

RSEs in the Age of AI: New Roles, New Responsibilities, New Era of Change

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Why US-RSE is So Much Needed

Growing Importance of Research Software Engineers (RSEs)

- Research software is at the heart of modern scientific discovery
- Despite their critical role, RSEs often operate in the shadows
- Universities, labs, and industry increasingly rely on high-quality software and sustainable software development

Hidden Contributors

The real “Hidden Figures”: Dorothy Vaughan, Katherine Johnson and Mary Jackson/Fotos courtesy from NASA



Hidden Contributors

The hidden REF

Celebrating all research outputs

Celebrating all research outputs

If we do not recognise the people who are vital to research, we limit our ability to conduct research.

From the UK

Research
Excellence
Framework

<https://hidden-ref.org/>

<https://us-rse.org>



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Hidden Contributors

Hidden roles

These roles can include, but are not limited to

Clinical trials managers

Data stewards and managers

Librarians

Technicians

Lived Experience Contributors

Research Software Engineers

Professional Research Investment and
Strategy Managers

Professional Services Personnel

Public Engagement Professionals

Researcher Developers

Research Knowledge Engineers

Research Managers and Administrators

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AI's Interruptive Force

From tools to teammates—AI is reshaping how research gets done.

2030 AND BEYOND

AI as a research partner

Agents propose, synthesize and accelerate discovery.

TRANSITION

AI embedded in workflows and infrastructures

Changing practices, roles and expectations.

TODAY

AI as a powerful tool

Assists with code, analysis and automation for researchers.



Code generation, workflow automation

AI accelerates development, reduces repetitive work and opens new possibilities.



Challenges: reproducibility, transparency, ethics

New risks require careful oversight, governance and responsible design.



Potential to reshape roles

RSEs must adapt, upskill and lead in this evolving landscape.



The choice ahead

Survival = passive today, only survival tomorrow
Thriving = intentional today, thriving tomorrow



The future is not something that happens to us.
It's something we build—together.



Adapt



Innovate



Collaborate



Lead

AI's Interruptive Force

A crossroads for RSEs, research and research infrastructure.



Risk of Surviving Only



Devaluation of expertise



Displacement by corporate / government AI priorities



Fragile ecosystems



Sidelined in research



Passive today, only survival tomorrow.



Opportunity of Thriving



Shape infrastructures and policy



Recognition of software and workflows as scholarship



Leadership in global ecosystems



Impact at scale



Intentional today, thriving tomorrow.



The choice is ours.

RSEs are essential in an AI-driven future—because research still needs **judgment, context, integrity and foresight.**



Corporate Narratives

NVIDIA CEO Jensen Huang (2023-2024):

- "AI means everyone can now be a programmer."
- Implies natural-language prompting replacing conventional coding.
- "The industry's goal is to create systems where 'nobody has to program' and 'the programming language is human'."
- Widely reported as signaling declining necessity of learning to code.

Meta CEO Mark Zuckerberg (Early 2025):

- AI systems would soon reach "mid-level engineer" capability.
- Raises prospect of "large-scale automation of coding tasks."
- Meta's hiring now permits AI tools in coding interviews.

Google CEO Sundar Pichai (Late 2024):

- More cautious framing: augmentation rather than substitution.
- Over 25% of new code at Google "already generated by AI under human oversight."
- Describes this as the "next platform shift" toward AI-mediated interfaces and agents.

Corporate Narratives and What They Miss

Overall Narrative

- Corporate rhetoric often emphasizes the substitution of human programmers by AI
- Suggests professional software engineers and RSEs "may be displaced."

What They Miss

- Overstates substitution, understates oversight
- Human expertise needed for validation and reproducibility
- Socio-technical roles remain essential

Thriving Requires Actions

- From 'support staff' to recognized career path
- Skills: domain + computing + engineering practices + AI
- International coordination and worldwide RSE associations
- Incentives for openness and sustainability
- Funding tied to workforce support
- Recognizing RSE contributions in evaluation

