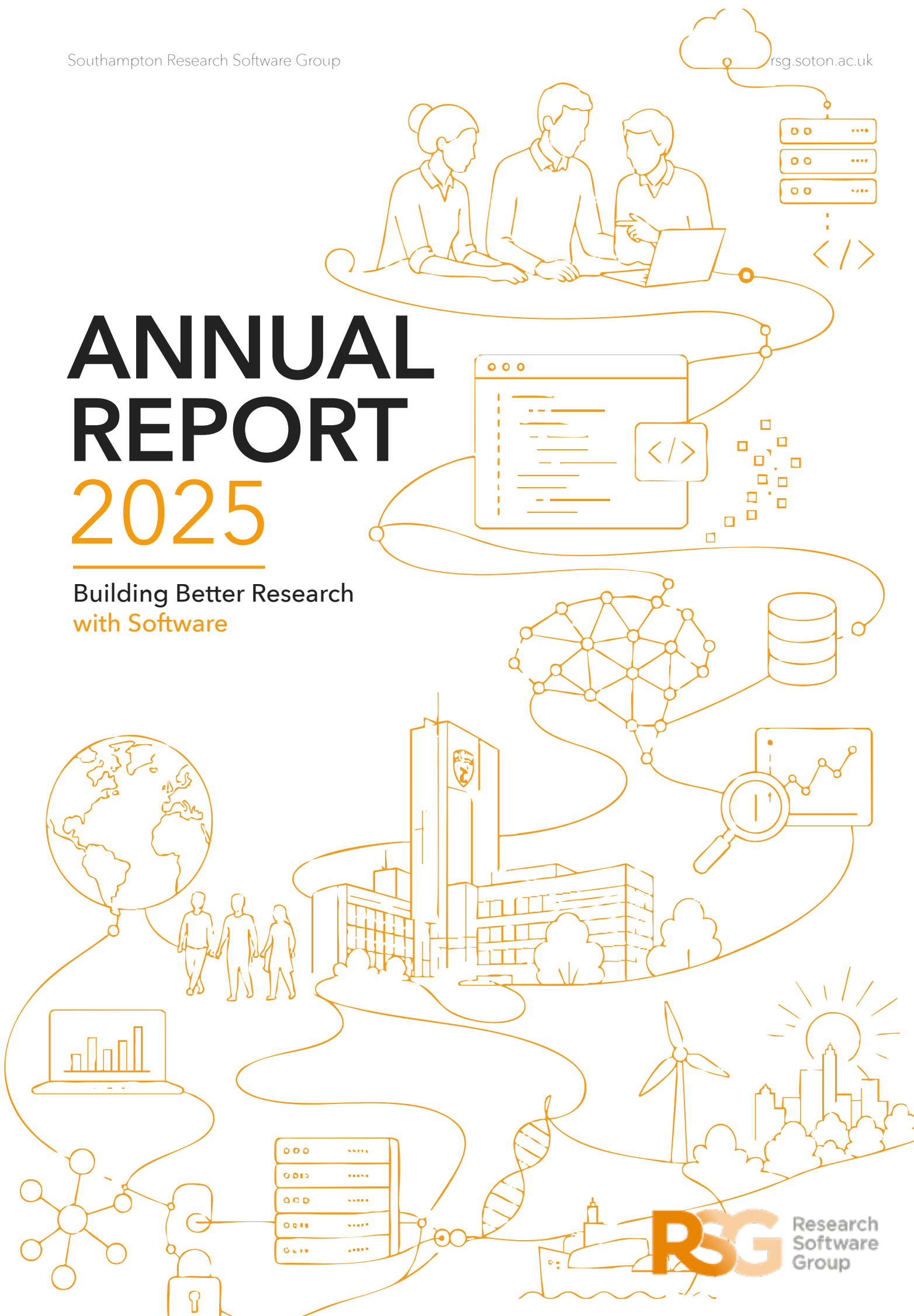


ANNUAL REPORT 2025

Building Better Research
with Software



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OUR IMPACT IN 2025

2025 BY THE NUMBERS

91
projects

349
researchers
trained

11
funding
organisations

14
schools and
organisations

Modern research depends on software. From analysing vast datasets and applying artificial intelligence, to modelling complex systems and supporting clinical decision-making, software has become as fundamental to research as laboratories and scientific equipment. Behind that software are the Research Software Engineers (RSEs) who design, develop and sustain it.

The Southampton Research Software Group (SRSRG) is the home of the University of Southampton's RSEs and also includes trainers, community managers and policy researchers. It is an independent research group based in the School of Electronics and Computer Science that works across all faculties and departments to develop research and commercial software, conduct training, build communities and develop research policy.

In 2025, the SRSRG partnered with researchers across every faculty and delivered 91 projects. Our collaborations helped researchers tackle problems that would otherwise have been impractical or impossible for them to solve, from enabling large-scale astronomical surveys and accelerating engineering simulations to supporting AI-enabled medical diagnosis and conducting secure research with large language models.

The SRSRG comprises 17 people including RSEs, researchers and community managers. Of these staff, 3 RSEs are centrally funded and the remaining 14 staff are cost recovered at 100%. In this year's report, the Accelerating Research section is dominated by projects from the three financially supported staff, which shows how central support allows higher risk projects to be pursued to deliver research advances.

The impact of our work extends beyond software. During 2025, we trained 349 researchers, embedding software engineering skills across postgraduate education, professional development and national training programmes. We also contributed to national initiatives that are helping define the future of research software engineering, data stewardship and research assessment, ensuring that the experience gained through practical collaboration informs research policy across the UK.

While every project in this review is different, they share a common purpose: enabling better research in Southampton. Whether improving the performance of scientific software, creating national research infrastructure, supporting industry collaboration or developing the next generation of researchers, the SRSRG exists to help Southampton staff achieve greater impact.



