**CHART**

Fundamental and applied research in intelligent cyber-physical systems and robotics technologies to support personalised health and well-being.

**Research Themes**

* Smart Sensing & Embodied Intelligence

https://www.chartresearch.org/research/smart-sensing-and-embodied-intelligence

* Robot Grasping & Manipulation

https://www.chartresearch.org/research/autonomous-and-human-guided-manipulation

* Mobility & Navigation

https://www.chartresearch.org/research/mobility-and-navigation

* Safety & Benchmarking

https://www.chartresearch.org/research/safety-and-benchmarking

* User-Centred Design Methods & Applications

https://www.chartresearch.org/research/user-centred-design-methods

* Accessible Human-Robot Interaction & Collaboration

https://www.chartresearch.org/research/accessible-human-robot-interaction

* Telepresence & Teleoperation

https://chartresearch.org/research/telepresence-and-teleoperation

* Ethics & Responsible Research and Innovation

https://www.chartresearch.org/research/ethics

**COL**

* Group has traditionally conducted interdisciplinary research on transportation and other logistic operations. The focus of our research has **expanded to include a broader range of AI methods** including machine learning, intelligent search agents, fuzzy logic, machine reasoning, and big-data analytics, **with applications to a wide range of domains** including health, energy, connected autonomous vehicles and unmanned aerial vehicles.
* The **vision** of COL going forwards is to further evolve by **expanding into** other state-of-the-art AI areas like **generative AI** (with large language models), **emergence (swarm) intelligence**, and **cognitive computing**. Optimisation for solving decision-making problems is still one of the highest levels of AI and yet unmatched by machine learning and generative intelligence for solving complex sequential decision problems.
* We aim to **consolidate our expertise** in optimisation and its synergy with machine learning, generative intelligence, emergence intelligence, cognitive computing, and big-data analytics to become the leading group researching and applying the highest levels of AI **to tackle complex decision problems**.

**CVL**

* **Continue to developing computer vision approach in the biosciences**: bringing AI across the domain boundaries to the biosciences more generally (beyond plants).
* **Develop affective computing technologies for healthcare applications**: combining multimodal cues (including audio-visual and biomedical data sources) and addressing associated issues of ethical AI.
* **Expand our work with Engineering**: our association with engineering has led to high profile papers, PDRA hires, and new grant development work; we have also been awarded a PhD scholarship from the RHS.
* **Create a phenotyping data science innovation centre**: strengthen Nottingham’s position as a centre for digital phenotyping innovation by starting a dedicated research centre. This would pave the way for sizeable national infrastructure funding opportunities. Initial investment could take the form of a **dedicated office space**, and **3-4 staff** work on software and data solutions for plant phenotyping. Establishing a digital phenotyping centre would strengthens Nottingham’s strategic positions in these areas:
* Basic research in the quantitative measurement of plant structure and function in controlled and semi-controlled environments.
* Development of high quality software tools and deployment strategies allowing new methods to be accessed both within UoN and by the wider community.
* Partnerships with leading academics, including the rapidly developing Agri-Robotics Centre at the University of Lincoln
* Industry collaboration, building upon CVL’s s existing relationships (e.g., with Syngenta), and liaising with InnovateUK’s AgriTech Centres to increase industrial involvement and move new techniques to higher Technology Readiness Levels.

**CybSec**

* Our main priority moving forward remains to **grow the core academic staff base** within the group, and thereby expand our potential to seek funding and build our external profile. We have been seeking to recruit at least two new members of staff.
* The group continues to aim towards a future application to become recognised as an **Academic Centre of Excellence for Cyber Security Research** (ACE-CSR) – a programme operated by the EPSRC and National Cyber Security Centre (NCSC). However, this will depend upon several metrics, and while we are able to demonstrate some (publications and interdisciplinarity of the group), and progress towards others (doctoral pipeline), we are still likely to look limited in others (e.g. overall funding income) until the group has a bigger core staff base and income associated with these individuals.

**DREAM**

Key **priority areas** include:

### **Health informatics/machine learning/data analytics for healthcare:** we recently lost a key academic (Grazziela Figueredo) whose expertise has played an important part in pushing forward healthcare and biology related research in the group. We need to **recruit an academic** with similar expertise and research interests to be able to support much of the core activity of the group.

