

The Research Software Engineer Movement

Vanessa Sochat PhD
Computer Scientist / Research Software Engineer
Lawrence Livermore National Lab





The RSE Movement

1.

The RSE Movement

2.

What is a research software engineer?

1.

The RSE Movement

2.

What is a research software engineer?

3.

What problems still remain?

1.

The RSE Movement

2.

What is a research software engineer?

3.

What problems still remain?

4.

How can you help?

1.

The RSE Movement

2.

What is a research software engineer?

3.

What problems still remain?

4.

How can you help?

5.

What do we want for the future?

Once upon a time...



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publish or perish!



publish or perish!



publish or perish!



domain science



software engineering





It's too much.



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Empirical Study of Tool Support in Highly Distributed Research Projects

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Abstract—The EU subsidizes research projects in the ICT area with hundreds of millions of Euros per year with the aim of strengthening Europe's global competitiveness. A key requirement of EU projects is the involvement of partners from at least three different countries. This leads to highly distributed software environments where company, country, and culture boundaries run in the midst of tasks like requirements engineering, architectural design, implementation or testing. We present results from an empirical study involving more than 50 transnational, multi-million Euro projects of the Sixth Framework Programme. The results show which tools are accepted by developers and used in practice in the respective phases of the software process. Finally, we shape the idea of Research Software Engineering.

I. INTRODUCTION

Based on the treaty establishing the European Union (EU), Framework Programmes serve two main strategic objectives¹: (i.) to strengthen the scientific and technological bases of industry and (ii.) to encourage international competitiveness while promoting research activities in support of EU policies. One such framework is the Sixth Framework Programme (FP6), running from 2002 until 2010 with a total co-funding (EU pays about 75%) of 18 billion Euros. About 1000 projects with a total cost of about 5.5 billion Euros are co-funded in

interesting to software engineering with an average cost of more than 5M Euros per project. Of course, compared to industry and open source projects, research projects are a bit different. EU projects share with industrial projects monetary factors but there is less pressure for software cost and quality. This is especially true for academic partners; to them software quality and cost reduction is secondary. Instead they aim for publications at high-reputation venues [12]. The projects' experimental character makes success and failure difficult to measure. Success is largely based on a review conducted once per year where the European Commission (EC) — as the executive branch of the EU — assesses if project progress seems reasonable and on schedule. Furthermore, there are no global competitors as EU projects are mostly restricted to European countries. Hence competition is not as fierce as in the free market. Therefore outsourcing and software process improvement are not equally necessary. EU projects share with open source projects a high degree of distributed development and volunteering to assume tasks. Yet developers might not be similarly motivated to develop good software [8].

Although EU projects involve academic research partners and have to generate scientific publications, they still tackle

an empirical study involving more than 50 internationally funded million Euro projects of the Sixth Framework Programme. The results show which tools are accepted by developers and used in practice in the respective phases of the software process. **Finally, we shape the idea of Research Software Engineering.**

I. INTRODUCTION

As a consequence of our experiences and the survey, we want to shape the idea of *Research Software Engineering*, not for a single-person-proof-of-concept-prototype-project-at-a-University but for highly distributed collaborative projects like EU projects. We want to find out how tools and workflows have to be adopted for that purpose. A major issue within this

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2010

First use of
term RSE



The film "The Lion King" and all other works in this presentation are copyright by the Walt Disney Company.

Image by Marie Brizard and Simon Hettrick

It was a beautiful sunny day in March 2012...

...a small group met at Queen's College Oxford...



CW12, Collaborations Workshop 2012

Why is there no career for software
developers in academia?



Daniel Emmerson (EPSRC, Capability)

to coll...@googlegroups.com

----- Original Message -----

From: Dan Emmerson [mailto:emmers...@gmail.com]

Sent: Thursday, March 22, 2012 03:08 PM

To: Daniel Emmerson (EPSRC, Capability)

Subject:

Developing the profession of a scientific software engineer and the career track of software developers in academia (James Hetherington)

Name of Chair: James Hetherington

Name of Scribe: Dan Emmerson

What are the five most important things learnt during this discussion:

1. We need a label/ name for a new profession: "Research Software Engineer"
2. Creating an institution or professional Body –SSI could help, BCS "Chartered eng."
3. Certification needed: BCS "Chartered eng."
4. Education: each other and UGs
5. Recognition and progression where are you based after being project based. Industry – academic movement is helpful Industrial experience is valuable.

What are the problems, and are there solutions?

Recognition

Where can univs. hire from? Don't hire general programmers

Professional body helps

Training not rigorous in software methods. Better training.

What further work could be done, and who should do it?

Create a group body (at BCS) join it. Need a big group to approach them with. ACTION: SSI needs to co-ordinate this.

Are there any useful resources that people should know about?

No See above

Roles: "research officer" – considered support don't want to be servants

NOT permanent postdoc

Not a lab technician



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A close-up of Morpheus from the movie The Matrix, wearing his signature black sunglasses. The reflection in the lenses shows two figures in a dimly lit room. The image has an orange border on the left and right sides.

WHAT IF I TOLD YOU

YOU'RE A RESEARCH SOFTWARE ENGINEER

The Research Software Engineer

Rob Baxter¹, Neil Chue Hong¹; Dirk Gorissen²; James Hetherington³; Ilian Todorov⁴

¹ Software Sustainability Institute & University of Edinburgh; ² University of Southampton; ³ UCL; ⁴ STFC Daresbury Laboratory

Background

Research is increasingly digital. Twenty-first century research has been characterised by the rise of digital methods, the third and fourth paradigms of science – computational simulation and data-intensive research. In their turn, these new approaches are both built on a common foundation – computer software.

Yet despite this increasing reliance on software in research, professional practices for developing research software in academia lag far behind those in the commercial sector. Computational research tools are often fragile, generally not sustainable or usable beyond the lifetime of a given project, and frequently unsuitable for scrutiny. Those trained solely within academia often employ ad-hoc or casual development techniques. Institutions miss out on opportunities to increase the impact of their research by producing robust software deliverables that could be used and cited by their peers.

Computational work must reflect the committed attitude of experimentalists towards caring about precise, professional, repeatable, meticulous work – no-one with the same casual attitude to experimental instrumentation as many researchers have to code would be allowed anywhere near a lab. This is striking considering how often research results now depend on software.

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LET'S TALK ABOUT THAT



The First UK RSE Workshop!

What's New? session: 11.30-12.30

Topic	Number	Room	Proposer
Clusters, clouds or your laptop: How can you make effective use of heterogeneous computing resources to run scientific HPC codes?	14	room 278	Jeremy Cohen
How do you share code (best practice, managing code, licensing, open source at university) and promote it? (Dryad and Figshare and other tools, etc.)	40	coffee lounge	Cass Johnston
The GATE tool for text mining	2	(coffee break)	Cass Johnston
Legacy code: how do you transform 20 year old Fortran code into something useful?	Go to testing....		James Hetherington Cass Johnston James Hetherington
Using Jenkins in research (testing)	15	room 277	James Hetherington
Recomputation manifesto (Using virtualisation and the cloud for reproducible research) & Who's using IRODS... and how are they finding it?	8	Reception meeting room	Ian Gent

Discussion group session: 13.45-14.45

Topic	Number	Room	Presenter
How should the research community recognise the work of RSEs?	15	Seminar room 051	
Organised or completely random... does your institution have a centralised RSE group, or is it more chaotic?	4	Outside seminar room 051	
Routes into research software development - why did you choose to be an RSE?	10	Reception meeting room	
What's the best way to funding RSEs? What should we be telling the funding agencies?	18	room 278	
Do we need an RSE community and, if so, how should it work?	20	Coffee lounge	
How do you manage quality and standards in training - how do you make sure people are doing their work properly, and what are the core competencies and practices of an RSE?	15	Room 277	
What should we be telling PIs, and the research community in general, about the benefits of working with an RSE? How do we promote the role?	5	Outside 278	



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Cloud vs. HPC



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Collaboration



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Sustainability



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Community, culture, and the RSE role



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2013

First UK RSE
Workshop



Society of Research Software Engineering

[About](#)[Community](#)[Events](#)[Careers](#)[News](#)[Resources](#)[COVID-19](#)[Join Us](#)[Member Log In](#)

Our Strategy

View the RSE Society Strategy for 2020/2021

[Learn More](#)

Join the Society of Research Software Engineering

The Society of Research Software Engineering was founded on the belief that a world which relies on software must recognise the people who develop it. Our mission is to establish a research environment that recognises the vital role of software in research. We work to increase software skills across everyone in research, to promote collaboration between researchers and software experts, and to support the creation of an academic career path for Research Software Engineers.

[Join Us](#)

<https://society-rse.org/>

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2014

UK RSE
Society
established

What comes after a society?

ONE DOES NOT SIMPLY

START AN RSE GROUP

James Hetherington

Founding leader of UCL Research Computing's
Research Software Development Team.



James Hetherington

Founding leader of UCL Research Computing's
Research Software Development Team.



Robert Haines

Head of Research IT, The University of Manchester

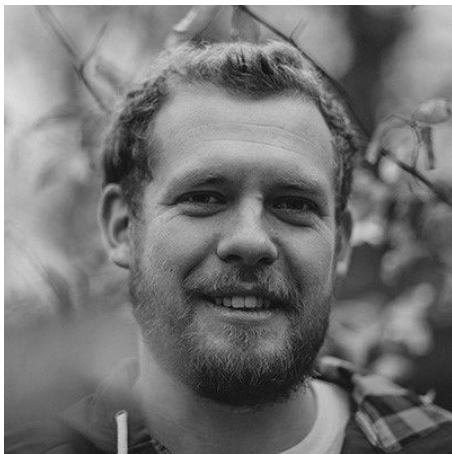


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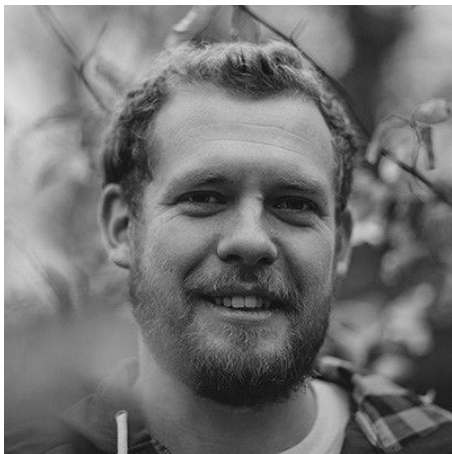


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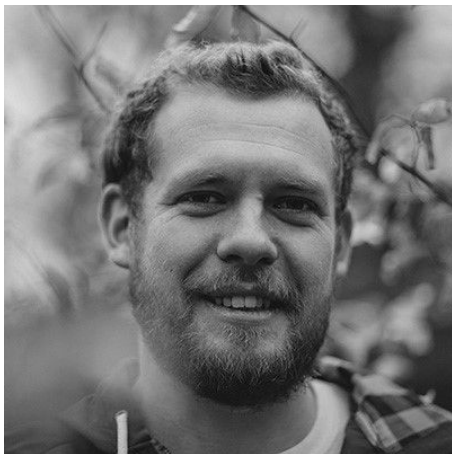


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University
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2015

University
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+3 more
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RSE Leaders Meetings

Upcoming meeting:

Past Meetings:

June 2020 - Virtual - Host: James Grant, Bath

December 2019 - Edinburgh - Host: Andy Turner

March 2019 - Newcastle

November 2018 - Cardiff

July 2018 - Birmingham

July 2017 - Sheffield

January 2017 - Oxford

July 2016 - Bristol

January 2016 - UCL

August 2015 - Southampton





2015



2015



2015



2015

2010



2012



2013



2014



What about the rest of the world?



