Robotics, Autonomous Systems & Artificial Intelligence Industrial Impact Acceleration

Lead by: Scottish Research Partnership in Engineering (SRPe)

Other RIS Members Involved: SICSA; ETP; The Data Lab; CENSIS; MASTS; Interface

Robotics and Autonomous Systems (RAS) is a key area where the UK is set to become a global leader, and was identified as one of the 'Eight Great Technologies' by the UK Government. Major investment was established by EPSRC, and Innovate UK via the Industrial Strategy Challenge Fund (ISCF), to ensure the full UK potential is realised by boosting research in RAS and one of its critical underpinning technologies, Artificial Intelligence (AI). The ultimate objective of these investments is to drive economic growth and to ensure the UK fully exploits and future-proofs its competitive advantage in this globally transformational field.

Scotland is fast becoming an internationally recognised centre of excellence in RAS and AI, with over 16% of all EPSRC research funding, and Scottish industries are already leading the way in several areas. Building upon this, and under the existing collaborative framework of the [Scottish Research Partnership in Engineering (SRPe)](#), Scotland is uniquely positioned to capitalise on the RAS and AI revolution to produce major societal and economic benefits.

To significantly stimulate the growth of the Scottish research portfolio, by taking best advantage of funding available via ISCF and other streams, and to grow Scotland's position as an internationally recognised centre of excellence in RAS and AI, it was imperative that an accelerated and targeted pan-Scottish collaborative initiative between academia and industry / end-users was launched on a timely basis.

Based on SFC strategic funding, [SRPe launched its *Robotics, Autonomous Systems (RAS) & Artificial Intelligence (AI) Industrial Impact Acceleration*](#) *Initiative* (Aug '18 to Jul '20), to expedite and focus the coordination of activities across Scotland to target ISCF funding and other opportunities, specifically reaching out to industry / end-users to further strengthen links with academia and identify areas where RAS & AI can have major impact. The aim was to ensure the effective delivery of game-changing solutions to industry / end-users and to provide the necessary pipeline of innovations to future-proof the international competitiveness of Scotland and the UK.

The initiative launched in August 2018 under [SRPe's Robotics and Autonomous Systems strategic theme](#) to accelerate the delivery and impact of collaborative research activities across Scotland. The aim was to identify priority areas of industry / end-user challenge and opportunity aligned with the research strengths of the Scottish universities in RAS & AI, and

to target key funding opportunities to support socio-economic growth and future-proof the competitiveness of Scotland.

Priority areas of industry / end-user challenge and opportunity were identified across RAS & AI applications in healthcare, advanced manufacturing, extreme and hazardous environments and AI in the data driven economy.

Six collaborative workshops were delivered:
- [Robotics in Healthcare](#) (Jan '19 - Glasgow)
- [RAS and AI in Advanced Manufacturing](#) (May '19 - Glasgow)
- RAS in Extreme and Hazardous Environments (Oct '19 - Glasgow)
- Socially Assistive Robots and Technology for Healthy Ageing (Oct '18 -Edinburgh)
- EPSRC Transformative Healthcare Technologies for 2050 Proposal Private Public Engagement Workshop (July '19 - Edinburgh)
- [RAS and AI in Advanced Manufacturing](#) (Sept '19 - Glasgow)

Three supporting networking and knowledge exchange events were held jointly with other research pools / centres:

- [Harnessing AI for a Better Scotland Networking Event](#) (March '19) – SRPe / SICSA / Edinburgh Napier and Heriot-Watt universities as part of DataFest '19

- Robotics for Maintenance of Offshore Renewables SRPe /ORCA Hub panel / workshop session (June '19) as part of [ETP Energy Innovation Emporium](#).

- SRPe invited Innovation Policy representatives from the Scottish Government to the Edinburgh Centre for Robotics (May '19) to showcase the SRPe RAS & AI Industrial Impact Acceleration Initiative, the Edinburgh Centre for Robotics, ORCA Hub and the wider SRPe collaborative activities. As a result of this engagement MSP Ivan McKee (Minister for Trade, Investment and Innovation) provided introductory remarks at [SRPe's RAS & AI in Advanced Manufacturing Industry Workshop](#) (Sept '19) and posted his views of the workshop impacts in a video on [Scotland CAN DO twitter feed.](#)

Overall, the initiative involved contributions from across seven RIS member research pools / innovation centres; ten universities; seven research / innovation organisations; forty-three industrial companies / end-user organisations; and five public sector organisations (see ANNEX 1: INITIATIVE WORKSHOP/EVENT CONTRIBUTORS).

