

LIRA Annual Report 2022



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Appendix: Members list

SCIENCE TECHNOLOGY COMPUTING INTEGRATION

- During 2022 LIRA brought together over 75 members from 15 departments across all Faculties of the University.
- LIRA was a key partner and LIRA members were PI or CoI of 20 new research grants funded during 2022 with the total funding credited to LIRA members in excess of £2.6M.
- LIRA plays an important role of a newly funded in 2022 project called ELSA: European Lighthouse for safe and secure AI (€10M total funding with €7.5M from the EC and €2.5M by UK and Switzerland). LIRA is responsible for one of the 3 technical work-packages and one of the 3 Grand Challenges.
- LIRA continued in 2022 to be a part of several other large European-wide Network projects funded by the EC, including ELISE and TAILOR (each funded by €12M)
- LIRA members were also awarded grants by the European Space Agency as well as by UK research councils (EPSRC, ESRC, AHRC) as well as from The Royal Society, NIHR and others.
- LIRA members gave keynote talks and received best paper awards, organised and chaired international conferences, workshops as detailed in the report. LIRA members were Editors-in-chief of 2 and Associate Editors of over 10 other highly prestigious scientific journals detailed in the report.
- 4 PhD students were awarded under the supervision of LIRA members. 2 new postdoctoral researchers were appointed to positions and 3 new PhD students joined being supervised by a LIRA member working on a LIRA related topic.
- Over 150 peer reviewed articles published by LIRA members in 2022 in renown scientific journals such as Nature Scientific Reports, IEEE Transactions on Pattern Analysis and Machine Intelligence, Brain, Information Fusion, IEEE Transactions on Neural Networks and Learning Systems, etc. and the 2nd edition of the Handbook on Computer Learning and Intelligence, World Scientific: Singapore.

During 2022 LIRA continued the consolidation and providing a forum for interdisciplinary research initiatives moving back to in-person meetings.

LIRA STRUCTURE

The structure of LIRA remains with 8 thematic groupings (Themes) as follows:

- **Advanced Manufacturing** (Led by Dr Allahyar Montazeri, 9 members)
- **Biomedical** (Co-led by Dr Jemma Kerns and Dr Amy Gadoud, 16 members)
- **Environment and Remote Sensing** (co-led by Prof. Michael James and Dr Ce Zhang, 13 members)
- **Fundamentals of Intelligent, Robotic and Autonomous Systems** (co-led by Dr Richard Jiang and Dr Ahmed Kheiri, 36 members)
- **Smart Cities and Mobility** (Led by Dr Amjad Fayoumi, 12 members)
- **Extreme Environments** (Led by Dr David Cheneler, 7 members)
- **Security and Defence** (Led by Prof Qiang Ni, 13 members)
- **Society and Human Behaviour** (Led by Dr Carolyn Downs, 14 members)

Two of the themes had their names and topic adapted and modified to reflect better the research challenges, interests, and activities of the members:

- Nuclear and Decommissioning – to Extreme Environments
- Intelligent Transport – to Smart Cities and Mobility

LIRA Centre Administrator, **Jake English** moved to another position within the University at the end of 2022 being substituted later on by **Megan Dugdale**. During the temporary absence of a incumbent of the LIRA Administrator post, **Dr Ahmed Kheiri** stepped in and was instrumental in setting up the web pages to be linked with PURE (thanks also to Chris Adams who manages PURE). **Dr Uraz Turker** took over seminar organisation from **Dr Ahmed Kheiri**.

The role of *LIRA NewsLetter* Editor was temporary vacant following very useful contributions by **Juliana Michelon Alvarenga** and is now going to the LIRA Administrator (**Megan Dugdale**).

This report has been organised and arranged by **Nikki Flook** who is project manager of one of the large projects LIRA is running - ELSA.

LIRA Centre continues to operate the A27 Lab space which is in a process of refreshing and rearrangement as part of a multimillion restructuring and refurbishment of the Infolab research labs. We are hopeful that there will be a similar physical space provided by the Engineering Department (currently under review).

During 2022 the membership expanded with co-opting new members, currently over 75 members, [People | Lancaster University](#).

The future plans include increasing the number of affiliated researchers and PhD students as well as establishing a stand-alone space/Lab, equipping it and setting up annual PhD studentships programme.