15-16 September

First conference of Research Software Engineers



[Home](#) [Programme](#) [Venue](#) [Hotels](#) [Diversity](#) [Registration](#) [Promotion](#) [Sponsorship](#) [Contacts](#)

Information for conference attendees

If you are attending the conference and are taking part in the practical workshops (A1-A4, B1-B4, C1-C4 - [see here for the workshops you are attending](#)), you will need to **bring a laptop** that has VirtualBox installed. For more information about requirements, please [click here](#).

The RSE Conference (15-16 September) is the first conference to focus exclusively on the issues that affect people who write and use software in research. It is not a standard academic conference! We welcome researchers, but we also want to hear from people who may not typically attend conferences. It's a community conference: get involved and help us build the RSE Community.

The conference will be held at the **Museum of Science and Industry, in Manchester, UK**. More information about this venue and how to get there is [available on this page](#).



2015



2015



2015



2015



2016

2010



2012



2013



2014



+3 more
Groups

2015

RSE Leaders
Network

2015

RSE
Conference

2016

2013

First UK RSE
Workshop

2014

UK RSE
Society
established

+3 more
Groups

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de-RSE
established

2017

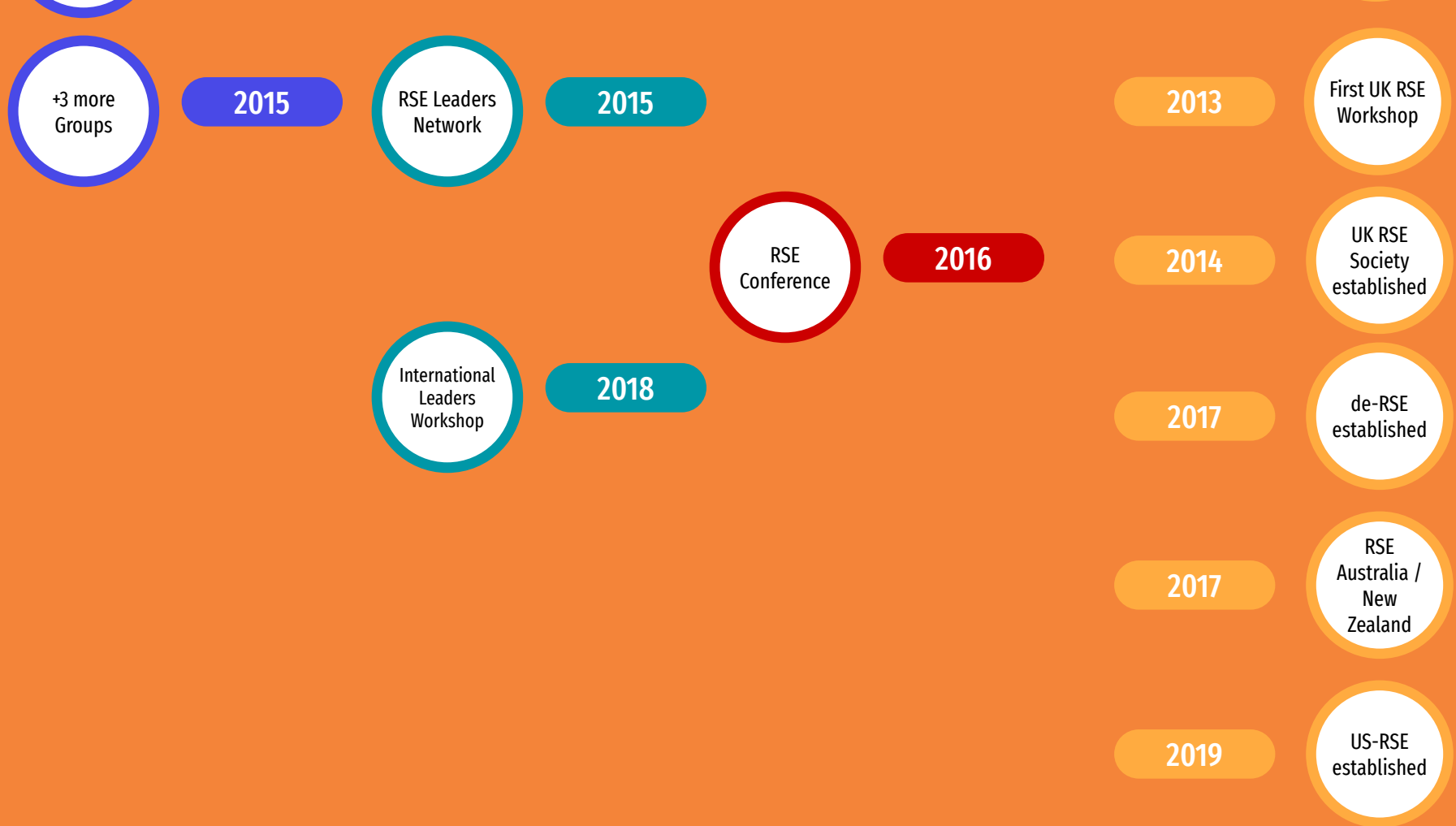
RSE
Australia /
New
Zealand

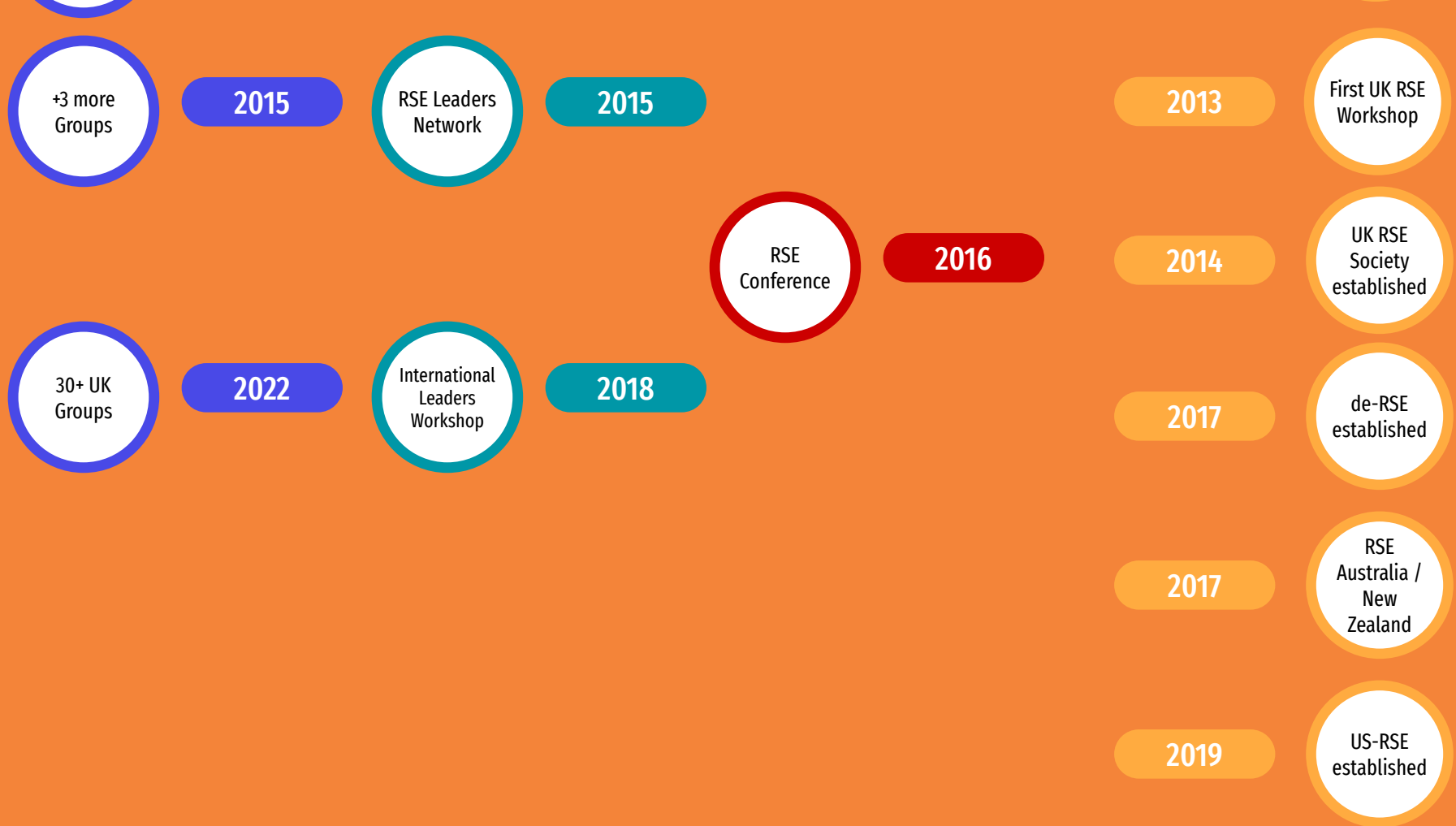


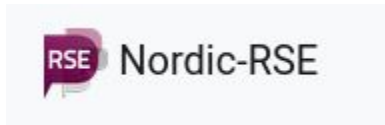
30th-31st January 2018 at the Alan Turing Institute, London

Bringing together leaders of Research Software Engineering groups and communities around the world to help each other improve access to research by pooling knowledge, coordinating efforts and establishing collaboration.










Software
Sustainability
Institute



The RSE Movement



research
software
engineering

2010

The RSE Movement



2010



2012

The RSE Movement



2010



2012



2016



The RSE Movement



What is a research software engineer?