Five funding calls were targeted under the initiative:
- EPSRC Transformative Healthcare Technologies for 2050
- ISCF Healthy Ageing Challenge Fund
- Scottish Enterprise Advancing Manufacturing Challenge Fund

- EPSRC Trustworthy Autonomous Systems
- EPSRC ORCA Partnership Fund

Six collaborative proposals were developed which were all successful through EoI stage or beyond, with a total value of £16m (with a potential £12.4m* coming to Scottish Universities). Four interdisciplinary collaborative proposals have been successful to date, bringing in total funding of £4.7m, including £3.1m awarded directly to Scottish universities (£2.4m under EPSRC Transformative Healthcare Technologies for 2050, £600k for 2 awards under EPSRC ORCA Partnership Fund and £100k under ISCF Healthy Ageing Challenge: Early Trailblazer Stage 1).
(* Includes an ISCF Healthy Ageing Challenge: Early Trailblazer Stage 1 proposal (value £6m for full proposal)).
An additional four proposals totalling £16m were developed and submitted as EoI but did not progress further.

In addition to strengthening the Scottish research portfolio, the initiative has significantly increased the visibility of Scottish research excellence in robotics, autonomous systems & artificial intelligence. The collaborative relationships between the academic, industry/end-user and the public sectors have been further strengthened future pathways cultivated for knowledge exchange and collaborative programmes.

Beyond the initiative, SRPe continues to deliver its collaborative programme of workshops under its wider Robotics and Autonomous Systems theme to drive cross-disciplinary cross-sectoral collaboration in other key priority areas for industry / end-user organisations. These activities continue to be targeted at UKRI, ISCF and other high-impact funding opportunities.

Two of the workshops already planned are to be jointly delivered with SICSA (RAS and AI applications) and ScotCHEM (RAS applications for the chemical sector). Further workshop themes being explored include, RAS for Agritech (precision farming / trustworthy autonomous systems), RAS solutions for geothermal energy (surveying and mining) and RAS for space robotics (sensor technology for remote operations).

SRPe also continue to work in close collaboration with the National Robotarium and the National Manufacturing Institute Scotland to initiate new pan-Scottish research and industrial collaborations, help drive the low-carbon revolution and create new business and jobs in Scotland. For example, cross-disciplinary RAS solutions are being explored as part of SRPe's Engineering in Response to Covid-19 initiative. This initially focused on advanced manufacturing challenges in collaboration with the National Manufacturing Institute Scotland (NMIS) in their supporting role to the Scottish Government Covid-19 response, and SRPe activities are now expanding across all of SRPe's strategic themes.

ANNEX 1: INITIATIVE WORKSHOP / EVENT CONTRIBUTORS

Research Pools / Innovation Centres
SRPe; SICSA; ETP; The Data Lab; CENSIS; MASTS; Interface

Universities
Strathclyde; Heriot-Watt; Edinburgh; Glasgow; Robert Gordon; Glasgow Caledonian; Edinburgh Napier; St Andrews; Stirling; Northampton.

Research / Innovation Organisations
Advanced Forming Research Centre; Advanced Manufacturing Research Centre; Oil & Gas Technology Centre; ORCA Hub; National Subsea Research Initiative; Offshore Renewable Energy Catapult; Scottish Association for Marine Science.

Industrial Companies / End-User Organisations
Babcock International; BAE Systems; Baker Hughes GE; Hexagon MI; iTech Troon; Kuka; Leonardo; Renishaw plc; Spirit Aerosystems; Weir Group; Add Energy; Castel Rock Edinvar HA; Digital Treetop; DNV GL UK Ltd; ENU; Frank Advanced Engineering Tech Ltd; Geckotech Solutions Ltd; Haggarty-Weir Consulting; Hanover; Hugh Ferguson; IBM UK; Kelly Energy Services; Modus Seabed Intervention; Oceaneering; Shifting Ideas; Aggreko; Cedeco Contractors; Impact Solutions; Industrial Systems & Control Ltd; Leyton UK; Mage Control Systems Ltd; Alzheimers Scotland; Edinburgh Health and Social Care Partnership; Health and Social Care Alliance Scotland; Institute of Occupational Medicine; NHS Lothian; NHS National Services Scotland; Loretto Care; Blackwood Housing & Care; Regulation Asia/RegWire; Royal Bank of Scotland; BTO Solicitors LLP.

Government / Public Sector Organisations
Scottish Government; Science and Technology Facilities Council (STFC); Scottish Enterprise; Defense & Security Accelerator (DASA); Engineering & Physical Sciences Research Council (EPSRC).