How Usability and Reproducibility in Software Improves Teaching and Research

Soren Harner, RC2AI

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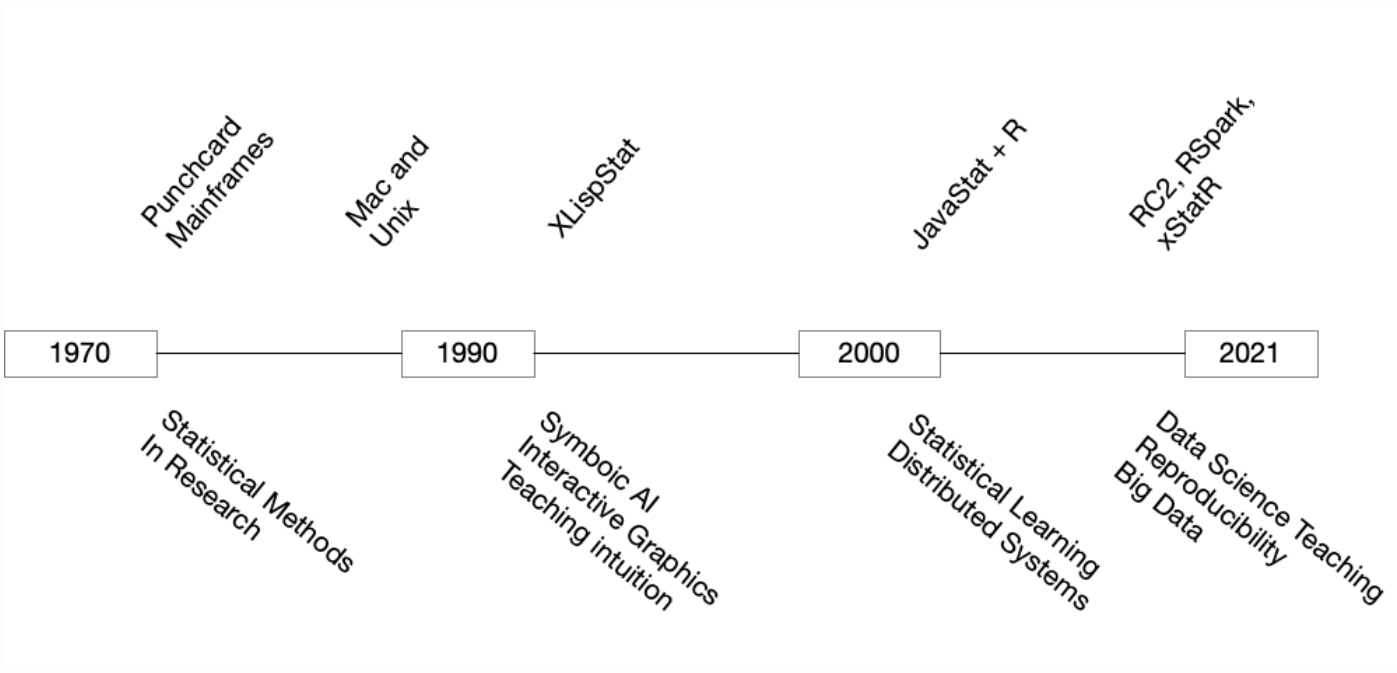
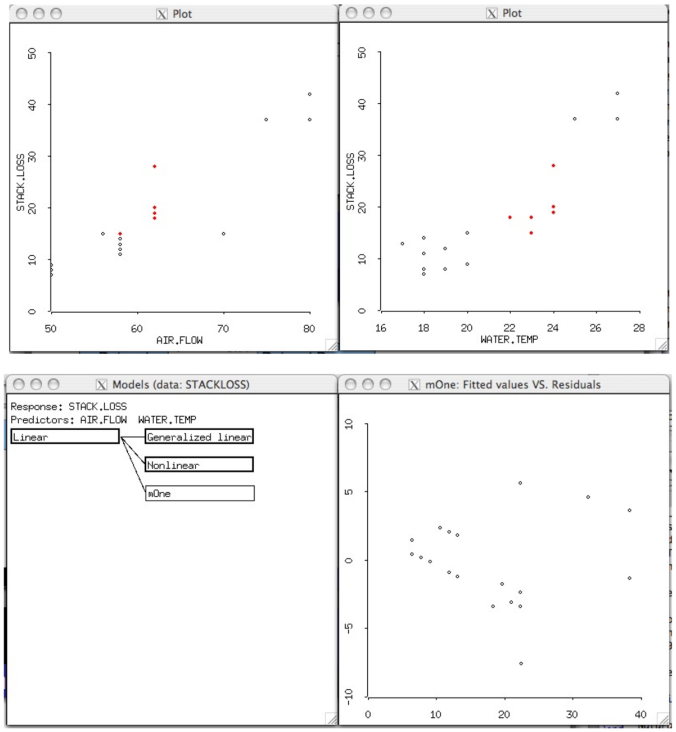
Jim's 50 years in statistical computing