NEWLY FUNDED RESEARCH PROJECTS

During 2022 LIRA members pursued various directions of research listed below:

- Earth Observation and remote sensing
- Explainable and interpretable deep learning (computer vision as well as non-image data) and its applications to autonomous systems
- Trustworthy and secure autonomous systems
- Robotic and Autonomous Systems (RAS) for nuclear waste treatment and decommissioning research
- AI in bio-medical research, directed to cancer research, in particular.
- Applications to environment, social and behavioural science

As a result of the activities of LIRA members, 20 externally funded research projects totalling over £2.6M were awarded during 2022 crediting LIRA. These are detailed in the following Table.

Successfully funded research grants (amount to Lancaster/LIRA)

Project title	Funded by	'000	Time period	Theme	PI/Col
ELSA: European Lighthouse for Safe and Secure AI (total 10M Euro)	EC/UKRI	497	2022-2025	Fundamentals, Security	P. Angelov
Understanding imprecise space and time in narratives through qualitative representations, reasoning, and visualisation	ESRC	285	2022-2025	Fundamentals	I. Gregory, P. Rayson
Realist evaluation of online mental health communities to improve policy and practice	NIHR	156	2022-2024	Biomedical	F. Lobban, E. Semino, P. Rayson, T. Rakic

Project title	Funded by	'000	Time period	Theme	PI/Col
FreeTxt: supporting bilingual free-text survey and questionnaire data analysis	AHRC	56	2022-2024	Fundamentals	M. El-Haj, P. Rayson
4D PICTURE: Design-based Data-Driven Decision-support Tools: Producing Improved Cancer Outcomes Through User-Centred Research	EC/UKRI	442	2022-2027	Biomedical	A. Greenwood, P. Rayson, E. Semino, A. Nwosu, S. Payne
Mapping Soils in Montserrat	Joint Nature Conservation Committee	63	2022-2023	Environment	H. Tuffen, D. Whyatt, C. Stevens, P. Haygarth, J. Quinton
Investigation of mechanisms of the surface wear behavior of the components and tribo-dynamic modelling method of the rolling element bearings	Royal Society	12	2022-2024	Advanced Manufacturing	M. Xia, J. Ye
Outreach for Diversity in Computing	Lancaster University	2	2022-2023	Advanced Manufacturing	R. Robinson
FST Research Catalyst Fund	Lancaster University	16	2022-2023	Advanced Manufacturing	Z. Wang

Project title	Funded by	'000	Time period	Theme	PI/CoI
A mixed method study to describe the factors associated with palliative care inequalities experienced by cancer patients in the North West, and the impact of these inequalities	North West Cancer Research Fund	99	2022-2025	Biomedical	A. Gadoud, S. Brearley
TWI: Horizon Europe: Up skilling for Industry 5.0 roll out	UKRI	425	2022-2025	Advanced Manufacturing	M. Xia, D. Williams
AI Democracy - Go Beyond the Clouds	EPSRC/Internal	2	2022-2022	Fundamentals	R. Jiang
Mapping illness trajectories for people with advanced cancer receiving immunotherapy treatment: a mixed methods study to identify something about need and health service input?	North West Cancer Research	240	2022-2023	Biomedical	N. Jacobs
Investigation of mechanisms of the surface wear behavior of the components and tribo-dynamic modelling method of the rolling element bearings	The Royal Society	12	2022-2024	Advanced Manufacturing	J. Ye, M. Xia
Motion Planning and Control for Autonomous Visual Manipulation of a Nuclear Robot	EPSRC	82	2022-2025	Advanced Manufacturing	S. Monk

Project title	Funded by	'000	Time period	Theme	PI/Col
Smart offshore wind farm with optimized efficiency using advanced control and machine learning	The Royal Society	12	2022-2024	Advanced Manufacturing	M. Xia
Innovation Across Boundaries: Implementing Design Thinking Practices in Innovation Ecosystems and Policy Making in Germany and the United Kingdom.	The British Academy	10	2022-2024	Smart Cities and Mobility	J. Rindt
Development of 'use-cases' for a digital palliative care bereavement service.	Liverpool CCG Research Capability Funding	18	2022-2022	Biomedical	A. Nwosu, L. Chapman, S. Stanley, S. Mason, A. Fayoumi
Control and Navigation of Cooperative Unmanned Aerial Systems for Characterisation of Environmental Processes	EPSRC	83	2022-2025	Advanced Manufacturing	A. Montazerri, M. James
Developing palliative and end-of-life care research partnerships and capacity in the North West Coast of England	NIHR Clinical Research Network: NW Coast	87	2022-2023	Biomedical	S. Payne, A. Nwosu, A. Gadoud, N. Preston, C. Walshe
Total		2.6M			

* credited to LIRA members who are PI/col out of the total funding of the project



SEMINAR SERIES

During 2022, LIRA hosted 15 seminars, all from external speakers including from NASA, UCLA, University of Florida, Technical University of Munich, Spain and UK. Details of seminars hosted in 2022 are given in the table below.