ACCELERATING RESEARCH



The SRSG is helping Southampton researchers answer questions that would otherwise be too slow, too computationally expensive or simply impossible to solve.

01

Secure AI for Southampton

Large language models (LLMs) have enormous potential for research, yet many researchers cannot use commercial AI services because of cost constraints or data sensitivities, making locally hosted, private or sovereign AI increasingly important. Researchers also rarely want to rely on a single model, creating a need for secure access to a range of open AI models.

Working with the AI@Southampton initiative and building on the University's considerable compute resources, the SRSG developed SotonGPT: a secure, locally hosted AI environment with an accessible chat interface and a programmatic API for integration with existing research tools.

By combining modern AI models with institutional security and computing infrastructure, SotonGPT opens new opportunities to accelerate qualitative and interdisciplinary research.

Research Lead

Professor Les Carr, Electronics and Computer Science

Research Software Engineers

Dr Conn O'Rourke & Dr Edward Parkinson

Funder

UoS High Performance Investment Plan



02

Detecting Respiratory Cilia

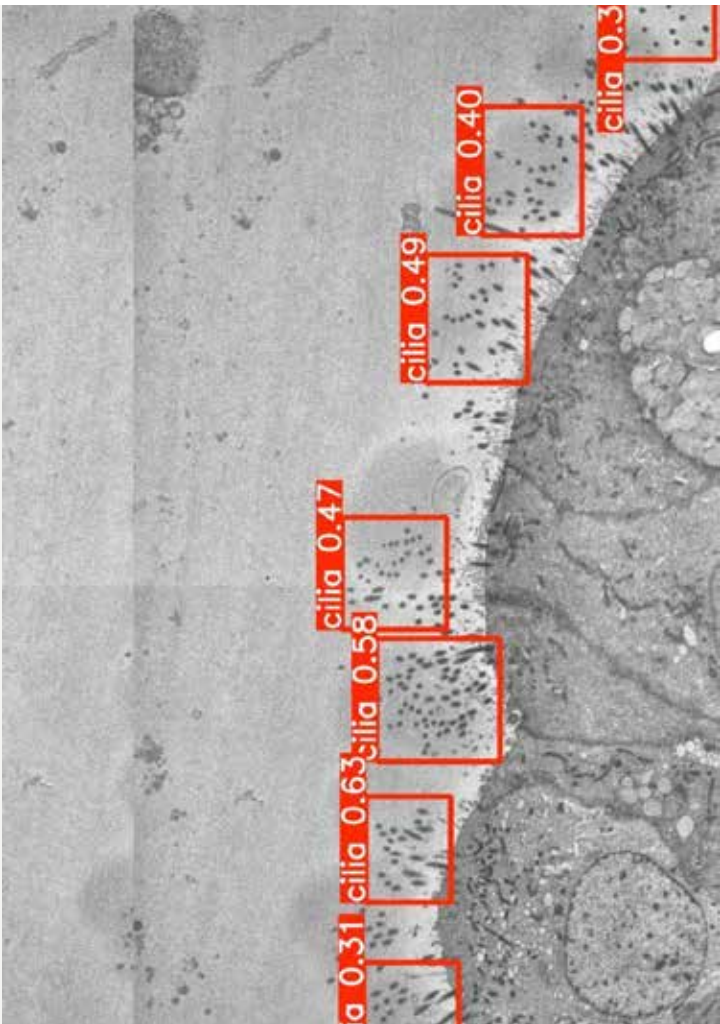
Diagnosing Primary Ciliary Dyskinesia relies on the careful examination of electron microscope images, a process that is both time-consuming and highly specialised.

In collaboration with researchers from the School of Physics and Astronomy, UCL Institute of Ophthalmology, Royal Brompton Hospital and UHS, the SRSG developed a software tool that uses machine learning to automatically detect cilia features. By integrating the system with the microscope management software, the tool provides clinicians with a reliable and efficient way to examine cilia structures which enhances diagnostic capabilities. The software is adaptable to other feature detection research, expanding its impact across various medical and scientific fields.

Research Lead
Professor Diego Altamirano, Physics & Astronomy

Research Software Engineer
Dr Mehtap Özbey Arabacı

Funder
Impact Acceleration Account - STFC



03

Making Large Simulations Possible

Large-scale fluid dynamics simulations can generate enormous datasets, making storage, visualisation and analysis increasingly difficult.

The SRSG worked with researchers in Aerospace Engineering on a widely used software framework to redesign how simulation data is stored, reducing file sizes by factors of up to 7,000 while preserving scientific accuracy. Researchers can now examine simulations more frequently, detect problems earlier and conduct larger studies without overwhelming storage resources.

Research Lead
Professor Neil Sandham, Engineering

Research Software Engineer
Dr Edward Parkinson

Funder
UoS High Performance Investment Plan



04 | Preparing for the World's Largest Sky Survey

The next generation of astronomical observatories will produce unprecedented volumes of data, demanding software capable of operating reliably across national computing facilities.

The SRSG collaborated with researchers in Physics and Astronomy and the LSST project to adapt and optimise the Vera C. Rubin Observatory data-processing pipeline for large-scale deployment. The resulting platform supports reproducible, scalable astronomy research while laying the foundations for future discoveries from one of the world's most ambitious scientific instruments.