1990s Interactive Graphics in XLispStat



2000s JavaStat: GUI with R Backend

JavaStat: a Java/R-based statistical computing environment

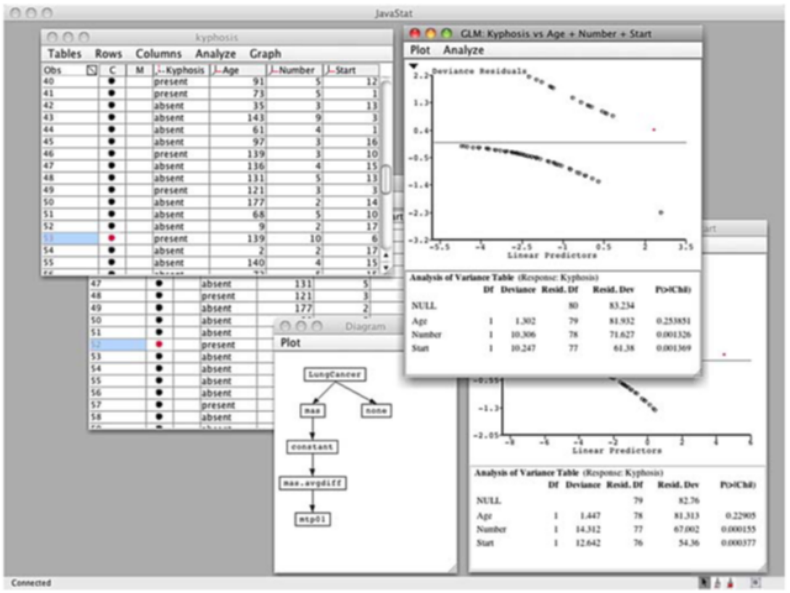
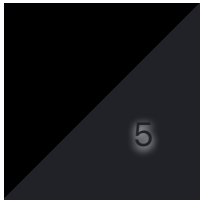