Examples for Advocacy

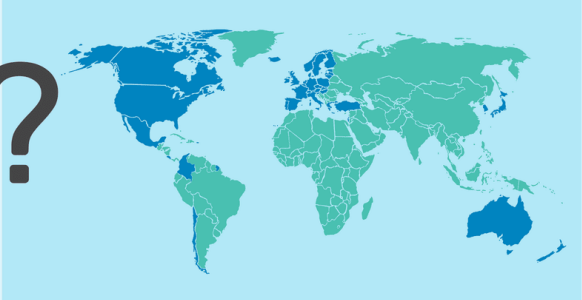
- This year first International Research Software Conference
- Funding bodies
- Fly-In to Senators and governors in Washington DC
- OECD Workshop on Research Software



Workshop on Access to Research Software at OECD

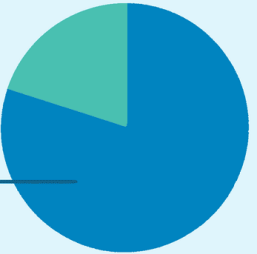
- Workshop (Sep 8, 2025, Paris/online):
Focus on research software in open science
- Organised by the OECD Committee for Scientific and Technological Policy (CSTP), building on open data work
- Themes: governance, infrastructure, workforce, standards, partnerships
- Sandra Gesing on Panel:
Human Resources and Motivation
- Goal: Input for CSTP and a policy paper on access to research software
- About 30 participants in the room, 50 online
- Follow-up workshop in March 2026

What Is the OECD?
(Organization for Economic Cooperation and Development)



- It is an association of 38 nations in Europe, the Americas, and the Pacific
- It helps member countries formulate economic and social policies
- It aids developing countries outside membership and promotes reform
- Members and key partners represent 80% of world trade

the balance



<https://www.oecd.org/en/events/2025/09/access-to-research-software-opportunities-and-challenges.html>

<https://us-rse.org>



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Webinar Series with Reach The World

Supercomputing and the Future of AI Virtual Exchange Program Results



Program Engagement Metrics



900+

K-12 students joined the live program



1,390+

Youtube views across six livestream events



46+

K-12 classrooms joined the live program



12+

U.S. states represented (+ Indonesia and Uganda!)

Journey homepage: reachtheworld.org/supercomputing-and-future-ai

Program Summary

Supercomputing and the Future of AI

From Coding in High School to



Travelers' Bios

From Coding in High School to Building a Movement

Location:

Chicago, Illinois

Latitude/Longitude:

41.878113600000, -87.629798200000

Journal Entry:

Hi everyone! My name is Sandra Gesing, and I have one of the most exciting jobs I could imagine—I get to work at the intersection of science, technology, and community building! I split my time between two roles: I'm the Executive Director of the U.S. Research Software Engineer Association (US-RSE), where I help bring together people who develop software for scientific research, and I'm also a Senior Researcher at the San Diego Supercomputer Center (SDSC), where I've been working to help researchers harness the power of supercomputing to solve real-world problems.



Giving a talk about my work in the U.K. with US-RSE's unicorn mascot



Representing the US-

More than 900 K-12 students dove into research software engineering and supercomputing with experts from the U.S. Research Software Engineer Association. Throughout this eight-week virtual exchange, students witnessed how supercomputing, AI, and research software shape the world around them. Participants created 11 background articles and students joined six livestream events to ask experts their questions to experts. These real-world connections sparked curiosity and awareness of future career paths.



On April 11, 2025, students met Princeton's Ian Cosden live to discover how research software and supercomputing power scientific breakthroughs and open doors to future tech careers. Ian's great examples and enthusiasm for his work inspired students to create some fanart for him!



<https://us-rse.org>



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<https://reachtheworld.org/supercomputing-and-future-ai/>



