RESEARCH COMPUTING

Consultancy Support for Research

Service Catalogue

2024/2025

INTRODUCTION

Our Research Computing Consultation Service at the University of Leeds, delivered through our dedicated Research Software Engineers (RSEs), offers a comprehensive range of expert services designed to support researchers throughout the entire lifecycle of their projects. This catalogue details the services we provide. By consulting this list, you can identify the specific support you need from our team to ensure the success of your research, from initial concept through to final dissemination.

HOW TO ACCESS OUR SERVICES

We are committed to making our RSE expertise accessible to all researchers. General advice, guidance, and grant consultancy are always available at no cost. Whether you need help refining your research ideas, selecting the right tools, or developing a solid bid, our team is here to support you.

For new projects, we understand that initial funding may be limited. Therefore, we offer a limited number of free hours for proof of concept work and other pump-priming activities to help you get started.

Typically, access to our RSE services is arranged by costing the support into your research grants. Our RSEs are usually costed as Top of Grade 7 or Grade 8 technical staff under 'Directly Incurred' costs, allowing you to tailor the level of support to your project's needs. This can range from a commitment of 0.2 FTE for one month, to more extensive support from multiple RSEs over a longer period.

HOW TO REQUEST SUPPORT

To begin, simply submit the details of your project via our contact form, including the scope of your project, the technical requirements, and the expected timelines. Once we receive your submission, we will reach out to arrange a one-to-one scoping meeting. During this meeting, we'll discuss your needs in detail and determine the best way to proceed, ensuring you receive the most effective support for your research.

CONTACT FORM

SERVICE CATALOGUE SUMMARY

1 Grant Proposal Support	**10** Research Data Management
2 Expert Software Development and Engineering	**11** Data-Driven Research Support
3 High-Performance Computing Expertise	**12** Data Visualisation and Interactive Tools
4 Numerical Computing and Advanced Modelling	**13** Software Sustainability and Longevity
5 Workflow Optimisation and Management	**14** Open Science and Community Engagement
6 Version Control and Collaborative Development	**15** Research Outputs and Dissemination
7 Containerisation and Virtualisation	**16** Compliance and Security
8 Cloud Computing and Infrastructure as Code	**17** Teaching and Curriculum Development
9 Reproducibility and Research Integrity	**18** Support for Interdisciplinary and Collaborative Research

GRANT PROPOSAL SUPPORT

Our support can begin at the earliest stages of your project, helping you to transform research ideas into feasible computational research plans. We will help you to select the best techniques, tools, and infrastructure, ensuring that your grant proposal is both innovative and competitive.

RESEARCH QUESTION FEASIBILITY

We collaborate with researchers to transform their research questions into feasible computational research projects. This includes assessing the problem, identifying the most suitable computational techniques, and proposing a realistic approach.

TECHNIQUES AND TOOLS IDENTIFICATION

Our team can help you select the best tools, algorithms, and methods to address your research objectives effectively, ensuring that your project is both innovative and feasible.

INFRASTRUCTURE REQUIREMENTS AND PLANNING

We provide expert advice on the computational infrastructure required for your project, including hardware, software, and cloud resources. We also facilitate connections with relevant IT and infrastructure teams to gather the necessary information for your grant application.

SUPPORT IN DRAFTING COMPUTATIONAL SECTIONS

We can assist in writing the computational and technical sections of your grant proposals, ensuring clarity, accuracy, and a strong justification for the requested resources.

EXPERT SOFTWARE DEVELOPMENT & ENGINEERING

Once your project is funded, our team can provide essential software development services. Whether you need to design new software, refactor existing code, or optimise computational workflows, we bring expert engineering skills to your research.

CONSULTATION AND DESIGN

We offer expert advice on software architecture and design, whether you need to develop software from scratch, refactor existing code, or improve the efficiency of your computational workflows.

CUSTOM SOFTWARE DEVELOPMENT

Our team can develop tailored software solutions that meet the unique needs of your research, ensuring they are optimised for performance and scalability.

SOFTWARE REFACTORING

We can improve the structure, readability, and performance of your existing software, making it more maintainable and efficient.