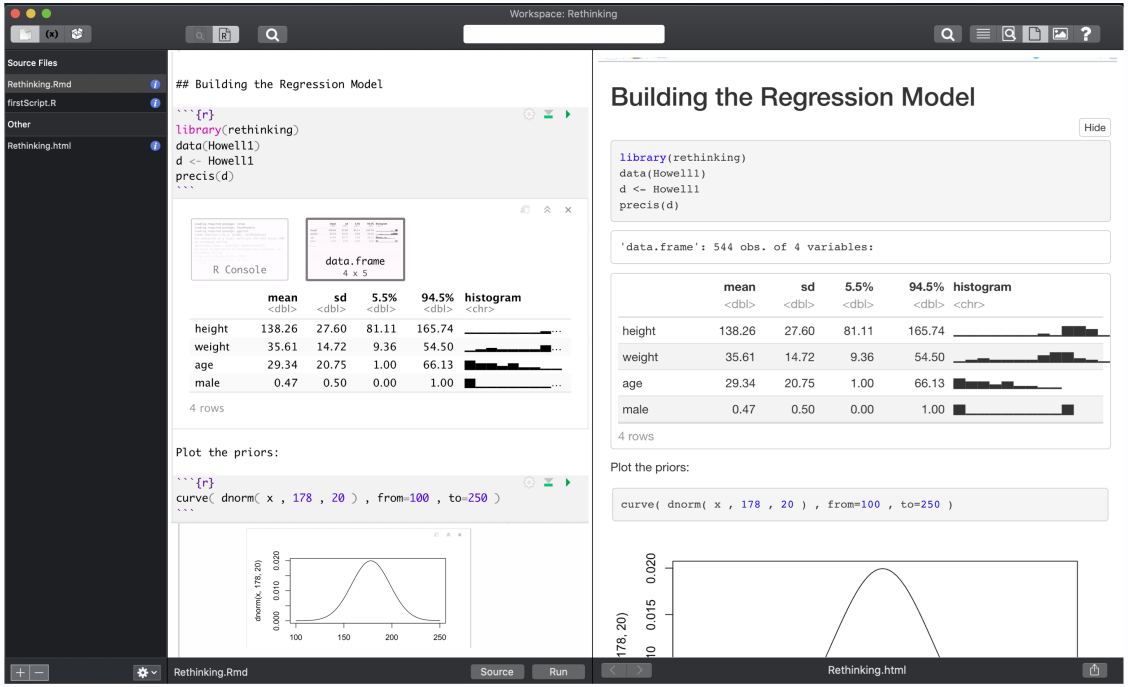
Fig. 3 JavaStat Java application

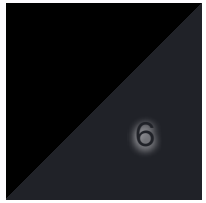
After 2015: RSpark and Reproducibility

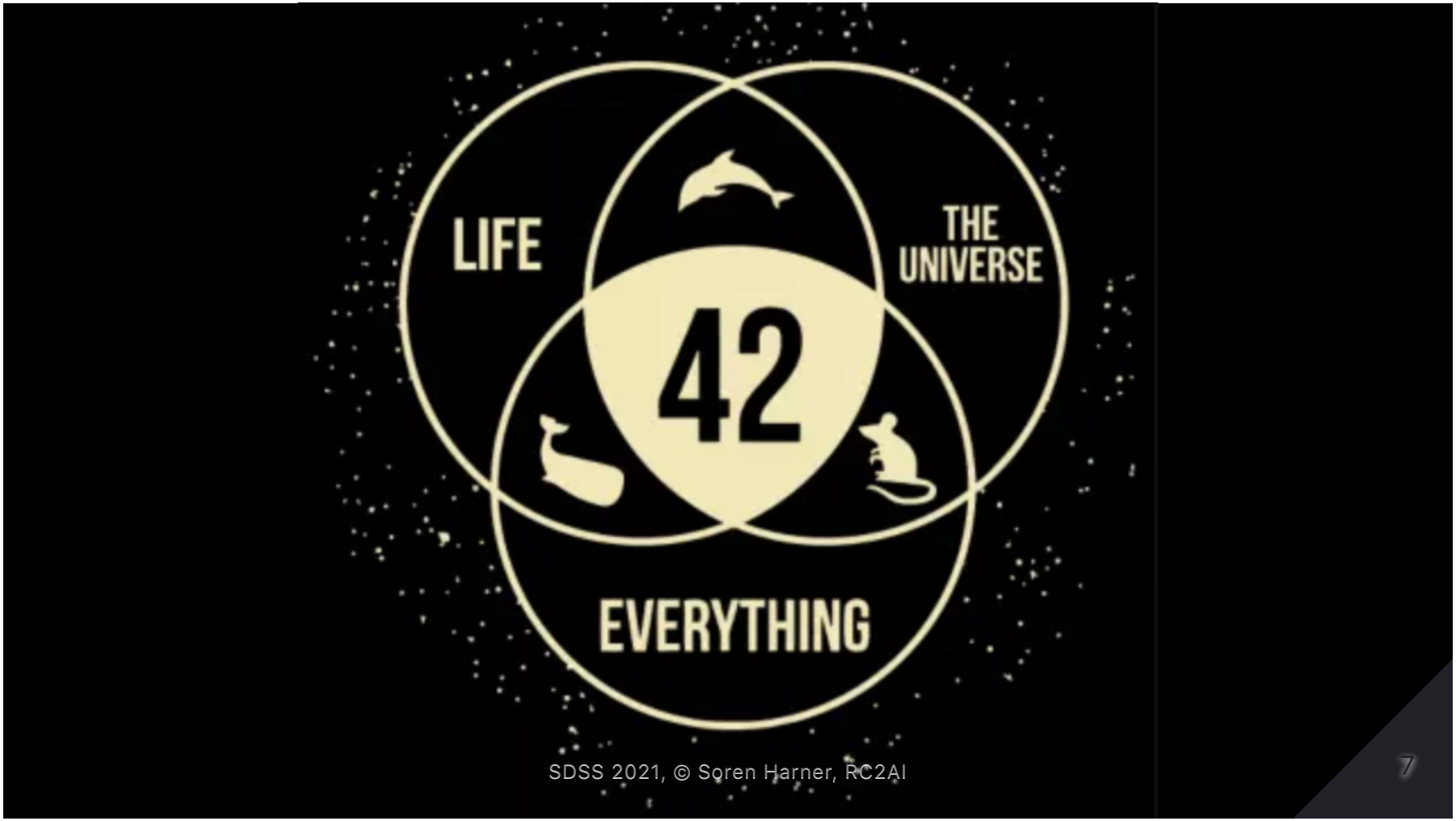
- Teach data science courses and seminars
- Introduce SQL, DataFrames, MapReduce, Streaming
- Emphasis on reproducibility with Docker and Git
- Built on R, Spark, Apache Arrow, and Postgres
- Building on rocker, R on Docker
- Brought back XLispStat with xStartR