2013

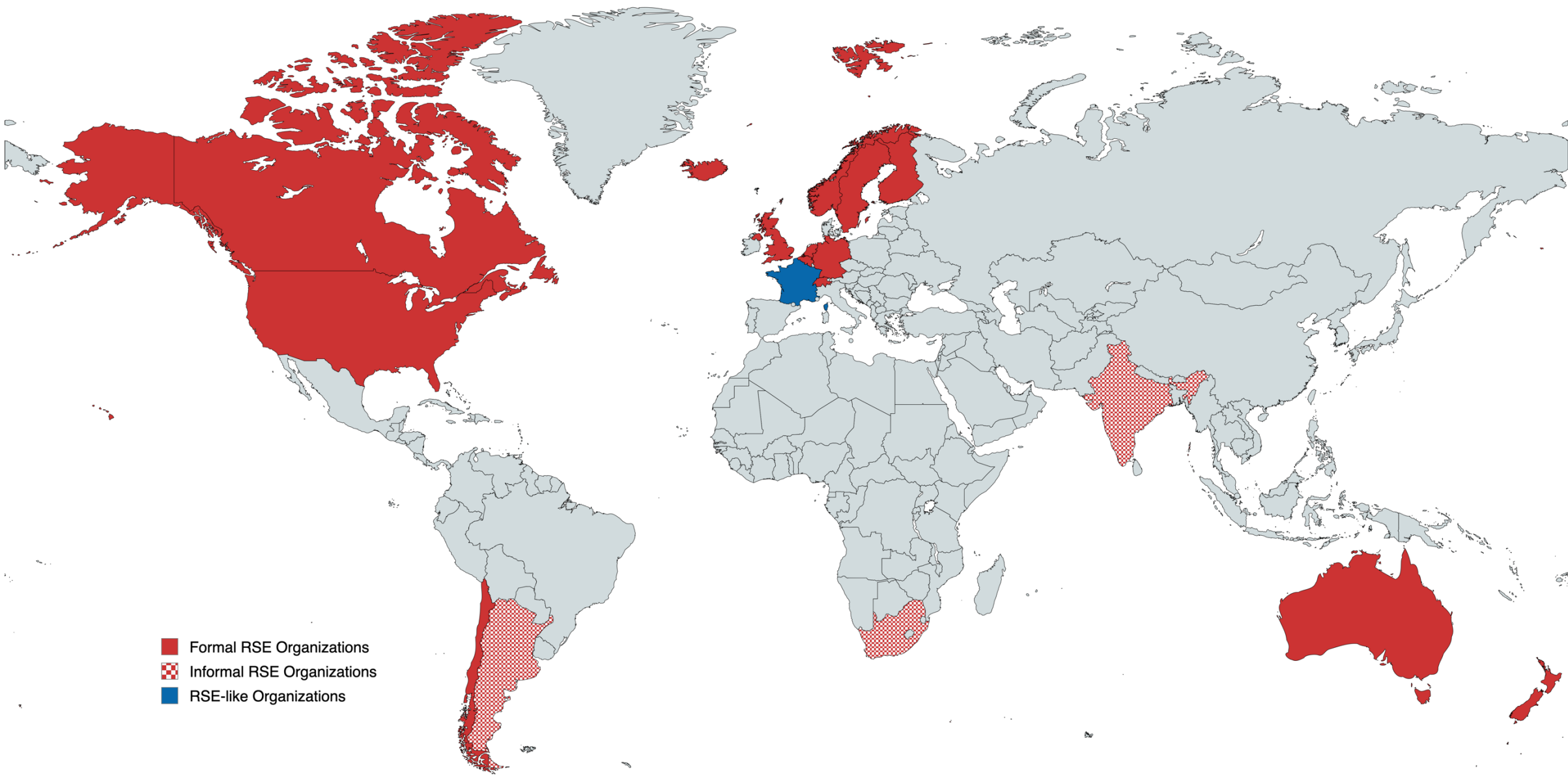


■ Formal RSE Associations

RSE

RESEARCH SOFTWARE
ENGINEERS ASSOCIATION

2026



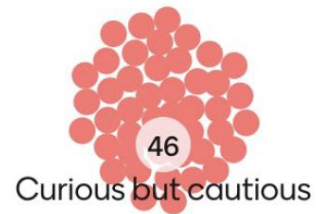
- Formal RSE Organizations
- Informal RSE Organizations
- RSE-like Organizations

Understanding AI Impact on Research Software Engineering

AI won't go away.

What do we need to do as community to set the stage for our workplace?

When you hear 'AI in RSEngineering,' what's your gut reaction?



Understanding AI Impact on Research Software Engineering

A landscape of cautious optimism

- Across all three events, “Excited” and “Curious but cautious” were the dominant reactions
- Neutral responses formed the middle block - people are using AI but still evaluating its role
- Smaller but meaningful groups expressed Frustration/Annoyance or saw AI as Overhyped

Overall trend: Optimism + realism.

