

# RESEARCH SOFTWARE ENGINEERING

2024



# INTRODUCTION

The past year has been a period of significant change and achievement for the Research Software Engineering team. We successfully delivered a range of key projects, have begun planning an expansion to our offering to include infrastructure and data services alongside software engineering. We have continued to build and maintain strong collaborative relationships with colleagues across the institution.

A notable highlight of the year was the creation of two new senior technical roles. For the first time, we have a career pathway to a senior level that doesn't require the line management of other staff. The new senior RSEs have already brought new perspectives and leadership to the team, elevating our technical capabilities and strategic vision. Additionally, we were honoured to host RSECon24, bringing 450 people to Newcastle to celebrate our community and its continued success. Many people from the team volunteered their time to make it such a success.

As we look ahead to the next year, we anticipate a period of both challenges and opportunities. The transition into NUIT will undoubtedly present new challenges, including

navigating an unfamiliar organisational structure. Due to sector-wide financial challenges, we must also negotiate a more complex approval process for purchasing and travel. Moreover, a freeze on recruitment could impact our ability to hire new skills and fill critical roles.

However, we also see significant opportunities on the horizon. Changes in UKRI funding rules will allow us to apply for new grants and expand our research capabilities. The move to NUIT, while challenging, could also provide us with greater resources and influence, allowing us to become an important advocate for researchers back into NUIT. Additionally, the acquisition of a new high-performance computing (HPC) machine will significantly enhance the University's computational power, and we are well placed to help researchers make the most of it.

By carefully navigating these challenges and seizing the opportunities, we are confident that we can continue to drive innovation, improve efficiency, and support the university's core missions.

MARK TURNER  
HEAD OF RESEARCH SOFTWARE ENGINEERING

ANNUAL REPORT 2024

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# HIGHLIGHTS

KEY EVENTS FROM 2024

## JAN - MAR

The first quarter of the year was about building on last year's successes. We added new skills to the team via recruitment and played a role in some strategically important new projects.



### RECRUITMENT

We recruited two new colleagues into the team, adding skills in computational modelling, UX, and graphic design.



### EPRASE 2

ePRaSE received further funding for a follow on to continue our work with NHS England.



### 5G INNOVATION NETWORK

The School of Natural & Environmental Sciences was a partner of a 5G Innovation Network grant to roll out high-speed internet to the University farms.

## APR - JUN

The second quarter of the year was all about upskilling. We were able to get some new senior technical posts approved, gave the whole team access to project management training, and spent time together refocusing on areas of improvement.

### SENIOR ROLES APPROVED

The team received approval for our first non-management senior roles.

### AGILE TRAINING

Colleagues from UCL visited Newcastle to deliver two days of training on Agile Project Management.

### SUMMER AWAY DAY

We got together as a team to work on our processes and enjoy a day out at the University Farm.

## JUL - SEP

In the third quarter of the year, the team delivered on strategic initiatives. The senior posts were filled, the RSE conference returned to Newcastle, and our first Research Infrastructure Engineers were appointed ahead of supporting a new HPC machine.

### SENIOR ROLE APPOINTMENTS

We promoted three colleagues into senior positions. One line manager and two new technical senior roles.

### RSE CONFERENCE

The RSE Conference returned to Newcastle, 450 people came to the city for a week of events, community, and socialising.

### RESEARCH INFRASTRUCTURE APPOINTMENTS

Three new colleagues joined the team in roles dedicated to supporting the University's investment in a new HPC machine.

## OCT - DEC

The final quarter of the year has been spent putting us on an upward trajectory going into 2025. Our leadership team made changes to the way we run things, we launched a new way for the team to learn from each other, and the HPC contract was awarded with delivery for mid-2025.

### LEADERSHIP AWAY DAY

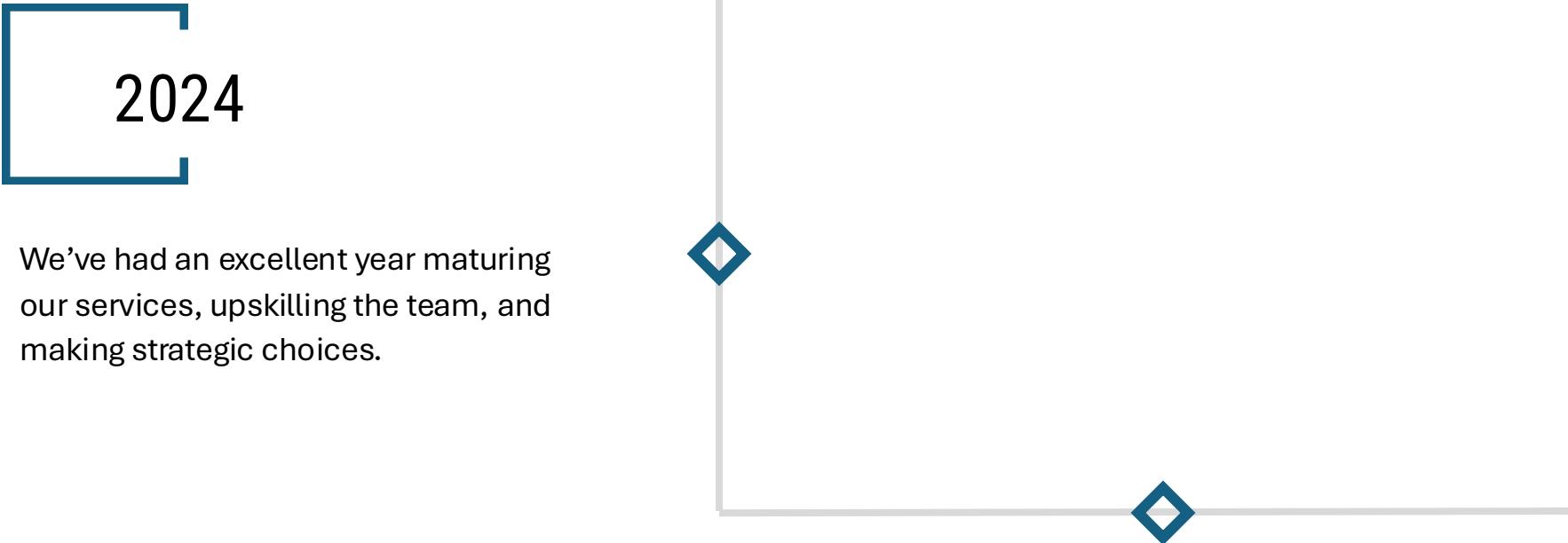
As a result of multiple senior appointments, we had a leadership away day to review our processes and plan our workloads.

### SPECIAL INTEREST GROUPS

We launched a series of special interest groups, replacing sub-team meetings, to let people explore different technology areas.

### HPC CONTRACT AWARDED

The University made an award to a preferred supplier for the new HPC machine that will be delivered in the new year.



# 2024

We've had an excellent year maturing our services, upskilling the team, and making strategic choices.

# 2025

LOOKING AHEAD

With ongoing financial uncertainty across the HE sector we need to be proactive in securing projects as well as playing our part in supporting the wider University.



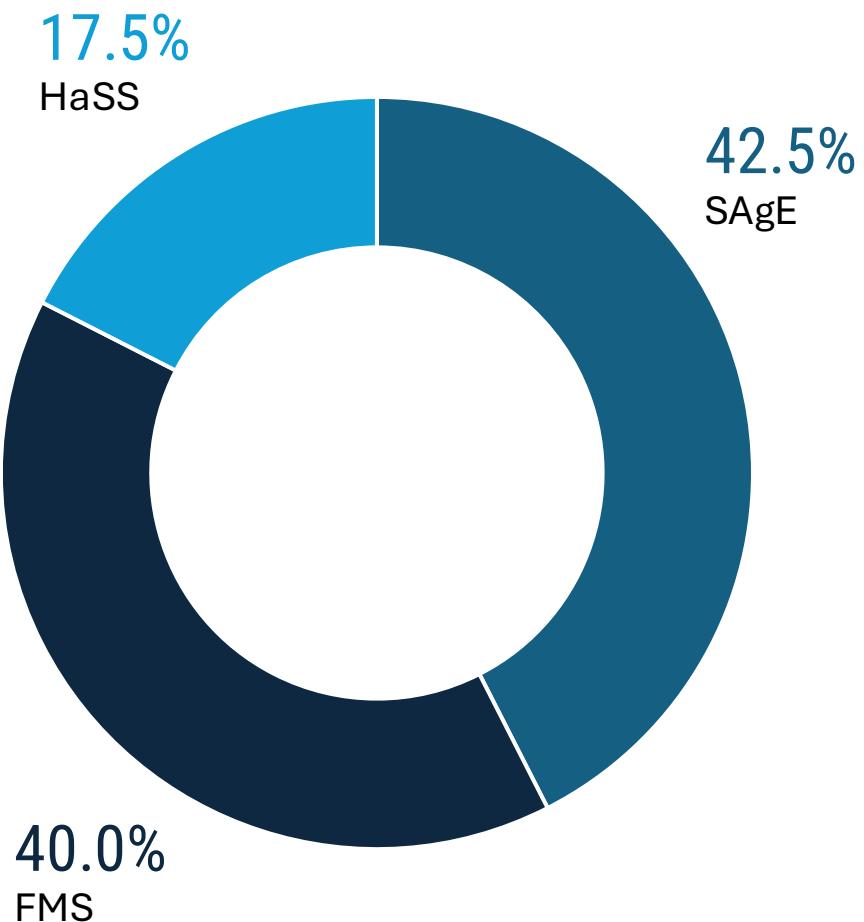
# FINANCES

INCOME AND EXPENDITURE

FUNDING BY

# FACULTY

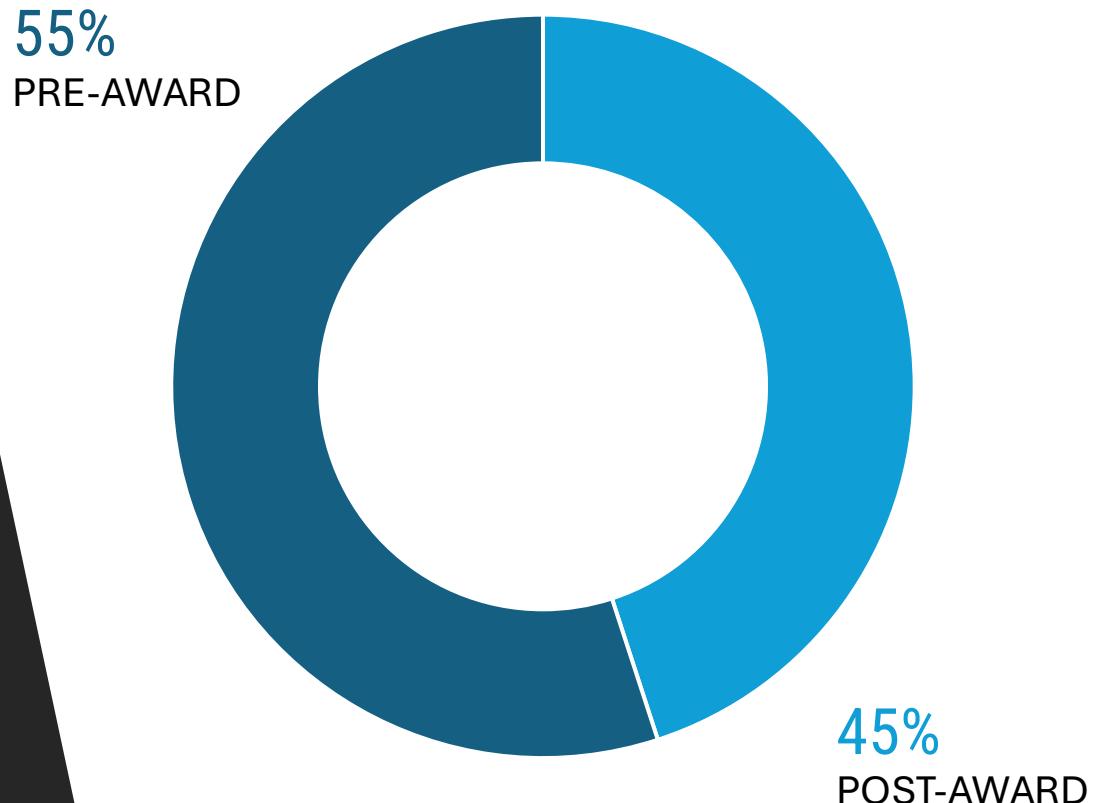
Funding breakdown by faculty has remained fairly constant, though there has been small increases in FMS and HaSS. SAgE disciplines tend to be more computationally intensive and are still the dominant faculty by project count.



FUNDING BY

## AWARD STAGE

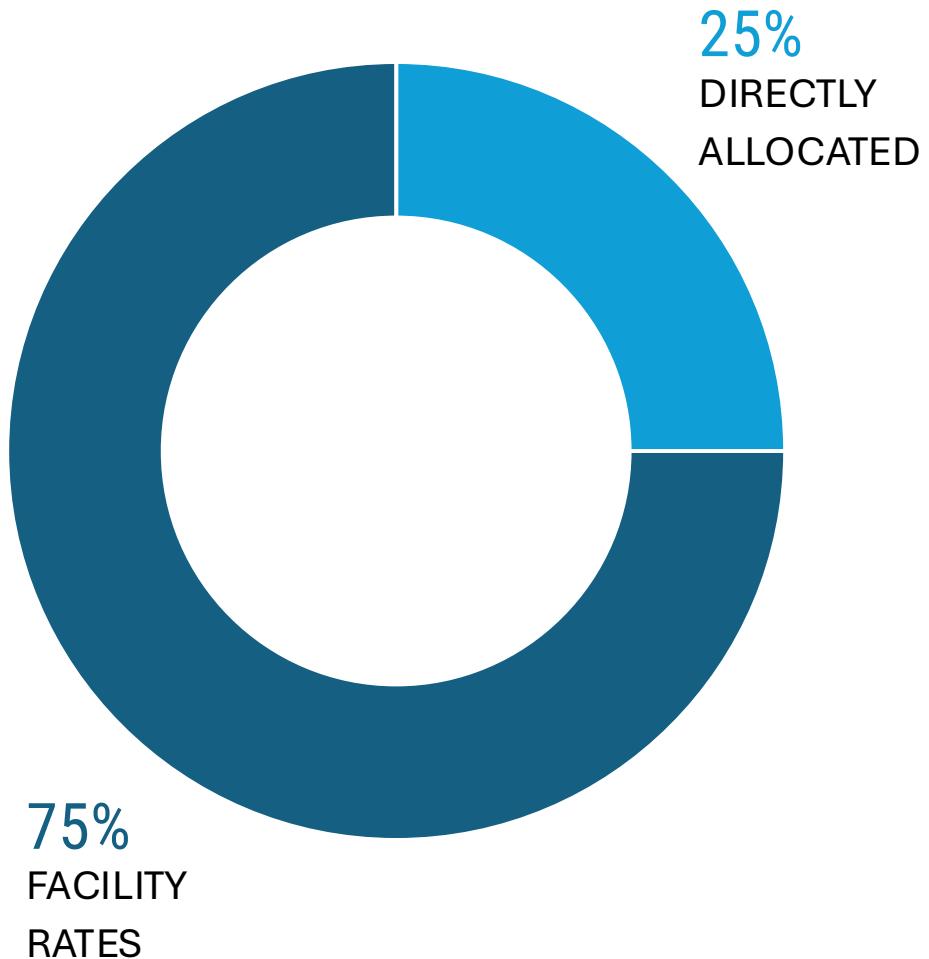
Post-award work is down on last year, but still higher than in previous years. Ideally this should be lower, as pre-award work represents were involved in during the grant writing stage. Post-award work will never be zero, but 45% is higher than it should be.