Rc^2 Reproducibility for Everyone






LIFE
THE UNIVERSE
42
EVERYTHING
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Reproducibility

Given the same raw data, can you follow the steps and understand the assumptions of how the authors arrived at their conclusion?

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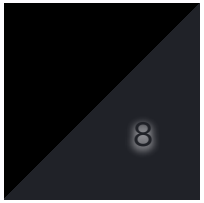
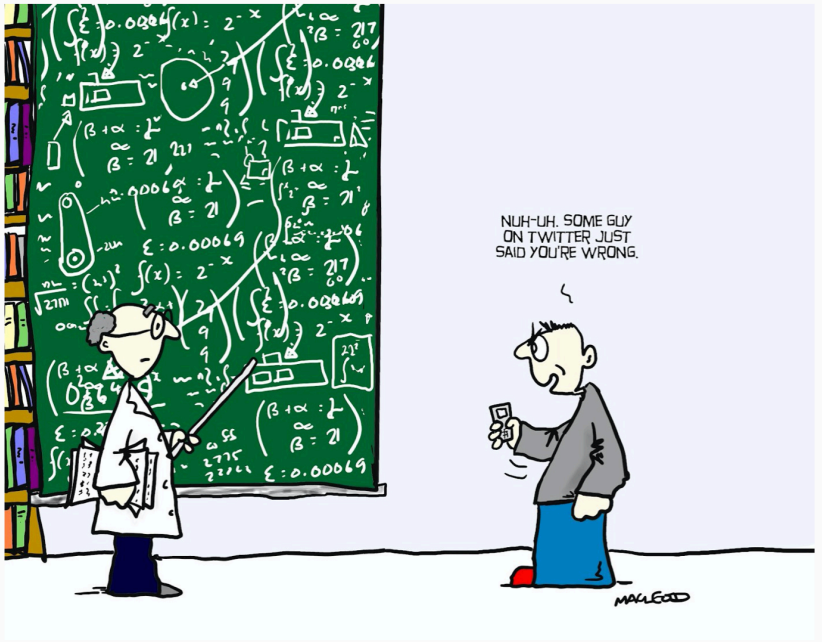


Why does it matter?

