



OXFORDSHIRE'S PIONEERING ROBOTICS & AI

Opportunities to collaborate and invest





ROBOTICS & AI

- 3 ROBOTICS INTRODUCTION
OXFORDSHIRE'S PIONEERING ROLE
- 4 CENTRES OF EXPERTISE
- 6 OPPORTUNITIES FOR COLLABORATION
- 7 SUCCESS STORIES
PRECISION MANUFACTURING AND PROTOTYPING
INVESTOR SUPPORT



Robotics and artificial intelligence continue to help us push the boundaries of human knowledge to new frontiers.

Harnessing their extraordinary power helps us to understand and operate in extreme environments, for example exploring space and deep sea, or decommissioning nuclear facilities. Meanwhile, recent advances in AI are increasing the potential for robots to interact in the real world, with the development of sophisticated sensing technologies such as robot skin. Advances in the integration of robotic technology and AI are set to change and improve all of our lives, whether assisting with routine and repetitive tasks, operating our transport, or providing disaster relief in the face of climate change.

OXFORDSHIRE'S PIONEERING ROLE

Robotics and AI is fast developing into a multi-billion dollar global market. Much of the earliest pioneering work in the field was carried out in and around Oxford and the region continues to lead the way today. Research into robotics at the [UK's Atomic Energy Authority](#) (UKAEA) has enabled the safe decommissioning of nuclear plants. Today the organisation is exploring how robots and automation can be used to perform maintenance tasks in nuclear fusion plants.

Two Oxfordshire centres offer unique world-class expertise – and many opportunities to collaborate:

The [Remote Applications in Challenging Environments \(RACE\)](#), based at the [Culham Science Centre](#), offers outstanding test facilities to companies from around the world to develop robotics and AI solutions.

The [Oxford Robotics Institute](#) has a world-leading reputation in large-scale mobile autonomy and offers industrial collaboration across several sectors. Its [Applied AI Lab \(A2I\)](#) is exploring how to enable robots to operate robustly and effectively in complex, real-world environments.

[Harwell Campus](#) hosts over £2 billion worth of facilities such as [Diamond Light Source](#), the UK's National synchrotron, and the [Faraday Institution](#). It is a world-renowned research centre for the physical and life sciences, laser technology and high performance computing, and plays a leading role in the UK space sector.



OXFORDSHIRE'S CENTRES OF EXPERTISE

ACADEMIC AND RESEARCH CENTRES

UNIVERSITY OF OXFORD

Investors in the region can benefit from collaboration with the [University of Oxford](#) and its exciting spin-outs.

The University of Oxford is known around the globe as a leading research institute. In 2021 it was ranked #1 for the sixth year. It was also ranked #2 for engineering and Technology ([2021 Times Higher Education](#)).

The University's robotics and AI teaching and research is led by the [Oxford Robotics Institute](#). Its work includes machine learning and AI, computer vision, fabrication, multispectral sensing, perception, and systems engineering.

[Oxford University Innovation](#), the University's commercialisation arm, has successfully spun out over 200 companies, including the fast-growing universal autonomy developer [Oxbotica](#).

The [EPSRC Centre for Doctoral Training in Autonomous Intelligent Machines and Systems](#) at the University's Engineering Department collaborates with a number of industry partners, including [Amazon Web Services \(AWS\)](#), [Google Deep Mind](#), [Samsung](#), [Schlumberger](#), [Toshiba](#) and [Toyota](#).

The [Oxford Machine Learning Research Group](#) is interested in applying machine learning methodology to problems in science, engineering, industry and commerce, and works closely with the [Oxford Man Institute](#), which focuses on quantitative finance.

The [Oxford-Singapore Human-Machine Collaboration Programme \(HMC\)](#) is an international multidisciplinary collaboration between universities, industry and investment, providing a platform for large-scale research utilising AI and robotics.