HIGH-PERFORMANCE COMPUTING EXPERTISE

For projects that require significant computational power, our deep expertise in high-performance computing is invaluable. We can help you maximize the potential of HPC resources, including parallel computing and GPU programming.

SPECIALISED KNOWLEDGE IN HPC

As the custodians of the university's High-Performance Computing (HPC) resources, our team has deep expertise in optimising software for HPC environments, including parallel computing and GPU programming.

HPC WORKFLOW SETUP

We can help you design and implement complex workflows that leverage HPC resources, ensuring optimal performance for your computational tasks.

NUMERICAL COMPUTING & MODELLING

We offer specialised services in numerical computing and advanced modelling, supporting complex simulations and analyses in fields such as fluid dynamics, molecular dynamics, and more, ensuring accurate and efficient computational results.

COMPUTATIONAL FLUID DYNAMICS

We provide support for CFD simulations, helping researchers design, implement, and optimise fluid flow models across a range of applications from aerospace engineering to environmental science.

MOLECULAR DYNAMICS

Our team can assist with the setup, execution, and analysis of MD simulations, which are essential in fields like chemistry, materials science, and biophysics.

MONTE CARLO SIMULATIONS

We offer expertise in Monte Carlo methods for stochastic modelling and probabilistic simulations, applicable to a wide variety of research areas including physics, finance, and climate science.

FINITE ELEMENT ANALYSIS

We can support researchers in applying FEA for solving complex structural, thermal, and electromagnetic problems, widely used in engineering and physical sciences.

AGENT-BASED MODELLING

We provide guidance and support in developing and running agent-based models, which are particularly useful in social sciences, economics, and ecology to simulate the interactions of agents within complex systems.

OPTIMISATION TECHNIQUES

We offer expertise in numerical optimisation techniques that are crucial for tuning models, optimising design parameters, and solving complex research problems.

WORKFLOW OPTIMISATION & MANAGEMENT

As your project progresses, we assist in optimising and managing complex workflows. Our team ensures that your research processes are efficient, scalable, and well-organised, allowing you to focus on discovery and innovation. We also help automate your research workflows, reducing repetitive tasks and streamlining complex processes. Our expertise in workflow orchestration ensures that your computational pipelines are efficient and manageable.

COMPLEX WORKFLOW SETUP

Our team is adept at setting up and organising complex research workflows that integrate multiple tools, data sources, and computational resources.

BEST PRACTICES IMPLEMENTATION

We implement best practices in software development and data management to enhance the quality, efficiency, and reproducibility of your research.

ENVIRONMENT SETUP

We assist in setting up and optimising development environments, such as using Conda for managing dependencies and environments.

AUTOMATION OF RESEARCH WORKFLOWS

We can automate repetitive tasks in your research workflow, from data processing to model training, freeing up more time for analysis and discovery.

AUTOMATED TESTING AND VALIDATION

We can automate your testing processes using test frameworks and GitHub Actions. This includes setting up continuous integration pipelines that automatically run tests, validate code, and ensure that your software remains reliable and bug-free throughout its development.

WORKFLOW ORCHESTRATION

We can implement workflow orchestration tools (e.g., Apache Airflow, Nextflow) to manage complex multi-step computational pipelines efficiently.

VERSION CONTROL & COLLABORATIVE DEVELOPMENT

Maintaining a robust codebase is crucial for any research project. We provide support for version control systems and collaborative development workflows, ensuring your software is reliable, traceable, and easy to manage.

VERSION CONTROL SYSTEMS

We provide support for setting up and managing version control systems like Git, helping you maintain a robust and traceable codebase.

VERSION CONTROL MIGRATION

If your project is still using Subversion (SVN), we can help you transition to Git, a more modern and flexible version control system. We ensure that the migration is smooth, preserving your project's history and enabling you to take full advantage of Git's features.

TEST AUTOMATION WITH GITHUB ACTIONS

We enhance your collaborative development process by integrating automated testing directly into your GitHub repositories. Using GitHub Actions, we set up workflows that automatically run your testing suite every time code is committed, ensuring continuous validation and maintaining high code quality.

COLLABORATIVE DEVELOPMENT WORKFLOWS

We can establish collaborative development environments using GitHub Actions, including setting up organisational structures and repositories in the enterprise GitHub. Our expertise includes automating testing, documentation generation, and deployment processes using GitHub Actions and GitHib Pages.