- Building on others' work
- Transparency over authority



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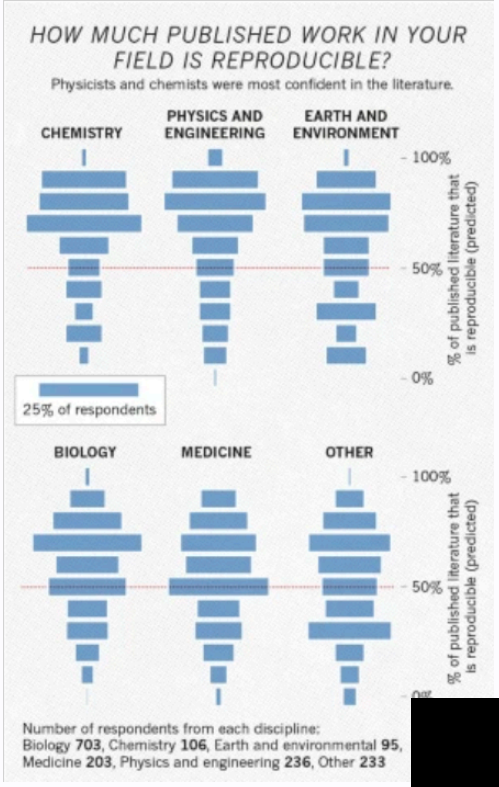
Reproducibility in Research

- Nature 2016 Survey 52% say there is a crisis
- Nature 2021 Survey confidence in science leads to vaccination



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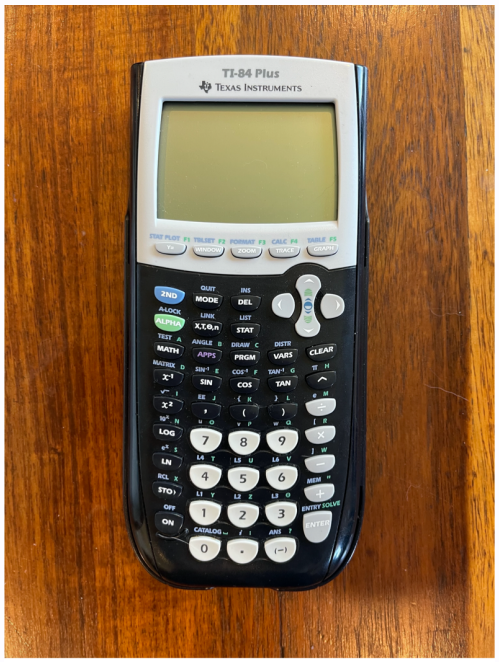
Teach reproducibility

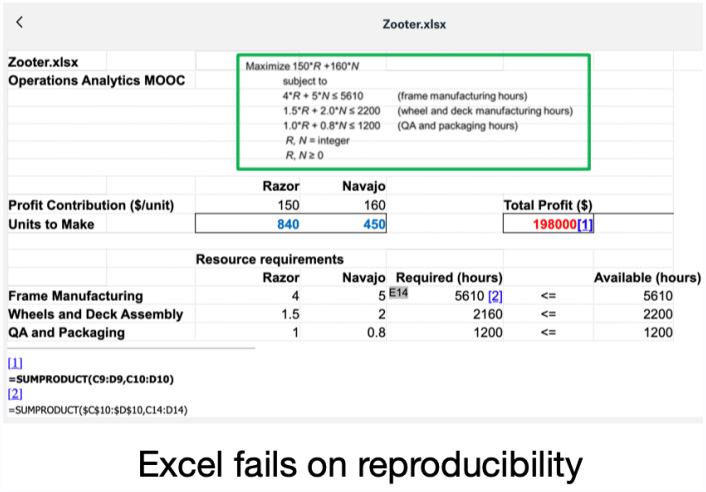
- Data used in all fields
- Computational sciences
- Larger models and big data



In 2021, really?