BUT YOU HAVEN'T TOLD ME

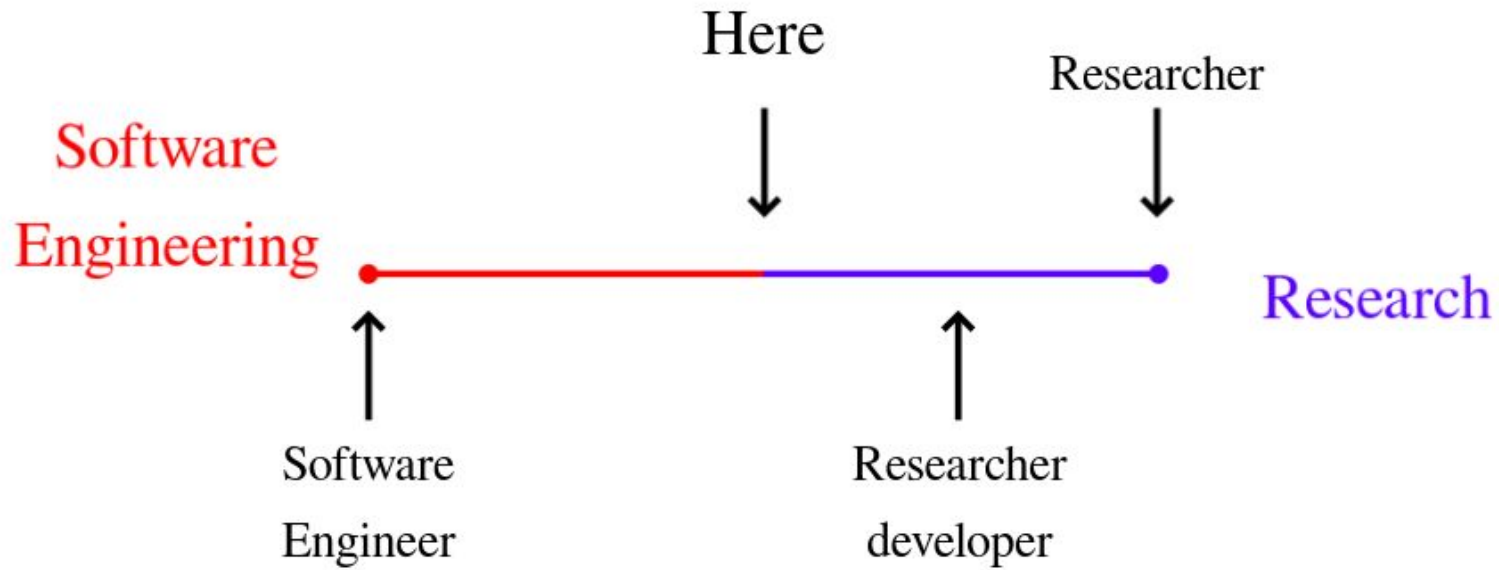


BUT YOU HAVEN'T TOLD ME



WHAT IS AN RSE?

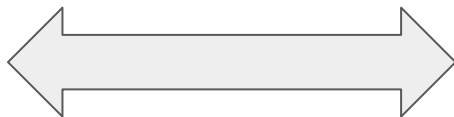
imgflip.com



An RSE is...



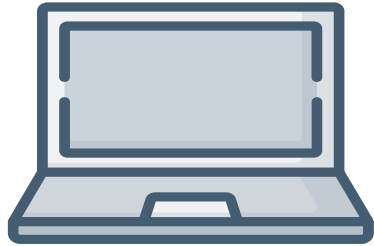
programmer



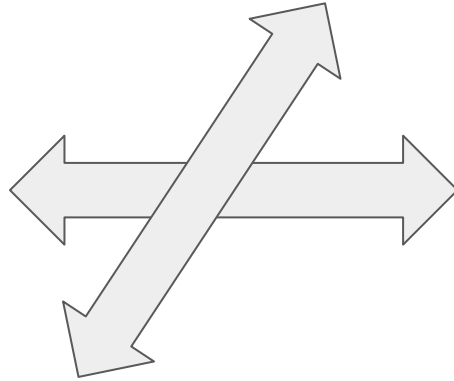
researcher

An RSE is...

system admins



programmer



researcher

web developers

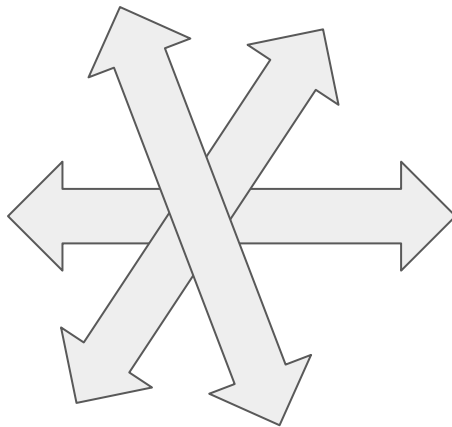
An RSE is...