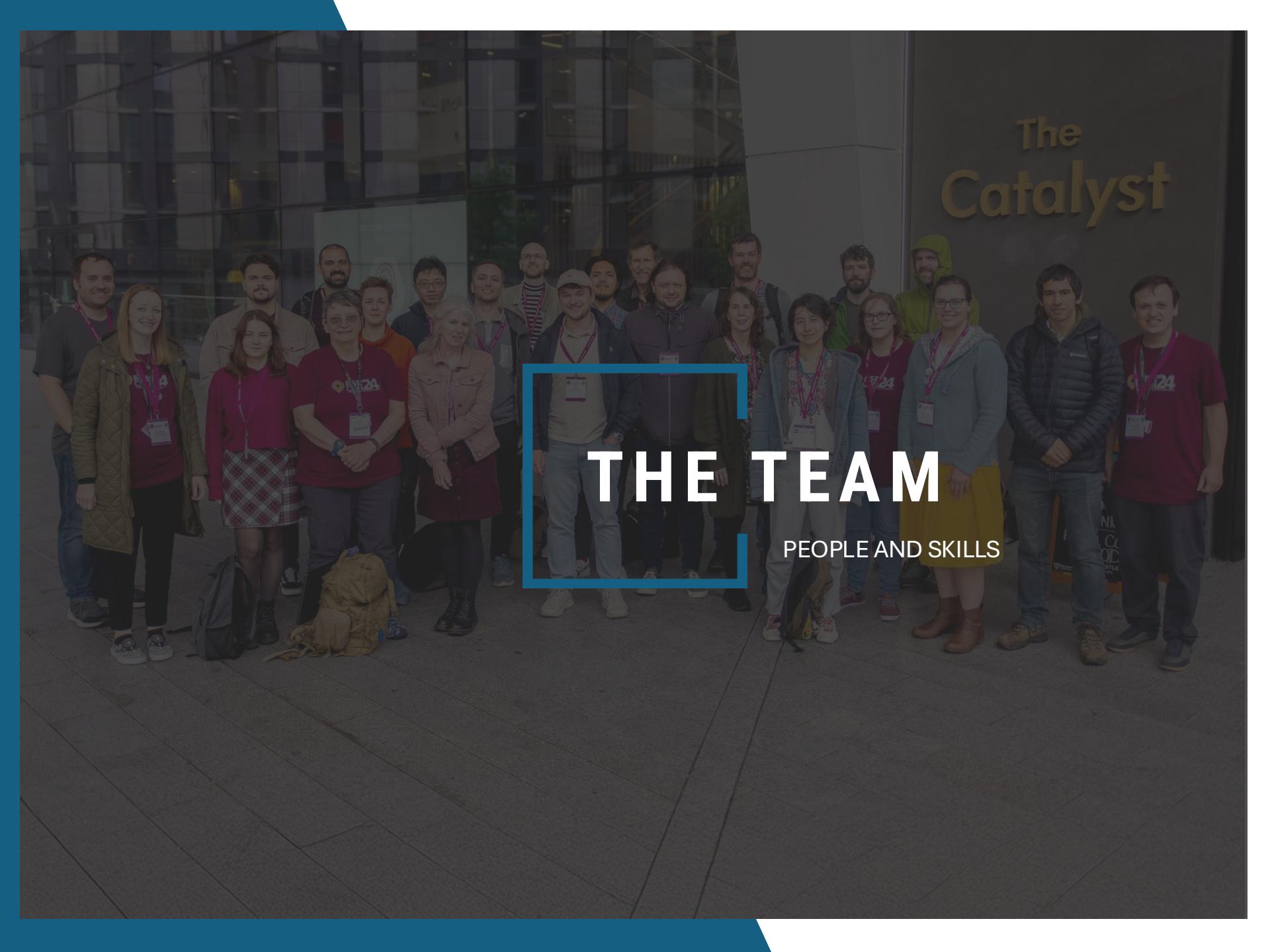


FUNDING BY

# RECOVERY

The share of our income coming from facility charge - out rates has continuing a strong upward trend, rising again from 63% last year to 75% this year. It is up from 45% in 2022 and 11% in 2021. The ambition is to get that figure as high as possible while accepting it will never be 100% due to internal or post-award funding.





The Catalyst

# THE TEAM

PEOPLE AND SKILLS



# ALEX SURTEES

## SKILLS

JavaScript, R, Python, SQL, Software: React.js, d3.js, R Shiny, Django, Medical Research, UX Design, Statistics, Data Visualisation

## INTERESTS

Climbing, Cooking (especially Sichuan and Indian food), Table Tennis, Chess

Alex is a full-stack web developer with experience working on a variety of medical research projects in software development or statistical roles, including health economic and neuroimaging statistical dashboards, and the Human Developmental Biology Resource.

He graduated from Northumbria University with a BSc Mathematics.

Alex is interested in learning new technologies and disciplines and applying his skills to a diverse range of meaningful projects.



# ARTURO GUZMAN PEREZ

Arturo joined the RSE team in April 2024, coming from a previous role as web designer/developer and animator. His career has been marked by unwavering dedication to the intersection of visual storytelling, technology and art - with experience designing and building online experiences for artists, curators, small businesses and creative studios.

He holds a MA in Art and Politics from Goldsmiths, University of London, and a BA in Fine Art from Facultad de Artes y Diseño, Universidad Nacional Autónoma de México.

## SKILLS

Javascript/Typescript, Svelte/SvelteKit, HTML/CSS, Tailwind, Node.js, Docker, Caddy, Postgres, Gitlab CI/CD, Neovim, Adobe Creative Suite, Figma, Affinity, Ableton, Web Development, UI/UX, Web Design

## INTERESTS

Art theory, Critical theory/philosophy, Self-hosting and automation, Cars, Coffee



# BECKY OSSELTON

## SKILLS

JavaScript, HTML/CSS, Vue.js, Knockout.js, PHP, Python, Perl, Docker, Azure, GitHub, Laravel, CakePHP, MySQL, SQLServer, Postgres, WordPress, Tailwind, Bulma, Bootstrap.

## INTERESTS

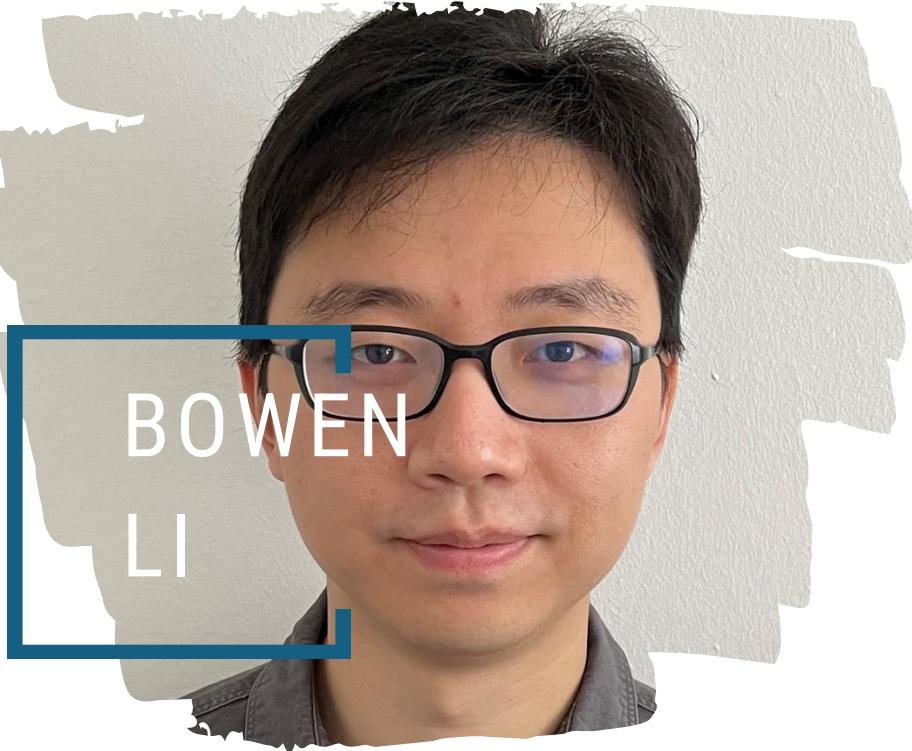
Karate. She is also interested in inspiring women to engage and seek careers in the technology sector.

Becky is a full stack web developer with many years of experience working in both the public and private sector. She graduated with an MSc in Computing Science in 1999 from Newcastle University.

She joined the RSE team in 2019 and is a member of the leadership group, managing a team of web and mobile developers.

Becky was previously employed with the NHS developing a healthcare application to modernise clinical practice for the Newcastle upon Tyne Hospitals NHS Foundation Trust. Becky continues with work closely with NHS Trusts and NHS England on various projects.

She has knowledge of multiple web frameworks, modules and libraries used in web applications and software deployment.



## SKILLS

C/C++, Java, Python, Docker, Unix Shell, LaTeX, Sphinx, Git/Github

## INTERESTS

Computational Biology, Mathematical Modelling, Numerical Simulation, Formal Verification, Machine Learning

Bowen Li joined the team in October 2022. His background centres on computational modelling, including both theory and application. Bowen received his PhD in formal modelling and verification. Since completing his PhD, he has contributed to several computational biology projects as a Research Associate and has been the lead developer of open-source scientific software NUFEB (<http://github.com/nufeb>), a platform for agent-based modelling and simulation of cell populations.

Since joining the RSE team, Bowen has expanded his interests to include machine/deep learning. He has participated in several related projects and developed software solutions. These include applications of image classification for livestock, and deep learning models to predict X-ray spectroscopy data. He also continues to enhance NUFEB, focusing on maintaining the software and extending its capabilities to modelling various biological systems.



# CARMELO CALAFIORE

## SKILLS

Computer Vision, Cognitive Robotics, Computational Neuroscience, Modelling, Machine Learning, High Performance Computing (HPC), Psychology, Cognitive Neuroscience, Statistics, Python, Bash, Batch, MATLAB

## INTERESTS

Reading, Travelling, Movies, Music, Recording and Editing Videos

Carmelo has a PhD from the University of Essex in the UK with a wide technical background that includes computer vision, machine learning, statistics, psychology, computational neuroscience, and cognitive robotics.

He started his academic studies with a Bachelor of Science (BSc) in psychological sciences, where he learned advanced statistics, cognitive psychology, and cognitive neuroscience.

He did his PhD in vision at the University of Essex where he investigated and compared the active action recognition of robots and humans.

Lastly, he joined the Research Software Engineering (RSE) team at the Newcastle University, where he supports academic research with his expertise in machine learning, statistics, and data analysis.



CAROL  
BOOTH

#### SKILLS

HPC User support, Linux system administration

#### INTERESTS

High Performance Computing  
Training (Software Carpentries)

After a degree in Linguistics, Carol started her career in Marketing scientific instruments but quickly moved into IT training and after her Masters degree went on to work in Secondary Education, managing assessment data and Virtual Learning Environments. She joined Newcastle University in 2017, providing specialist support for research and teaching in Electrical and Electronic Engineering, with a particular interest in Linux. In 2022, Carol joined the newly formed Academic IT Consultancy Team, providing advice across all faculties for novel and complex IT systems. In 2024 Carol joined the Research Software Engineering Team as a member of the specialist support team for Comet HPC, providing training, user support and HPC Service Development.

Carol is working towards certification as a Carpentries Instructor and is interested in learning new technologies and working with other RSEs to ensure that researchers at all career stages get the best value from HPC.



# DANIELA BASURTO LOZADA

## SKILLS

Python, JavaScript, C#, R, Pytorch, Shell, Matlab, Git, GitHub, Workflows, Software Development, Web Development

## INTERESTS

Films, Photography, Videogames

Daniela Basurto Lozada is a Research Software Engineer based in Newcastle. She works on developing the cell atlas web application as well as other software tools to process and visualize the Haniffa lab's research data.

Daniela received her bachelor's degree in Computer Systems Engineering from Instituto Tecnológico de Querétaro, and a master's degree in Image Analysis from Mexico's Instituto Politécnico Nacional where she worked with machine learning and deep learning techniques. She also has experience in computer vision in the industry.



# DAVID HORSFALL

## SKILLS

Programming: Python, PHP, JavaScript, Flask, Docker, MySQL, VSCode, GCP/AWS/Azure, Terraform, GitHub Workflows

## INTERESTS

Running, climbing and walking my springer spaniel

Dave joined the RSE team in March 2020 and is a key member of the Haniffa Lab within the Faculty of Medical Sciences. With a master's degree in Theoretical Physics from the University of Durham, he brings a strong analytical background to his role. Dave's experience spans the open-source community, the private sector, and academic research software development.

In his work, Dave primarily develops web-based software using Python and React, emphasising user-centred design principles. Recently, he has deepened his engagement with the research software engineering community through a Software Sustainability Institute fellowship. His fellowship research focuses on improving mental health awareness and support within this community.

Passionate about creating inclusive and effective software solutions, Dave continually seeks opportunities to advance the state of research software engineering.



# DAVID HERBERT

## SKILLS

Full stack web developer (backend Python Django, Java, PHP Laravel, frontend Javascript Vue3, React, Alpine, CSS Bootstrap, Tailwind, Bulma). With a particular interest in web mapping/GIS systems

## INTERESTS

Jazz piano, repairing electrical items, woodwork, learning languages, gardening, walking and the outdoors, good food.

David worked in the commercial sector (mechanical engineering CAD systems), as a freelance web developer for 10 years focussing on third sector organisations, and for 10 years as a GIS web developer for British Antarctic Survey (BAS). During this time David developed high profile web front ends to support both scientific data access and situational awareness for operations and logistics in the Antarctic.

The underlying GIS web mapping framework allowed a spin-off project for a marine conservation organisation based in Tasmania.

David joined the RSE team in 2019, applying GIS and data expertise to several related projects for the Department of Geography, bringing interactive web front ends to urban planning model outputs. He has also provided student support for the Geospatial Engineering Centre for Doctoral Training.



## SKILLS

C#, JavaScript/TypeScript, HTML/CSS, Java, React, NodeJS, Azure, .NET, ASP.

## INTERESTS

Tech, Travelling, Music, Video Games, Reading

Fatih became a member of the Research Software Engineering team in March 2023, bringing his enthusiasm and expertise to the group. With over seven years of professional experience spanning multiple industries, he is a passionate developer who thrives on exploring, experimenting, and mastering new technologies.

In his previous roles, Fatih specialized in the .NET ecosystem, focusing on developing custom APIs, Azure Functions, and delivering performant, optimized code.

His contributions as a Solution Developer and DevOps professional were instrumental in building scalable and efficient solutions, often bridging the gap between development and operational excellence.



## SKILLS

Matlab, Python, R, Bash, NEURON, SQL, Django, Unity, FSL, Docker, Blender, Inkscape, LaTeX, Adobe Creative Cloud, GitHub Workflows, Azure, Docker, Oracle Cloud, HPC, Pytorch, Tensorflow

## INTERESTS

Data Analysis, Mathematical Modelling, Network Analysis, Dynamical Systems, Machine Learning, Tabletop Gaming, Spiking Neural Networks, Neuroimaging, UI design

Dr. Frances Turner is a Senior Research Software Engineer with a background and experience in Data Science, Computational Modelling and Machine Learning.

She has worked as a Research Software Engineer with the RSE Team since June 2019. She first joined Newcastle University in 2013 to study for a Masters in Neuroinformatics, which led to a PhD and RA positions based in the School of Computing with a focus on applying computational solutions to neuroscience questions.

During her tenure as a Research Software Engineer Frances has qualified as a Software Carpentries Instructor and has been able to develop computational solutions to a wide variety of projects from across all three faculties, picking up skills in machine learning, data science and user interface design.



# GABRIELLE SCHROEDER

## SKILLS

Programming: Python, R, MATLAB, HTML/CSS, Javascript, D3.js  
Software: Git/GitHub, LaTeX, Adobe Creative Cloud, Quarto, Qt, AWS (serverless), Docker

## INTERESTS

Data Visualisation, Data Analysis, Signal Processing, UI/UX, Biomedical Research

Gabrielle Schroeder joined the team as a data scientist in September 2023. After undergraduate training in molecular biology and genetics, she transitioned to research in computational neuroscience as a PhD student and postdoctoral researcher at Newcastle University. Her work focused on developing pipelines and applying a variety of techniques, such as time series analysis and unsupervised learning, to analyse brain activity and clinical data.