Date	Speaker	Institution	Title
16/01/2022	Nile Dixon	Lancaster University, UK	In-situ Real-time Monitoring of Waterborne Low Energy Betas
27/01/2022	Prof. Feng Hao	University of Warwick, UK	An overview of password-authenticated key exchange protocols
10/02/2022	Eduardo Soares Almeida	Lancaster University, UK	Transparent deep learning classifiers of driving scenarios able to identify and learn from unseen situations
10/02/2022	Dr. Bethany Colling	UK Atomic Energy Authority - Culham Centre for Fusion Energy	Towards the Proportionate Regulation of Fusion Energy Systems
15/02/2022	Patrick Chard	Mirion Technologies	Applications of advanced radiometric science, and potential careers in the nuclear industry
03/03/2022	Dr. Mahdiah Sadabadi	University of Sheffield, UK	Cybersecurity in power-electronics-dominated power grids
10/03/2022	Dr. Imil Imran	Lancaster University, UK	Adaptive control of quadrotor unmanned aerial vehicle with uncertainties
24/03/2022	Prof. Jose C. Principe	University of Florida, USA	A functional operator framework for uncertainty quantification in RKHS

Date	Speaker	Institution	Title
07/04/2022	Dr Ramin Ramezani	University of California, Los Angeles	Machine learning in healthcare: Some of the challenges and opportunities
12/05/2022	Ivica Obadic	Technical University of Munich, Germany	Explainability Insights for Deep Learning in Earth Observation
19/05/2022	Prof. Xiaoxiang Zhu	German Aerospace Center (DLR), Germany	Artificial Intelligence and Data Science in Earth Observation
26/05/2022	Dr Adrian Stoica	NASA, USA	Telepresence and how it is changing our society
16/06/2022	Prof. Wen-Hua Chen	Loughborough University, UK	Dual Control for Exploration and Exploitation (DECC) with Active Learning
30/06/2022	Dr Rodolfo Haber	Center for Automation and Robotics, Madrid, Spain	Research Challenges and Opportunities of Automation and Robotics in 21st century: Some Successful Stories
November 2022	Dr. Yi Li	Newcastle University	Joint Learning with Shared Latent Space for Self-Supervised Learning Based Monaural Speech Enhancement
November 2022	Burak Yuksek	Cranfield University	AI-based Control and Navigation Systems in Aviation
December 2022	Prof. Ivan Tyukin	Kings College London	Rethinking the problem of learning for post-classical data analysis

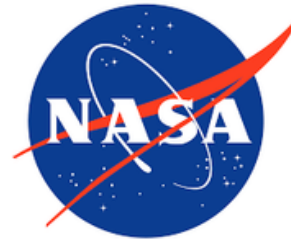
Date	Speaker	Institution	Title
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January 2022

Ivica Odabic

Technical University of Munich, Germany

Understanding Black-Box Models with Intuitive and Human Understandable Concept and Prototype-Based Explanations



OTHER ACTIVITIES BY LIRA MEMBERS

Awards:

- Best paper award at the 18th International Conference on Mobility, Sensing and Networking, 14-16 Dec. 2022, China

Keynote talks:

- 21st International Conference on Machine Learning and Applications, ICMLA 2022, 12-15 December 2022, Nassau, The Bahamas
- 29th International Conference on Systems, Signals and Image Processing, IWSSIP'22, 1-3 June 2022, Sofia, Bulgaria
- IEEE International Conference on Intelligent Systems, IS 22, Warsaw, 12-14 October 2022
- International Conference on Artificial Intelligence: Methodology, Systems, and Applications, AIMS 2022, 8-10 September 2022, Varna, Bulgaria.