OXFORD BROOKES UNIVERSITY

[Oxford Brookes University](#) offers advanced education in AI through its research groups and facilities.

Its [Institute for Ethical AI](#) develops ethical intelligent software solutions for business, organisations and society and has a track record in professional collaborations.

Robotics and AI research at the Cognitive Robotics Laboratory encompasses applications in health, business development, and engineering.

The [Autonomous Driving and Intelligent Transport](#) group advises, researches and consults on all aspects of the vehicles of the future.

The [Visual Artificial Intelligence Laboratory](#) specialises in the application of machine learning and AI to fields including robot-assisted surgery, activity recognition and scene interpretation. It has worked with industry partners including [Createc Robotics](#).

CULHAM SCIENCE CENTRE

[Culham Science Centre](#) is home to UKAEA (the United Kingdom Atomic Energy Authority) and the [Culham Centre for Fusion Energy](#), the UK's national fusion energy laboratory, which will design and build the world's first compact fusion reactor by 2040. UKAEA operates the [Joint European Torus \(JET\)](#) – the world's largest and most powerful tokamak – on behalf of its European partners, and the Mega Amp Spherical Tokamak (MAST) Upgrade device. The UK government will invest £184m by 2025 in new fusion facilities, infrastructure and apprenticeships at the Culham Science Centre.

RACE - REMOTE APPLICATIONS IN CHALLENGING ENVIRONNEMENTS

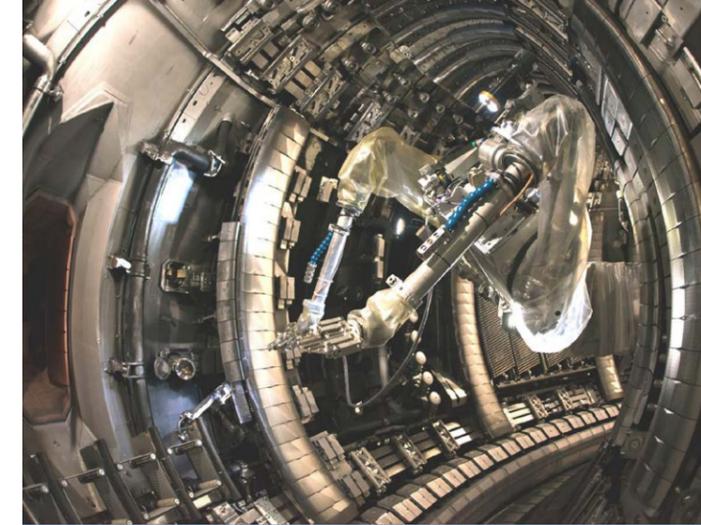
[RACE's](#) 100 engineers have conducted more than 35,000 hours of remote operations, working principally on nuclear reactor shutdown. RACE is now applying this unparalleled knowledge to a growing range of commercial situations. The world leader in fully remotely operated systems has formed international private sector collaborations in sectors including petrochemical, space exploration, construction and mining. Its robots are overcoming physical environments such as radiation, extreme temperature, limited access, vacuum and magnetic fields.

HARWELL CAMPUS

Harwell's [Space](#), [HealthTec](#) and [EnergyTec](#) clusters attract innovative companies and numerous multidisciplinary collaborations. Its Space cluster encompasses the [European Space Agency \(ESA\)](#), [Satellite Applications Catapult](#), [UK Space Agency](#) and [STFC RAL Space](#), and includes the [ESA's Human and Robotic Exploration Directorate](#).

RAIN

The University of Oxford and RACE are participants in [RAIN](#), a multi-university collaboration on human-robot interaction, remote inspection, remote handling, sensors and software.



OPPORTUNITIES FOR COLLABORATION

RACE services

[RACE TEST](#) hosts Europe's only standardised test facility for ground and air-based robots. Developed alongside the [US National Institute of Standards and Technology](#), RACE's test lanes give developers a chance to measure their performance against international standards while giving end users a space to impartially compare robotics in a controlled environment, and an opportunity for consistent and standardised operator training.