As a member of the RSE team, Gabrielle has designed data analysis workflows on AWS and developed software for biomedical signal processing. She has also added skills in user interface/user experience design and developed graphical user interfaces for data analysis and visualisation. Her interests include data visualisation, software design, and medical research software.



## SKILLS

Mobile Apps Publishing, Swift, Swift UI, Kotlin, App Store Distribution

## INTERESTS

Generative AI, LLMs, Photo Editing, Photography

Since joining the RSE team in 2022, Imre has been working to move the RSE Web and Mobile Team towards an exciting new direction.

Imre is actively leading the development and maintenance of mobile phone applications for seven University research initiatives.

Most notably he planned and developed the University's NU Signoffs app. It is now used as part of an elemental tool for students as part of their degree to record their assignments.

Prior to this, he published an Organ Assessment mobile app, aimed to assist Transplant Surgeons.

Having spent the past 6 years in software development, a key-factor in his career was working at a consulting firm; where he kick-started his career in mobile app development for an industry leading financial firm.



## SKILLS

Java, JavaScript, Python, R, MatLab, HTML/CSS, PHP, C/C++,  
Tcl/Tk, Git, Unix Shell, Docker, OpenRefine, MongoDB,  
Postgres, High Performance Computing (HPC), Carpentries  
Instructor Trainer, Web Design, Azure, Docker

## INTERESTS

3D Printing, Electronics, Raspberry Pi, Yoga, Martial Arts, Cross  
stitching

After many years in industry, Jannetta returned to academia fulltime, first to do a Masters in Bioinformatics and Computational Systems Biology and then a PhD in Computational Neuroscience. After two years as a bioinformatician and another 2 years doing a post-doc in the School of Computing, Jannetta joined the RSE team 2019.

Since then, Jannetta has taken the lead in delivering foundational coding and data skills training to researchers. She is a certified Carpentries instructor and instructor trainer. In 2022 Jannetta was awarded an SSI fellowship to further her work on CarpentriesOffline which focuses on delivering software, data, library and HPC carpentries workshops with limited or no Internet access.



# JOHN SCHONEBOOM

## SKILLS

JavaScript, HTML/CSS, SQL, PHP  
MySQL, PostGreSQL, SQLite, Strapi, Vue.js, JQuery

## INTERESTS

Martial arts, writing, music

John has a PhD and an MA in Creative Writing, an MA in Science and Technology Policy, and a BA in Political Science. John comes to the RSE Team from a previous gig at Newcastle University as a research software engineer for ECPPEC (Eighteenth Century Political Participation and Electoral Culture), where he developed the database that drives that project's website. He also works as a consultant for the New York State Department of Health, working on its Health Profiles site, which allows end users to explore and compare quality data for hospitals, nursing homes, and other health care facilities.

John is also a published writer, with two novels — *Fontoon* (Dedalus Books) and *The Day Aunt Gina Came To Town* (Roundfire Books) — and a non-fiction work called *Surrealpolitik* (Zer0 Books), and a playwright, with numerous plays performed mostly at Off Broadway venues in New York. He's won a Northern Writers' Award for fiction and an Artists' Fellowship Award for playwriting.



# JOHN SNOWDON

## SKILLS

C, Python, Ruby, Bash, SQL, Puppet, MySQL/MariaDB, Apache, OpenLDAP, Memcache, OpenStack, Django, SQLAlchemy, Rails, Slurm, VMWare, Citrix Xenserver, Linux KVM, unix, Linux, Azure Labs, Systems programming, Middleware design, Performance scaling of systems, Data processing, Configuration management

## INTERESTS

Scale models and miniatures, Restoring and modifying classic cars, Collecting 80s/90s computers and video games

John has worked at Newcastle University since 2003 in a variety of roles designing, building and supporting Unix infrastructure. In 2014 he moved to the Science, Agriculture and Engineering faculty, supporting the School of Computing Science in their Linux infrastructure systems, subsequently taking over the head of the Computing Science IT service in 2015.

Since 2022 John has been the primary support for the Newcastle University Rocket HPC facility; providing advice and guidance to users of that system and other users with advanced computing requirements. John is a member of the HPC replacement project team and has had major input into the design and specification of the new Comet HPC service which is expected to come online in early 2025.

In addition to being the main University technical contact for HPC services, John is also responsible for the design and implementation of the supporting tools (such as the HPC portal) which will accompany the HPC facility itself.



## SKILLS

Kate is a full stack web developer, familiar with a range of JavaScript frameworks.

## INTERESTS

Kate enjoys sewing and walking outdoors.

Kate originally trained in the Arts and has an MLitt in Textile Histories and a PhD which investigated women's creativity and communities built around knitting. She retrained, completing an MSc in Computer Science, and joined the RSE team in 2019. She now line manages a team of Data Scientists.

Kate is a full stack developer, lending her hand to a variety of websites and technology stacks. Kate has worked with Oracle, AWS, Azure and Firebase cloud services.



## SKILLS

Python, C/C++, Fortran, Numpy, PyTorch, MPI, OpenMP, CUDA, HIP, Unix Shell, Latex, Git/Github

## INTERESTS

Machine Learning, Neural networks, Computational & Mathematical Physics, Mathematical Modelling, General Relativity, Numerical Simulations, High-performance Computing (HPC), Data Visualisation

Lorenzo joined the team in 2024. For the XANESNET project, he implements neural networks to predict molecular structures. For computational fluid dynamics projects, Lorenzo manages codebases and datasets, provides advice on research best practices, and enhances simulations by integrating HDF5 libraries. He also contributed to MemoryChat, a chatbot for the detection of dementia designed to meet NHS standards.

Before joining the team, Lorenzo was a research scientist in computational and mathematical physics. Lorenzo also contributed to GRFolres, a C++ code to simulate generalisations of Einstein's general relativity.



# MARK TURNER

## SKILLS

JavaScript, HTML/CSS, Python, Terraform, Adobe Creative Cloud, GitHub Workflows, UI/UX, Web Design, Azure, AWS, DevOps, Containers, Docker, Kubernetes, Serverless

## INTERESTS

Travelling, Climbing, Hiking, Photography, Football

Mark leads the Research Software Engineering team in the University. The team focuses on delivering software engineering expertise for research projects across the university. He graduated with a BSc in Computing from Northumbria University in 2008 followed by an MSc from Newcastle University in 2012. In 2016 he was elected as a trustee for the UK Research Software Engineering Association, contributing to the transformation of the association into a registered charity in 2018.

Since joining the university in 2012 he has designed and implemented software applications for a number of research projects. Everything from the gamification of stroke rehabilitation physical therapy to mobile applications for alerting stakeholders to damage to rock art carvings and the leveraging of cloud computing to render a trillion-pixel image from a vector model of Newcastle city centre.



## MICHELLE GILBRIDE

### SKILLS

Planning, Project Support, Finance Support

### INTERESTS

Music, Travelling, Football

Michelle serves as the Operations Administrator for the team, delivering vital support across all aspects of our work.

Working closely with the Head of Research Software Engineering to provide high-level administrative and logistical support. She takes the lead in managing meetings, coordinating schedules, and ensuring that all aspects of planning and execution are seamless. Michelle is instrumental in organising events for the team, managing everything from venue arrangements and attendee communications to logistical details that ensure events run smoothly and effectively.

Beyond her operational and event-planning responsibilities, Michelle also supports the team's training initiatives. She oversees the organisation of teaching spaces, ensures accurate registration processes, and coordinates catering and other essential services to create a supportive and professional environment for participants.



# MIKE SIMPSON

## SKILLS

Python, C++, Java, D3.js, JavaScript/TypeScript, HTML/CSS, Blender, PowerBI, Unity, OpenGL, Photoshop, WordPress.

## INTERESTS

Data Visualisation, 3D Graphics, Virtual Simulation, Gamification (i.e. in Education/Healthcare), Video Game Development

Dr Mike Simpson has been part of the team since it was founded in 2019. After graduating from a BSc in Computing (2008) and an MSc in Computer Games Engineering (2009), he worked as a game programmer at a local studio before returning to the university for his PhD. He has developed software solutions for dozens of research projects across multiple domains, including with the NHS and the Alan Turing Institute.

Mike has been an active member of the RSE community, including being on the organising committee for the RSE Conference in 2022 and 2023, and being elected as Trustee of the Society of Research Software Engineering, becoming vice-president of the Society in 2024.

His research interests include the use of 3D graphics and games industry technologies for applications such as gamification in education and healthcare, virtual simulation and interactive data visualisation. He also has experience of web development and software engineering in a range of programming languages and domains.



REECE  
WALSH

## SKILLS

Javascript/TypeScript, React, Java, Kotlin, Web/Mobile development

## INTERESTS

Robotics, Golf, Video games, Piano, Guitar, Tennis

Reece joined the Research Software Engineering team while completing his masters in Computer Science at Newcastle University. His dissertation project was to develop a pathfinding algorithm visualiser that allowed users to interact and experiment with different pathfinding algorithms in the hope of furthering their understanding when paired with traditional academic methods.

Since joining the team, Reece has worked on multiple mobile applications and full stack systems.

He is currently developing a patient registry system which is being used by multiple medical research groups within the university.

Reece is also developing a website and mobile application for OrQA, an organ transplant assessment tool.



# RICHARD HOWEY

## SKILLS

Programming: C++, R, Python, Java, JavaScript, HTML/CSS,

PHP

Software: Unix Shell, SQL, LaTeX, GIMP, Davinci Resolve

Topics: Mathematics, Mathematical Modelling, Statistics,

Genetics, Epidemiology

## INTERESTS

Running, Reading, Travelling, Board Games

Richard has an extensive background working in different areas of Mathematics, Statistics and Computer Science. He completed his PhD in Pure Mathematics working in the field of functional analysis and after briefly working in the software industry, he worked in the field of Artificial Intelligence Planning at Durham and Strathclyde Universities. He wrote major extensions to the plan validation tool, VAL, which is used extensively by the research community to develop new planning methodology and applications.

Prior to joining the RSE group he has worked for over 10 years within the School of Medicine at Newcastle University in the field of Statistical Genetics developing methods and software to analyse genetic and biological data. During this time, he has also completed an MSc in Statistics (part-time at Sheffield University).



ROBIN  
NANDI

## SKILLS

Data analysis with R and python, Building application infrastructure on AWS, Machine Learning

## INTERESTS

Science & Technology, Badminton, Running

Robin is an experienced technology professional with strong software, data and cloud skills. He has been in the RSE Team at Newcastle for 3 years. He has experience leading projects and making sure they are delivered successfully and on time. He has good communication skills to a range of audiences.

He has worked on an organ quality assessment project. The aim was to provide a model-based assessment of the quality of livers and kidneys to transplant surgeons. He led the team at Newcastle which built the application and cloud infrastructure on AWS. The website and apps enabled surgeons to upload an image of an organ and receive a model-based assessment of its quality.

In another project, he programmed a microcontroller to control the DC/DC converter that provides power to the plane. The C code enabled CAN communication to enable the converter to be controlled from an external PC.



## SKILLS

Python, C / C++, Unix shells, Java, FORTRAN, Modelica, Matlab, Docker, Terraform, MongoDB, PostgreSQL, OpenModelica / Dymola, GitHub Workflows, Software Project Management

## INTERESTS

Drumming, golf, video and board games, modelmaking

Robin joined the Research Software Engineering team in May 2021, on completing a PhD in Energy at Newcastle University. He graduated with a Master's Degree in Electro-mechanical Engineering from Manchester University; and has additionally worked in RA positions at Sheffield, Durham and Newcastle Universities, working in engineering dynamics and on energy systems demonstrator and modelling projects, including in collaboration with the Centre for Energy Systems Integration.

Robin has also worked extensively in industry, principally in scientific and simulation software environments, and has significant project management experience in both industrial and university contexts. As well as developing data and software solutions for research in the RSE team, Robin is a qualified Software Carpentries Instructor and has also taught Degree Apprenticeship modules in collaboration with the Institute of Coding.



## SKILLS

Web development (HTML/CSS, Javascript, Python, Svelte, React, Flask, JQuery, Bootstrap, Tailwind), Text Analysis and Encoding (TEI, XML, XSLT, Python, R), AI and MLOps.

## INTERESTS

Photography and film photography, cycling, literature, music, motorsports.

Tiago is a Senior Research Software Engineer and digital humanist. Before his graduate and post-graduate education in literature, he worked as a software developer and studied computer engineering in Portugal. Between 2017 and 2021, he was the Research Associate for the ATNU project, based at the School of English, where he also taught literary and digital humanities' focused modules.

In 2020-2021, he convened and ran the *Coding for Humanists* study group, and from 2022 was one of the co-convenors of the Code Community at Newcastle University. Until 2022 he was a co-managing editor of the *Journal of the Text Encoding Initiative* and an editorial assistant for *The Programming Historian*. He became a Fellow of the English Association in 2024

# PROJECTS

SOFTWARE ENGINEERING

packages  
scripts  
src  
test  
types  
.babelrc.js  
.editorconfig  
.eslintignore  
.eslintrc.js  
.flowconfig  
.gitignore  
BACKERS.md  
LICENSE  
package.json

v2.6.0-beta.2 build: release 2.6.0-beta.2

build: build 2.6.0-beta.2

feat: dynamic directive arguments for v-on, v-bind and custom directives (#9368)

origin/dynamic-directive-arguments

feat: dynamic args for custom directives

perf: improve scoped slots change detection accuracy (#9371)

test: test cases for v-on/v-bind dynamic arguments

refactor: v-bind dynamic arguments use bind helper

test: fix tests, resolve helper conflict

fix: fix middlewares

feat: handle dynamic arguments for v-bind and v-on

origin/slot-optimization

feat: dynamic directive arguments for v-bind and v-on

refactor: extend dom-props update skip to more all keys

fix: fix checkbox event edge case in Firefox

test: fix tests in IE/Edge

refactor: simplify timestamp check

change: update component

# 5GIR

JAMES STANDEN

SAgE  
DSIT

## 5GIR Data Collection System



Wireless sensors which aim to revolutionise agricultural practices are in place at Newcastle University's Farms as part of a government programme to drive 5G adoption. Using advanced technology, they are collecting real-time data from a network of crop, soil, livestock and environmental sensors to empower farmers to make informed decisions in a bid to increase automation, boost efficiency and enhance environmental sustainability. The project is one of four in the Northeast funded as part of the Department for Science Innovation and Technology (DSIT) '[5G Innovation Regions \(5GIR\)](#)' initiative. The funding includes a £1.28million investment in NU Farms.

The Newcastle University RSE team are providing data collection and archiving expertise in the areas of:

**Data Collection:** handling multiple data stream types and formats; automatically extracting data from commercial farm software; integration with the LoRaWAN network and IoT platform (Daizy).

**Data Processing Hub:** Using Apache NiFi as a data processing platform to isolate sensors from the data warehouse for scalability and security, and for performing intermediate data processing, raw data archiving, and validation.

**Data Warehouse:** Using the [e-Science Central Data Warehouse](#) a proven technology developed within NICD, implementing a data warehouse capable of storing measurements from all farm sources and ensuring storage scalability, write and search performance.

# AI Multiply

NICK REYNALDS

SAGE  
NIHR



The RSE team was approached by the School of Computing to help transfer very large amounts of patient data into a new database. The data was downloaded from an existing system and needed a certain amount of data cleansing and wrangling before it could be transferred into a new Postgres database.

