Resource Efficiency of Agri-business supply chain by Minimizing Waste using Big Data and Internet of Things Sensors	INTERREG VB NWE	£348,209	10/01/19 – 09/07/22
Prof LP Maguire	Dr George Moore Chair in Data Analytics	Mrs Angela Moore	£3,000,000	01/08/18 – 31/07/35

### Portfolio of Research Grants awarded during period 1 August 2021 - 31 July 2022

Unit of Assessment Member	Title of Award	Funding Body	Value	Date
Prof Gerard Leavey Prof Jamie Murphy Prof Mark Shevlin Dr Michael Rosato Prof Victoria Simms Dr Magda Bucholc Samuel McKenzie Dr Richard Douglas Dr Maria Loane Dr Joanne Given	ADR-NI renewal 2022- 26	ESRC Economic & Social Research Council	£2,036,341.00	29/10/21

Prof R Woods, QUB Dr I Tikhonova, QUB Prof P Hu, QUB Dr D Hester, QUB Prof V Molkov Prof D Coyle Prof SJ Smartt, QUB Dr S Scott-Hayward, QUB Prof M Salto-Tellez, Inst of Cancer Research Prof AJ Bjourson Prof HTK Vandierendonck, QUB Dr KR Rafferty, QUB	NI-HPC+: Increased High Performance Computing for Data Science Applications	EPSRC Engineering & Physical Sciences Research Council	£499,645.00	01/11/22
Prof Joan Condell Karla Munoz Esquivel Prof Elaine Ramsey Dr Ruth Price Prof Assumpta Ryan Prof Gerard Leavey Dr Niamh Kennedy	Enhancing CAREgivers WELLbeing (eCAREWELL)	UK Community Renewal Fund	£741,859.80	03/11/21
Prof Damien Coyle Prof Girijesh Prasad Dr Saugat Bhattacharya Prof Sonya Coleman Peter Devine	Smart Nano- manufacturing corridor	Innovate Uk	£1,998,909.74	01/12/21
Prof Joan Condell Michael Callaghan	Heritage in Virtual Environments	Interreg NPA 2021-2027 Programme	£16,727.00	08/12/21
Prof Joan Condell Dr Daniel Kelly	HALE	Interreg NPA 2021-2027 Programme	£12,040.00	08/12/21
Prof Joan Condell Dr Ian Cleland	Homes for Healthy Ageing Draft Submission with Catapult	Catapult (Connected Places)	£50,000.00	17/12/21
Prof Sonya Coleman Dr Justin Quinn Mr Peter Devine Dr Dermot Kerr	Smart Manufacturing Data Hub (SMDH)	Innovate UK	£5,629,266.00	17/12/21
Prof Joan Condell Michael Callaghan	Promoting Heritage In Virtual Environments	Interreg NPA 2021-2027 Programme	£19,820.09	10/02/22

Prof Joan Condell Dr Helen Jackson	CADI-SHAC - CApitalising on Digital InnovationS for Heritage And Capacity	Interreg NPA 2021-2027 Programme	£22,333.11	10/02/22
Prof Sonya Coleman Dr Dermot Kerr Dr Emmett Kerr Dr Philip Vance Prof Damien Coyle Prof Liam McDaid	CobOt eNvironments FOR Manufacturing	DfE NI Department for the Economy	£463,973.00	17/02/22
Prof Joan Condell	Digital Health: A digital twin to improve holistic community-based diagnosis of heart disease	EPSRC Engineering & Physical Sciences Research Council	£81,317.70	14/03/22
Prof Joan Condell	Unpacking the black box of interventions such as peer support to optimize mental health outcomes of family caregivers	EPSRC Engineering & Physical Sciences Research Council	£83,925.96	14/03/22
Prof Joan Condell	RBOC Network+ Resilience Beyond Observed Capabilities	EPSRC Engineering & Physical Sciences Research Council	£32,629.59	18/03/22
Prof Malachy O Neill Prof Liam Maguire Dr Laura Bradley- McCauley Prof Sandra Moffett Dr Kristel Miller Dr Trevor Cadden Dr Karen Bonner Prof Maurice Mulvenna Prof Siobhan O'Neill	Strand III: Atlantic Innovation Research Network	HEA Higher Education Authority	£1,056,965.00	27/04/22

Prof Michaela Black Deborah Rankin Prof Helene McNulty Dr Catherine Hughes Dr Leane Hoey Prof Jonathan Wallace Dr Adrian Moore	Artificial Intelligence approaches to addressing Mental Health inequalities in Ireland through improved diet and lifestyle: an interdisciplinary North- South investigation of the TUDA cohort integrating nutrition, environmental science and data analytics	HEA Higher Education Authority	£86,364.38	27/04/22
Dr Cian O'Donnell	Synaptic strength instability from stochastic gene expression in neurons	BBSRC Biotechnology & Biological Sciences Research Council	£368,740.00	10/06/22
Prof Sonya Coleman Mr Peter Devine Dr Justin Quinn	Environment Centred Optimisation of SME Productivity using Realtime INTelligence	Innovate UK	£99,291.39	23/06/22
Dr JG Harkin Mr M McElholm Prof LJ McDaid	Nervous Systems	EPSRC	£614,711.00	01/07/22