Participants accept AI's growing importance but want reliability and transparency.

Understanding AI Impact on Research Software Engineering

Results from BoFs at RSECon'25, eScience 2025 and USRSE'25
Sentiment

excited

curious

cautious

neutral

annoyed overwhelmed optimistic realistic

frustrated overhyped



Understanding AI Impact on Research Software Engineering

Results from BoFs at RSECon'25, eScience 2025 and USRSE'25
Challenges

reliability hallucinations instability ethics

transparency security skills governance

gatekeeping integration complexity



Understanding AI Impact on Research Software Engineering

Results from BoFs at RSECon'25, eScience 2025 and USRSE'25
Opportunities

productivity prototyping tutoring reproducibility

accuracy empowerment creativity research

collaboration workflows



Understanding AI Impact on Research Software Engineering

Results from BoFs at RSECon'25, eScience 2025 and USRSE'25
Associations

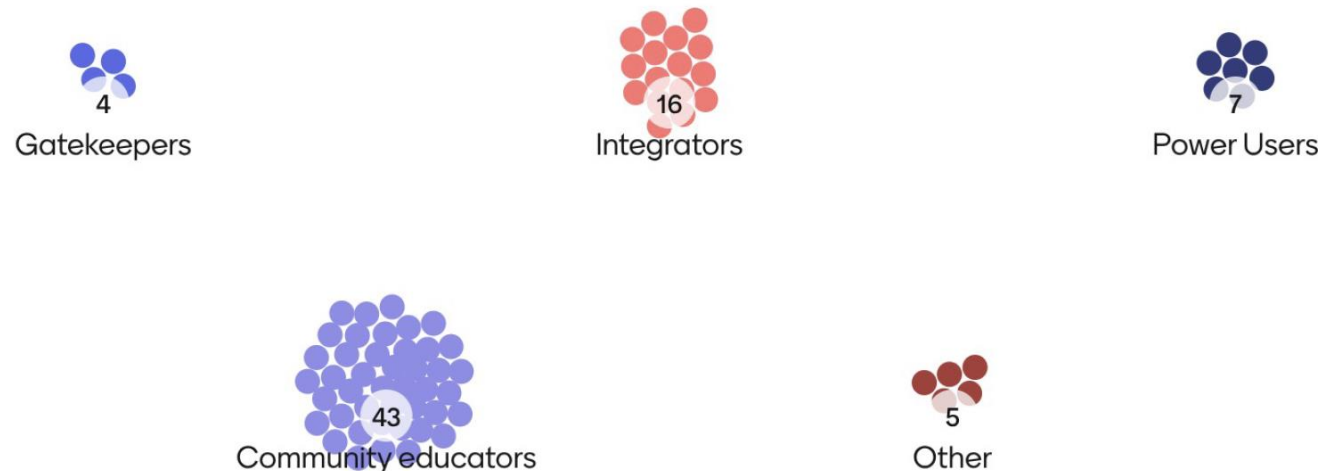
helpful useful productive faster
interesting fun unreliable bugs
risk overwhelmed dangerous misunderstood
ethics gatekeepers integrators freedom



Understanding AI Impact on Research Software Engineering

- Calls to **embrace AI, become experts, educate others**
- Some resistance: “resist” or “panic”
- Strong desire for **agency, ethics, and practical frameworks**

What role should RSEs play with AI?



Understanding AI Impact on Research Software Engineering

Opportunities

- faster prototyping
- productivity
- democratizing software development
- novel interfaces

Risks

- poor code quality
- misleading results
- job deskilling
- loss of junior opportunities
- security
- environmental cost

What makes an RSE valuable in an AI-rich world?