Why is it hard?

- Methods and habits
- Accessible tools and data
- Version everything
- Sharing and verify identity



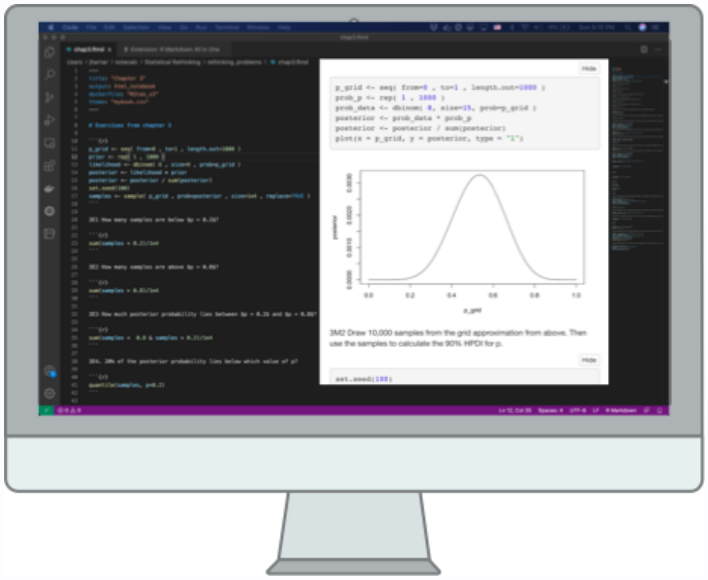
Excel fails on reproducibility

Making reproducible methods more teachable

Continuing Jim's Work

Author reproducibly

- VS Code Extension
- Versioned markdown
- Remotely executed code
- Github, Bitbucket integration
- R, Python, Julia, etc.
- Javascript, CSS, vegalite
- Pull request to publish



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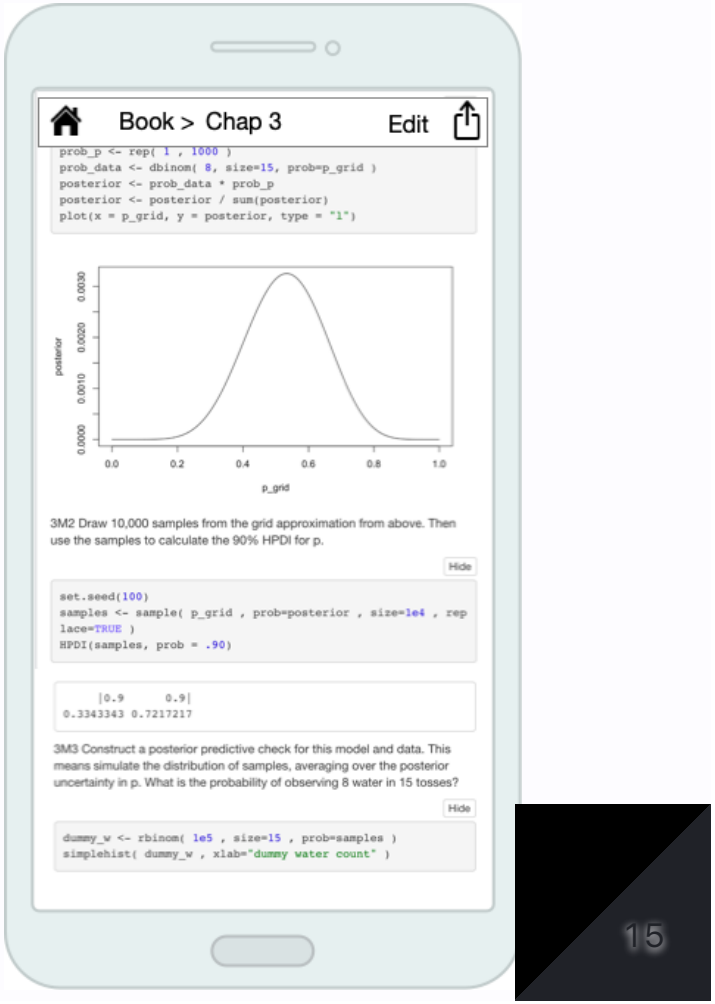
Read, tinker