Organised and co-chaired conferences:

- IEEE Conference on Evolving and Adaptive Intelligent Systems, EAIS 2022, Larnaca, Cyprus, 25-27 May 2022 – Honorary Chair
- 31st International Conference on Artificial Neural Networks (ICANN), 6-9 September 2022, Bristol, UK – Programme Committee co-chair
- EALS Symposium and Deep Learning Symposium within SSCI2022, Singapore, 4-7 Dec. 2022, co-chair
- The 15th Mediterranean Conference on Information Systems (MCIS) and the 6th Middle East & North Africa Conference on digital Information Systems (MENACIS), Madrid, Spain 2023 - AI and Emerging Technologies in Practice track co-chair

Organised and co-chaired workshops at:

- Co-Chair, Human-Centred AI, organized within the Thirty-sixth Conference on Neural Information Processing Systems, NeurIPS2022, 9 December 2022
- Co-Chair, Workshop on Pervasive and Resource Constraint AI, PerConAI 2022 organized within PerCom2022, Pisa, Italy, 25 March 2022

Co-Chair of the Program/Technical Committee of International Conferences:

- IEEE International Conference on Fuzzy Systems (FUZZ-IEEE-2022) within the World Congress on Computational Intelligence, WCCI2022, Padua, Italy, 18-23 July 2022 – Technical Chair

Tutorials presented at major international conferences:

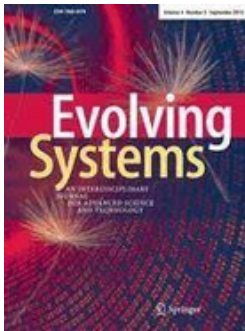
- *From Hyper-parametric towards Prototypes-based Deep Learning* at IEEE Symposium Series on Computational Intelligence, SSCI2022, 4-7 December 2022, Singapore

Other important academic activities:

- Vice Chair of the Working Group on the XAI standard by IEEE, P2976
- Elected member of the Board of Governors of the Systems, Man and Cybernetics Society, IEEE
- Elected special representative (liaison with Europe), NAFIPS: North American Fuzzy Information Processing Society.
- A plan to improve policy engagement opportunities among the members of the society theme through the production of a summary of expertise to lodge in the House of Commons Library.
- Initial meetings with members of the theme (law in particular) about joint projects.

Editorial Activities by LIRA members

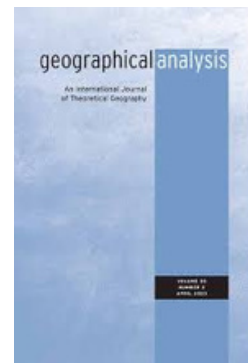
- Editor-in-chief
 - Evolving Systems journal (Springer, impact factor 3.6)
 - Science of Remote Sensing (Elsevier, Open Access journal)



Editorial Activities by LIRA members

- Associate Editor
 - IEEE Transactions on Cybernetics (IEEE Press, impact factor 19.118)
 - IEEE Transactions on Fuzzy Systems (IEEE Press, impact factor 12.253)
 - Environmental Informatics (impact factor 10.22)
 - International Journal of Applied Earth Observation and Geoinformation (Elsevier, Impact factor 7.672)
 - Complex and Intelligent Systems (Springer, impact factor, 6.859)
 - Soft Computing (Springer, impact factor 3.732)
 - Geographical Analysis (John Wiley and Sons, Impact factor 3.566)
 - Spatial Statistics (Elsevier, Impact factor 2.152)
 - Environmetrics (John Wiley and Sons, Impact factor 1.527)
 - IEEE Transactions on AI (IEEE Press)
 - and many other journals
- Topic Editor
 - MDPI Sensors Special Issue "Mobile Robots: Navigation, Control and Sensing"
 - Frontiers In Nuclear Engineering Special Issue "Molten Salt Reactors for a Sustainable Society"
 - Quantum Artificial Intelligence, Frontiers in Robotics and AI
- Review Editor
 - Frontiers in Nuclear Engineering.