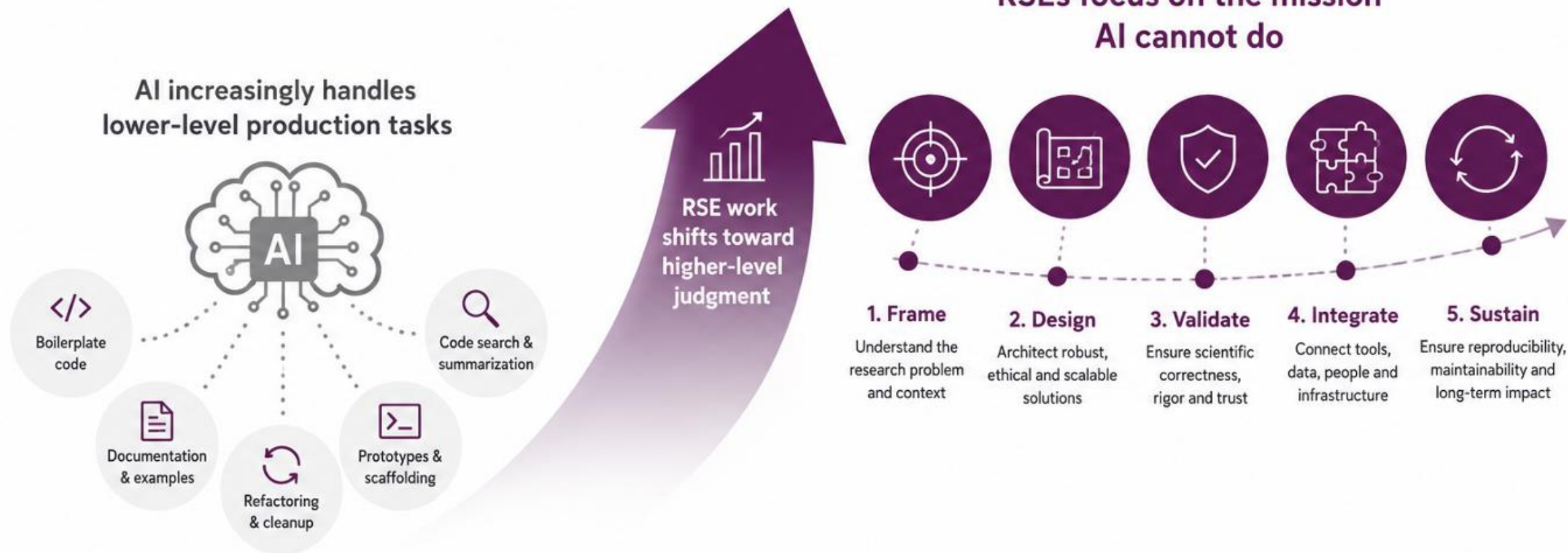
Not typing code faster. Turning research questions into trustworthy computational work.



AI can generate implementation. RSEs connect implementation to meaning.

AI changes RSE tasks. It does not remove the RSE mission.

RSE work shifts upward—to higher-level judgment, integration and stewardship.



From producing code to designing, judging, integrating and sustaining research systems.



Deep domain insight



Judgment & ethics



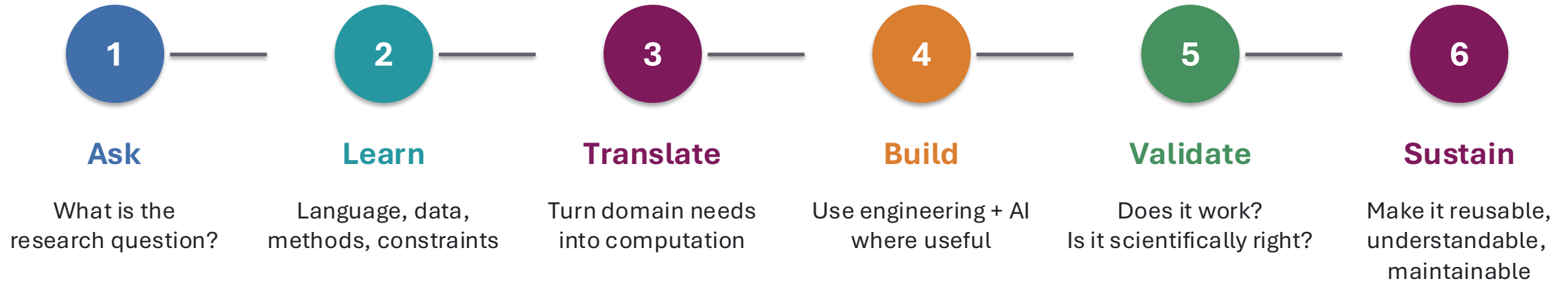
Collaboration



Stewardship for society

The RSE superpower: curiosity + translation

RSEs routinely enter domains they did not start in and learn enough to solve the right problem.