- Read, share, re-use interactive notebooks
- Mobile and Web
- Obviate the calculator
- Better than static books and reports
- Verifiable, tamperproof



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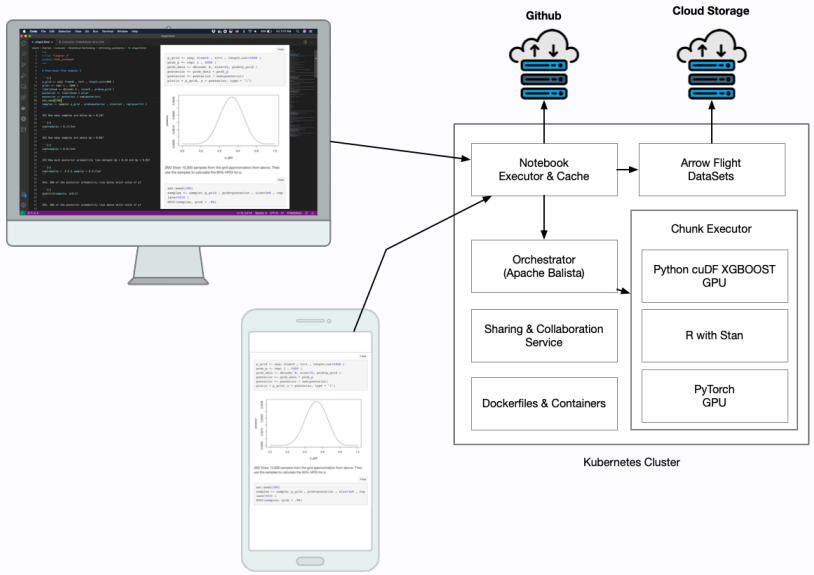
Accessible, scalable cloud containers