Research Lead

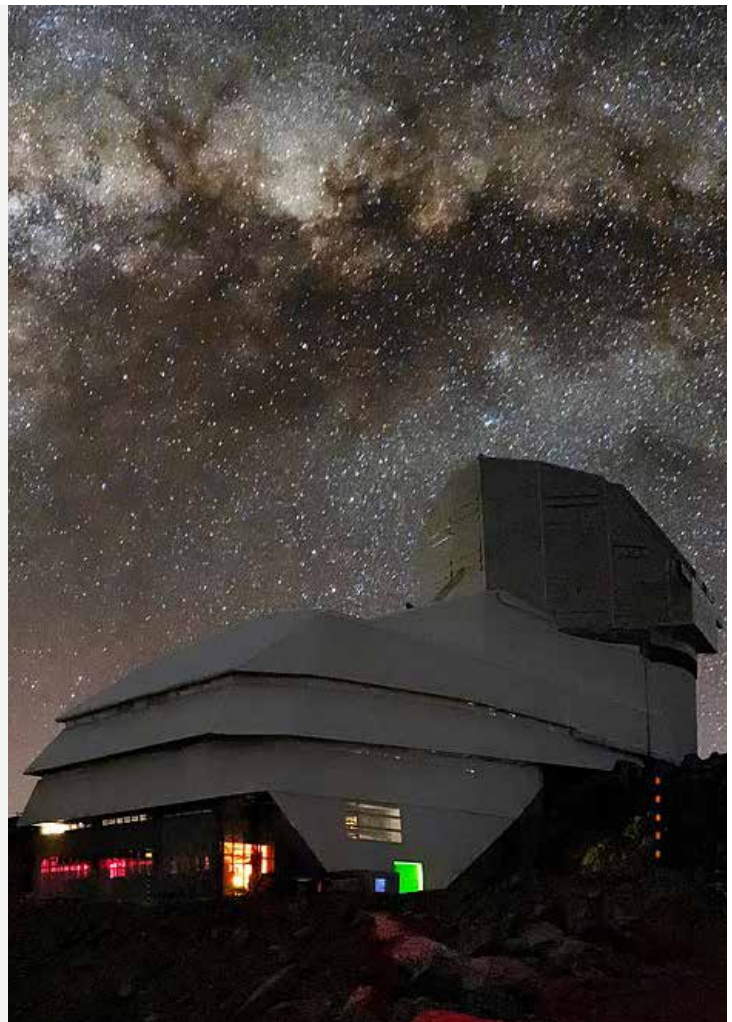
Professor Manda Banerji & Dr Elham Saremi, Physics & Astronomy

Research Software Engineers

Dr Jamie Court & Dr Edward Parkinson

Funder

UoS High Performance Investment Plan & EPSRC



05 | Graph Neural Networks for Engineering

Machine learning offers the potential to transform engineering simulation by replacing some computationally intensive models with accurate AI-based alternatives.

The SRSG worked with researchers from Aeronautical and Astronautical Engineering to mature an experimental research code into a more robust and scalable software framework. The code is now capable of tackling larger and more complex problems across multiple GPUs within HPC facilities such as the University of Southampton's IRIDIS. The software is the basis for a new spin-out company.

The work helps bring advanced AI techniques closer to routine engineering practice, accelerating design while reducing computational cost.

Research Lead

Dr David Masegur & Professor Andrea Da Ronch, Engineering

Research Software Engineer

Dr Stephen Pooley

Funder

UoS High Performance Investment Plan



BUILDING RESEARCH FOUNDATIONS

The SRSG transforms research prototypes into lasting infrastructure that supports researchers, communities and future discoveries.



06

Making Quantum Crystallography Accessible

Modern quantum crystallography depends on combining multiple specialist software tools into a coherent workflow, yet these tools have traditionally been difficult to install, integrate, and maintain.

Working with the National Crystallography Service and researchers at Durham University, the SRSG transformed Quantum Box into a resilient, cloud-native platform capable of scaling with demand, which researchers access simply by logging in.

By removing barriers to entry, QCrBox makes advanced quantum crystallographic analysis accessible to a wider research community, enabling complex and reproducible workflows.

Research Lead

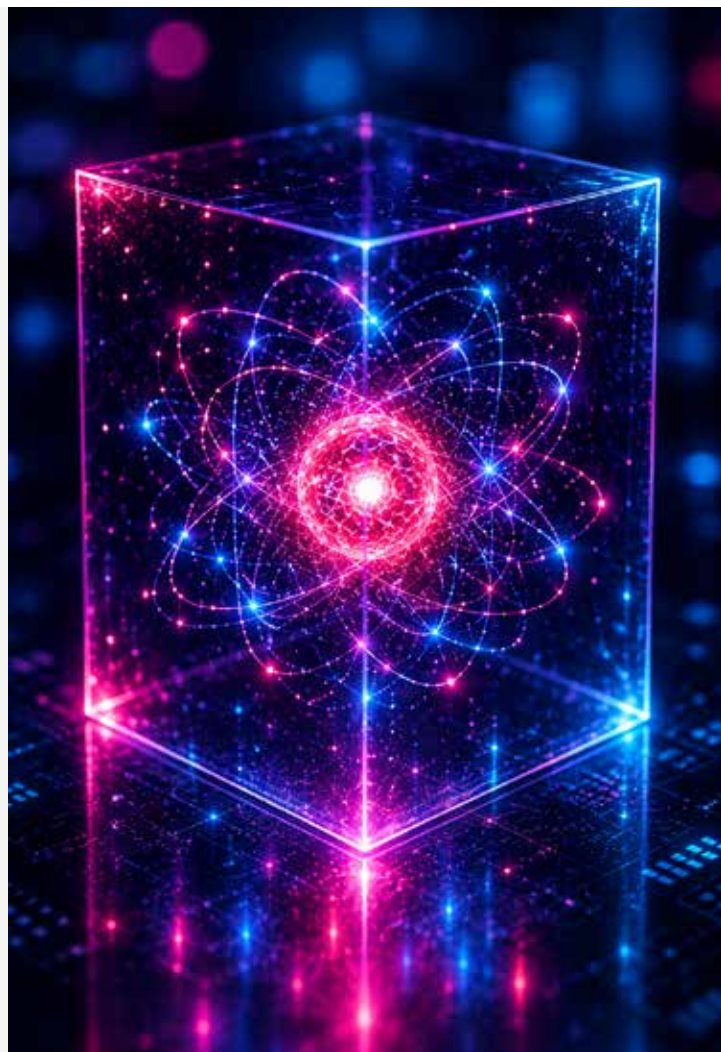
Professor Simon Coles, Chemistry and Chemical Engineering

Research Software Engineers

Dr Jamie Court, Dr Stephen Crouch, Dr Philippa Wilding, Dr Edward Parkinson & Dr Stephen Pooley

Funder

UoS High Performance Investment Plan & EPSRC



07

Connecting Data Across the Physical Sciences

Research in the physical sciences increasingly depends on access to diverse, high-quality datasets.