- Editorial Board members
 - Article Handling Editor, Environmental Modelling & Software
 - Progress in Nuclear Energy
 - Biosystems Engineering
- Guest Editor
 - Special Issue: Recent Advances in Personal Human Identification based on Biomedical Traits, Journal of Information Security and Applications
 - Special Issue: Recent Advances in Artificial Intelligence for Medicine and Healthcare Data Analysis, Sensors (Switzerland)
 - Special Issue on Machine Learning in Communications and Networks, IEEE Journal on Selected Areas in Communications (JSAC)



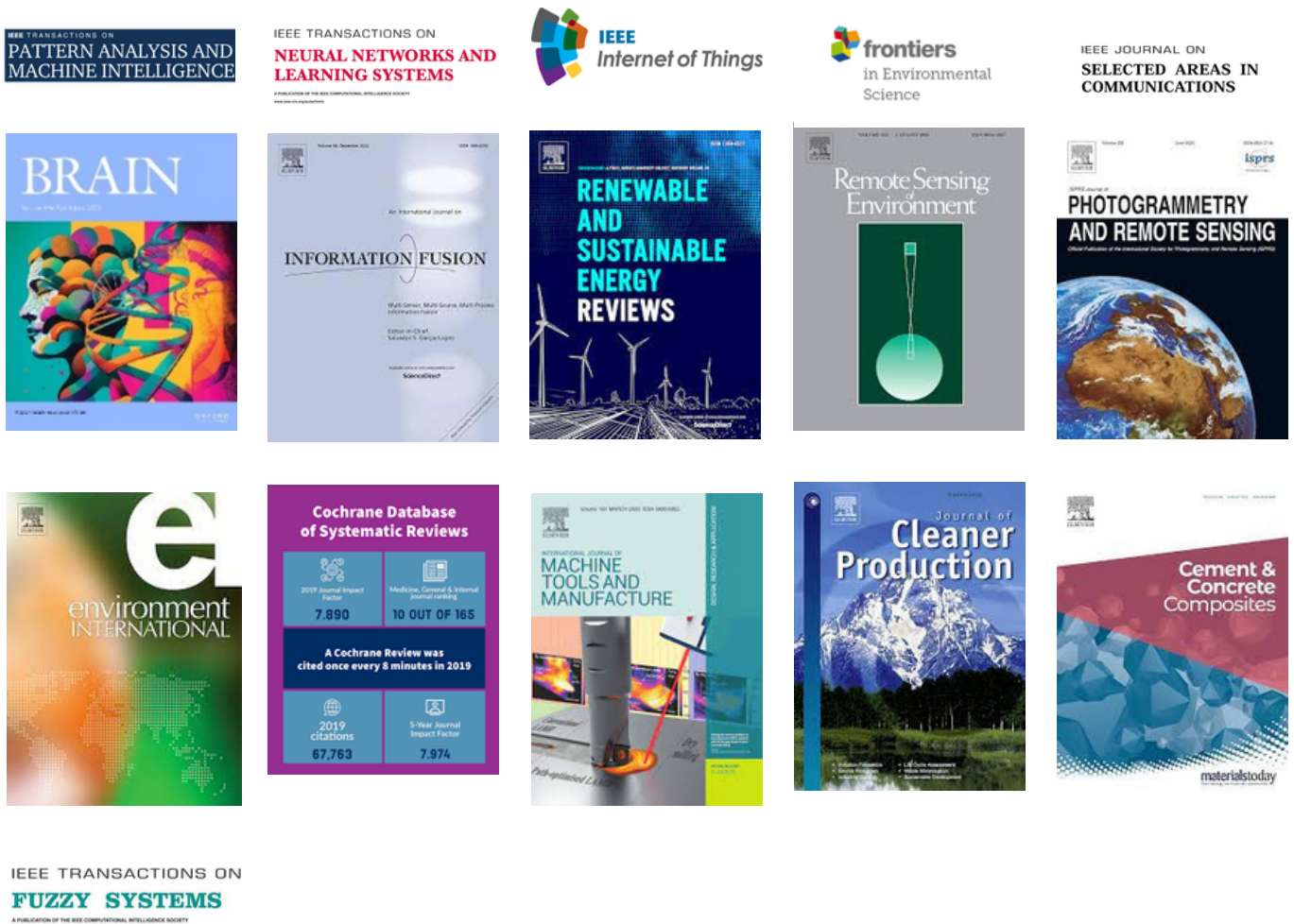
IEEE TRANSACTIONS ON
CYBERNETICS

IEEE TRANSACTIONS ON
FUZZY SYSTEMS

A PUBLICATION OF THE IEEE COMPUTATIONAL INTELLIGENCE SOCIETY

PUBLICATIONS BY LIRA MEMBERS

Articles in peer reviewed journals with impact factor between 10 and over 24 such as:



as well as journals with impact factor between 5 and 10 such as:





and others as listed below:

PUBLICATIONS BY LIRA MEMBERS

A Peer reviewed journal papers:

- Svetunkov, I., Kourentzes, N., Ord, J.K., Complex exponential smoothing. 31/12/2022 In: Naval Research Logistics. 69, 8, p. 1108-1123. 16 p.
- Farooq-i-Azam, M., Ni, Q., Dong, M., Pervaiz, H., Zarakovitis, C., Alsolami, F., Interference Avoidance in Cognitive Radio Networks Using Cooperative Localization. 31/12/2022 In: IEEE Systems Journal. 16, 4, p. 5120-5130. 11 p.
- Dixon, J., Sturgeon, B., Huck, J., Hocking, B., Jarman, N., Bryan, D., Whyatt, D., Davies, G., Tredoux, C, Navigating the divided city: Place identity and the time-geography of segregation. 31/12/2022 In: Journal of Environmental Psychology. 84, 18 p.
- Li, Y., Li, T., Li, Y., Pervaiz, H., Ni, Q., Outage Performance Enhancement for NOMA Based Cooperative Relay Sharing Networks. 31/12/2022 In: IEEE Wireless Communications Letters. 11, 12, p. 2665-2669. 5 p.
- Gu, X., Angelov, P., Shen, Q., Self-Organizing Fuzzy Belief Inference System for Classification. 31/12/2022 In: IEEE Transactions on Fuzzy Systems. 30, 12, p. 5473-5483. 11 p.
- Ma, N., Monk, S., Cheneler, D., Collaborative Continuum Robots for Remote Engineering Operations. 22/12/2022 In: Biomimetics. 8, 1, 19 p.
- Ding, X., Hou, X., Xia, M., Ismail, Y., Ye, J., Predictions of macroscopic mechanical properties and microscopic cracks of unidirectional fibre-reinforced polymer composites using deep neural network (DNN). 15/12/2022 In: Composite Structures. 302, 13 p.
- Chen, L., An, K., Huang, D., Wang, X., Xia, M., Lu, S., Noise-Boosted Convolutional Neural Network for Edge-based Motor Fault Diagnosis with Limited Samples. 13/12/2022 In: IEEE Transactions on Industrial Informatics. 11 p.
- Cheng, R., Zhong, S., Wang, Z., Anker Nielsen, O., Jiang, Y., A hyper-heuristic approach to the strategic planning of bike-sharing infrastructure. 30/11/2022 In: Computers and Industrial Engineering. 173, 12 p.
- Wang, X., Kanani, A., Pang, K., Yang, J., Ye, J., Hou, X., A novel genetic expression programming assisted calibration strategy for discrete element models of composite joints with ductile adhesives. 30/11/2022 In: Thin-Walled Structures. 180, 18 p.
- Kumar, A., Yadav, A., Gill, S., Pervaiz, H., Ni, Q., Buyya, R., A secure drone-to-drone communication and software defined drone network-enabled traffic monitoring system. 30/11/2022 In: Simulation Modelling Practice and Theory. 120, 27 p.
- Li, K., Wang, X., Ni, Q., Huang, M., Entropy-based Reinforcement Learning for computation offloading service in software-defined multi-access edge computing. 30/11/2022 In: Future Generation Computer Systems. 136, p. 241-251. 11 p.
- Wang, Z., Hu, B., Zhang, C., Atkinson, P., Wang, Z., Xu, K., Chang, J., Fang, X., Jiang, Y., Shi, Z., How the Air Clean Plan and carbon mitigation measures co-benefited China in PM2.5 reduction and health from 2014 to 2020. 30/11/2022 In: Environment International. 169, p. 1-13. 13 p.
- Ryder, M., Downs, C., Rethinking reflective practice: John Boyd's OODA loop as an alternative to Kolb. 30/11/2022 In: International Journal of Management Education. 20, 3, 1 p.
- Vandercruyssen, D., Baker, S., Howard, D., Aggidis, G., Tidal range electricity generation: A comparison between estuarine barrages and coastal lagoons. 30/11/2022 In: Heliyon. 8, 11, 11 p.