biologists and farmers

system admins



programmer

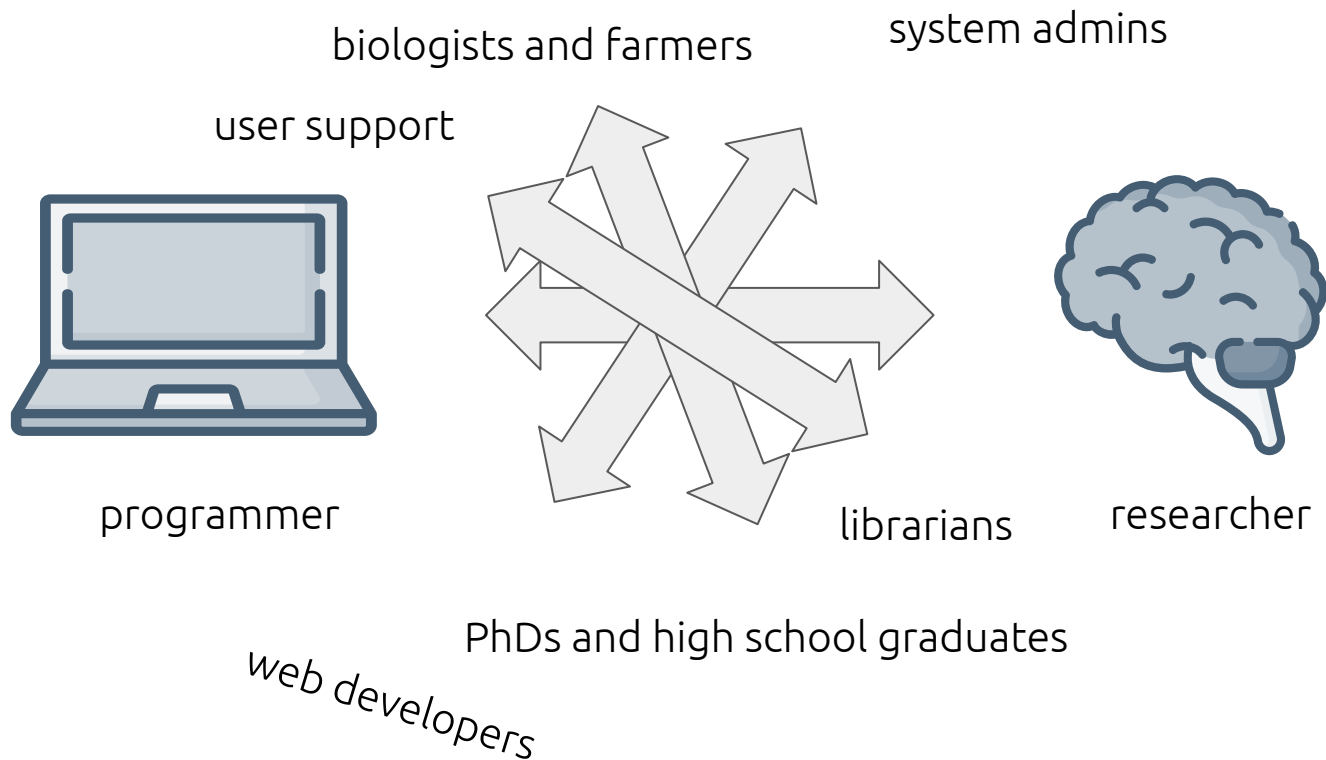


researcher

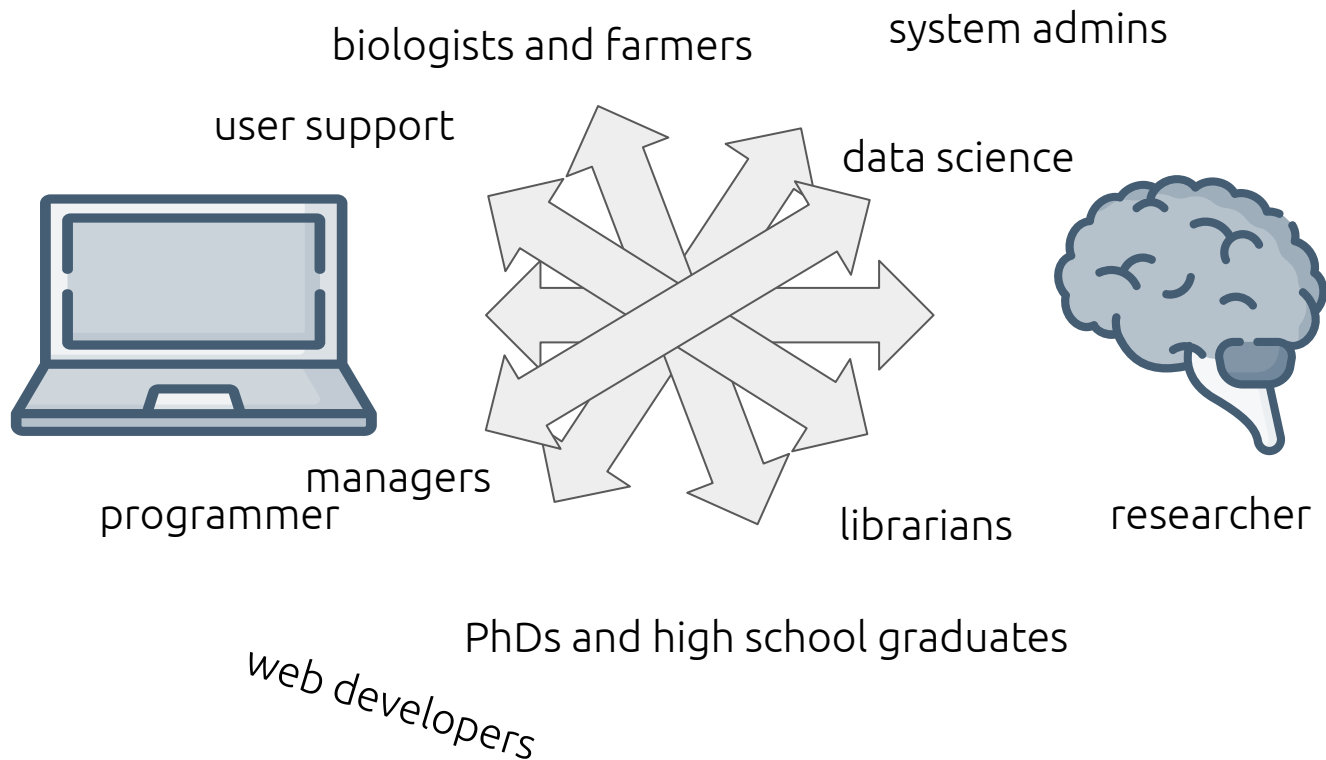
PhDs and high school graduates

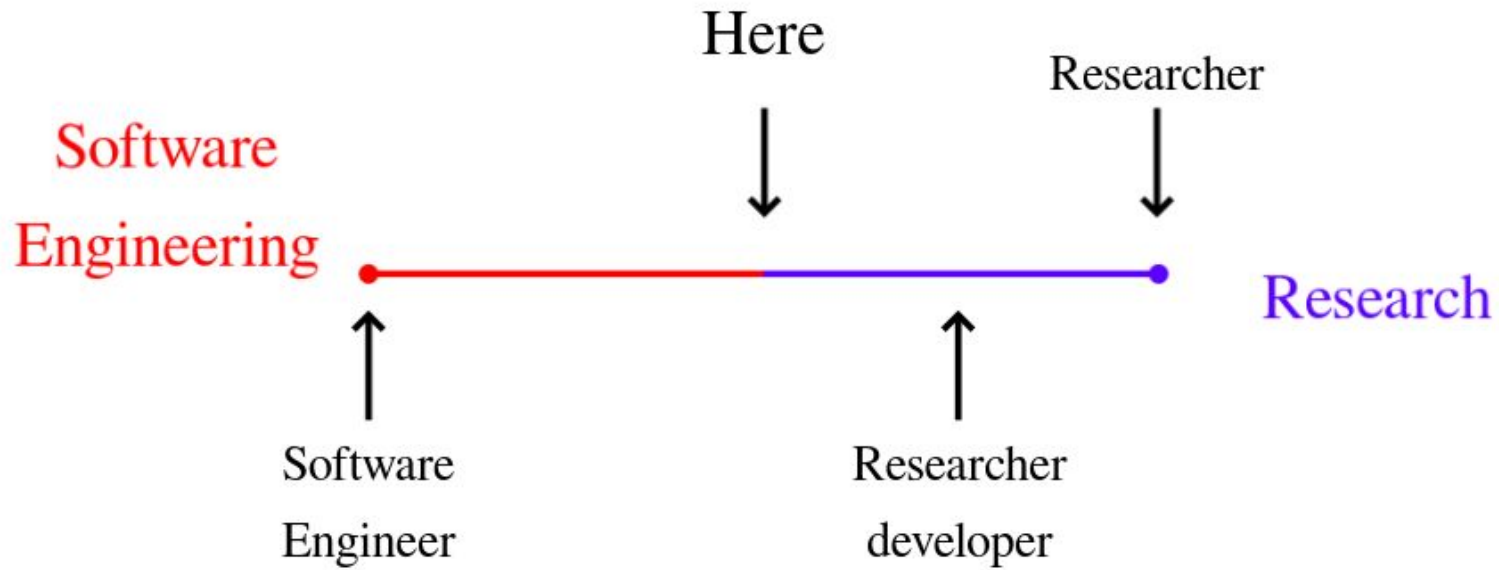
web developers

An RSE is...



An RSE is...





How do we hear RSE Stories?



<https://www.youtube.com/watch?v=trAfA9VWLTQ&t=10s>

“The Story of the Research Software Engineer”

Research Software Engineer Stories

Welcome to RSE Stories! Here we share stories from research software engineers to better understand the many phenotypes and facets that can define an RSE. As initiatives to empower RSEs take off in both the United States and the UK, whether you are a scientist, a programmer, or something else, your story is interesting and unique, and we want to hear about it!

EPISODES

ITUNES

GOOGLE PODCASTS

SPOTIFY



For the Love of Learning

Tim Haines is a quintessential passionate learner, and will tell you all about astrophysics, compilers,...

Posted by @vs0ch on December 02, 2021 · 1 min read



Tweets by @us_rse

**US Research Software Engineers**

@us_rse

We've reached our fundraiser goal!!!

Thanks to everyone, especially
[@NCSASoftware!](#)

There's still 10 days left to order your very
own US-RSE shirt/hoodie.
customink.com/fundraising/us...

US-RSE 2021 Winter T-Shirt Bonanza

Organized by @us_rse

Research Software Engineer Stories: Hello World!

For the first episode of RSE Stories, we interview Ian Cosden from Princeton.

Posted by @vsoch · 1 min read

26 September 2019

In this first episode, we interview [Ian Cosden](#), a manager of one of the first Research Software Engineering groups at Princeton, and a leader in establishing a model to support RSEs.

▶ 0:00 / 19:47





Code for Thought

RSE

Welcome to Code for Thought, the podcast on software, engineering, research and anything in between. Find out more about our work, the technologies we use (and why) and meet us at workshops and conferences.



More

EPISODES



Keeping It Together

DECEMBER 07, 2021



Making Machine Learning Reproducible

NOVEMBER 23, 2021

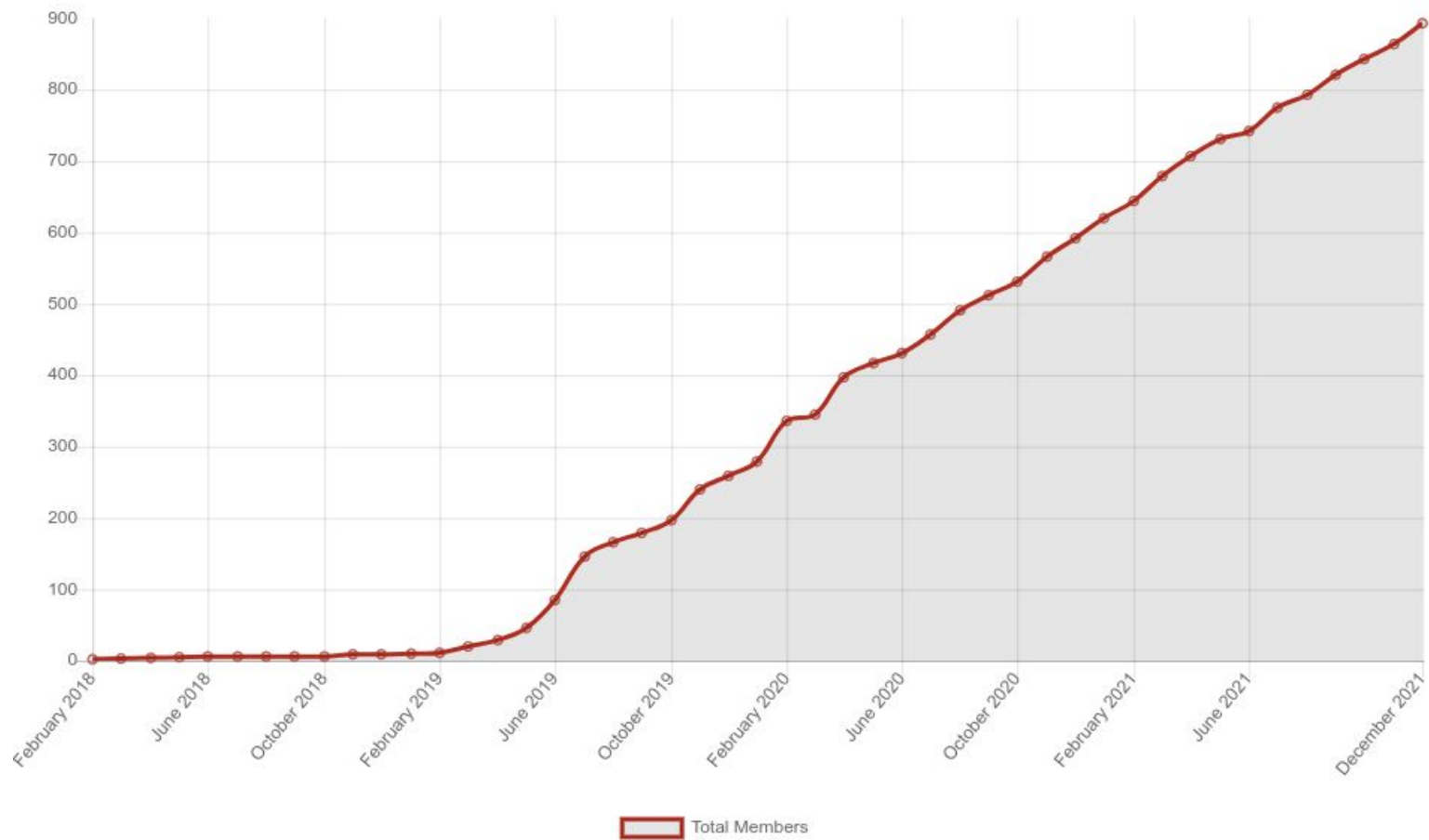


Learning to Code at the Research Software Camp

NOVEMBER 12, 2021



Membership in the US Research Software Engineer Association



What do RSEs do?

Skills Used by RSEs

The following is a list of skills that an RSE might possess. The US-RSE Education and Training Group maintains and publishes this list in an effort to provide resources to better define RSE roles and to help direct individuals looking to invest in learning new skills. An RSE typically has experience with a subset of these skills. This list can be used to create a profile or job description, help individual identify topics they wish to learn, and (eventually) provide links to relevant training resources. This list is a work in progress. If you have additions or suggestions for topics or existing training resources, please either create a pull request or contact the [US-RSE Training and Education Working Group](#).

The list was originally developed as part of the 2nd International RSE Leaders Workshop held in 2020. It is based off of the analysis of several job postings as well as crowd sourced.