Working with the Physical Sciences Data Infrastructure, the SRSG is helping create a national platform that allows researchers to discover, combine and analyse data from multiple sources through a single point of access. By supporting FAIR data, AI-enabled analysis and cloud-based computation, the project is helping establish essential infrastructure for data-driven physical sciences research across the UK.

Research Lead

Professor Simon Coles, Professor Jeremy Frey & Dr Sami Kanza, Chemistry and Chemical Engineering

Research Software Engineer

Dr Bryan Gillis

Funder

EPSRC



08

Opening Up Crystal Structure Data

Modern crystal structure prediction generates huge volumes of valuable computational results but is computationally expensive. Extracting long-term value depends on making those results easy to query and reuse.

Building on earlier phases of work, the SRSG developed the infrastructure needed to bring disparate datasets together into a single secure platform. By improving accessibility and interoperability, the project creates a lasting research resource that will support future discoveries in computational chemistry.

Research Lead

Professor Graeme Day & Dr Christopher Taylor, Chemistry and Chemical Engineering

Research Software Engineer

Dr Stephen Pooley

Funder

EU



09 | Safeguarding a Global Physics Resource

The High Energy Physics Model Database is an internationally important resource for simulation and modelling used by particle physicists, including researchers at CERN.

As changing security requirements threatened the long-term viability of the platform, the SRSG designed a modern architecture that meets both information security standards and the needs of the international research community. The work safeguards a globally significant scientific resource while providing a strong foundation for future development and investment.

Research Lead

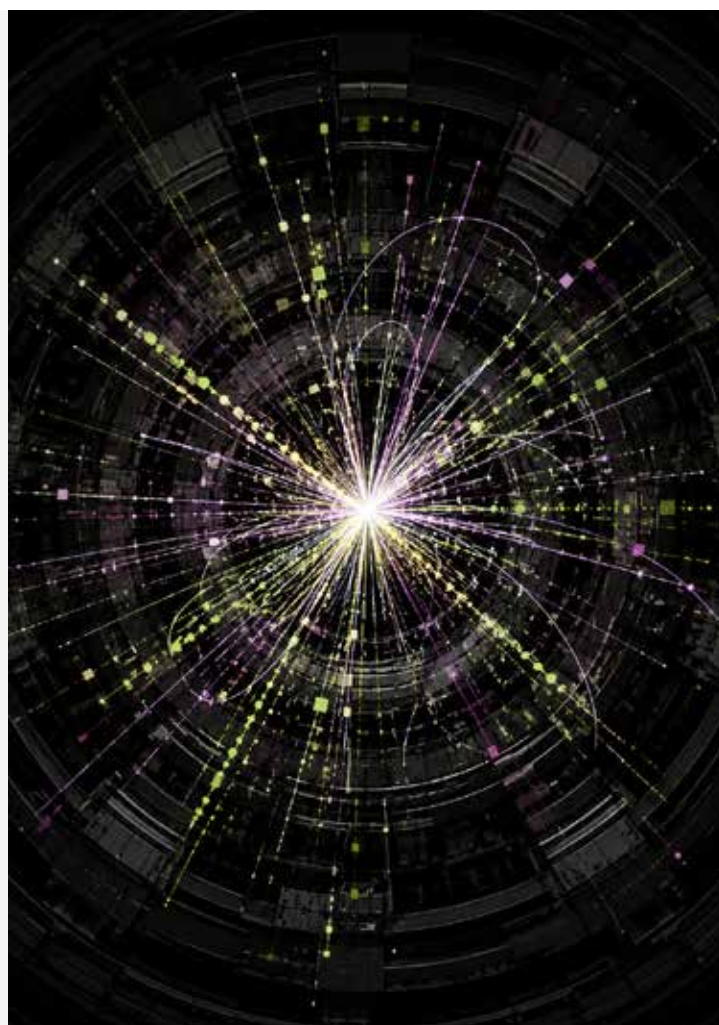
Professor Alexander Belyaev & Professor Nicholas Evans,
Physics & Astronomy

Research Software Engineers

Dr Sam Mangham

Funder

STFC



10 | European Data Marketplaces

As organisations increasingly share data across institutional and national boundaries, trustworthy mechanisms for managing those exchanges become essential.

The SRSG contributed to the development of the UPCASt platform, a major European collaboration involving sixteen partners across nine countries. By developing reusable software components and supporting sustainable software practices, the project is helping create the trusted digital infrastructure needed for future European data spaces.