GITHUB CODESPACES

We can set up and optimise the use of GitHub Codespaces, providing you with a cloud-based development environment that's ready to use instantly. This service enhances collaboration by offering a consistent, pre-configured environment that's accessible from anywhere.

CONTAINERISATION & VIRTUALISATION

To enhance the portability and reproducibility of your research, we offer services in containerisation and virtualisation. These techniques ensure that your software runs consistently across different computing environments.

CONTAINERISATION

We offer services to containerise your software and workflows using tools like Apptainer or Docker, ensuring that they can run consistently across different computing environments.

VIRTUALISATION

We can help set up virtualised environments tailored to your research needs, allowing for isolated and repeatable computational experiments.

CLOUD COMPUTING & INFRASTRUCTURE AS CODE

For projects that require scalable and flexible computing resources, we provide cloud computing solutions and infrastructure as code services. These tools allow you to deploy and manage computational environments with ease.

CLOUD RESOURCE MANAGEMENT

Our team can help you design and implement cloud-based solutions for your research, including setting up and managing cloud resources, optimising cost, and ensuring scalability.

INFRASTRUCTURE AS CODE

We can assist in automating the setup and management of your research infrastructure using IaC tools like Terraform, making your computational environments more reproducible and easier to manage.

REPRODUCIBILITY & RESEARCH INTEGRITY

Reproducibility is key to credible research. We work with you to implement best practices that enhance the reproducibility of your results, ensuring that your findings can be validated and built upon by others. This ensures that your research is not only successful but also maintainable and extensible for future work.

REPRODUCIBILITY BEST PRACTICES

We implement robust practices to enhance the reproducibility of your research, ensuring that your results can be easily validated and built upon by others.

CODE QUALITY ASSURANCE

We assist in establishing and maintaining high coding standards that enhance readability, maintainability, and collaboration across your codebase. This includes providing guidelines and tools for ensuring consistent code quality.

TESTING SUITES

We develop comprehensive testing suites tailored to your project's needs, including unit, integration, performance, and functional tests. These testing suites ensure that your software is robust, stable, and performs as expected under various conditions.

SOFTWARE DESIGN PATTERNS

Our team applies appropriate software design patterns to your project, promoting modularity, reusability, and scalability. This ensures that your software is well-structured and adaptable to future needs.

COMPREHENSIVE DOCUMENTATION

Our team can create clear and comprehensive documentation for your software, workflows, and research processes, facilitating understanding and reuse by others in your field.

RESEARCH DATA MANAGEMENT

Proper data management is crucial to the success of any research project. We offer services to help you plan, curate, and preserve your research data, ensuring it is well-organised, accessible, and compliant with relevant standards.

DATA MANAGEMENT PLANNING

We assist in creating Data Management Plans (DMPs) as required by many funding bodies, ensuring that your data is handled, stored, and shared according to best practices.

DATA CURATION AND PRESERVATION

We provide services for curating and preserving research data, ensuring it is well-organised, accessible, and compliant with data preservation standards.

DATA-DRIVEN RESEARCH SUPPORT

Leveraging data effectively is at the heart of many research projects. We provide support for advanced data analysis techniques, including AI and machine learning, ensuring that your data-driven research is impactful and insightful.

AI AND MACHINE LEARNING

We offer support in integrating artificial intelligence and machine learning techniques into your research, from exploratory data analysis to the deployment of predictive models.

ETHICAL DATA MANAGEMENT

Our team is well-versed in the ethical considerations and governance related to data handling, ensuring that your research adheres to the highest standards of data integrity and compliance.

DATA VISUALISATION & INTERACTIVE TOOLS

Effective communication of research findings often depends on high-quality data visualisation. We help you create reproducible, accurate visualisations and develop interactive tools to present your data compellingly.

DATA VISUALISATION EXPERTISE

Our team excels in data visualisation, employing scripting languages to create high-quality, reproducible visualisations. We adhere to best practices to ensure accuracy and avoid data misinterpretation.

INTERACTIVE DASHBOARDS AND WEB APPLICATIONS

We can develop interactive dashboards and web applications for real-time data visualisation, making it easier to explore and present your research findings.