This list has the following categories:

- [Software Development](#)
- [User Interface](#)
- [Areas of CS](#)
- [Domain-Specific Topics](#)
- [Around Software](#)
- [Data Management Systems/Information Storage Systems](#)
- [Data](#)
- [People-Related](#)
- [Research Output](#)
- [Community](#)
- [Other](#)

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- [People-Related](#)
- [Research Output](#)
- [Community](#)
- [Other](#)

120 topics

A close-up photograph of a Siamese cat's face. The cat has light-colored fur with darker points on its ears and face, and striking blue eyes. It has a slightly downturned mouth and long, white whiskers. The background is a soft, out-of-focus bokeh of green and yellow light. The text "SIGH...." is overlaid in a bold, white, sans-serif font with a black outline at the top of the image.

SIGH....

TOO MANY THINGS TO DO....

makeameme.org

What are different types of RSEs?

What are different types of RSEs?

Service Oriented:

- Sitting within a lab or group, or provided as a service for researchers from a central department.

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What are different types of RSEs?

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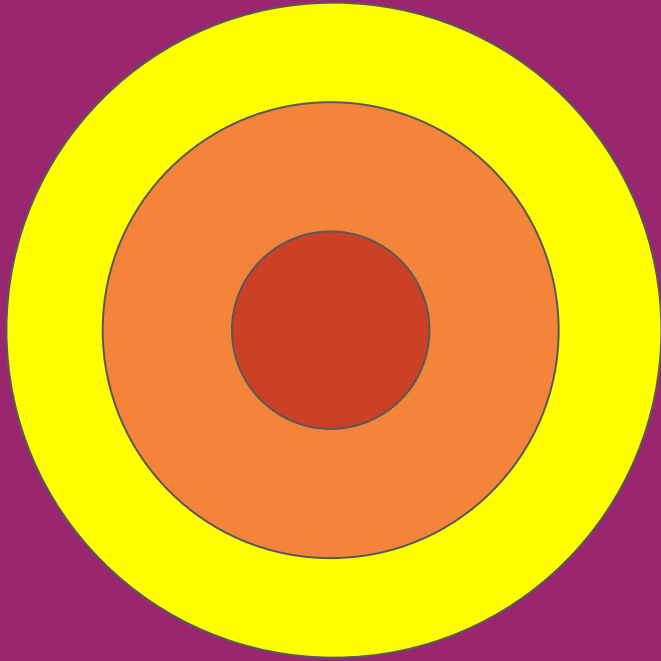
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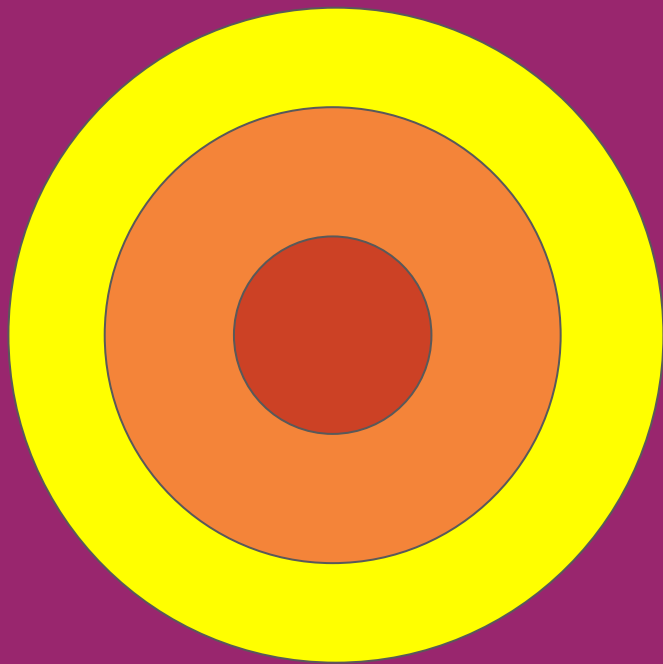
Research Oriented:

- Working on fundamental models or introspection around software.

The flavors of Research Software Engineer



The flavors of Research Software Engineer



Application Development
High Performance Computing
Data Science, Engineering, or Management
User Experience
Release or Test Engineer
Algorithm or Method Development
Management
Systems



The RSE Movement



What is a research software engineer?



What problems still remain?

Vanessa Sochat PhD

Computer Scientist / Research Software Engineer

Lawrence Livermore National Lab

Vanessa Sochat PhD

Computer Scientist

Lawrence Livermore National Lab

**Research Assistant
Research Technician II
Information Specialist I
Computer Scientist**

Vanessa Sochat PhD

Computer Scientist

Lawrence Livermore National Lab

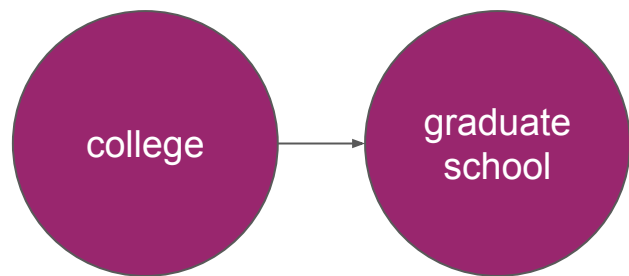
Analyst Developer Analyst Programmer Analyst Programmer - SITS (x 3) Analyst Programmer Applications Developer Applied Scientist Architectural Robotics Developer Assistant Data Programmer Assistant Project Manager Atmospheric Correction and Radiative Transfer Model Scientist Audio Software Developer - KTP Associate Bioinformatician Bioinformatician In Potato Genomics and Genetics Bioinformatician/Computational Bioscientist in Microbiology Bioinformaticians Bioinformaticians Analyst Bioinformaticians Postdoctoral Researcher Bioinformatics scientist Biometric Software Systems Developer Biorepository Software Developer C++ / 3D Graphics Software Engineer Casebooks Project Editor (Research Assistant/Associate) Climate Researcher (Research Associate) Clinical Study Programmer CoMPLEX Research Associate Computational Biologist / Bioinformatician Computational Scientist Computational Scientist in Computational Fluid Dynamics & Industrial Applications Computational Scientist in Structural Mechanics and Industrial Applications Computer Scientist Computer Vision Researcher Content Developer/Programmer Control Engineer-IMG - 3 posts CREATe Data Specialist Data Analyst Data Integration Coordinator Data Manager x3 Database and Software Engineer Database Manager/Researcher Database Programmer Digital Media Technician E-Learning Portal Manager (KTP Associate) e-Learning Systems Development Analyst e-Learning Systems Development Analyst (Moodle, SQL) E-Learning Web Developer E-Portfolio Learning Technologist Embedded Systems Engineer Engineering Technician Environmental Scientist EPSRC Studentship on Algorithmic Construction of Finsler-Lyapunov Functions Experimental Officer in Bioinformatics Experimental Psychologist Finance Assistant Gaia Alerts Software Developer Gaia Software Developer (Gaia UK Team) GIS Applications Specialist Graduate Programmer / Software Developer Graphics Programmer Health Data Manager / Scientist High Throughput Bioinformatician High Throughput Sequencing Bioinformatician (Two posts) HIVE Manager/ HIVE Co-ordinator HIVE Senior Researcher and Technical Lead Hydro-informatics Scientific Software Developer Image Analysis Manager for Cancer Imaging Information Systems Developer Instrumentation Engineer Investigator Statistician IT Developer IT Services Manager IT Services Specialist (e-Learning Systems) IT Support Technician (Unix / Windows Systems) Knowledge Transfer Partnership (KTP Associate: Invenio Technologies LTD Knowledge Transfer Partnerships (KTP) Associate - Software Developer KTP Associate - Robot Vision Scientist (Research Fellow) KTP Associate (Fixed-term) KTP Associate (24 months) KTP Associate (Precision Agriculture Data Analyst) KTP Associate â€” Graduate Web Developer Knowledge Transfer Partnership (KTP Associate: Invenio Technologies LTD Knowledge Transfer Partnerships (KTP) Associate - Software Developer Linguist / Psycholinguist Maker Space Technician Marie Curie Early Stage Researcher Marie Curie Early Stage Researcher in Radar Rainfall for Integrated Water Quality Modelling Marine Earth Observation Scientists Medical Statistician Medical Statistician/Senior Medical Statistician Metrology Engineer Mobile Application Developer NASC IT Support - Programmer and Systems Administrator (Fixed-term) NIHR Research Methods Fellow PDRA on EU Project on Automated Multisensor Surveillance Planning Officer Policy Modeler 2014 Post-Doctoral Research Assistant INSTRON Post Doctoral Research Worker Post Doctoral Researcher in the application of Digital Technology Post-Doctoral Research Assistant Simulation and Visualization Post-Doctoral Research Associate Post-Doctoral Research Associate (Pathogen Genomics) Post-Doctoral Research Assistant Post-Doctoral Fellow - population genetics / evolutionary genetic Postdoctoral Fellow in Bioinformatics Postdoctoral Fellow in Cancer Therapeutics Postdoctoral Research Assistant Postdoctoral Research Associate Postdoctoral Research Fellow Postdoctoral Research Scientist Postdoctoral Researcher in Declarative (Logic and Functional) Programming Postdoctoral Researcher Postdoctoral Scientist Postdoctoral statistician Postdoctoral Training Fellow - Statistical and Computational Genetics of Autism Principal / Senior Bioinformatician Principal Bioinformatician Product Development Engineer (Rail) Publishing Portal Web Developer Radio Frequency Engineer Reader in Computer Science Reporting Analyst Research (Software) Engineer Research Assistant Research Associate Research Fellow Research Image Data Manager, Biomedical Engineering Research Officer Research Officer â€” Social Protection Research postgraduate Research Programmer Research Scientist Research Scientist / Senior Research Scientist Research Scientist in Machine Learning and Computer Vision Research Software Developer Research Software Developer for the Herchel Smith Professor of Organic Chemistry Research Software Engineer Research Studentship Research Worker Researcher SAP Trainee Technical Analyst Scientific Officer with Michela Garofalo Scientist SEAHA Studentship: Extracting epidemiological data from collections SEEG Data Archive Manager Senior / Research Associate in Clinical Integration and Image Analysis for Fetal Surgery Senior Analyst Programmer (Business Analysis) Senior Analyst/Programmer Senior Bioinformatician Senior Bioinformatician / Bioinformatician Senior Computational Statistician - Spatial Models Senior Data Acquisition Scientist / Data Acquisition Scientist Senior Data Manager Senior Database Administrator Senior IT Developer Analyst Senior Mathematical Modeller Senior Media Developer Senior Postdoctoral Researcher - Evolutionary and Computational Analysis of Infectious Disease (Phylogenetics) Senior Research Assistant Senior Research Associate Senior Research Associate â€” Molecular Modelling & Simulation Senior Research Associate in Quantitative Clinical MRI Senior Research Fellow Senior Research Fellow/Research Fellow in Vibration Diagnostics and Prognostics/Digital Signal Processing Senior Research Laboratory Technician Senior Research Technician Senior Software Developer in Bioinformatics Senior Software Engineer / Software Engineer Senior Statistical Epidemiologist Senior Systems Administrator Senior Technician / Demonstrator (UCMK) Senior Web Developer SharePoint Developer Software Developer Software Developer (Bioinformatics) Software Developer (KTP Associate) Software Developer x 2 Software Developer/Programmer Software Developers in e-Learning Software Engineer Software/ Database Developer (KTP Associate) Sports Programme Manager Statistical Geneticist Statistical Programmer/Data Scientist Statistician Statistician/Epidemiologist Student and Enrolment Services Manager SWCAR Information Assistant System Administrator Systems Developer Systems, Data and Applications Team Leader Teaching Fellow in Computational Methods UTRCI Research Scientist, Control Systems Web Application Programmer Web Developer