Research Lead

Professor George Konstantinidis, Electronics and Computer Science

Research Software Engineer

Dr Philippa Wilding

Funder

EU



11 | Supporting Astronomy Collaboration

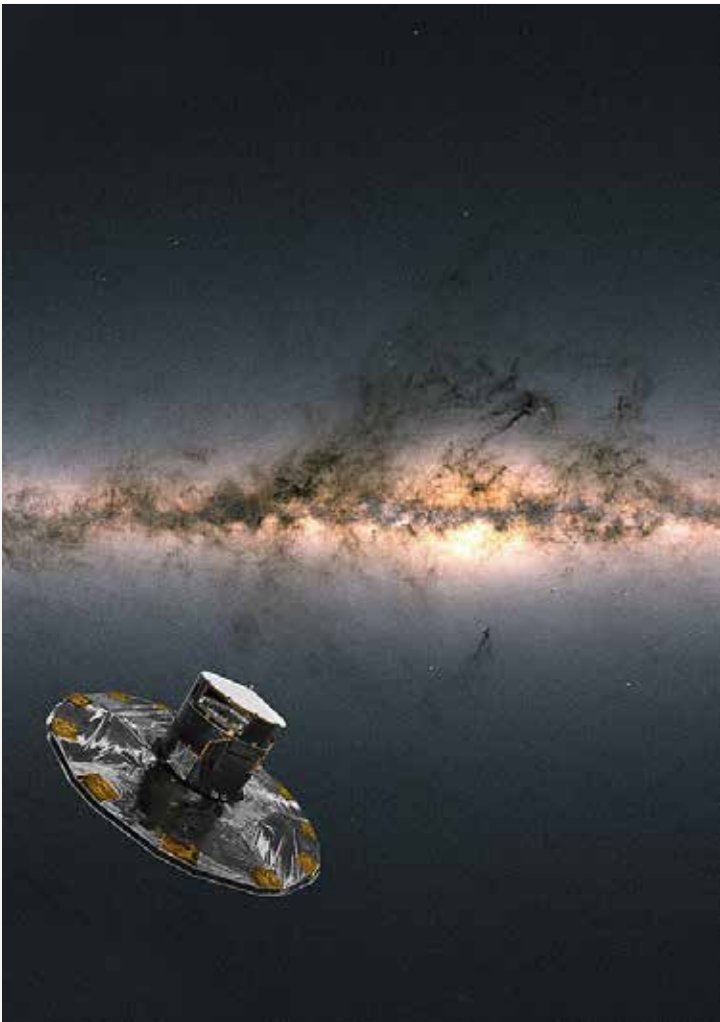
Launched by the European Space Agency (ESA) in 2013, the Gaia space telescope is an astrometry mission designed to create the most precise 3D map of the Milky Way. There is no standard platform for collaborations to manage bids for telescope time, or to share data outside of the main NASA/ESA data sources. Collaboration on bids and the sharing of data was handled in non-standardised ways, which led to issues tracking provenance of data and reproducibility.

Working with Prof. Poshak Gandhi's team, the SRSR rapidly implemented a robust solution to create an accessible web-based data access portal to facilitate collaboration and stream-line research in this field of astrophysics.

Research Lead
Professor Poshak Gandhi, Physics & Astronomy

Research Software Engineers
Dr Jamie Court & Dr Sam Mangham

Funder
STFC



12 | Supporting Software Fellows

Supporting a thriving research fellowship programme is a considerable administrative undertaking. Secure, robust and reliable systems are required to manage funding and reporting.

For more than five years the SRSR has developed and maintained the open-source lowFAT framework, which underpins the Fellowship Programme at the Software Sustainability Institute and other organisations. This software supports hundreds of SSI Fellows, and helps increase the impact of one of the UK's leading investments in the research software community.

Research Lead
Dr Giacomo Peru, EPCC, University of Edinburgh

Research Software Engineers
Dr Mehtap Özbey Arabacı

Funder
AHRC



13

Finding Signals in Cosmic Noise

Astronomical sources, such as accreting black holes or neutron stars often show stochastic variability, which, with irregular time sampling, makes detecting genuinely periodic signals extremely difficult.

The SRSRSG worked on refactoring a Gaussian Process Modelling tool to improve its ease of use, maintainability and functionality to broaden its user base and ensure it is a useful tool for the research community.

Research Lead

Dr Morgan Taylor, Dr John Lawson & Dr Bharath Ganapthisubramani, Physics & Astronomy

Research Software Engineers

Dr Conn O'Rourke

Funder

UoS High Performance Investment Plan



14

Accelerating Aerodynamic Analysis

Particle Image Velocimetry is an optical measurement technique used to capture and analyse fluid flow by tracking the movement of tracer particles in a fluid. It is crucial in aerodynamics and fluid mechanics for studying flow behavior in applications such as wind tunnel testing, turbulence research and optimising engineering designs for aircraft and vehicles.

The SRSRSG developed an HPC-ready Particle Image Velocimetry tool, significantly improving the computational runtimes through distributed parallelism and offering an open-source direct competitor to commercial software.

Research Lead

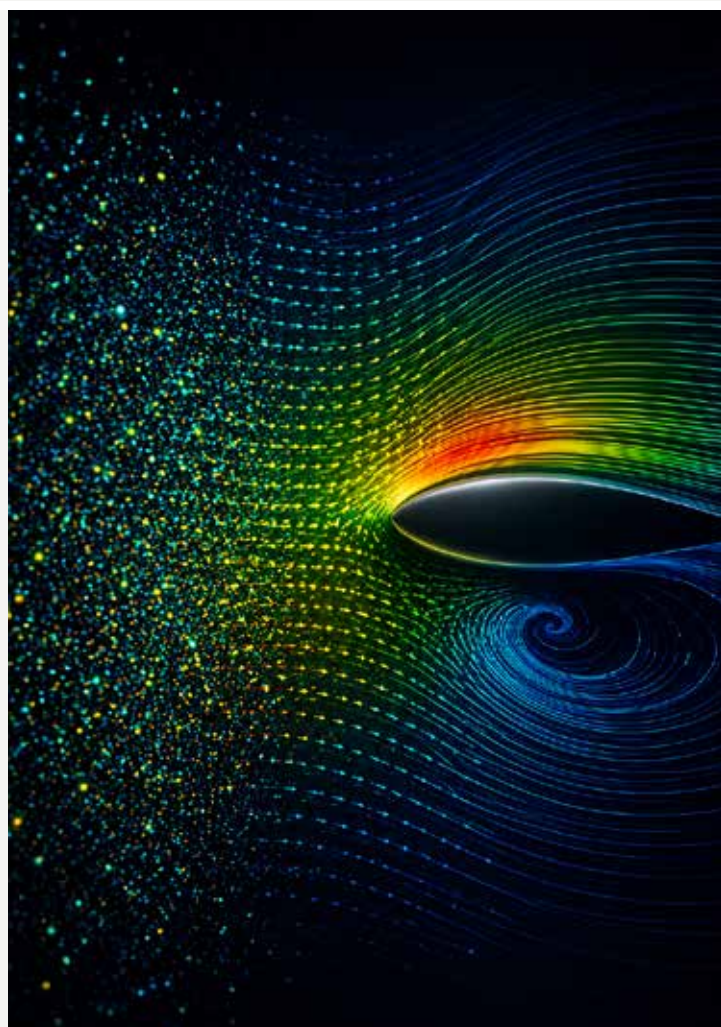
Dr Andres Gurpide Lasheras, Physics & Astronomy