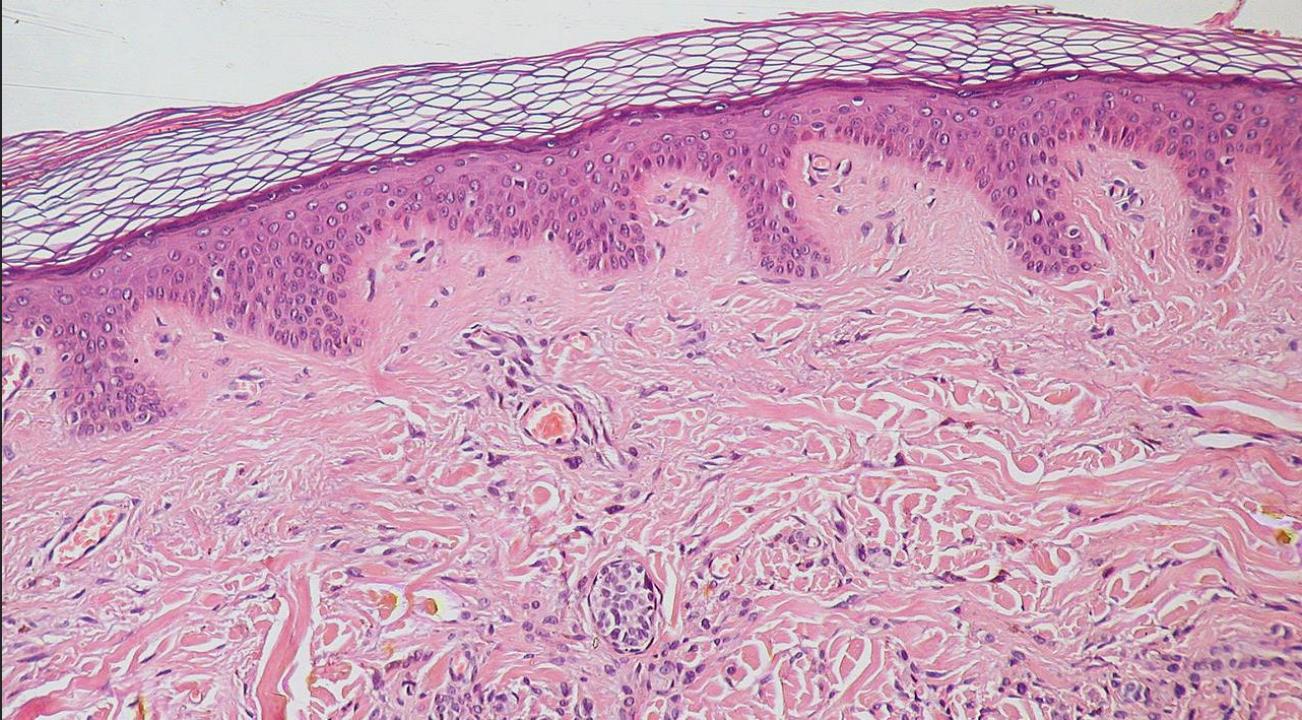
The challenges included manipulating data files that were extremely large on a protected server, dealing with slow operations and using system expertise to write batch files that would increase transfer efficiency. The RSE team were able to use their expertise in data management processes and database knowledge to complete the task.

# AI-PSORT

NICK REYNALDS

FMS

Rosetrees Trust



Psoriasis is a common, chronic, potentially disfiguring disease that affects more than 1 million people in the UK. It can cause considerable psychological and social disability. In the past 10 years there has been a dramatic improvement in clinical outcomes for patients with severe psoriasis due to the introduction of a new class of injectable drugs called biologics. However, these drugs are very expensive, and not all patients respond. The project aims at closing this gap by using Artificial Intelligence approaches to develop personalised biologic therapies and computational models that can reliably predict the outcome of biologic therapies.

The RSE role aims develop an agent-based model and software for simulating epidermal cell dynamics and their response to the treatments. The simulation would allow us to gain insights into how immune cytokine stimuli induce hyperproliferation in psoriasis to better understand disease formation, structural changes, and the recovery from biologic treatment.

# Arctic Lakes

MAARTEN VAN  
HARDENBROEK  
VAN AMMERSTAL

HaSS  
NERC



Maarten's team are working on predicting methane emissions from Arctic lakes, using large scale climate modelling combined with empirical data to help better inform global and local climate change predictions.

Inland lakes are responsible for large amounts of methane and carbon dioxide emissions, to the point where accurate estimates of these fluxes are important for climate change predictions. It is also therefore important to gain an understanding of what different factors impact greenhouse gas emissions from lakes.

The RSE team has been supporting data processing and pipeline building in R to help provide more accurate data feeds for lake methane emission models. We have focused on a subset of Alaskan lakes, accounting for differences in location and elevation using GIS encoded data.

# Ballast Hills Burial Ground

MYRA GIESEN

ECLS, HaSS

HaSS



The Ballast Hills Burial Ground requires a comprehensive digital platform to preserve and honour the memory of 37,000 individuals interred at this historically significant site in Newcastle's Ouseburn. A dedicated website will serve as both a registry and memorial, documenting the lives and stories of those buried at Ballast Hills whilst providing insights into local history.

This initiative is being developed in collaboration with the University's Research Software Engineering (RSE) team, based in the Catalyst building. The project emphasises accuracy, accessibility, and long-term sustainability through weekly support meetings where progress is reviewed, challenges are addressed, and development plans are refined. The ultimate goal is to create a meaningful and informative digital memorial that serves the Ballast Hills Burial Ground community.

# Bayesian Computation

CHRIS OATES

Mathematics, Statistics  
and Physics, SAGE

EPSRC



Funding for RSE time was obtained through an EPSRC grant for a project entitled “Harnessing the Power of Stein Discrepancies”. Part of this grant was to co-author a book with three others from Lancaster University, which involved statistical methodology related to the grant. The book included Markov chain scripts written in R, Python, and MATLAB by different authors resulting in inconsistent figure styles which were not suitable for a formal book published by the Cambridge University Press. The RSE team was requested to standardize the scripts into the Python language to provide a consistent style and accessible code for book readers who requested it.

There were many challenges faced when standardizing the code. In particular, the indexing in R and MATLAB begins at 1 rather than 0 as in Python which caused a surprising amount of complexity with one-off errors a frequent risk. Statistical software packages that did not exist in Python or behaved differently also presented challenging problems. The final Python code provided consistent diagrams with global styling variables so that diagrams can easily be updated throughout the book.

# Bee-ing Human

MAGNUS WILLIAMSON

HaSS

Leverhulme Trust



*Bee-ing Human* is an interdisciplinary research project gathering researchers and practitioners from literary studies, musicology, digital humanities and biology (animal behaviour). It centres on a seventeenth-century apiculture book, Charles Butler's *The Feminine Monarchy of Bees*, using it both as an object of study and as a departure point to contrast the early modern knowledge and culture around bees and beekeeping with the latest research in animal behaviour and emotion. Literary scholars will study and edit Butler's original text, musicologists will study the compositions included in Butler's writing, as well as respond with new compositions and reinterpretations of the sound of bees and research results; biologists, inspired by Butler's work, will work on the emotional states of bees. Alongside this disciplinary research, we will record, document, and present our own interdisciplinary process, as bees with different roles working together for the good of the colony.

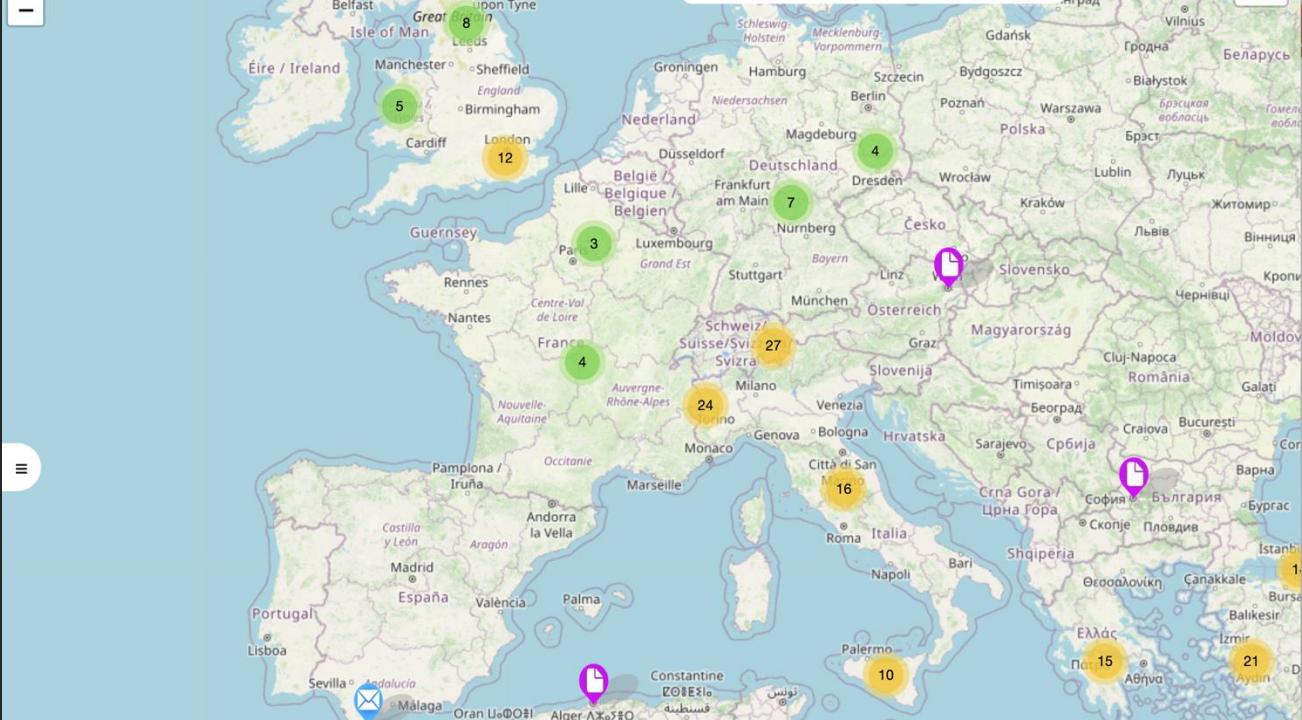
The RSE team is responsible for creating the final output (the digital hub that will become the new bee book) that will gather all the material and research produced during the project, digital experiments to communicate the research methods employed by the different disciplines, as well as coordinate and oversee the digital editing component of the project.

# Beyond the Margins

IAN JOHNSON

HaSS

Archives and Records Association



Beyond the Margins takes the archive of some 12,000 photographs, letters, and diary entries by Gertrude Bell, mapping each document to a particular location. The map can be filtered by date range, location, and type of document, with links to scans of the original documents with transcriptions (diary entries and letters), descriptions (photographs), and other meta data. In addition, the map provides the ability for an authenticated user to add historical overlay maps and to create and map custom stories based on selected Gertrude Bell documents.

The correspondence, diaries and photographs held within the Gertrude Bell Archive cover complex and crucial periods of geopolitical history, such as the fall of the Ottoman Empire, the First World War, and the creation of the Kingdom of Iraq. The material also provides detailed depictions of diverse landscapes, people, and cultures whilst recording Bell's movements and experiences in the Middle East, Europe, and East Asia. Included within the Archive are extensive notes, photographs, and sketches relating to Bell's archaeological work, complemented by correspondence between Bell and her contemporaries on the subject.

# Brain MoNoCle

YUJIANG WANG

CNNP Lab, SAgE

EPSRC



The project is developing a statistical model to analyse neuroimaging data using the normative modelling framework. The model allows researchers to assess the abnormality of brain morphology metrics across a wide range of brain regions in patients with neurological disorders, furthering our understanding of the patterns of clinical and biological markers in patients with complex, heterogeneous disorders.

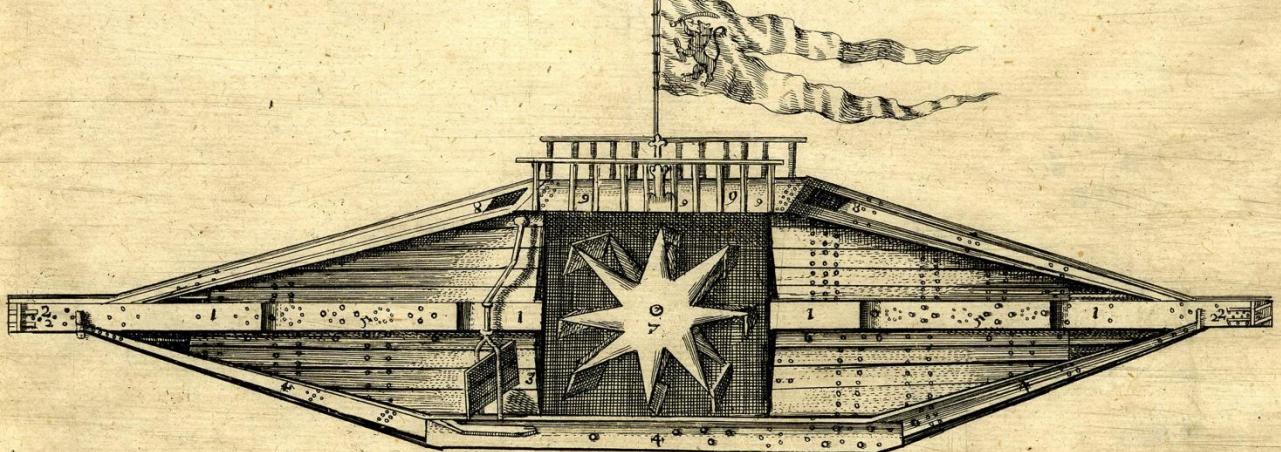
The Research Software Engineering team is ensuring the robustness of the model codebase and developing a web application to allow a wide range of researchers to run the powerful model being developed.

# British Printed Images

Adam Morton

HaSS

AHRC



The true & perfect forme of the Strange Ship built at Rotterdam A 1653, the inventor of it doeth undertake in one day to destroy a hondred Ships, can goe from Rotterdam to London and backagaine in one day, & in 6 Weekes to goe to the East Indiens, and to run as Swift as a bird can fly no fire, nor Storme, or Bullets, can hinder her unless it please God, Although the Ships meane to bee safe in their hauens, it is in vain, for shee shall come to them in any place, it is impossible for her to bee taken, unless by treacherie, and then can not bee governed by any but himselfe, the length is 72, the height 12 foote, the breadth 8 foote, The middle beame, the two  
... with ... wherein the Strength of the Ship lieth on both ends alike, the rudder of

The British Printed Images website is a digital archive of images produced between 1650 and 1800. The original 'British Printed Images to 1700' project ran between 2006 to 2009 and was funded by the Arts and Humanities Research Council (AHRC). It contains a database with links to over 11,000 images and contains associated metadata, including many images that are large and high quality. The site in its first form was created and hosted by Kings College London. By 2023, the website technology stack was no longer supported, so the project was brought to Newcastle University to rebuild.

The challenges for the RSE team were around understanding the previous database structure and redesigning the site to make it highly accessible and intuitive to use. In particular, the searches made available to users. Changes were made to the site to allow users to search in a variety of free text methods, focusing on search by Producer/Printmaker, Subject, Person and Technique. The website was subsequently rebuilt and the end application cloud hosted on Azure.

# CloseNiT

TIAGO DA SILVA COSTA

FMS

EPRSC



The purpose of this study is to explore the effects of transcutaneous auricular Vagus Nerve Stimulation (taVNS) and how these can be modified by the breathing cycle. There is preliminary data from other groups to suggest that delivering taVNS at specific times in the breathing cycle might boost its effects.

TaVNS is being actively explored as an adjunctive treatment for depression, with low cost and minimal side effects it has the potential to greatly improve mental health care.

The RSE team developed a desktop application which allows us to automatically deliver taVNS at specific times in the breathing cycle.

# Colouring Cities

POLLY HUDSON

SAgE

Alan Turing Institute



The Colouring Cities Research Programme, managed by The Alan Turing Institute, is a research-led, free public resource, providing open spatial data on the buildings in our cities. It is also an open knowledge initiative, built collectively by, and for, academia, communities, government, industry and the third sector. The programme began with the Colouring London prototype in 2016 and now consists of over 100 contributors in more than 20 countries. The CCRP allows international academic institutions to co-work on a global network of interoperable open data platforms on national building stocks, and to accelerate sharing of resources and expertise. The CCRP's overall aim is to help improve the quality, efficiency, resilience and sustainability of buildings, and urban areas, and to accelerate the move to net zero in line with United Nations Sustainable Development Goals.

The RSE team has been involved with Colouring Cities for a couple of years and has made numerous contributions to the programme. They have overseen the transition from the Colouring London prototype to the Colouring Core platform, which is now used by dozens of different institutions across the world.