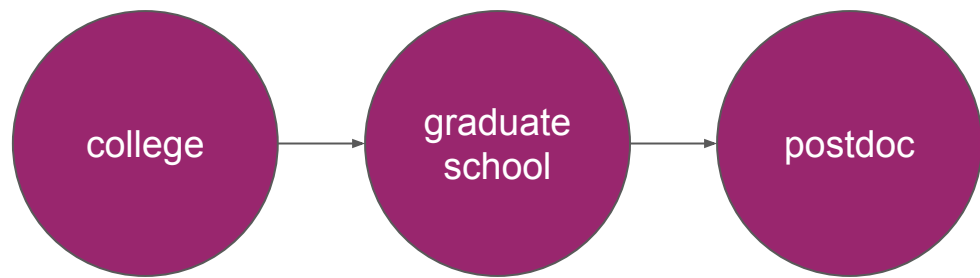
194 different job titles

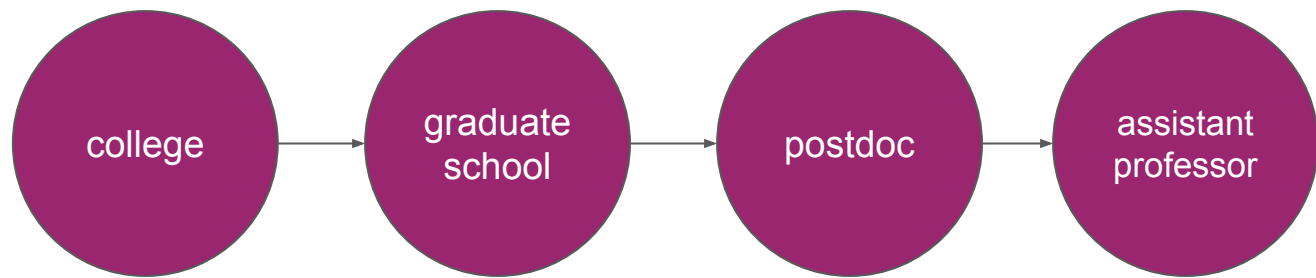
There isn't recognition or formal structure

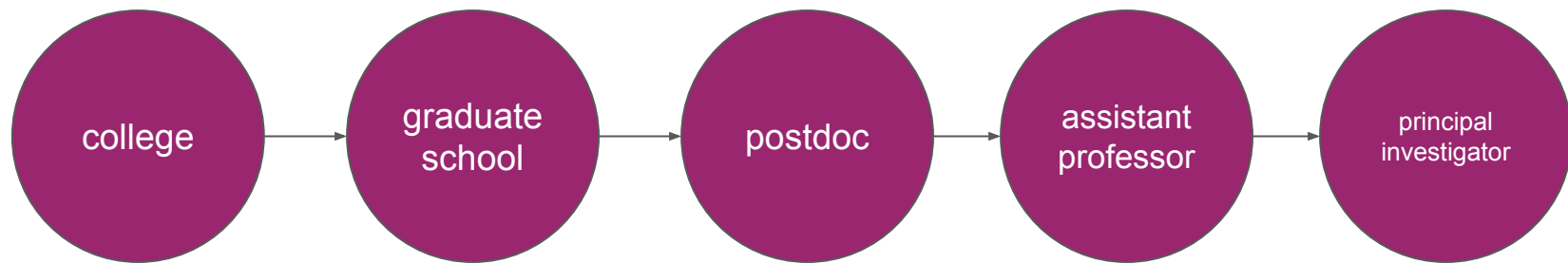


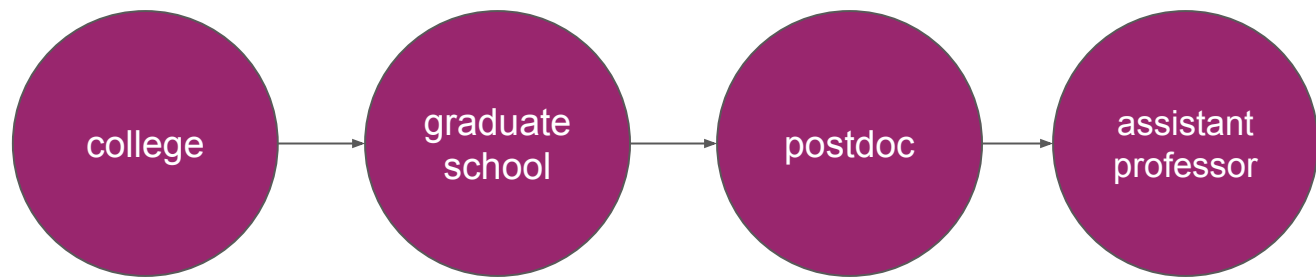
college

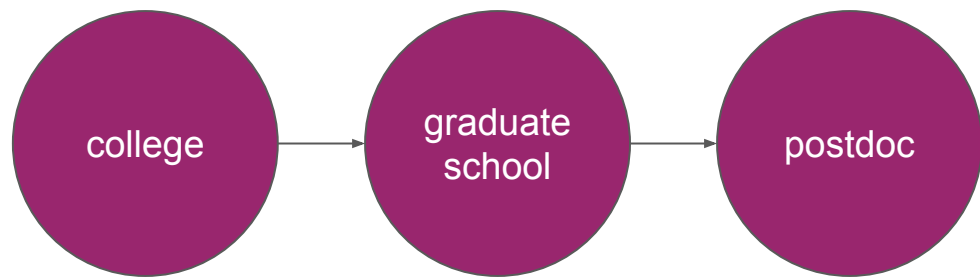


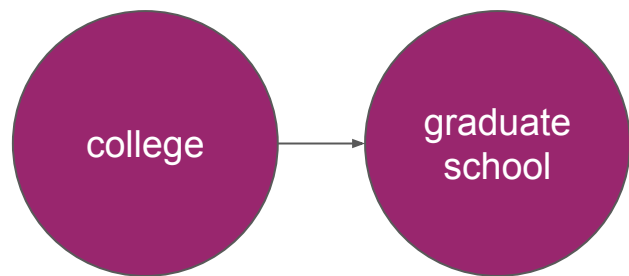


















There isn't training or a stable career path.



The RSE Movement



What is a research software engineer?



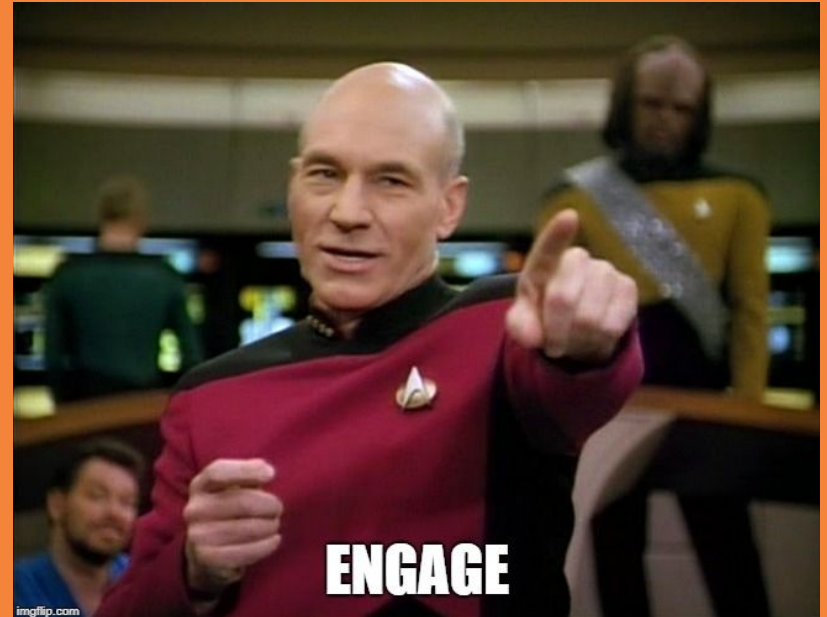
What problems still remain?



How can you help?

What are easy ways that you can help? 🙌

Engage with your local research software engineer community



deRSE conferences

We organize the international **deRSE** conferences, by and for Research Software Engineers.