Research Software Engineers

Dr Conn O'Rourke

Funder

UoS High Performance Investment Plan



RESEARCH TO REAL-WORLD IMPACT



The SRSR helps researchers improve health, develop products for industry and tackle global challenges.

15

Building Health Networks

Healthcare outcomes are influenced not only by clinical treatment but also by the strength of an individual's personal social networks and community support.

The SRSR continued the development of GENIE, a platform that connects people living with long-term conditions to local health and wellbeing services and activities. Now deployed in Australia, Canada, the UK and the US, GENIE demonstrates how research software can move beyond academia to deliver practical benefits for patients and healthcare professionals around the world.

Research Lead

Dr Ivo Vassilev, Health Sciences

Research Software Engineer

Dr Jamie Court

Funder

Customer subscriptions



16 | Monitoring Shipping Performance

The shipping industry faces increasing pressure to reduce fuel consumption and greenhouse gas emissions.

Working with researchers in Mathematical Sciences, the SRSg developed a platform that combines operational data with AI predictions to help shipping companies monitor vessel performance and identify the optimal time for hull cleaning. By translating advanced research into a deployable and accessible decision-support tool, the project demonstrates how research software can contribute directly to environmental sustainability and cost management.

Research Lead
Professor Alain Zemkoho, Mathematical Sciences

Research Software Engineers
Dr Jamie Court & Dr Mehtap Özbey Arabacı

Funder
Impact Acceleration Account - EPSRC



17 | AI for Heart Rhythm Diagnosis

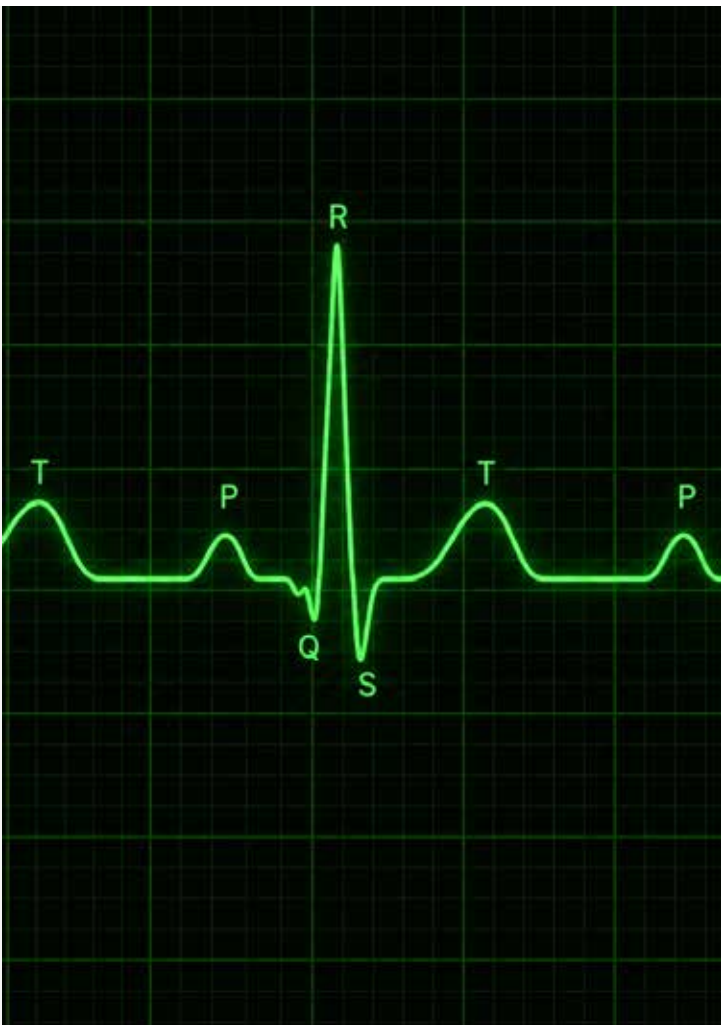
Determining which patients are suitable for implantable cardioverter defibrillators requires clinicians to analyse large volumes of ECG data.

Building on previous work with the School of Mathematical Sciences, the SRSg developed an AI-assisted clinical decision-support system in partnership with clinicians at University Hospital Southampton. The resulting software reduces the effort required to interpret ECG recordings and has the potential to improve both the speed and consistency of patient assessment.

Research Lead
Professor Alain Zemkoho, Mathematical Sciences

Research Software Engineers
Dr Jamie Court & Dr Sam Mangham

Funder
Higher Education Innovation Fund



18 | Improving Cochlear Implant Assessment

Assessing cochlear implant performance requires clinicians to identify subtle patterns within complex electrical measurements, a process that has traditionally relied on laborious manual interpretation.