SOFTWARE SUSTAINABILITY & LONGEVITY

We ensure that the software developed during your project remains functional and maintainable in the long term. Our services include advice for software maintenance and for the sustainable evolution of your tools, and legacy code modernisation.

LONG-TERM SOFTWARE MAINTENANCE

We offer services to help you ensure the long-term sustainability of your software, including setup of workflows that will help you handle regular updates, bug fixes, and adaptations to new hardware or software environments.

LEGACY CODE MODERNISATION

If your research relies on legacy software, our team can help modernise and migrate it to current technologies, improving performance and compatibility.

OPEN SCIENCE & COMMUNITY ENGAGEMENT

We support open science initiatives, helping you develop and share open-source software, engage with the research community, and build tools that are accessible and beneficial to others in your field.

OPEN SOURCE SOFTWARE DEVELOPMENT

We encourage and support the development of open-source software, providing guidance on licensing, community building, and best practices for open-source projects.

RESEARCH DISSEMINATION SUPPORT

We can assist in creating and managing platforms for sharing your research outputs, such as code repositories and data archives.

RESEARCH OUTPUTS & DISSEMINATION

As your project nears completion, we assist in disseminating your research findings. Our team can co-author papers, contribute to science communication, and participate in conferences, ensuring your work reaches the widest possible audience.

CO-AUTHORSHIP AND PUBLICATION SUPPORT

Our team is available to co-author papers, contributing our computational expertise to the research outputs. We assist in writing, editing, and reviewing sections related to software, data analysis, and computational methods.

BLOG POSTS AND SCIENCE COMMUNICATION

We can collaborate on writing blog posts or other forms of science communication to share your research findings with a broader audience, highlighting the computational aspects of your work.

WORDPRESS WEBSITE SETUP

We offer specialised support to help you set up and customise your WordPress website. Whether you need a platform for research dissemination, collaboration, or outreach, we ensure that your site is effectively designed and optimised for your needs.

SEMINARS AND CONFERENCE PRESENTATIONS

Our team is available to present seminars, contribute to conference presentations, and participate in workshops, sharing our expertise and the outcomes of our collaborative work.

TRAINING ON RESEARCH DISSEMINATION TOOLS

We offer training and support in using tools and platforms for research dissemination, including setting up and maintaining research websites, creating interactive visualisations, and using social media effectively.

COMPLIANCE & SECURITY

Ensuring that your research complies with relevant regulations and is secure from vulnerabilities is critical. We provide guidance on data security, secure coding practices, and compliance with standards like GDPR.

DATA SECURITY AND COMPLIANCE

We provide advice and support to ensure that your research complies with relevant security protocols and data protection regulations (e.g., GDPR), particularly when dealing with sensitive or personal data.

SECURE CODING PRACTICES

We can help you implement secure coding practices to protect your software from vulnerabilities and ensure data integrity.

TEACHING & CURRICULUM DEVELOPMENT

Beyond direct project support, we contribute to the academic environment by developing and delivering educational content. We help design curricula, provide mentorship, and foster computational skills across the university.

CURRICULUM SUPPORT

We can help develop and deliver courses or modules related to research software engineering, programming, data analysis, or computational methods, tailored to the needs of your department or research group.

MENTORSHIP AND TRAINING

Beyond workshops, we offer one-on-one or small group mentoring sessions to build the computational skills of researchers, fostering a culture of continuous learning.

SUPPORT FOR INTERDISCIPLINARY & COLLABORATIVE RESEARCH

We excel in facilitating interdisciplinary research, providing the computational tools and expertise necessary for successful collaboration across diverse fields. Our support ensures that complex, multi-disciplinary projects achieve their full potential.

CROSS-DISCIPLINARY COLLABORATION

Our team is experienced in working across disciplines, providing the computational tools and methods necessary to support interdisciplinary research.

COLLABORATIVE PLATFORMS

We can set up and manage collaborative research platforms, enabling seamless communication, data sharing, and joint development among diverse research teams.

CONTACT

Research Computing

https://arc.leeds.ac.uk/ 🌐

Contact Form 📋

RCTeam@leeds.ac.uk ✉️