# DOLFIN

JEREMY PARR

FMS

NIHR



Babies who are born very early, or who suffer poor blood supply or lack of oxygen to the brain before or around birth, are more likely to have problems with their brain development and child neurological development. This may affect how children think and learn, communicate, play, and interact with the world around them.

DOLFIN aims to answer the research question:

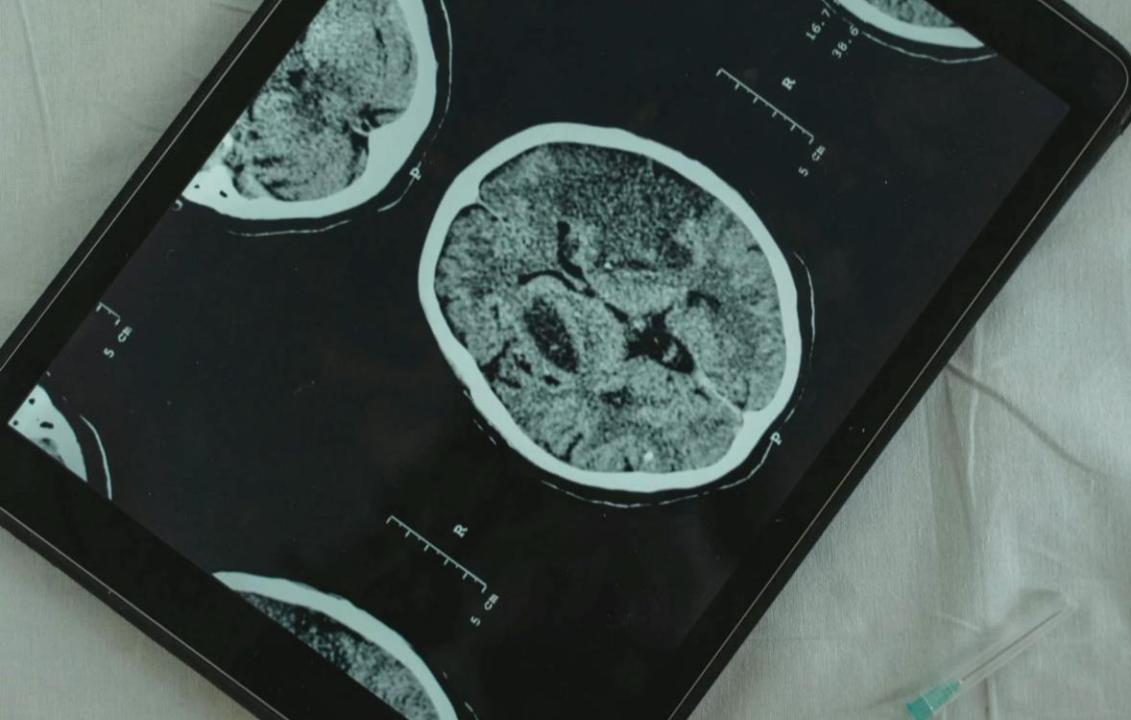
In babies who are born very early or who suffer poor blood supply or lack of oxygen to the brain before or around birth, does giving a nutritional supplement daily for a year improve long-term cognitive development?

Parents can record daily information about whether they have given their child their nutritional supplement in a mobile app developed by the team.

# Epilepsy MRI Visualiser

PETER TAYLOR

School of Computing, SAgE  
EPSRC-MRC



About a third of patients with epilepsy have seizures that are not controlled by medication. These cases can be treated through surgery to remove the part of the brain causing seizures; however, identifying this area is challenging, and many patients continue experiencing seizures after surgery.

Our collaborators have developed computational approaches to identify abnormal brain regions that are responsible for generating seizures. To make this approach available in clinical practice, they need to develop a tool that clinicians can use to upload, analyse, and visualise this data.

We will 1) refine and deploy a software pipeline for computing brain abnormalities and 2) develop a website that clinicians can use to upload brain scans, run the pipeline, and visualise the computed abnormalities.

# ePRaSE

STEPHANIE KLEIN

FMS

NHS England



ePRaSe is a 3-year project to take forward a previous software pilot to allow NHS Trusts in England to evaluate the mitigation of risk their e-Prescribing systems. The RSE team has been commissioned to develop the pilot tool further, with an eventual aim for it to become a standardised assessment exercise undertaken annually by Trusts. The RSE team has been working closely with the Newcastle Hospitals NHS Foundation Trust to develop test patients for the system and suitable clinical scenarios.

Phase 2 of the project has included a complete rewrite of the web front end to use the most up-to-date version of the Vue JS framework, and improvements to the Java Spring Boot back end. The user experience has been considerably enhanced by allowing partially completed assessments to be saved and continued later from any device. The project will see a phase 3 of implementation in 2025, including a complete rewrite of the back end to use the Strapi web database framework. Currently focused on adult patients, there are plans to expand the tool to include mental health and paediatric scenarios.

# e-TIPS

ANNA PUMA BASU

FMS

NIHR



e-TIPS is a home based parent-delivered intervention for babies affected by perinatal stroke, developed by a team at Newcastle University and made possible by an NIHR Career Development Fellowship to Dr Anna Basu. Families involved are given developmental resources relevant to their baby's condition and additional support and advice throughout.

Dr Basu contacted the RSE Team with the goal to develop a brand new, functional and easy to use website that allowed the delivering of the materials she has developed throughout a pilot feasibility study. The main challenges of this project were to make the materials as accessible as possible whilst considering the particularities of the health affection of the baby, as well as considering the role of the person accessing the website.

The website has enabled for these materials to be shared widely with those that require the support and information treating people with perinatal stroke. Feedback from the PI and end-users has been positive, with this website becoming an essential tool for healthcare professionals and parents as well as to further the research project.

# Fair Water

BOGUSLAW OBARA

School of Computing, SAgE

Water Services Regulation Authority



The Fairwater project aims to help customers save water and energy, lowering bills and reducing their carbon footprint. Part of this involves collecting data from domestic water and energy sensors. Dozens of sensors have been installed in a number of homes, including water flow sensors on individual devices such as washing machines, showers and dishwashers. This data is being combined with water and energy smart meter data from the properties.

The data will be used by the project team, which includes partners like Northumbrian Water, National Energy Action, Procter & Gamble and Northern Gas Networks, to evaluate the effectiveness of interventions aimed at reducing water and energy usage. Tools are also being designed to help users set goals and track their progress towards those goals, as well as generally tracking and visualising utility usage. The RSE Team is working on a pipeline to capture, process, store and visualise the data from those sensors. The main goal is to produce a dashboard that informs the users about their water/energy usage and helps them track progress towards their goals. The sensor installations are in progress, and the RSE team is currently helping with requirements capture, collaborating with the Urban Observatory.

# FIRM2

RICHARD DAWSON

School of Engineering, SAgE

Data and Analytics Facility for National Infrastructure



FIRM2 is a reimplementation of a NetLogo agent based flood incident management model, FIRM, in Java that will allow it to run inside a docker on the DAFNI platform.

The FIRM model can be used to explore magnitudes of events and impact of choices on the outcome of events, and how people respond to extreme weather events, to model how people are likely to be exposed to dangerous depths and speeds of water.

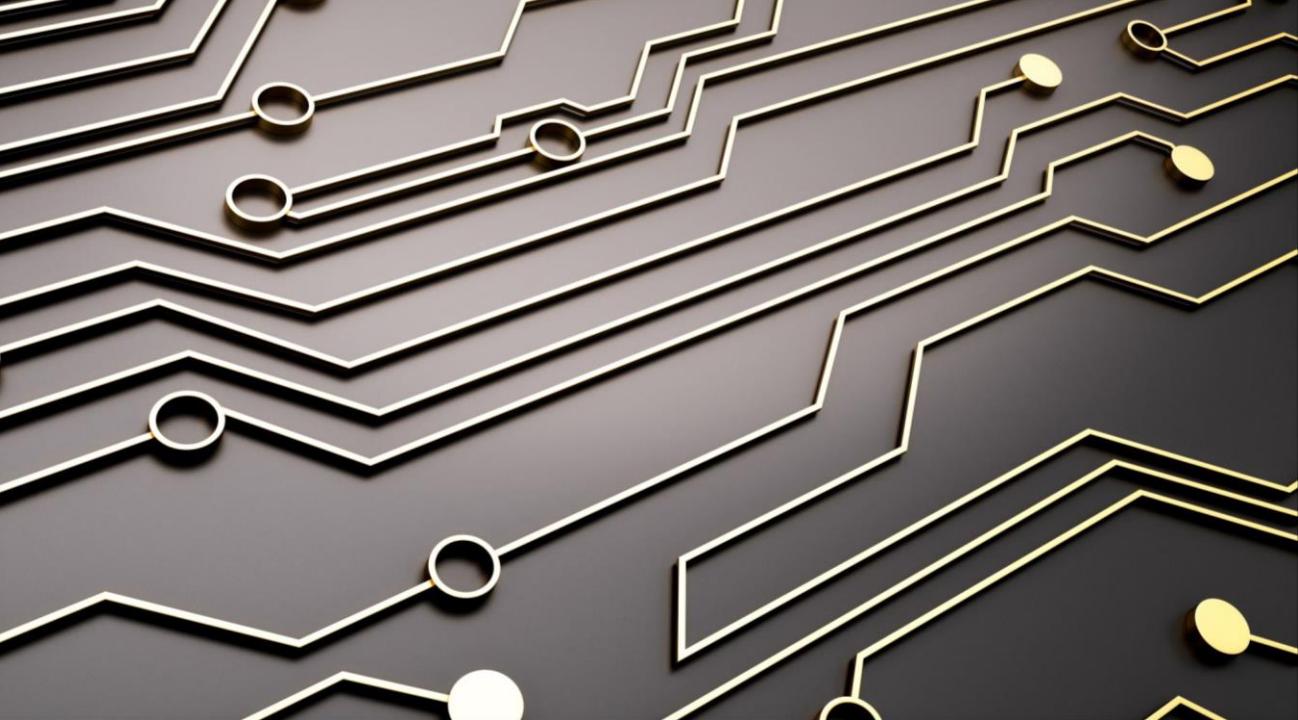
DAFNI will make the FIRM model more accessible and widely applicable.

# H2GEAR

NICK WRIGHT

School of Engineering, SAgE

Innovate UK



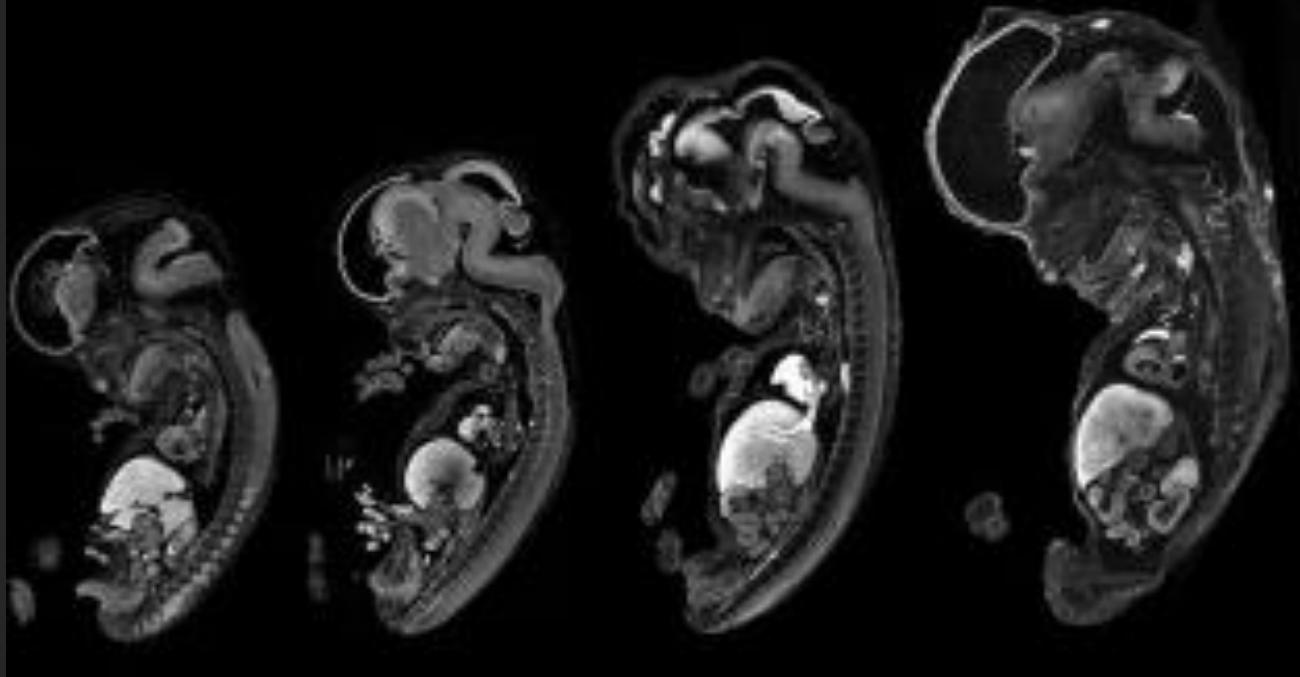
The School of Engineering was engaged by GKN Aerospace to help with the development the technology required for an electric powered passenger plane. Specifically a DC/DC converter to convert power from a hydrogen fuel cell, which is necessary to power the engine. The task for the RSE team was to program a microcontroller to enable external control of the converter over Control Area Network (CAN). CAN communication is a standard used for electric vehicles to enable efficient communication. The team developed C code to program a Texas Instruments C2000 microcontroller to send and receive periodic CAN messages every 0.1ms.

Using Code Composer Studio and configuring the bit rate parameters, the received messages are unpacked and the component instructions used to control the converter. Example controls are to power on, power off and request a target current. A response message is returned over the CAN network with the converter status and sensor data. A Simulink model running on the PC was the other node on the CAN network and enabled GKN Aerospace to do the testing they required to confirm they could control the converter. We developed a MATLAB app as a GUI to run the Simulink model with graphical representation of the sensor data and buttons for the control options.

# HDBR

STEVE LISGO

Institute of Genetic Medicine, FMS  
Medical Research Council



The HDBR (Human Developmental Biology Resource) was established in 1999 and is a tissue bank storing human embryonic tissue for onward use in research. Differences between humans and animals mean that some research can only be done with human tissues. This includes research looking at the early stages of human development and some types of research looking at treatments for human disease.

The HDBR supports research looking at how humans and their tissues and organs form. This includes studies looking at the reasons why some babies develop abnormalities before they are born and how this might be prevented in the future.

During this time, tissue provided by the HDBR has supported a vast number of research projects, at home and internationally. The RSE team has developed a web application for storing and managing data related to the tissue bank in line with the Human Tissue Authority, such as tissue location, allocation to projects, and disposal.

# Integrated Multi-Modal Tissue State Mapping

BOGUSLAW OBARA

School of Computing, SAgE

Wellcome Trust



Segmenting cell nuclei in 2D images is a problem that has been solved by training 2D convolutional neural networks such as Cellpose and StarDist2D on massive 2D image datasets with ground truth (GT) masks. However, segmenting nuclei in 3D images is still challenging due to the lack of a large 3D image dataset with GT masks. The reason is that manually annotating 3D images is hundreds of times more expensive than 2D images. By exploiting the multiple 2D views in 3D images, we aimed to efficiently segment nuclei in 3D images with a 2D model.

The RSE team segmented the same 3D images with the same 2D model, Cellpose, from either single-views (Cellpose2D) or multi-views(MVCellpose2D). MVCellpose2D was more accurate than Cellpose2D, proving that we can segment 3D images with the multi-view approach without needing a large 3D dataset with GT masks.

# Invasive Water Hyacinth

DEEPAYAN BHOWMIK

School of Computing, SAgE

Royal Academy of Engineering



Water Hyacinth is highly invasive aquatic weed which grows in cycles, blocking waterways in Kerala and causing significant disruption to communities. Currently, the Hyacinth growth in waterways is discovered with aerial drones and then removed manually. The project aims increase the effectiveness of interventions by using downloaded satellite imagery in combination with a recognition algorithm to identify Hyacinth density along riparian water channels. The project hopes to map the extent of invasive Water Hyacinth across selected polygon regions of India.

