How to achieve high quality research

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A few words about me

2008-2012  DPhil in Computer Science at the University of Oxford (constraints)

2012-2017  (Senior) Research Associate at UCL (software engineering)

2017-      Principal Research Fellow & Proleptic Associate Professor at UCL

Teaching:   MSc module on Research Methods in Software Engineering
How to achieve high quality research?
Research Evaluation Criteria

Novelty

Soundness

Significance

Presentation

Reproducibility & Replicability / Verifiability & Transparency
Research Evaluation Criteria

Novelty
Importance of Literature Review

Back in 2010..

My first talk at the main track of a conference!

Best paper nomination!

Then someone from the audience asks.. “hasn’t this been done in the 70s?”
Interesting plagiarism story

Paper B is published on arXiv

timeline
Interesting plagiarism story

Paper A is published on arXiv

Paper B is published on arXiv

Authors of Paper B accused of plagiarism by authors of Paper A
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https://www.reddit.com/r/MachineLearning/comments/pvgpfl/ndr_alleged_plagiarism_of_improve_object/
Interesting plagiarism story

Paper C is rejected

Paper A is published on arXiv

Paper B is published on arXiv

Authors of Paper B accused of plagiarism by authors of Paper A

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Paper B almost exact copy of Paper C

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Interesting plagiarism story

Paper C is rejected

Paper A is published on arXiv

Paper B almost exact copy of Paper C

Latest:
Authors of Papers A and C provide evidence that they developed the ideas independently

https://www.reddit.com/r/MachineLearning/comments/pvgpfl/ndr_alleged_plagiarism_of_improve_object/
Good reference for Literature Reviews


http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.117.471
Research Evaluation Criteria

Soundness
Research Methods

Proofs, experiments, case studies, surveys, etc.

Has an appropriate research method been used for the problem? Has it been used correctly?

Bad practice: develop a tool/technique and then find a problem to which you can apply it to

Empirical Standards in Software Engineering:
https://github.com/acmsigsoft/EmpiricalStandards/tree/master/docs
The spreadsheet bug(s)

The Reinhart-Rogoff error

In 2010 Reinhart-Rogoff showed average economic growth slows when country’s debt rises to more than 90% GDP

Consequence: used as an argument to introduce austerity cuts

https://theconversation.com/the-reinhart-rogoff-error-or-how-not-to-excel-at-economics-13646
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One of the errors: data for 5 out of 20 countries was not taken into account

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Research Evaluation Criteria

Significance
Significance

Think about beneficiaries, e.g., academic, industrial, other

Important for grant applications

A few tips:

What is the larger problem you are trying to tackle? Who could benefit if not now, then in years to come?

Would negative results be interesting?
Research Evaluation Criteria

Presentation
Presentation / Communication

Do not underestimate the importance of write-up

Talk to your colleagues, people at conferences, workshops, etc.

Submit to top venues
Research Evaluation Criteria

Reproducibility & Replicability / Verifiability & Transparency
Verifiability & Transparency

Proofs: should be self-contained
Software: open source
Artifact Evaluation tracks
Maintainability..

Justyna Petke, UCL Computer Science
Summary

Novelty: thorough literature review is key

Soundness: apply the right techniques to your problem

Significance: think about beneficiaries

Presentation: take every opportunity to talk about your work

Verifiability & Transparency: practice open science

https://xkcd.com/292/