This is why domain expertise matters — and why RSEs never stop learning.

The AI-era RSE skill stack

Domain literacy

Understand the science, vocabulary, data and success criteria

Research methods

Validation, uncertainty, provenance, reproducibility

Software engineering

Architecture, testing, performance, security, maintainability

AI fluency

Model/tool selection, prompting, evaluation, limitations, responsible use

Collaboration & leadership

Communication, mentoring, facilitation, community and policy

FOUNDATION: curiosity • problem solving • judgment • willingness to learn

The paradox: more generated code can mean more need for RSEs



AI lowers the cost of producing code.

It does not lower the cost of knowing whether the code is correct, appropriate, reproducible or worth sustaining.

That is RSE territory.

Evolving Role of RSEs in the AI Era

Same mission. More opportunities for greater impact.

Current role

Build, maintain and support research software that enables science.



Future role

Continue core activities and take on additional responsibilities to guide, evaluate and integrate AI for trustworthy and sustainable research.



What Are We Actually Rewarding?

Publications remain important, but they are only one part of research.

Publishers and incentives have changed



AI makes it much easier to generate papers.



Preprints, low-quality journals and paper mills increase publication numbers.



Large research groups can produce many papers, which the current system often rewards.

Publications have their own problems



A paper can describe a result while the software behind it remains invisible.

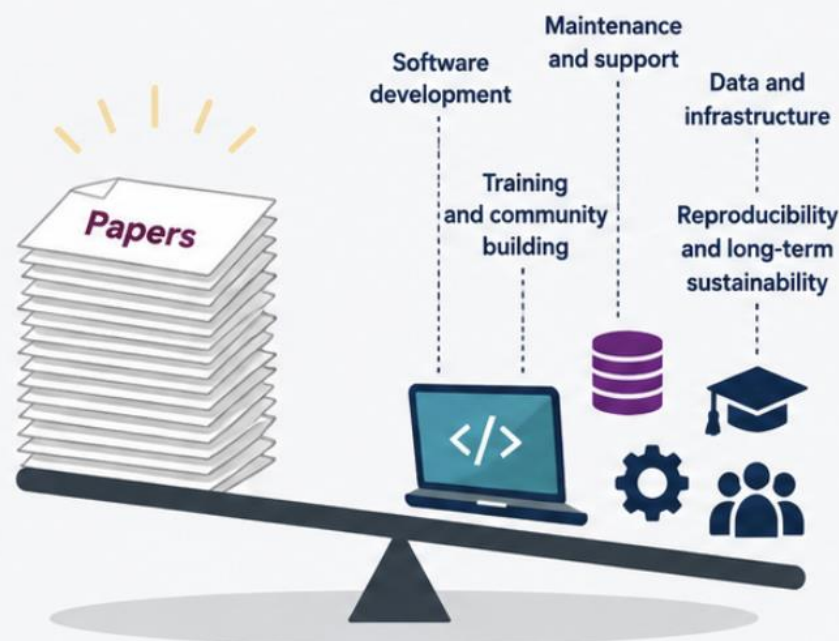


Publication counts reward output volume, not necessarily reliability, reproducibility or long-term impact.



The system can be gamed through self-citations, group citations and fragmentation of results into many papers.

Current publication metrics have blind spots



Traditional metrics like the h-index are still valuable, but they need to evolve to account for new realities and potential gaming of the system.

Ideas for a more balanced approach

-  **Keep quality metrics**
Continue to use and refine metrics like the h-index, while being aware of their limitations.
-  **Consider publication rate**
Include metrics on the number of papers per year, with thresholds or normalization to discourage excessive fragmentation.
-  **Account for citations**
Track self-citations and group citations separately to reduce gaming of citation metrics.
-  **Normalize for team size**
Use field- and team-size-aware metrics so that large research groups are not unfairly advantaged.
-  **Value diverse research outputs**
Include software, data, infrastructure, training, community building and other contributions in evaluation.
-  **Combine quantitative and qualitative**
Use a balanced approach with informed peer review, narratives and evidence of real-world impact.

Back to the UK: The Hidden REF

1 What is the Hidden REF?

Community-led initiative in the UK to celebrate the people and outputs often overlooked by traditional research assessment.