The RSE team were able to build a prototype web-based application with integrated mapping software. Satellite imagery is downloaded for a select region, preprocessed for colour balance, fed into the recognition algorithm, and outputted as a series of layers onto a front-end mapping web interface. Each layer is delineated by Hyacinth density and has the option to toggle on/off via a user selectable button.

# MemoryChat

JUDITH HARRISON

NIHR Newcastle Biomedical Research Centre,  
FMS

Royal College of Psychiatrists



Memory Chat is an AI-powered chatbot to identify dementia symptoms. It gathers information from an individual familiar with someone potentially affected by dementia. By streamlining the diagnostic process of dementia by automating routine tasks, it allows clinicians to focus on the aspects of their job that require human expertise.

The challenge for the RSE team was to develop an application designed to protect the confidentiality of medical records and meet NHS standards. It needed to be employing an open-source Mistral large language model. The tool si sritten in the Python programming langauge and hosted in the cloud.

# MicroEMG Software

ROGER WHITTAKER

Translational and Clinical Research Institute  
FMS  
MRC



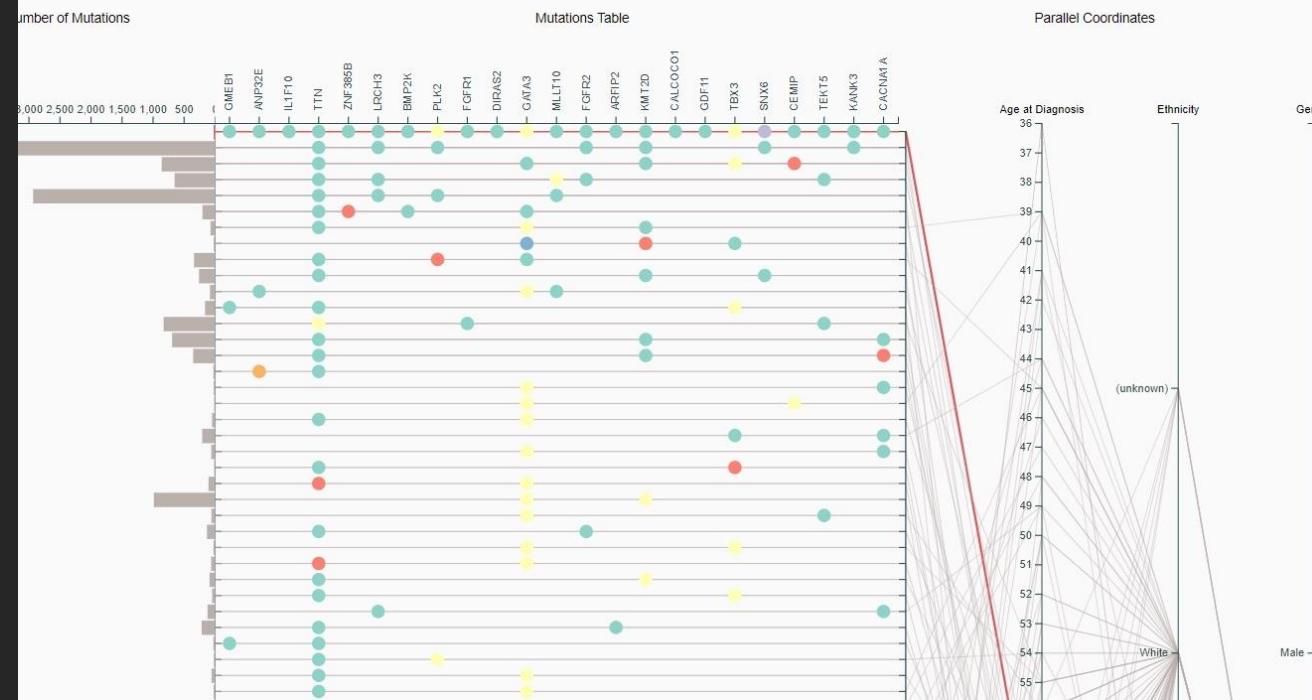
In clinical practice, electromyography (EMG) is used to diagnose and monitor neuromuscular disorders by recording electrical activity from muscle fibres. Our collaborators sought help improving and extending their software for analysing a novel type of multi-channel EMG recording, microEMG, so that clinicians can use these recordings to diagnose neuromuscular disorders such as myasthenia gravis.

We developed a prototype that meets clinical requirements by 1) optimising the speed of the analysis (from several hours to several minutes for one recording), 2) developing adapted analyses for clinical measures such as muscle fibre jitter, and 3) creating a graphical user interface that allows clinicians to explore and analyse microEMG recordings.

# Multiomics Visualisation

SARA FERNSTADT

School of Computing, SAgE  
SAgE



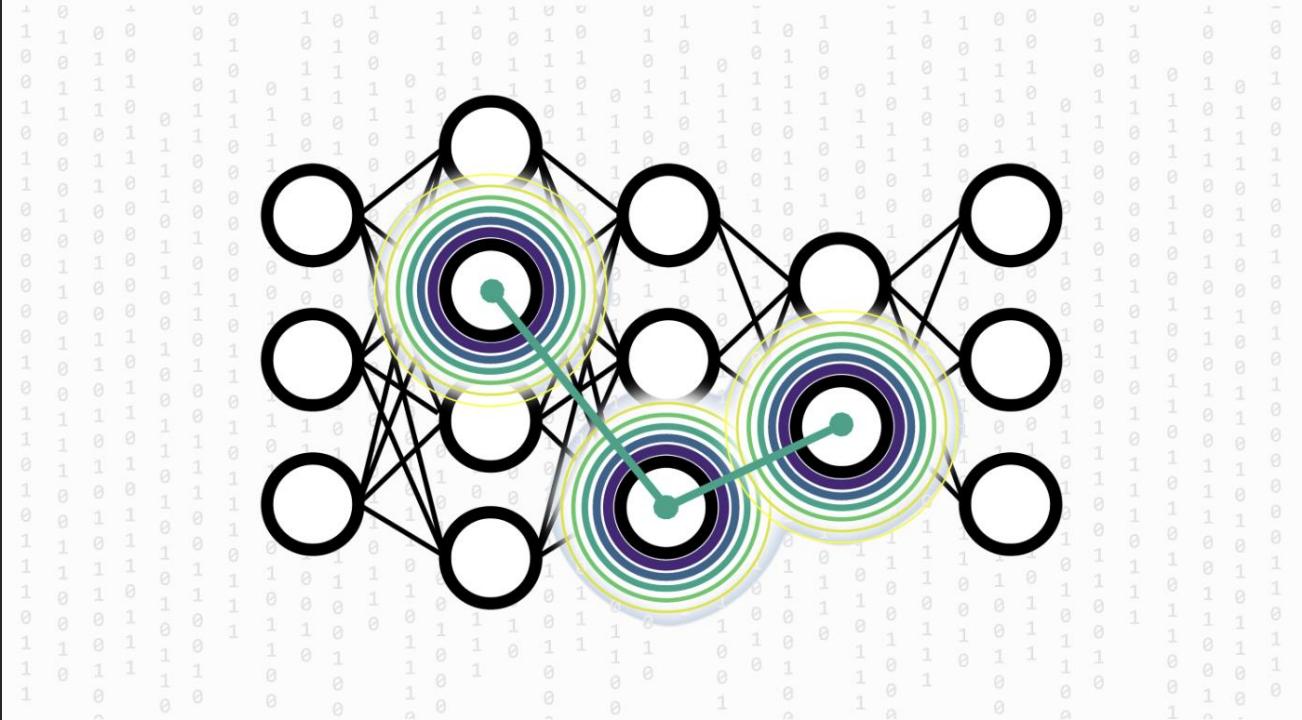
An early concept visualisation and data framework demonstration system: "Multi-omics visualisation to support decision-making in clinic-diagnostic settings". This tool reflects the very early stages of one aspect of a planned cross-disciplinary project which aims to bring the advantages of co-designed visualisation of multi-omics to clinical decision-making by molecular tumour boards within oncology (i.e. panels of experts convened to decide upon cancer treatment).

This early version of the data framework manages data from breast cancer patients reposed in the National Cancer Institute's Genomic Data Commons Data Portal and was created to test whether such data could be effectively wrangled and queried, and that basic visualisations could be built quickly upon the back of it. It is intended as a proof-of-concept with a long road of co-design ahead. The prototype was developed as part of a collaboration between researchers at Newcastle University: Northern Visualization and Visual Analytics (NoVA) team at the School of Computing and Wolfson Childhood Cancer Centre at the Faculty of Medical Science; and at UCL / Great Ormond Street Institute of Child Health to provide a fundamental data framework to support future research into multi-omics visualisation to support decision-making in clinico-diagnostic settings.

# XANESNET

TOM PENFOLD

School of Natural and Environmental Sciences  
UKRI



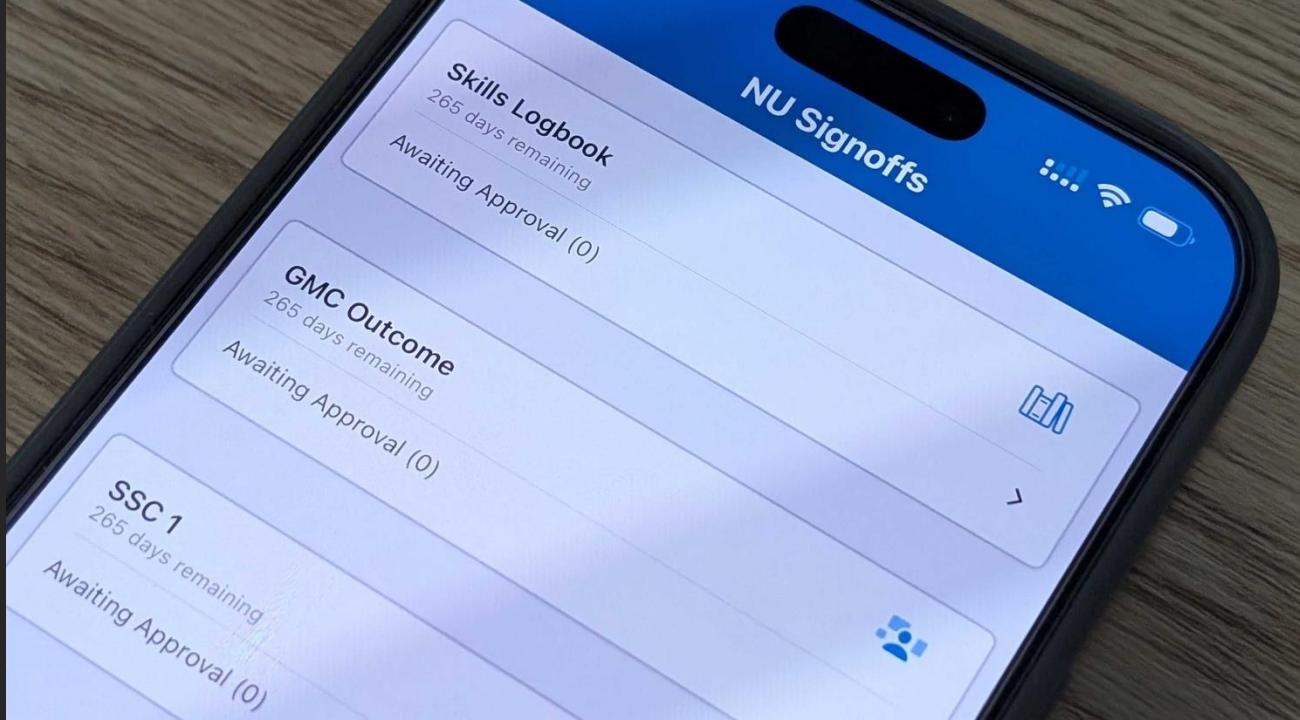
The focus of the XANESNET project is deep learning for the fast and automated analysis and prediction of x-ray spectroscopy data. The aim was to develop neural networks for analysis and prediction of x-ray spectroscopy data and the prediction of molecular structures from X-ray absorption spectra.

To complete the brief, the RSE team was tasked to help with the development and training of a variety of deep learning models: Multi-layer Perceptrons, Convolutional Neural Networks, Long Short-Term Memory Networks, Autoencoders, Graph Neural Networks. The project also required the development of a graphical user interface (GUI) allowing users to upload structures of their molecules.

# NU Signoffs

ANDY STOKES

School of Medicine, FMS  
Medical Sciences



The challenge for the RSE team was to replace an existing, outdated mobile app, no longer functional in development mode. The app required urgent updates and bug fixes. Despite its limitations, it remained essential for 3,000 Medical School students. The team developed two system-native mobile apps designed for daily use. Fully integrated into the students' curriculum, the new apps enhance the MLE form submission process, both in efficiency and user experience, focusing on the design guidelines of the University, Google as well as the Apple App Stores.

The Medical Learning Environment (MLE) Forms Submission Tool is a purpose-built mobile application designed to simplify and enhance the process of managing and submitting forms throughout students' degree programmes across five stages. With a focus on user experience, the app offers a clean, intuitive interface that guides students through each step of their form submissions, reducing accidental errors and improving the accurate tracking of completed assignments.

# OpenScan

TERESA FORTUNE

INNOVATION OBSERVATORY, NIHR  
NIHR



OpenScan is a National Institute for Health and Care Research (NIHR) Innovation Observatory project that collects, standardises, analyses, and provides access to international clinical trial and medical device data. Since OpenScan's initial development, NIHR has faced challenges with maintaining, expanding, and fully utilising the project for their research, in part due to the project's complex technical stack and Amazon Web Services (AWS) infrastructure.

The role of the RSE team is to

- 1) assess OpenScan's back-end software and cloud computing infrastructure.
- 2) design and implement new frameworks to improve collaboration, maintainability, ongoing development, and cost.
- 3) provide training for the Innovation Observatory OpenScan developers.

Additionally, the frameworks provided by the RSE team will be used to develop infrastructures and pipelines for related work, allowing the Innovation Observatory to rapidly and robustly implement new projects.

# Optimising fighter jets with deep reinforcement learning

STEPHEN MCGOUGH

School of Computing, SAgE

Leonardo UK



The challenge for the RSE team was produce software to optimise the policy of fighter jets with deep reinforcement learning. We aimed to architecture, train and deploy models that optimally execute the military mission of a team of fighter jets. We optimised models for the mission by deep reinforcement learning. The simulated environment contained aircraft, which were fighter jets (the agents) and their missiles. The mission was to fly the fighter jets over an objective, shoot missiles at the enemy fighter jets, avoid getting hit by the enemy missiles, go back to the base and land on the base.

We trained neural networks, which could either be non-recurrent (NNs) or recurrent (RNNs). The model input was an array of coordinates of the objective, base, and detected aircraft. The models were trained to predict the cumulative reward given each possible agent's action and the current agent's input. RNNs were more accurate than NNs because they could carry the memory of the previous observations and produce more stable and accurate predictions.

# OrQA

COLIN REES

Newcastle Hospitals, FMS

NIHR



OrQA (Organ Quality Assessment) is a project to provide a model-based assessment of organ quality to transplant surgeons. The goal is to improve organ utilization rates and increase the number of successful transplants of livers and kidneys. Currently surgeons use visual cues only to decide on an organ's suitability for transplant. It is hoped that an automated scoring system will give a base level score that will aid the speed and quality of decision making.

The RSE team developed a web application, an Android app and an iPhone app backed by an AWS infrastructure running machine learning models. The development of the application and infrastructure was key to the team's successful application for a grant to go to clinical trial with the technology.

# Patient Registries

FAING / HELEN WALKER

FMS

NIHR



The brief for the RSE team was to create a patient registry system that could be used by multiple different research groups with varying requirements, but which are centred around the same core functionalities. The main challenge we faced was creating something dynamic that would be fit for purpose for current groups, but that could be extensible for future groups and their changing needs.