- Chen, W., Zhou, H., Cheng, L., Xia, M., Wind Turbine Blade Icing Diagnosis Using Convolutional LSTM-GRU With Improved African Vultures Optimization. 30/11/2022 In: IEEE Open Journal of Instrumentation and Measurement. 1, p. 1-9. 9 p.
- Murphy, I., Sivashankar, A., Gadoud, A., Refractory angina is a growing challenge for palliative medicine: a systematic review of non-invasive interventions. 25/11/2022 In: BMJ Supportive and Palliative Care. 12, e6, p. e869-e881.
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- Alghamdi, M., Angelov, P., Lopez Pellicer, A., Person Identification from Fingernails and Knuckles Images using Deep Learning Features and the Bray-Curtis Similarity Measure. 7/11/2022 In: Neurocomputing. 513, p. 83-93. 11 p.
- Jackson, M., Szczepaniak, M., Wall, J., Maskery, M., Mummery, C., Morrish, P., Williams, A., Knight, J., Emsley, H.C.A., Numbers and types of neurological emergencies in England and the influence of socioeconomic deprivation: a retrospective analysis of hospital episode statistics data. 4/11/2022 In: BMJ Open. 12, 11, 7 p.
- Amaechi, C.V., Wang, F., Ye, J., Understanding the fluid-structure interaction from wave diffraction forces on CALM buoys: Numerical and analytical solutions. 2/11/2022 In: Ships and Offshore Structures. 17, 11, p. 2545-2573. 29 p.
- Yang, Y., Jiang, X., Yan, Y., Liu, T., Jiang, Y., Joint optimization of bimodal transit networks in a heterogeneous environment considering vehicle emissions. 1/11/2022 In: Journal of Cleaner Production. 373, p. 1-12. 12 p.
- Su, H., Zhang, X., Luo, Y., Zhang, C., Zhou, X., Atkinson, P., Nonlocal feature learning based on a variational graph auto-encoder network for small area change detection using SAR imagery. 1/11/2022 In: ISPRS Journal of Photogrammetry and Remote Sensing. 193, p. 137-149. 13 p.
- Ismail, Y., Wan, L., Chen, J., Ye, J., Yang, D., An ABAQUS® plug-in for generating virtual data required for inverse analysis of unidirectional composites using artificial neural networks. 31/10/2022 In: Engineering with Computers. 38, 5, p. 4323-4335. 13 p.
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- Wang, Z., Zhang, C., Atkinson, P., Combining SAR Images with Land Cover Products for Rapid Urban Flood Mapping. 20/10/2022 In: Frontiers in Environmental Science. 10, p. 1-12. 12 p.

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- Huang, Z., Deng, W., Li, R., Chen, J., Sui, L., Zhou, Y., Zhao, D., Yang, L., Ye, J., Multi-impact performance of prestressed CFRP-strengthened RC beams using H-typed end anchors. 30/09/2022 In: Marine Structures. 85, p. 1-30. 30 p.
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B Peer reviewed conference publications:

- A Nonlinear Discrete-Time Sliding Mode Controller for Autonomous Navigation of an Aerial Vehicle Using Hector SLAM Can, A., Price, J., Montazeri, A. 31/12/2022 In: *IFAC-PapersOnLine*. 55, 10, p. 2653–2658. 6 p.
- Adaptive Integral Terminal Sliding Mode Control for the Nonlinear Active Vehicle Suspension System under External Disturbances and Uncertainties Ghadiri, H., Montazeri, A. 31/12/2022 In: *IFAC-PapersOnLine*. 55, 10, p. 2665-2670. 6 p.
- Robust Formation Control and Trajectory Tracking of Multiple Quadrotors Using a Discrete-Time Sliding Mode Control Technique Can, A., Imran, I., Price, J., Montazeri, A. 31/12/2022 In: *IFAC-PapersOnLine*. 55, 10, p. 2974-2979. 6 p.
- Understanding Online Customer Touchpoints: A Deep Learning Approach to Enhancing Customer Experience in Digital Retail. Zhao Y., Fayoumi, A., Shahgholian, A. 24/05/2023, IEEE ITT-2023.
- In search of digital transformation: an industrial firm's quest to find their "predictive maintenance" business model. Cepa K., Fayoumi A., Gilchrist A. 28/07/2023, The European Group for Organizational Studies (EGOS) conference.
- Home Care Automation: Market Research, Industry Analysis, and Security Assessment. Fayoumi A. et al. 05/01/2023, The International Conference on Cyber Management and Engineering (CyMaEn).
- User-Centric Democratization towards Social Value aligned Medical AI Services, Zhang Z. and Jiang R., 2023, The 32th International Joint Conference on Artificial Intelligence, Macau, China.