### **Inference and machine-learning under uncertainty:** Risks associated with uncertainty in machine learning are fuelling a rapidly growing interest in developing approaches with the capacity for **uncertainty quantification**, and more broadly, for handling uncertainty in data and providing reliable assessments of model robustness and confidence.

### **Communication of uncertainty in healthcare via visualisation**: Informed decision-making is particularly critical in healthcare, both at the professional and the patient levels. As AI-enabled and supported systems adopt an increasing role across the healthcare space, from diagnosis to treatment, articulation and accessible and effective communication of uncertainty associated with AI outcomes via visualisation is critical.

### **Machine learning for biology:** the group seeks to expandinterdisciplinary collaborations with academics in the biological and biotechnology sciences (e.g. Pharmacy, Life Sciences, Biosciences, Veterinary Medicine), which have previously led to successfully funded external grant applications.

**FP**

* Our primary focus to date has been on foundational research, but we are also **keen to expand into more practical areas**, as the kind of topics that we study in the group are increasingly relevant to real-world applications.
* The group has recently strengthened its profile in **type theory** with the promotion of Nicolai Kraus and the appointment of Ulrik Buchholz, and in **categorical techniques** with the appointment of Dan Marsden.
* To further enhance and develop the group, we would like to **recruit two new members** of academic staff. Our proposal is to recruit **one in the area of type theory** to build on Kraus's promotion, and one in other areas to maintain group balance.

**Horizon**

* Horizon has just over a year left until the end of the grant (December 2025) and as the Digital Economy theme has closed, we are aligning our research with new priority areas. The **AI mission-driven priority** is of particular relevance, as is the ProSquared network (From Prototyping to Production of Digital Devices), which provides another avenue of future research and is aligned with the **engineering theme**.
* Support is needed from the School to **cover technical support for the Cobot Make Space**.

**MRL**

* **Responsibility** continues to be a key theme for the MRL, especially in relation to **Human-centred AI**. This includes our ongoing core involvement in RAI-UK, led by Joel Fischer.
* Steve Benford’s Turing Fellowship on “Somabotics” builds on and develops this with significant strands of MRL work in **Human-Robot Interaction**.
* Research on **Interactive Music**, led by Craig Vear, continues to develop, including the recruitment of Anna Shvets to the group and continuing collaborations with the Music Department (including Joanne Cormac’s Future Leaders Fellowship). Interactive Music has been **recognised as a SIG within the School**.
* Work on HCI and the Brain continues to develop well, with the **Brain-Data SIG** led by Max Wilson & Horia Maior.
* Aislinn Bergin’s appointment brings fresh focus to the group’s work on digital technologies and **Mental Health and Wellbeing**. This work is in collaboration with Elvira Perez, who has just set up a cross-group **Digital Mental Health SIG**, the Institute of Mental Health and the Biomedical Research Centre Mental Health and Technology theme, and complements the Brain Data SIG’s focus on mental workload.
* There is continuing core strength and activity in **Immersive Experience Design** including VR, AR and (or course) mixed reality (led by Paul Tennent). Both areas maintain diverse interdisciplinary collaborations, with particularly strong links between the MRL and the Faculty of Arts (Helen Kennedy, Sarah Martindale) including the **Virtual and Immersive Production Studio**.

**RDF**

* The Responsible Digital Futures group aims to advance digital solutions that respect ethical standards, embrace inclusivity, and contribute positively to societal and environmental well-being.
* The research themes addressed by the RDF explore the **implementation of principles of responsible innovation** with a focus on digital technologies; the identification of future and emerging technologies and trends; highlight benefits and downsides of future and emerging technologies; and explore responsible practices of design and use of future and emerging digital technologies.
* This includes: **specific technologies and application areas** including mental health / neuroscience, human-robot interaction, responsible autonomous systems, and responsible AI; **research and innovation governance** including research ethics and integrity, data ethics and governance, and public engagement; and **conceptual approaches** **to responsible digital futures** including philosophy of technology and digital culture.