2021

Event	Date	Place	URL	Remarks
SeptembrSE	2021-09-06 - 2021-09-30	online	https://septembrse.society-rse.org/	Funding available from de-RSE

| [Event](#) | [Date](#) | [Place](#) | [URL](#) | [Remarks](#) |

2020

Event	Date	Place	URL	Remarks
SORSE	09/2020-12/2020	online	https://sorse.github.io/	A Series of Online Research Software Events
deRSE20 - <i>cancelled</i>	25.-27.8.2020	Jena	www.de-rse.org/deRSE20/	

2019

Event	Date	Place	URL	Remarks
FOSDEM 2019	2.-3.2.2019	Brussels	fosdem.org/2019/	
MPG Open Science Days (Research Software)	5.-6.2.2019	Berlin	osd.mpg.de	
RDA Deutschland Tagung 2019	19.-20.2.2019	Potsdam	rda-deutschland.de/events/tagung-2019	
DHd 2019	25-29.3.2019	Frankfurt(Main), Mainz	DHd 2019	
E-Science-Tage 2019	27-29.3.2019	Heidelberg	e-science-tage.de	
Collaborations Workshop 2019	1.-3.4.2019	Loughborough	www.software.ac.uk/cw19	
deRSE19	4.-6.6.2019	Potsdam	www.de-rse.org/de/conf2019/	
FrOSCon	10.-11.8.2019	Sankt Augustin	froscon.de	
Fourth RSE conference	17-19 September 2019	University of Birmingham	rse.ac.uk/conf2019/	

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RDA Deutschland Tagung 2019	19.-20.2.2019	Potsdam	rda-deutschland.de/events/tagung-2019	
DHd 2019	25-29.3.2019	Frankfurt(Main), Mainz	DHd 2019	
E-Science-Tage 2019	27-29.3.2019	Heidelberg	e-science-tage.de	
Collaborations Workshop 2019	1.-3.4.2019	Loughborough	www.software.ac.uk/cw19	
deRSE19	4.-6.6.2019	Potsdam	www.de-rse.org/de/conf2019/	
FrOSCon	10.-11.8.2019	Sankt Augustin	froscon.de	
Fourth RSE conference	17-19 September 2019	University of Birmingham	rse.ac.uk/conf2019/	





RSE Opportunities

Current RSE openings

1. [HPC Gateway Engineer](#): Tufts University (Remote) *Posted: Dec 17, 2021*
2. [Senior Full Stack Web Developer - Scientific Applications](#): Kitware, Clifton Park, NY; Carrboro, NC; Possible Remote *Posted: Dec 17, 2021*
3. [Research Software Engineer](#): Princeton University, Princeton, NJ *Posted: Dec 15, 2021*
4. [Research Programmer / Analyst](#): Pittsburgh, PA (Hybrid/Remote) *Posted: Dec 10, 2021*
5. [Software and User Interface Engineer](#): Lawrence Berkeley National Laboratory, Berkeley, CA *Posted: Dec 10, 2021*
6. [Data Analyst I](#): Allen Institute, Seattle, WA *Posted: Dec 10, 2021*
7. [Research Software Engineer](#): Vanderbilt University, Nashville, TN (Hybrid/Remote) *Posted: Dec 08, 2021*
8. [Digital Library Software Engineer](#): Arizona State University, Tempe, AZ *Posted: Dec 08, 2021*
9. [Research Software Engineer \(Entry Level\)](#): RAND: Santa Monica, CA; Pittsburgh, PA; Boston, MA; Washington D.C. *Posted: Dec 07, 2021*
10. [Senior Research Software Engineer](#): Genentech, South San Francisco *Posted: Dec 03, 2021*
11. [Research Software Engineer](#): Breakthrough Energy, Seattle, Washington, District of Columbia, United States, San Francisco Bay Area *Posted: Nov 18, 2021*
12. [Applications Developer, User Interface](#): Caltech, Pasadena, CA *Posted: Nov 16, 2021*
13. [Applications Developer, Data Systems](#): Caltech, Pasadena, CA *Posted: Nov 16, 2021*
14. [Assistant Director, Penn State's Applications of Artificial Intelligence and Machine Learning to Industry \(AIMI\) Center - Institute for Computational and Data Sciences \(ICDS\)](#): State College, Pennsylvania *Posted: Nov 10, 2021*
15. [Data Analyst Lead - Center for Education Efficacy, Excellence, and Equity \(E4\)](#): Northwestern University, Evanston, IL *Posted: Nov 09, 2021*
16. [ICDS Technical Director - Institute for Computational and Data Sciences \(ICDS\)](#): State College, Pennsylvania *Posted: Nov 09, 2021*
17. [System Engineering and Integration Lead - Institute for Computational and Data Sciences \(ICDS\)](#): State College, Pennsylvania *Posted: Nov 09, 2021*
18. [Operations Team Lead - Institute for Computational and Data Sciences \(ICDS\)](#): State College, Pennsylvania *Posted: Nov 09, 2021*

RSE Survey 2021

Nov 26, 2021

Complete the international RSE survey and help us understand the RSE community

Keeping up with the phenomenal growth of the RSE community is far from easy, so we run a survey every two to three years across all the [national RSE associations](#) and publish the results as an open, anonymised [dataset](#). The survey provides insight into the community and how best to support it, so it is of incredible value to RSEs, policymakers and funders. Please help us update our data by completing this year's survey:

You can complete the 2021 RSE survey in [English](#), [French](#), [German](#) or [Spanish](#).

You don't need to be called an RSE to complete the survey. Your formal job title does not matter: we want to hear from you if you develop software for academic research as part of your work. The survey provides considerable detail about the RSE role: a person's route into the role, the type of work they conduct, their working practices, job satisfaction and demographics. This means it takes around 20 minutes to complete. We appreciate that this is a significant amount of your time to donate - and we thank you for it!

The last survey took place in 2018 and collected responses from 985 people from around the world. With all of the national associations reporting growth, and a number of new countries joining the community, we expect even more responses this year which will provide an unrivalled overview of the RSE community.

You can view the [results of the last survey](#), including a worldwide view of the data and breakdowns by country. Without the survey, we wouldn't know that 19% of RSEs have a background in physics and astronomy, but almost 40% now work in biological sciences, that RSEs have 9 years of experience of software development on average, or that half of RSEs came into their current role from another position in a university (with 22% coming into the role from a job in industry). We also wouldn't know important facts about the demographics of our community, such as the fact that 83% of RSEs identify as male. This information helps us understand whether our endeavours to improve the diversity of the community are succeeding.

We would like to thank everyone who helped construct the survey: Radovan Bast, Alex Botzki, Jeff Carver, Ian Corden, Eleonora D'Andrea, Abhishek Dasgupta, Alejandra Gonzalez-Baltran, Ulf Hamster, Scott Henwood

International RSE Associations

- Australia/New Zealand: [@rse_aunz](#)
- Belgium: [be-rse.org](#), [@rse_be](#)
- Germany: [de-rse.org](#), [@RSE_de](#)
- Netherlands: [nl-rse.org](#), [@nl_rse](#)
- Nordic: [nordic-rse.org](#), [@nordic_rse](#)
- UK: [society-rse.org](#), [@ResearchSoftEng](#)
- USA: [us-rse.org](#), [@us_rse](#)

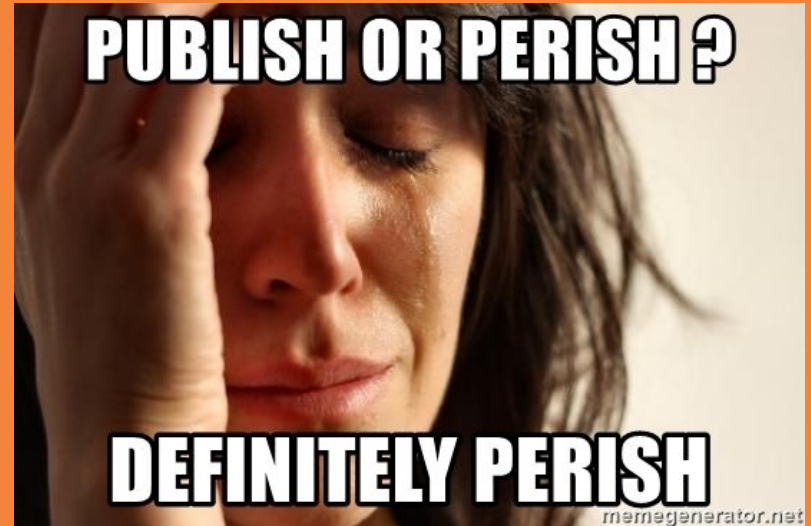
What are easy ways that you can help? 🙌

Engage with your local research software engineer community
Find RSEs at your institution, and talk to them.



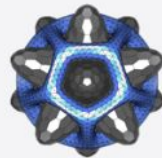
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Engage with your local research software engineer community
Find RSEs at your institution, and talk to them.
Give credit to your research software engineers!



What are easy ways that you can help? 🙌

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Find RSEs at your institution, and talk to them.
Give credit to your research software engineers!
Encourage them to publish just the software.



**The Journal of
Open Source Software**

What are more involved ways that you can help? 💪



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Talk to people with influence.



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Talk to people with influence.
Write software needs and RSEs into your proposals.



What are more involved ways that you can help? 💪

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Write software needs and RSEs into your proposals.

What would it take to start a group?



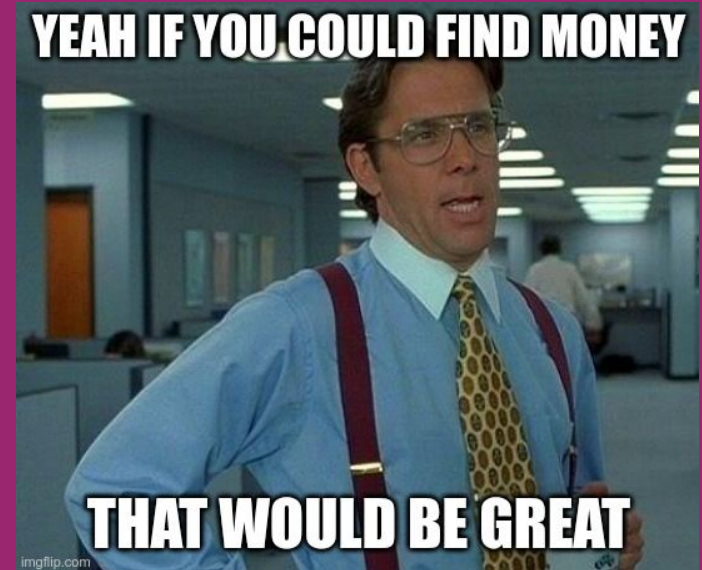
What are more involved ways that you can help? 💪

Talk to people with influence.

Write software needs and RSEs into your proposals.

What would it take to start a group?

Work with your department to hire a research software engineer.



What happens if I don't? 🤯



Papers rejected

A Scientist's Nightmare: Software Problem Leads to Five Retractions

Until recently, Geoffrey Chang's career was on a trajectory most young scientists only dream about. In 1999, at the age of 28, the protein crystallographer landed a faculty position at the prestigious Scripps Research Institute in San Diego, California. The next year, in a ceremony at the White House, Chang received a Presidential Early Career Award for Scientists and Engineers, the country's highest honor for young researchers. His lab generated a stream of high-profile papers detailing the molecular structures of important proteins embedded in cell membranes.