C1. Books:

- Plamen Angelov (Ed.), *Handbook in Computer Learning and Intelligence*, 2nd edition, World Scientific, 2 volumes, 1000pp., DOI: 10.1142/12498, August 2022
- Jiang, R., Zhang, L., Wei, H., Crookes, D., Chazot, P., *Recent Advances in AI-enabled Automated Medical Diagnosis*, London: CRC Press. 370 p. ISBN: 9781032008431. Electronic ISBN: 9781003176121, 20/10/2022.
- Richard Jiang, Ahmed Bouridane, Chang-Tsun Li, Danny Crookes, Said Boussakta, Feng Hao, Eran A. Edirisinghe, Springer Nature Switzerland, 2022, <https://doi.org/10.1007/978-3-031-04424-3>
- Richard Jiang, Ahmed Bouridane, Chang-Tsun Li, Danny Crookes, Said Boussakta, Feng Hao, Eran A. Edirisinghe, *Big Data Privacy and Security in Smart Cities*, Springer Nature Switzerland, 2022, <https://doi.org/10.1007/978-3-031-04424-3>

D. Other publications:

- Zhang, Z., Angelov, P., Soares, E., Longépé, N., Mathieu, P., An Interpretable Deep Semantic Segmentation Method for Earth Observation, 23/10/2022 In: arXiv 2210.12820

NEWLY APPOINTED RESEARCHERS AND STUDENTS

Four PhD students were awarded under the supervision of LIRA members during 2022 3 PhD students started their research supervised by LIRA members and 2 new postdoctoral Research Associates were appointed, as detailed in the following table.

2 new postdoctoral Senior Research Associates started during 2022

Name	Supervisor	Funded by	Project	Theme
Dmitry Kangin	P. Angelov	EC/UKRI	ELSA Project: European Lighthouse for Safe and Secure AI	Fundamentals, Security
Gabrielle Blewitt	S.D. Monk, D. Cheneler	EPSRC iCASE/Do unreyay Site Restoration Ltd	Soft robotic highly active cell and pipe explorer featuring SiC semiconductors to characterise alpha, beta, gamma and neutron contamination	Extreme Environments

3 new PhD students started during 2022

Name	Supervisor	Funded by	Project	Theme
Alvaro Lopez Pellicer	P. Angelov	EPSRC	TAS-S project: Trustworthy Autonomous Systems	Security
Boyuan Wang	R. Jiang	Self Funded	Energy Efficient Deep Neural Networks towards Net Zero 2030	Fundamentals
Chris Lawrence	A. Fayoumi, R. Williams	Lancaster University	Towards Hybrid Modelling and Simulation of Competitive Signalling between Firms	Advanced Manufacturing

4 PhD Research students supervised by LIRA members graduated (were awarded) in 2022

Name	Supervisor	Thesis title	Theme
Eduardo Soares	P Angelov	Explainable-by-design Deep Learning, funded by Ford's Greenfield Lab, Palo Alto	Fundamentals, Intelligent Transport
Nicolas Ian Arnold	P Atkinson, P Angelov	Object Classification from Point Cloud Data	Fundamentals, Environment
Chris Nyamayaro	A Pinkerton, D Cheneler	Practical and Theoretical Investigation of Underwater Laser Cutting for Decommissioning Applications	Extreme Environments
Abdullah Alharthi	Q. Ni, R. Jiang	Blockchain Based Security and Trust Mechanisms for Vehicular Ad hoc Networks	Security and Defence, Fundamentals

APPENDIX - MEMBERS LIST

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Dr Amjad Fayoumi	MS	LUMS FST	Theme co – Lead Advanced Manufacturing Theme Lead Smart Cities and Mobility	a.fayoumi
Dr Jemma Kerns	LMS	FHM	Theme co - Lead Biomedical	j.kerns
Dr Amy Gadoud	LMS	FHM	Theme co - Lead Biomedical	a.gadoud
Dr David Cheneler	ENG	FST	Theme Lead Extreme Environments	d.cheneler
Prof Michael James	LEC	FST	Theme co - Lead Environmental Modelling	m.james
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Dr Carolyn Downs	MS		Theme Lead Society & Human Behaviour	c.downs
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