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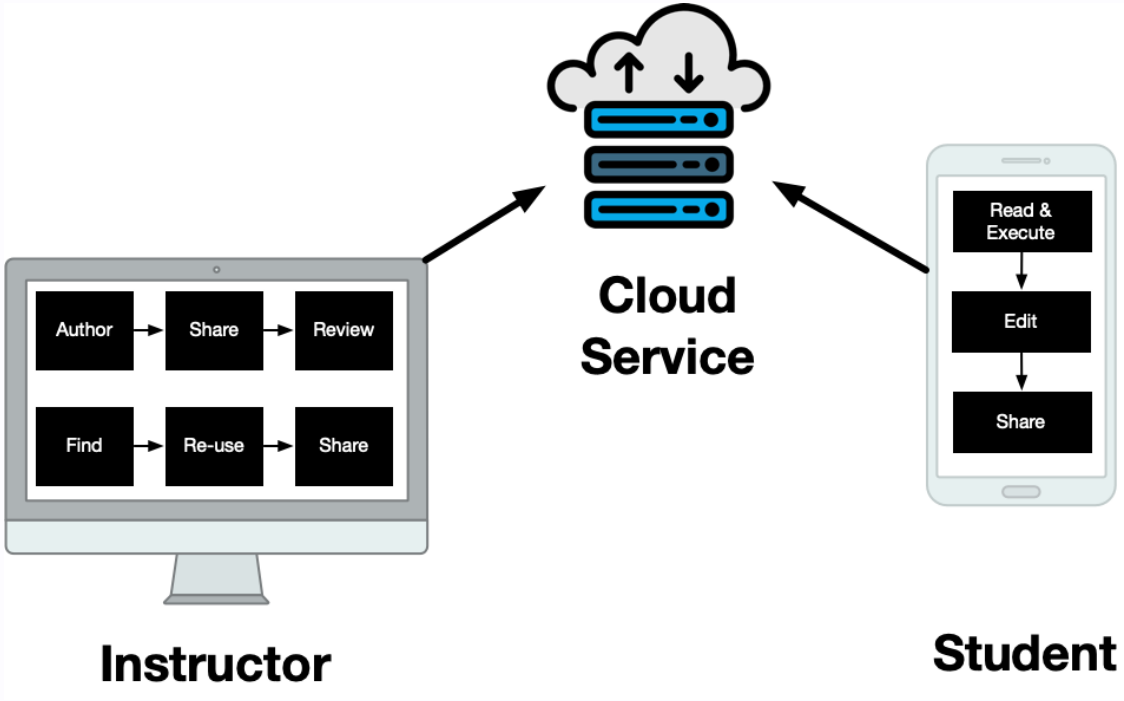
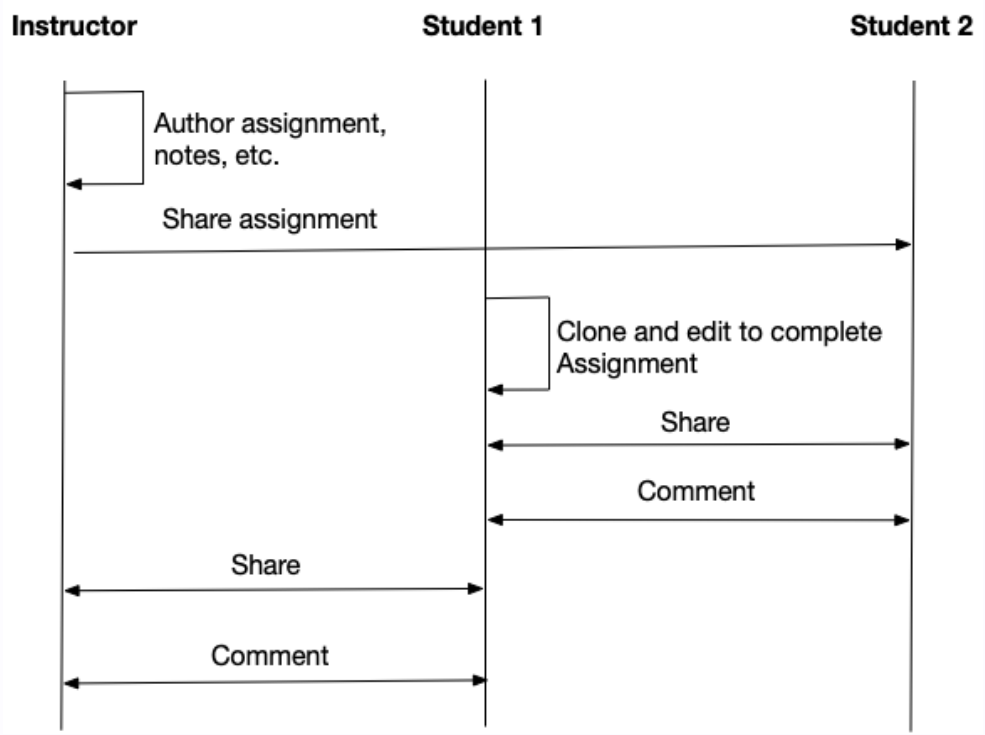
Integrated collaboration



Use-case: instructor student sharing



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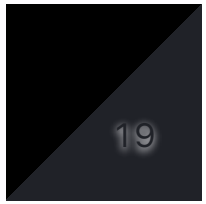
Next steps

- Collect feedback
- Conduct pilots (sign up)
- Continue active development
- Finalize commercial component



You can get involved

- Join the pilot (sign up)
- Looking for open source collaborators
- Some funding available for developers

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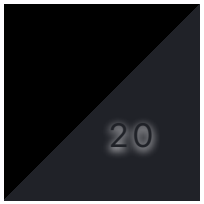

Thank you

Link to presentation, references, etc.

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