Working with the Southampton Auditory Implant Service, the SRSG developed an interactive analysis platform that automates much of this workflow while retaining clear visual explanations for clinicians. The result is a streamlined and reproducible approach to identifying potentially faulty implant electrodes, supporting improved patient care and more consistent clinical decision making.

Research Lead

Professor Tracey Newman, Callum Findlay & Dr Mary Grasmeder, Auditory Implant Service

Research Software Engineer

Dr Mehtap Özbey Arabacı

Funder

Southampton University Hospitals NHS Trust



19 | Smarter Battery Modelling

Accurate battery models are essential for designing the next generation of electric vehicles and energy storage technologies.

Previous work with the SRSG and researchers from the School of Mathematical Sciences and the University of Portsmouth had developed a scalable, ultra-fast, online model of Li-ion battery performance. The SRSG built on this work with About Energy, a commercial partner, to enable the use of cloud-based serverless technology, providing rapid on-demand scalability.

By making sophisticated battery simulations more accessible, this project supports faster innovation while strengthening links between academic research and industry.

Research Lead

Professor Giles Richardson, Mathematical Sciences; Dr Ivan Korotkin, Dandelion; Professor Chris Skylaris, Chemistry and Chemical Engineering

Research Software Engineer

Dr Jamie Court

Funder

Faraday Institution



21

Predicting Mechanical Wear with AI

Predicting wear in mechanical devices can reduce maintenance costs, improve safety and lower environmental impact.

The SRSRG worked with tribologists to design the software architecture underpinning a scalable, AI-powered monitoring system capable of combining multiple sensing technologies into a single decision-support platform. The platform provides real-time notification of unexpected wear enabling users to proactively intervene. A dashboard visualisation of both real-time and historic data is available enabling unprecedented insight into mechanical wear. The work contributed directly to a successful UKRI Proof of Concept award, helping move the technology closer to industrial deployment.

Research Lead

Professor Robert Wood & Zack Tian, Electronics and Computer Science

Research Software Engineer

Dr Stephen Pooley

Funder

EPSRC



23

Making Teaching Workloads Fairer

Allocating university teaching fairly across academic staff had become increasingly difficult as years of spreadsheet development created a system that was complex, fragile and time-consuming to maintain.

The SRSRG worked with the School of Physics and Astronomy to replace this with a dedicated web platform that allows teaching responsibilities to be allocated consistently, transparently and efficiently. The result reduces administrative burden while helping departments ensure workloads remain fair over time.

Research Lead

Professor Poshak Gandhi & Professor Matthew Middleton, Physics & Astronomy

Research Software Engineer

Dr Sam Mangham

Funder

STFC



DEVELOPING RESEARCH CAPABILITY



The SRSG's training team works with researchers, students and research professionals to ensure they have the digital skills they need.

2025 BY THE NUMBERS

349
researchers
trained

39
training
sessions

7
CDTs/DTPs
supported

13
courses
available

More information
rsgsoton.net/training

Developing the Next Generation of Southampton Researchers

The SRSG's training team works with researchers to ensure they have the skills to develop robust research software and reproducible data analysis pipelines. From basic software engineering principles to using the latest AI technologies in their software development processes, our training ensures that the University's next generation of researchers advance their careers with the digital skills needed to deliver high-quality research.

During 2025, we delivered training for 349 staff and students at the University of Southampton and beyond, through a wide range of programmes, including CHEP, the AI for Sustainability CDT, the Quantum Technology Engineering CDT, the Doctoral College, MRC DTP and MSc Genomics, NBIC, and the NERC DLA. We also contributed to post-graduate teaching with the ISVR.

Addressing Future Skills Needs

In 2025, we became the first organisation to develop a programme for The Carpentries (an international researcher training organisation) on responsible use of AI tools in research software development. We are now collaborating with The Carpentries on an official AI Carpentry suite of courses that will be delivered across the UK and internationally.

Through the CHARTED project, we are working with colleagues from Edinburgh and Imperial to create clearer skills pathways, training opportunities and career development for Research Technical Professionals. In partnership with the Software Sustainability Institute and UK Reproducibility Network, we have delivered FAIR Research Software training courses to staff and students at organisations across the UK, providing researchers with the skills to develop research software that is reproducible and in line with Open Science principles. Our new Industry Skills Bootcamp (described below), prepares students for careers in industry. We are currently preparing this for wider national delivery and CPD.

Alongside our training, the SRSG is developing a reusable set of research software delivery processes based on ISO standards and adapted for research. Now being trialled in Southampton, these processes will be shared openly with the international RSE community, extending Southampton's contribution to better research software practice.

Together, these activities demonstrate that the SRSG is shaping how research software engineering is taught and practised, creating training, communities and processes that will benefit researchers for years to come.

A LOOK AT OUR NEW COURSES



AI for Research Software Development

BUILDING AI SKILLS FOR SOFTWARE DEVELOPMENT

Our four new AI courses build a practical understanding of AI fundamentals, allowing researchers to make informed decisions when using AI in their research. Most take a hands-on approach where learners code along with the instructor to create research software with AI. We also teach ethical and security issues throughout. Two courses cater for researchers with no prior coding experience, and two are focused on experienced research software developers.

The courses were developed in collaboration with the Doctoral College with funding from EPSRC. Following successful pilots, the courses will be delivered nationally with the National Centre for Research Methods and at the Software Sustainability Institute. We are working with the Carpentries to establish official AI Carpentry courses that will be taught worldwide.



I would like to thank you all for initiating this topic, I have been really wanting to understand how to use AI for my research effectively, and I think I've got good information now.

Workshop participant



Industry Skills for Software Engineering

INDUSTRY SOFTWARE ENGINEERING FOR RESEARCHERS

Our new Industry Skills Training Bootcamp tackles the skill gaps early-career software engineers face moving from study into industry.

