Reproducibility in Cartography

Amy Griffin, RMIT, Australia
& Arzu Çöltekin, UZH, Switzerland
Who are we
(if you didn’t already know)

• **Amy** (with Sidonie, who couldn’t be here today) is ICA’s CogVis co-chair
  → [https://cogvis.icaci.org/activities.html](https://cogvis.icaci.org/activities.html)

• **Arzu** is ISPRS’ Geovis, Virtual and Augmented Reality working group chair (Sidonie also co-chair there)
  → [https://geoviz.casa.ucl.ac.uk/](https://geoviz.casa.ucl.ac.uk/)
Reproducibility, rigor, transparency, and independent verification are cornerstones of the scientific method.
Why do we do this?
Nature’s survey

Is there a reproducibility crisis?
A Nature survey lifts the lid on how researchers view the ‘crisis’ rocking science and what they think will help.

BY MONYA BAKER

52% Yes, a significant crisis
38% Yes, a slight crisis

1,576 RESEARCHERS SURVEYED
Science Collaboration (OSC) (1) conducted “a large-scale, collaborative effort to obtain an initial estimate of the reproducibility of psychological science” by attempting to replicate 100 original studies that had been published in one of three top-tier psychology journals in 2008. Depending on the criterion used, only 36 to 47% of the original studies were successfully replicated, which led many to conclude that there is a “replication crisis” in psychological science (2).


http://science.sciencemag.org/content/351/6277/1037.2.full
Terminology

• Reproducibility vs. replication?
• Experimental vs. other forms of empirical research?
  – Spatial analyses → sampling (?), data maintenance & annotation/coding + software/methods
  – Experimental research → also participants, description of context/tasks, conditions in which the experiment was conducted from the recruitment to the actual room, forms of communication (priming), ...
Interdisciplinarity

Research Article Summary

Psychology

Estimating the reproducibility of psychological science

Open Science Collaboration*

Raise standards for preclinical cancer research

C. Glenn Begley and Lee M. Ellis propose how methods, publications and incentives must change if patients are to benefit.

“The criteria for reproducibility can vary dramatically between scientists.”

Repeatability in Computer Systems Research

http://science.sciencemag.org/content/349/6251/aac4716.full
https://www.nature.com/articles/483531a
https://dl.acm.org/citation.cfm?id=2812803
Interdisciplinarity (II)

Enhancing reproducibility for computational methods
Data, code, and workflows should be available and cited

Five selfish reasons to work reproducibly
Statistical Analyses and Reproducible Research

http://science.sciencemag.org/content/354/6317/1240.full
https://biostats.bepress.com/bioconductor/paper2/
https://www.nature.com/articles/548485a

Technology Feature
Reproducibility: Check your chemistry
Monya Baker
Our corner

Advancing Science with VGI: Reproducibility and Replicability of Recent Studies using VGI

Frank O. Ostermann* and Carlos Granell†

Reproducible research and GiScience:
an Evaluation using AGILE conference papers

Reproducible Research in practice

Dr. Edzer Pebesma
Institute for Geoinformatics, University of Münster

http://o2r.info/

Quantitative methods I: Reproducible research and quantitative geography

Chris Brunsdon
National Centre for Geocomputation, Maynooth University, Ireland

http://link.springer.com/chapter/10.1007/978-3-319-57336-6_13
https://peerj.com/preprints/26561/
http://journals.sagepub.com/doi/abs/10.1177/0309132515599625
http://o2r.info/

... seems like so far there’s nothing on experimental studies (in Carto/ Vis/ GiScience) though
Interventions

• Systemic (grants, grant agencies...)
• Individual (initiatives, workshops...)

http://science.sciencemag.org/content/354/6308/142
https://doi.org/10.1186/s13059-017-1205-3
http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0020124
http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001747
What next (today)?

• We discuss ...

• We write down a collective document (Google docs)
  – Add opinions, directions, experiences, suggestions ...
  – Add some resources, literature, best practices also there
Science Isn’t Broken
It’s just a hell of a lot harder than we give it credit for.

By Christie Aschwanden
Graphics by Ritchie King
Filed under Scientific Method
Published Aug. 19, 2015
Outcomes of Discussions, I

• Importance of political economy & institutions and scientific behaviour

• What is established cartographic fact?
  – Of what things are we sure?
  – What are the assumptions of the cartographic cannon?

• Two database efforts that might be helpful
  – Katarzyna Słomska’s study of maps used in user studies (2000- onwards)
Outcomes of Discussions, II

- Multilingual search terms for database to extend it to include non-English studies
  - 1973 ICA publication of multilingual terms as a starting point (carto-nyms?)
- Building out/extending Travis’s database
  - Hosting on UUU or CogVis site on the ICA website?
  - To populate/update: Hackathon event every 2-4 years
    - that will update the database
    - then use it as a research tool to do metaanalysis or other analysis of what we know
    - examining the assumptions of the cartographic cannon
Outcomes, III

• Exploring potential of replication studies and/or multisite studies (generalizability of findings)?
  – Masaryk Uni has some experience with this on a small scale
    • largely found similar findings (builds some confidence we do not have a crisis in cartography research 😊)
    • could be tried by others with MSc students
  – We will explore the potential for multi-site efforts
    • Suggestions for topics welcome!
Your opinions/involvement/commitment?

• What’s possible, what’s desirable
• What do we consider ‘established’ experimentally?
  – Lit review? Find, code, ...
• Can we replicate this?
• Your own work? Stuff you know well, and willing
to support (answer questions from others)
  – Multi-site MSc studies?
• Meta-analyses?