Then the dream turned into a nightmare. In September, Swiss researchers published a paper in *Nature* that cast serious doubt on a protein structure Chang's group had described in a 2001 *Science* paper. When he investigated, Chang was horrified to discover that a homemade data-analysis program had flipped two columns of data, inverting the electron-density map from which his team had derived the final protein structure. Unfortunately, his group had used the program to analyze data for

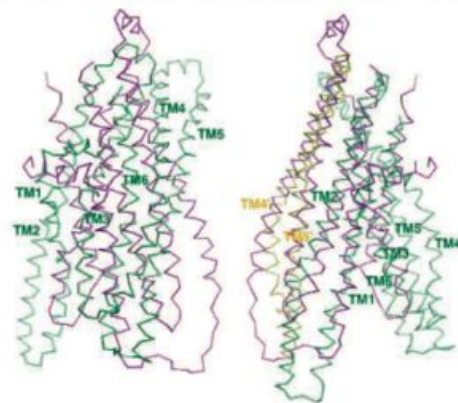
2001 *Science* paper, which described the structure of a protein called MsbA, isolated from the bacterium *Escherichia coli*. MsbA belongs to a huge and ancient family of molecules that use energy from adenosine triphosphate to transport molecules across cell membranes. These so-called ABC transporters perform many

Sciences and a 2005 *Science* paper, described EmrE, a different type of transporter protein.

Crystallizing and obtaining structures of five membrane proteins in just over 5 years was an incredible feat, says Chang's former postdoc adviser Douglas Rees of the California Institute of Technology in Pasadena. Such proteins are a challenge for crystallographers because they are large, unwieldy, and notoriously difficult to coax into the crystals needed for x-ray crystallography. Rees says determination was at the root of Chang's success: "He has an incredible drive and work ethic. He really pushed the field in the sense

of getting things to crystallize that no one else had been able to do." Chang's data are good, Rees says, but the faulty software threw everything off.

Ironically, another former postdoc in Rees's lab, Kaspar Locher, exposed the mistake. In the 14 September issue of *Nature*, Locher, now at the Swiss Federal Institute of Technology in Zurich, described the structure of an ABC transporter called Sav1866 from *Staphylococcus aureus*. The structure was dramatically—and unexpectedly—different from that of MsbA. After pulling up Sav1866 and Chang's MsbA from *S. typhimurium* on a computer screen, Locher says he realized in minutes that the MsbA structure was inverted. Interpreting the "hand" of a molecule is always a challenge for crystallographers,



Flipping fiasco. The structures of MsbA (purple) and Sav1866 (green) overlap little (left) until MsbA is inverted (right).



Papers rejected / ↑ Papers accepted

Papers rejected / ↑ Papers accepted
Slower career progression



This is fine.

**WE USED HOME
GROWN LAB SCRIPTS**



Papers rejected / ↑ Papers accepted
Slower career progression
Your work can't easily be extended



Papers rejected / ↑ Papers accepted
Slower career progression
Your work can't easily be extended
Hard time finding collaborators
Hard time getting funding



I DON'T NEED ANY HELP

Signs in the Wild that you need an RSE

Signs in the Wild that you need an RSE

You don't have a strategy for storing or moving data



Signs in the Wild that you need an RSE

You don't have a strategy for storing or moving data
You don't share any of your code on GitHub

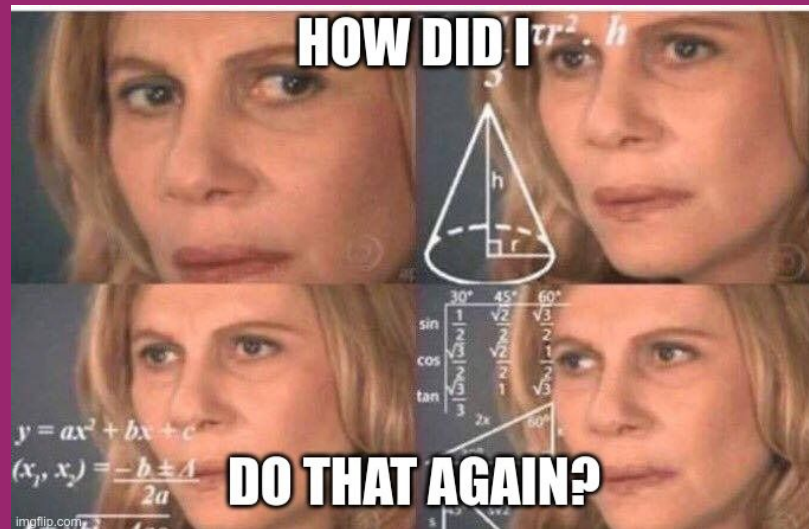


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Feedback in a paper that methods aren't clear



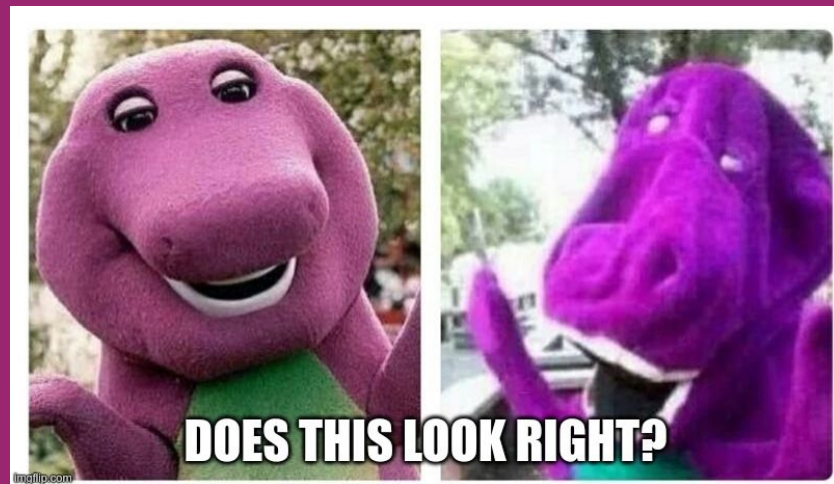
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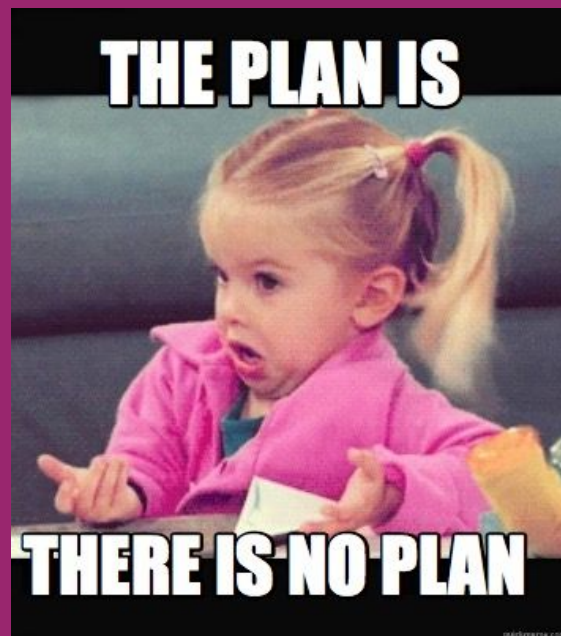
Feedback in a paper that methods aren't clear

Someone tries your software, and they struggle



Signs in the Wild that you need an RSE

- You don't have a strategy for storing or moving data
- You don't share any of your code on GitHub
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- Someone tries your software, and they struggle
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Signs in the Wild that you need an RSE

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- You don't share any of your code on GitHub
- Feedback in a paper that methods aren't clear
- Someone tries your software, and they struggle
- You don't have a plan for testing, portability, or validation
- Your code isn't optimized (it's slow!)

Signs in the Wild that you need an RSE



Advanced Computing Research Centre

Advanced Computing Research Centre



High Performance Computing

Research Data Storage Facility

Research Software Engineering

↳ What is Research Software Engineering?

↳ Case Studies

↳ Training

↳ Who are we?

↳ Software HowTos

ACRC enabled research and activities

Research Software Engineering to reduce the environmental impact of a long-running script

The Research Software Engineering (RSE) Group worked with Dr Gary Barker, a Senior Lecturer in the School of Biological Sciences, to speed up a Perl script that he developed to find the minimal set of genetic markers needed to differentiate all samples in a genotyping dataset. After 10 days of work, the software was accelerated by over 25,000 times (figure 1). This reduced the runtime for identifying the minimal set of markers to distinguish different varieties of wheat **from about 10 days to just 34 seconds!** This benefits both Gary's work, enabling him to routinely process very large data sets, and it benefits the environment. Significantly less electricity is required to run the newly optimised script and optimisation has removed the need for Gary to invest in a dedicated server that would be left running for days. Quoting Gary:

"We are really excited about the improvement in speed and the reduced carbon footprint of the re-designed code. With our existing datasets it's great to results in minutes that previously took weeks to obtain, but this actually opens up new avenues of research now that we can start looking at millions of genetic markers across whole genomes rather than focussing on just a few tens of thousands at a time."



The RSE Movement



What is a research software engineer?



What problems still remain?



How can you help?



What do we want for the future?

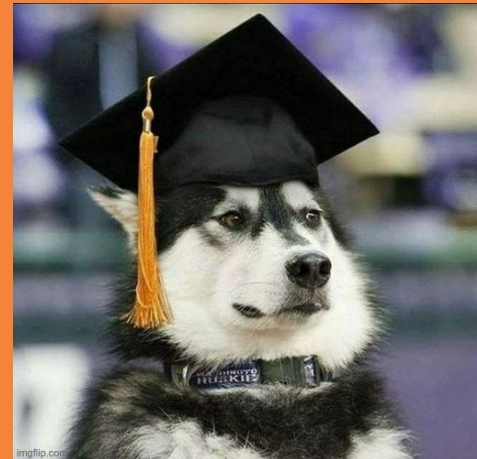
What do we want for the future?

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- I don't want to publish or perish.



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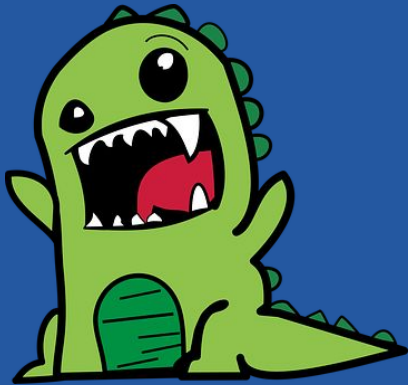


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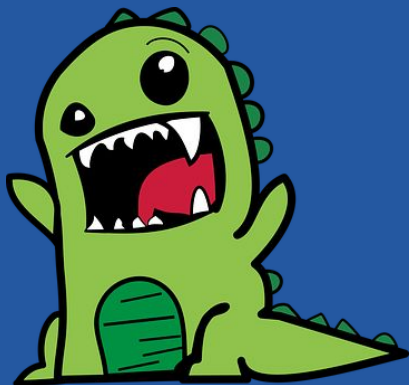


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Given that better software will help your research?
How do you want to help?



@vsoch
Twitter and GitHub



Graphics are from the Lion King, by Disney, memes, and creative commons!

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