The team created an extremely dynamic patient registry system that contains a multitude of features encompassing the essential requirements for each group. The registry's most coveted feature is the questionnaire builder, which allows users to create, edit, publish and manage research questionnaires with multiple question types. The ability to create custom questionnaires with multiple features was something the team found lacking in other questionnaire/survey builders.

# PBTG

DEBBIE HICKS

FMS

Cancer Research UK



The Paediatric Brain Tumor Group is a cutting-edge web application designed to support researchers in pediatric oncology. Built with a Python/Flask backend, the platform serves as a secure and efficient repository for biological data, including genes, mutations, and DNA/RNA sequences.

Beyond simple data storage, the app is designed as an advanced search tool, enabling researchers to query and explore complex biological datasets with precision. It also offers robust formatting and processing capabilities, streamlining workflows and facilitating seamless data preparation for deeper computational analysis.

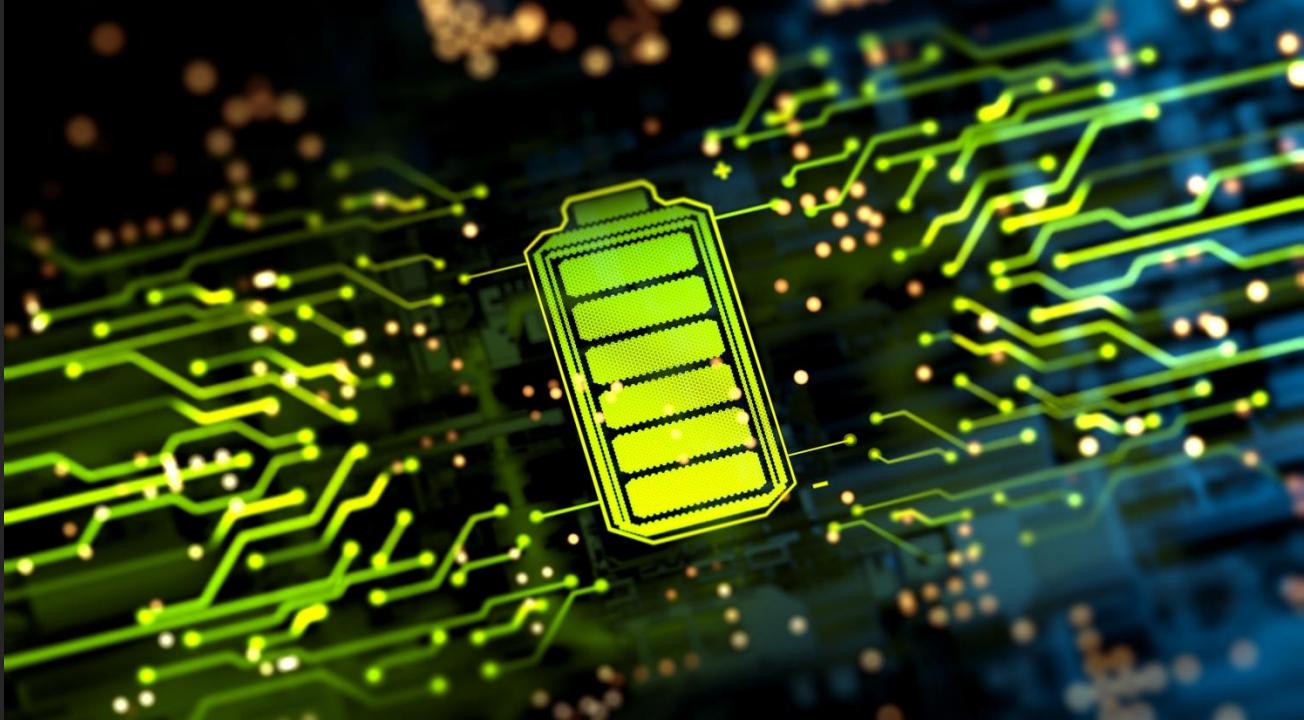
By combining user-friendly design with advanced functionality, the Paediatric Brain Tumor Group web app empowers researchers to access, analyze, and organize critical data efficiently, driving progress in the fight against pediatric brain tumors.

# PS-ITE

HARIS PATSIOS

School of Engineering, SAgE

Higher Integrated Educational Funding



The Power Systems Integrated Test Environment (PS-ITE) is an agent-based electrical power network simulation environment written in Java that was originally developed by the School of Engineering's Power Systems Group from 2015-2016. Version 0.3 was released as a functioning application which modelled a power system as a collection of agents communicating to manage the state of the network. The agent system uses the JADE framework. After being used for a short while, the application became abandoned following the shutdown of Newcastle University's NUCode repository management service.

A pilot project has been conducted by the RSE team in collaboration with the Power Systems Group to investigate the feasibility of reviving the PS-ITE Java codebase and application. The pilot presents some proposals for modernising the application for use within the Power Systems Group and Centre for Energy. Potential uses as a research tool and as a teaching environment provide motivation for the evolution of the tool. In particular, it is envisioned that research and student projects will help to develop the functionality and usability of the application further by adding new power systems analytical and control techniques.

# SPATIAL INEQUALITY

RACHEL FRANKLIN

School of Geography, HaSS  
HaSS



Our cities are now smarter than ever, but they are also more unequal. Where sensors, such as those measuring air quality, are placed can either help tackle or contribute to this inequality. When decision makers place sensors there are a number of hazards, risks and vulnerabilities in the environment and local population to consider.

This project resulted in a decision support tool that presents population data and suggested sensor networks to the user. A genetic algorithm is used to evaluate the coverage of networks for different population groups. The tool is designed as a thinking tool to help visualise the gains and losses of networks, highlighting the complexity of reaching a 'fair' smart city.

# Statistical Genetics

HEATHER CORDELL

Population Health Sciences, FMS  
Wellcome Trust



Genome-wide association studies investigate genetic variation (changes to the DNA sequence) across the entire genome, to see which changes correlate with disease or disease-related outcomes. This project aims to both detect such correlations and understand the biological mechanisms behind them. The research includes measuring potential intermediate processes like gene expression (where DNA is transcribed to RNA), DNA methylation (the presence or absence of a chemical modification to the DNA sequence) and measurements of proteins (based on the amino acids into which RNA is translated), in a set of diseased and non-diseased individuals.

These measurements can also be extrapolated to other diseased and non-diseased individuals with genetic data available. An important part of this work is to develop improved statistical methods and accompanying software implementations in order to carry out the required data analyses. The work carried out allows a better understanding of the biological processes leading to disease development, and thus to propose potential therapies and cures.

# Transforming Access

MARK JACKSON

HaSS  
AHRC



Transforming Access To Mediterranean Cultural Heritage Science Collections is a project based in the School of History and has links to the British School of Rome and the British School of Athens. A two year multi-stakeholder project, it involves developing and extending existing specialised application software to allow users to create rich, interactive websites. The challenge for the RSE team was to become familiar enough with a specialised system and adapt it to fit user requirements.

The aim is to create specific web themes for the Schools to use and to integrate greater functionality into the museum, library and archival software. The additional features will allow the Schools to create aspirational websites for digital archive, museum and archeology collections.

# Turbulent Boundary Layers

NILANJAN CHAKRABORTY

School of Engineering, SAgE  
EPSRC



The focus of the project was to produce software enhancements of computational fluid dynamics research practices for the School of Engineering. This included managing large amounts of data in various HPC clusters (Rocket and Archer2) and creating a standard for data storage, including compression and documentation.

In addition, the RSE team helped integrate HDF5 I/O libraries in large codebases and used software engineering expertise to advise on coding best practices (such as the use of Git/GitHub) for researchers. Another requirement of the project was specialised knowledge of parallel programming in Fortran.

# TRAINING

SKILLS DELIVERY

An image of the RPi Imager software screen while writing the image

Once the image has been written to the SD card a **Write Successful** message will be displayed.

Raspberry Pi Imager v1.7.2



Write Successful

CarpentriesOffline.img has been written to Internal SD card reader

You can now remove the SD card from the reader

CONTINUE

An image of

More great success executing the SD card from

the Raspberry Pi

CONTINUE



# SKILLS TRAINING

DELIVERED BY RSEs

## RESEARCH FOCUS

Many RSEs have been researchers, all are driven to promote and enhance research practice

## CARPENTRIES CERTIFIED

All our instructors are certified by The Carpentries proven, research-backed pedagogy

## PGR DEVELOPMENT CREDITS

Students earn credits on our workshops

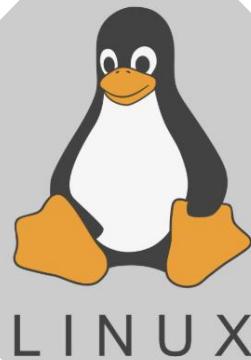
# THE UNIX SHELL

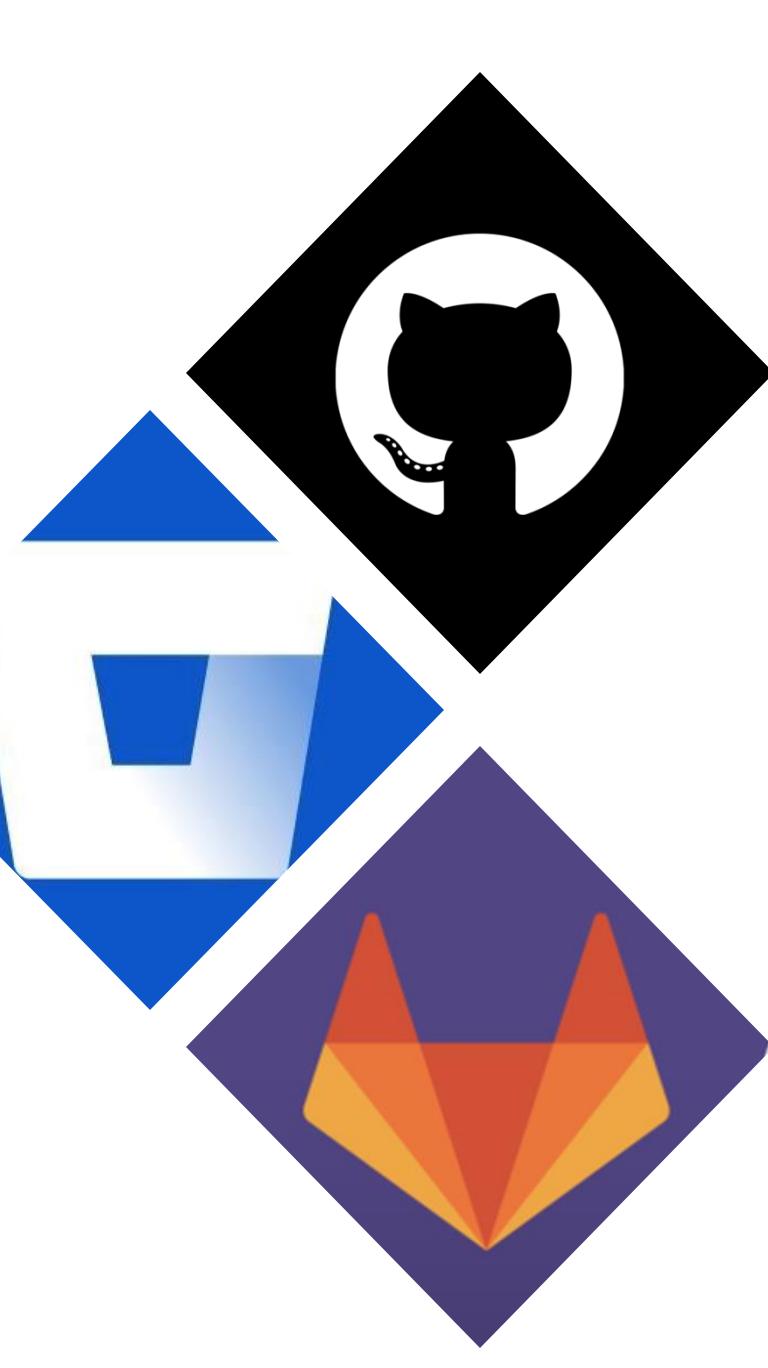
## COMMAND LINE

Use of the shell is fundamental to a wide range of advanced computing tasks, including high-performance computing.

## SCRIPTING

The Unix shell is both a command-line interface (CLI) and a scripting language, allowing such repetitive tasks to be done automatically and fast.





# GIT

## VERSION CONTROL WITH GIT

Version control is the lab notebook of the digital world: it's what professionals use to keep track of what they've done and to collaborate with other people.

Every large software development project relies on it, and most programmers use it for their small jobs as well.

# PROGRAMMING

Python and R programming languages are widely used in research due to their simplicity, versatility, and extensive collection of libraries that enable efficient data analysis, visualization, numerical computations, and machine learning

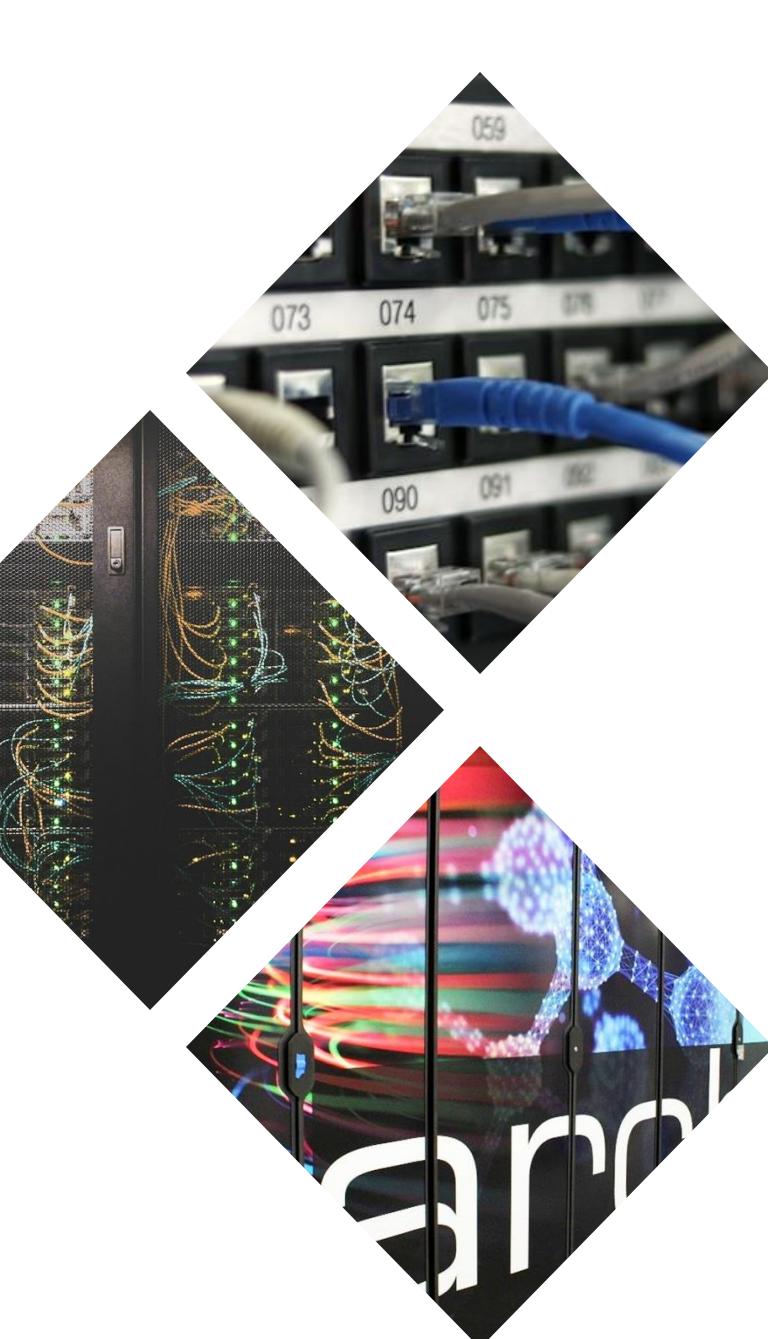
## PYTHON

Following on from the Unix Shell and Git workshops, an introduction to Python 3 for researchers with little or no programming experience.