ORI membership

Industrial collaboration lies at the heart of the [Oxford Robotics Institute](#) (ORI)'s research. ORI membership buys partners deep immersion and access to its full portfolio of research and activity, accelerating and catalysing knowledge transfer.

ESA BIC UK

Harwell Campus has ambitious plans to grow its space cluster to 200 organisations by 2030. [The European Space Agency's Business Incubation Centre](#) (ESA BIC UK), part of a European-wide network, helps 10 young space-related companies to turn their ideas into commercial reality each year.

Oxford Investment Opportunity Network

[Oxford Investment Opportunity Network \(OION\)](#) is a business angels network for investors and private companies interested in investing in spinout companies from the University of Oxford. It has recently invested in agricultural robotics start-up [Muddy Machines](#).

Createc

Robotics and computer imaging specialists [Createc](#) can efficiently build prototype systems and develop them into working products, often bridging the gap between leading research and industrial applications.

THE OXFORD-SINGAPORE HUMAN-MACHINE COLLABORATION INITIATIVE

This collaborative initiative aims to revolutionise the approach to research, education, innovation and commercialisation in AI and robotics by providing a platform for large scale international collaboration. The multidisciplinary programme is driven by computer science and engineering sciences and spans 15 universities, 30 SMEs, and many researchers and AWS-funded PhD students.

Oxford Robotics Institute (ORI) leads AWS-funded research in a number of areas, including large-scale mixed-initiative autonomy for logistics, and human-robot shared autonomy. A recent project addressed how autonomous mobile robots can operate in service environments for, or alongside, humans, studying manipulation, locomotion, navigation and



interaction in applications such as customer service and stock management, industrial inspection and social care.

Further AWS-supported projects have explored what happens when robots from multiple vendors are sharing the same physical space (eg cleaning and stock monitoring in a supermarket), and others have looked into safe exploration and mapping in hazardous environments.



SUCCESS STORIES

MDA

Canadian international space mission partner [MDA](#) is a pioneer in robotics, satellite systems and geointelligence, working with partners globally. In April 2021, MDA was listed on the Toronto Stock Exchange. Its only international facility outside Canada and in Houston, USA, is at Harwell in Oxfordshire.

Intuitive Surgical

Californian firm [Intuitive Surgical](#) created the da Vinci surgical system, one of the first robotic-assisted, minimally invasive surgical systems to be cleared by the FDA. Today its systems and technologies are used by surgeons in 67 countries around the world. Its UK location is in the Schrödinger building at [Oxford Science Park](#).

PRECISION MANUFACTURING AND PROTOTYPING

Within Oxfordshire's manufacturing sector are companies providing precision manufacturing and prototyping services to help bring concepts to commercial reality. Here are some of them:

[RAL Space](#) at Harwell Campus operates a wide range of space test and calibration facilities.

[Precipart](#): high precision custom solutions for aerospace, industrial and medical, including machined and 3D printed parts for surgical robotic tools. Location: Oxford Science Park.

[3DNC](#): precision engineers for machined components. Base: Milton Park

[AW Clarke Engineering](#): sheet metal and machined components. Location: Littlemore, Oxford

[Blackmore Precision Engineering](#): machine tools and software for lean manufacturing. Location: Kidlington.

[Oxford Product Design](#): industrial design and prototyping. Location: central Oxford.

[SRD Engineering](#): precision engineering for aerospace, F1, and manufacturers. Location: Bicester.

INVESTOR SUPPORT

Learn more about investment opportunities in Oxfordshire including energy and future mobility [here](#).

For further support, please contact the [inward investment team](#).



investservice@oxfordshirelep.com
www.oxfordshirelep.com/business/invest-oxfordshire



 @oxfordshirelep

 Oxfordshire Local Enterprise Partnership