The curriculum draws on a qualitative study by policy researchers based at the SRSG, which found employers and graduates consistently cite two gaps: limited real-world application of technical skills, and underdeveloped professional skills like teamwork, communication, client interaction, and working within established processes.

While the Bootcamp covers some important technologies and software best practice, the main focus is on allowing participants to practise development skills within a team-based agile environment.

The training's content and structure have been refined through a sequence of three pilot workshops. We are now working to offer this as a CPD programme for graduates and early-career software engineers.



The workshop was really informative and was delivered at a good pace. It provided a good opportunity for team building, leadership, technique development, and knowledge improvement.

Workshop participant

FROM RESEARCH TO POLICY



The SRSG ensures that the needs and opportunities of research software and data are understood by policymakers, and campaigns at a national level for better support for the modern research workforce.

CRITICAL SOFTWARE STUDY

Software underpins an enormous proportion of modern research, yet it is rarely recognised or supported as a strategic component of research infrastructure. The SRSG policy team worked with the SSI to examine the role of critical software across the UK research landscape, identifying both the opportunities and the risks associated with software that has become essential to research.

The resulting report is being used by UKRI to inform future approaches to funding, sustaining and managing research software, ensuring that this increasingly important infrastructure receives the support that it requires.

INDUSTRY SKILLS STUDY

Working with employers, graduates and industry partners, the SRSG investigated the professional skills needed for graduates to thrive in software-intensive careers in industry.

The findings from this research directly informed the development of the Industry Skills training programme described in the previous chapter, demonstrating how evidence gathered through policy and research can be translated into practical training that benefits both researchers and employers.

Strengthening the Research Ecosystem

While many research software engineering groups focus primarily on developing software, the SRSG also works to influence how research itself evolves. By combining practical experience with strategic leadership, we help ensure that the lessons learned through software engineering contribute to improving the wider research ecosystem.

Recognising Hidden Contributions

Software teaches us that research depends on many valuable contributions and a diversity of research-related roles that have historically received little formal recognition. We launched the Hidden REF campaign in 2019 to broaden recognition of vital-but-unrecognised contributions and roles. In 2025, we received £3.4 million from Research England to run the Hidden REF alongside the mainstream REF process.

During 2025, the campaign developed practical guidance on assessment of “not-traditionally submitted outputs”, uncovered evidence of the importance of all outputs, ran invited workshops for universities across the UK and continued to develop a community that sustains its work. By gathering evidence and helping shape national conversations around research assessment, the Hidden REF is driving a culture that will make research more equitable and more effective.

Sixteen Years of Software Sustainability

The Software Sustainability Institute (SSI) has helped transform attitudes towards research software within the UK and internationally and demonstrated the importance of investing in software, people and skills alongside traditional research infrastructure. We established the Institute in 2010 with the universities of Edinburgh and Manchester and continue to play leading roles in its national training programmes, community building and policy development.

A National Data Stewardship Community

As research becomes increasingly data-intensive, professional data stewardship is becoming essential to ensuring that research data remains secure, reusable and FAIR. Through the CaSDaR programme, the SRSG is working with the School of Chemistry to replicate its success with the RSE community and establish a national community for data stewards.

THE PEOPLE BEHIND THE PROJECTS

Every project in this report was delivered by the SRSR through collaboration between researchers, Research Software Engineers, trainers, community managers and policy researchers. Together, we help researchers tackle bigger questions, develop new skills and create lasting impact.



Prof Simon Hettrick
Director



Prof John Robinson
Director



Lyndsey Ballantyne
Senior Community
Manager



Dr Philippa Wilding
Senior Research Software
Engineer & Training Lead



Dr Jamie Court
Research Software Engineer



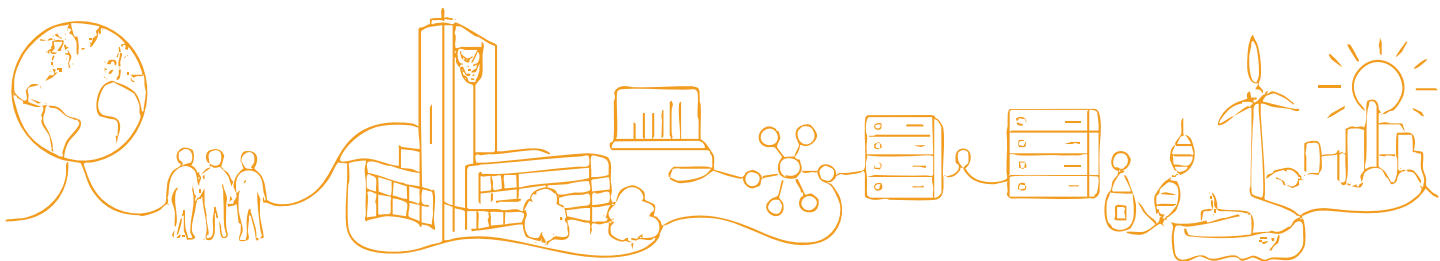
Dr Steve Crouch
Software Architect



Michael Donnay
Community Manager



Dr Bryan Gillis
Senior Research Software
Engineer





Wioleta Kijewska
Research Software Engineer



Veronica Ng
Hidden REF Administrator



Dr Sam Mangham
Senior Research Software Engineer



Dr Conn O'Rourke
Senior Research Software Engineer



Dr Mehtap Özbey Arabacı
Senior Research Software Engineer



Dr Edward Parkinson
Senior Research Software Engineer



Dr Stephen Pooley
Principal Research Software Engineer



Dr Ben Thomas
Senior Policy Fellow



Dr Corran Webster
Senior Research Software Engineer

Contact Us

If you would like to work with the Southampton Research Software Group, please get in touch.

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Web: rsg.soton.ac.uk

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