## R

Following on from the Unix Shell and Git workshops, an introduction to R for researchers with little or no programming experience.





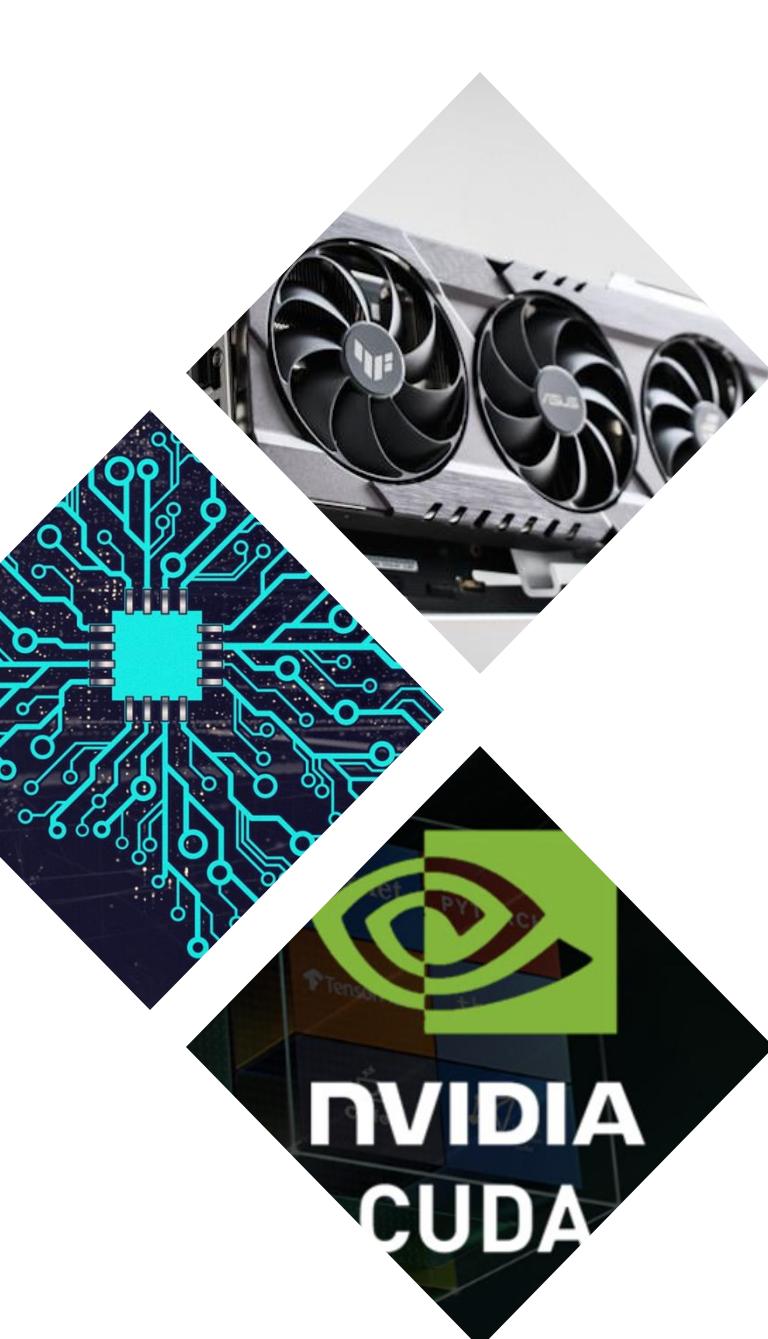
# HIGH PERFORMANCE COMPUTING

## INTRODUCTION TO HPC

This workshop is intended to give students a good introduction and overview of the tools available on an HPC and how to use them effectively.

## HPC DRIVING TESTS

Before being allowed to use the University's new HPC, Comet, users will have to pass the driving test.



## OTHER WORKSHOPS

### IMAGE CLASSIFICATION WITH CONVOLUTIONAL NEURAL NETWORKS

It is the goal of this training workshop to produce a Deep Learning program, using a Convolutional Neural Network. At the end of this workshop, we hope this code can be used as a “starting point”.

### GPU PROGRAMMING WITH PYTHON AND CUDA.

An introduction to programming graphical processing units (GPUs) using Python.



# BESPOKE WORKSHOPS

## EXCLUSIVELY FOR GROUPS

We can work with you to create a private workshop for your group, tailored to your needs.

## NEW TOPICS

Need to upskill in an area our standard workshops don't cover? Talk to us. Our RSEs have skills across many other digital aspects of research.



A dark, slightly blurred photograph of three individuals, possibly children or teenagers, gathered around a tablet device. One person's hand is visible holding the tablet, which has a Samsung logo on its back. The tablet screen is facing the viewer, displaying a large, bold, white word.

# COMMUNITY

OUTREACH ACTIVITIES

# ADVANCED COMPUTING



HPC



CLOUD  
DEPLOYMENT



LANGUAGES



EFFICIENCY AND  
ENERGY USE



IOT AND AI



AUTOMATION AND  
ENVIRONMENTS



# DATA SCIENCE



MACHINE  
LEARNING



TESTING



TOOLS AND  
LANGUAGES



PIPELINES



BEST PRACTICE



DATA  
VISUALISATION



# TRAINING & COMMUNITY



Developing Training Materials



Training Skills



Training Needs Survey



Training Offering



Promoting Training Service



Community infrastructure



# WEB & MOBILE



Frameworks



SaaS, PaaS  
and IaaS



Mobile



SW architecture  
principles



Web security



Design principles and  
tools



# RSECon24



Dave Horsfall served as the Programme Chair for RSECon24, the eighth annual UK Research Software Engineering conference. Returning to Newcastle for the second time, the event welcomed 421 in-person attendees from across the globe and engaged approximately 90 participants online. The conference celebrated diversity and inclusivity, offering accessible hybrid participation.

Key contributions from the team included:

- Organisation and delivery: Imre Draskovits, Jannetta Steyn, and Mike Simpson.
- Talks: Presentations by Mike Simpson and Gabrielle Schroeder.
- Volunteers: Support from Carmello, Michelle, and Frances.

RSECon24 continued to champion inclusivity, reinforcing the importance of diverse perspectives in advancing research software engineering.

# RSE COMMUNITY



Several members of the team have also been involved with the wider RSE Community.

## Society of Research Software Engineering

- Robin Nandi finished his 2<sup>nd</sup> term as a trustee of the Society of Research Software Engineering, having served as Treasurer.
- Mike Simpson is entering his 2<sup>nd</sup> term as trustee and was elected as vice-president of the Society.

Both Mike and Robin contributed to the transition to a new membership platform and other changes behind the scenes at the Society, as well as being involved in supporting the RSE Conference and other Society events.

## Other Awards and Achievements

- Dave Horsfall had an article “Research Software Engineering Accelerates the Translation of Biomedical Research for Health” published in *Nature*.
- Mike Simpson was part of the team that won the top prize at the hack day at the Software Sustainability Institute’s Collaborations Workshop.
- Richard Howey, Gabrielle Schroeder and Mike Simpson, gave talks at various conferences.

A photograph of a person's hands interacting with a silver laptop. One hand is on the trackpad, and the other is pointing at the screen. The person is wearing a dark long-sleeved shirt and a black fitness tracker on their left wrist. A solid blue rectangular box is overlaid on the upper left portion of the image, containing the word "TESTIMONIALS" in large white capital letters.

# TESTIMONIALS

OUR FEEDBACK



The RSE team brought essential skills, including web development and software deployment, which were crucial to our project's success but outside our team's expertise. In addition, their experience in managing software engineering projects made the entire process seamless, efficient, and professional. Their support enabled rapid, high-quality progress, resulting in a product we're proud to showcase globally. I would gladly work with the RSE team again.

**Jonathan Horsley, Research Assistant**  
**Epilepsy MRI Visualiser**



I have been working with the RSE team now for over 5 years. However, 3 years ago we started working towards a large formal grant which necessitated a lot of specialist input. I have been extremely impressed with their professionalism, ability to listen and react, as well as their focus to deliver to time on critical projects. We now have an app available in both the iOS and Android app store and hopefully have the next tranche of funding well on the way.

**Colin Wilson, Consultant Surgeon**  
**Organ Quality Assessment**



Over the past year, my team and I have had the pleasure of working closely with the RSE team on the development of our OpenScan2 system. Their technical expertise has been absolutely critical in progressing this highly complex and ambitious project, and their support has extended beyond just the technical. They've played a key role in upskilling our staff, equipping us with the knowledge and confidence to engage with the system as it evolves, and they have even supported our internal recruitment efforts. What has stood out most to me is their approachability and collaborative spirit. In my experience, technical experts can sometimes unintentionally create barriers to progress by being overly guarded. This has never been the case with the RSE team. They've consistently been patient, supportive, and respectful, fostering an open and inclusive working relationship. I can't recommend them highly enough - they are an exceptional asset to the university.

**Dr Chris Marshall, Principal Research Associate  
OpenScan 2**

The background of the image is a dark, moody photograph of a person climbing a rugged, rocky mountain. The climber is silhouetted against a lighter sky, wearing a cap and carrying gear. The scene conveys a sense of challenge and perseverance.

# CHALLENGES

RISKS FOR 2025

# Financial Uncertainty

A crisis in sector funding has led to a £35 million shortfall in Newcastle University's income compared to its financial plan. The implications for the RSE team of the implementation of financial controls have now become apparent. These controls apply to the entire organisation, academic and professional services.

Expenditure is subject to an approvals process, with only “business critical” activities being approved. Most RSE activity is project-funded (cost codes RES, KHP, TAL) rather than facility (OSR) but this is still subject to the approvals process. Some RSE activity such as teaching is not project funded and this is being heavily affected. We are recommending that RSE team members allow an additional 2-3 weeks lead time for financial approval.

Travel-related expenditure is subject to approval by the Facility Head, and incidental expenses and transport also need to be pre-approved. Travel is a difficult area to manage as many RSE trips are decided at short notice. Where possible we are switching to remote attendance at events and only seeking approval for travel that can be externally funded.

The RSE team no longer has its own purchasing card, so our business-critical subscriptions have been transferred to another purchasing card within the university. The loss of the team’s purchasing card mainly affects the procurement of items like general office equipment, IT supplies, new subscriptions, and catering for training and events. Most of the time, important purchases will still be possible but will take much longer than previously.

Changes to staff contracts and the pay reward process have been put on hold, reducing the opportunities for internal movement and promotions. However, there is no immediate concern about role security, and the RSE team is currently stable with sufficient project-funded work. In the future, we expect the pay reward process to be highly competitive due to the backlog of cases.

# Recruitment Freeze

The University has imposed a recruitment freeze as part of its strategy to manage its 2024-25 financial deficit. This includes roles where a business case for the replacement of departing staff would previously have been straightforward.

A 4-6 month delay is in place before a case for replacement can be put forward, and there is an embargo on new RSE roles. The suspension of the HR system for several weeks before the freeze announcement acted additionally as an extension to the recruitment embargo period for the RSE team. Subsequently, we have been unable to replace a team member who left in October or recruit new staff. There is a resulting considerable risk of being unable to fulfil pending committed projects, which often have calendar deadlines connected to funding rules thus making it difficult to delay project start dates.

Other staff changes have also impacted on our overall capacity to deliver project work. Three internal staff were promoted to Senior RSE roles, which have a reduced (50%) project work allocation. Despite an increase in senior staff hours, in real terms the team has lost around 2 FTE of billable RSE time.

Pressure on staff has existed for an extended period which is now expected to last longer than hoped. Many RSEs have been

stretched over multiple projects, so newly promoted senior staff are having to assist with projects in unexpected ways, which has brought more pressure to these roles.

The recruitment freeze has generated some tangible risks to the RSE team. Overstretched staff may potentially underperform, become unwell or leave. Non-delivery of projects could be reputationally damaging and hinder the success of a transition into a new Research Computing unit. Some projects involve stakeholders who are external to the University, and a lack of delivery could cause wider reputational damage to the University and have potential contractual consequences.

Our management responses to the challenges presented are to create more opportunities for social engagement within the team and to set more boundaries around the work we do with academic project leads. Such boundaries are crucial in effectively managing project scope to avoid project overrun. We also recognise where RSE workload pressure occurs and, where possible, divert resources when staff are overstretched. To manage stress, RSE staff can work flexibly and are given control and discretion over how they deliver their work.

A photograph of a person from behind, looking at a map spread out in front of them. The map shows a detailed area with roads and landmarks. The person is wearing a dark long-sleeved shirt. The background is a dark, out-of-focus landscape.

# OPPORTUNITIES

OPENINGS FOR 2025

## OPPORTUNITY

# UKRI Funding Changes

Recent changes in UKRI funding rules reflect the growing importance of software engineering in research and have created new opportunities for RSEs. There is now a stronger emphasis on supporting software engineering activities within research grants. Funders encourage grant applications to include dedicated support for the development, maintenance, and sharing of research software, ensuring that RSEs receive the necessary resources and recognition for their work. Notably, RSEs can now apply for funding as Principal Investigators (PIs) and Co-Investigators (Co-Is), and Open and Open Plus fellowships are now available to RSEs.

Funding calls focused on software projects remain limited, but there is growing potential for these to serve as the foundation for RSE-led grant applications. The RSE team will be able to contribute to the scoping and development of research software as well as assuming greater responsibility for project direction. This can provide a pathway for RSE projects that align with personal research interests, and which offer an alternative career trajectory that mirrors the academic pathway.

Fostering collaboration between RSEs and academics can nurture ideas that evolve into successful projects. The RSE

team has begun to explore relevant funding opportunities and is collating a bank of example applications from previous projects to aid in their assessment and personal applicability.

The RSE team is exploring accelerator funding for potential commercialisation opportunities. Innovative software is often developed for use within a single lab and is not shared with the broader research community, limiting its potential impact. Accelerator funding provides an opportunity for RSEs to build on existing software products and develop them into research tools with global reach and benefit.

The Patient Registry Project is an example of a software product with potential for broader impact beyond a narrow usage within Newcastle University. This platform includes a research registry with integrated questionnaire builder, diary, and secure data storage for sensitive research data, and is already being rolled out to multiple research groups in the rare disease space.

# High Performance Computing

The first University HPC facility, Rocket, was introduced in 2017. The system has, as of November 2024, ran almost 40 million user jobs and provided more than 330 million hours of compute time. It is heavily used by projects representing all three Faculties. Rocket was designed as a very traditional HPC facility, largely built to provide command-line, batch-based access to relatively standard compute resources. Overtime, the needs of our research community have changed and grown and now greatly exceed the functionality offered by traditional HPC facilities.

Recent years have seen substantial growth in the need for advanced compute capacity and a need to re-align our facilities to more closely follow recent trends, such as the expansion of GPU-based computing, the introduction of data science principles to new subject areas and the massive growth in machine learning and AI. The new HPC facility, Comet, aims to address these shortcomings and to put control of the facility within the academic community.

The capabilities of Comet will enable the expansion into new areas of interactive compute, on-HPC post-processing and analysis and open further opportunities for novel computing amongst disciplines that have not been traditional users of HPC. As part of replacing the HPC facility, we have also redesigned the support services for users of the system. The

revamped service will include expanded and updated training, reporting and management tooling to support project resource tracking and capabilities for cost modelling and reporting.

The operating model for Comet includes provision for both staff without funds, as well as those with dedicated computational resource in their grants. Comet will be largely free to use, initially, due to the lead time of grants including compute funding, but this will transition to the split funding model which has been developed to cover the operational costs of the facility and support services. This approach is designed to ensure that the service is financially sustainable over the long term.

Engagement with the research community highlighted the need for improved support capabilities and this has shaped the design of the service. Our more recent, more detailed analysis of historical usage information shows that whilst this is true, it is perhaps a larger, more ambitious goal than anyone first thought.

This provides an opportunity to boost the effectiveness of any compute used, and therefore by extension the research outputs gained through using HPC. This will be achieved through more focused training in response to issues revealed by our enhanced monitoring and feedback processes.

## GET IN TOUCH

Ut wisi enim ad minim veniam, quis nostrud exerci tation  
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