Recognizes a wide range of research roles and contributions.



Includes software, data, infrastructure, engagement, professional services and more.



Aims to complement, not replace, the formal Research Excellence Framework (REF).

The hidden REF

Celebrating all research outputs

<https://hidden-ref.org/>

2 What did it recognize?

People, outputs and activities such as:



Research software and technical expertise



Data stewardship and management



Infrastructure, platforms and facilities



Technicians, research managers and professional services



Public engagement and knowledge exchange



Training, mentoring and community building



Research strategy, policy and enabling roles



Lived experience contributors and diverse career paths

3 What was missed or limited?

Important gaps and open questions:



Voluntary and community-led
Not a formal part of the REF assessment process.



Limited institutional adoption
Awareness and use vary between institutions and disciplines.



No direct career or funding impact
Recognition is valuable, but does not (yet) translate into systemic changes in hiring, promotion or funding decisions.



Focus on recognition, not metrics
Highlights contributions, but does not provide a detailed, quantitative assessment framework.



Does not fully address gaming
Does not solve broader issues with publication metrics, self-citations or large-group advantages.

4 Did it change academia? Where does it stand now?



Raised awareness
Increased visibility for a broader range of research contributions and roles.



Influenced discussions
Helped shape conversations about research culture and assessment in the UK and internationally.



Some institutional uptake
Adopted in various forms by universities, funders and research organizations, but not consistently.



Ongoing development
The Hidden REF initiative continues, with regular updates and community engagement.



Next steps
Opportunity to build on these lessons and develop a more formal, international framework for research assessment.

AI Makes Better Evaluation More Urgent

Code generation is accelerating. Trust still requires expertise.



Assess validation and correctness

Evaluate provenance, security and scientific correctness.

Human judgment still essential

Reward expertise in selecting, testing and governing AI tools.



Track real impact

Monitor whether AI improves reproducibility and accessibility, not just code volume.

Develop community guidance

Create standards for responsible AI-assisted development.



What Should Count as Research Impact?



Scientific value

Does it enable trustworthy findings or new questions?

- Use in research workflows
- Citations in diverse fields
- Contribution to new scientific insights



Software quality

Is the software reliable, robust and reproducible?

- Tests and documentation
- Security and privacy
- Reproducible environments
- Adherence to open standards and good practices



Reuse and community

Is it used, adopted and built upon?

- Reuse and adoption in other research projects
- Accessibility and usability
- Community support and collaboration
- Training and knowledge sharing



Sustainability

Can it be maintained over the long term?

- Maintainability and funding
- Governance and ownership
- Responsible stewardship
- Clear plans for long-term access and preservation



Use evidence and context, not one universal score.

Research impact is multi-dimensional and depends on the discipline, community and goals.

Do Not Replace One Bad Metric with Another

More numbers do not automatically mean better evaluation.

- GitHub stars do not equal scientific impact
- Commit counts do not measure quality, mentoring or design judgment
- Downloads and citations favor some disciplines and software types
- Qualitative narratives, peer review and field-specific evidence matter

Measure what we value, rather than valueing what is easy to count.

Make the Invisible Work Visible

Build credit into the everyday research workflow.



Visibility should not require every RSE to publish a paper.

Broader Evaluation is a lot of Work

Recognizing more research products is valuable, but it adds work. We need practical solutions.



Automate routine tasks

- Collect metadata
- Use templates



Use AI (with oversight)

- Summarize evidence
- Flag issues



Share the workload

- Common rubrics
- Trained reviewers



Open Science and FAIR

- Open methods and code
- FAIR data and software



Keep human judgment

- Validate results
- Context matters



Support and incentivize

- Provide infrastructure
- Recognize effort

Cultural change will only happen if extra work is manageable.

What Can We Do as Community



Badges & certificates

Recognize good practices



Community awards

Celebrate diverse contributions



Peer recognition

Endorse, review and document



Shared standards

Evaluation rubrics and frameworks



Positive peer pressure

Highlight and encourage adoption

Funding and Institutions

Lasting change requires aligned funding and institutional policies.



From Recognition to Systemic Change

We have built a global community. Now we can change what research rewards.



Thanks!

<https://give.communityin.org/unicorn2026>



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