

How to achieve high quality research

Justyna Petke
University College London, UK

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

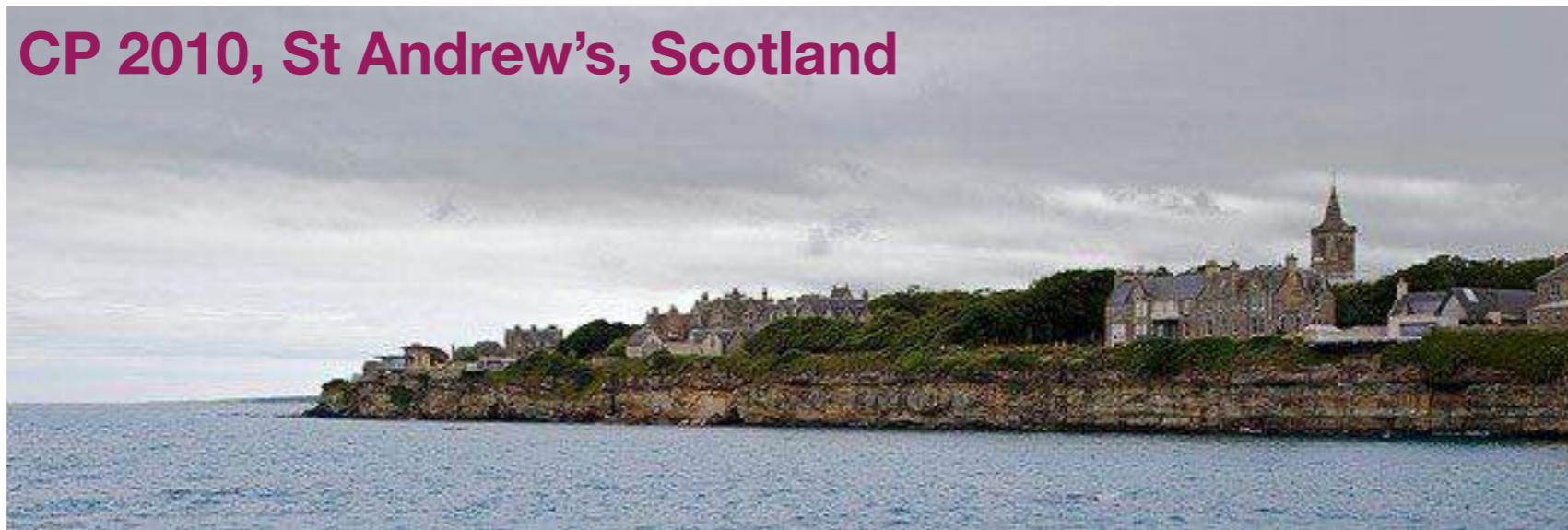
Presentation

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!

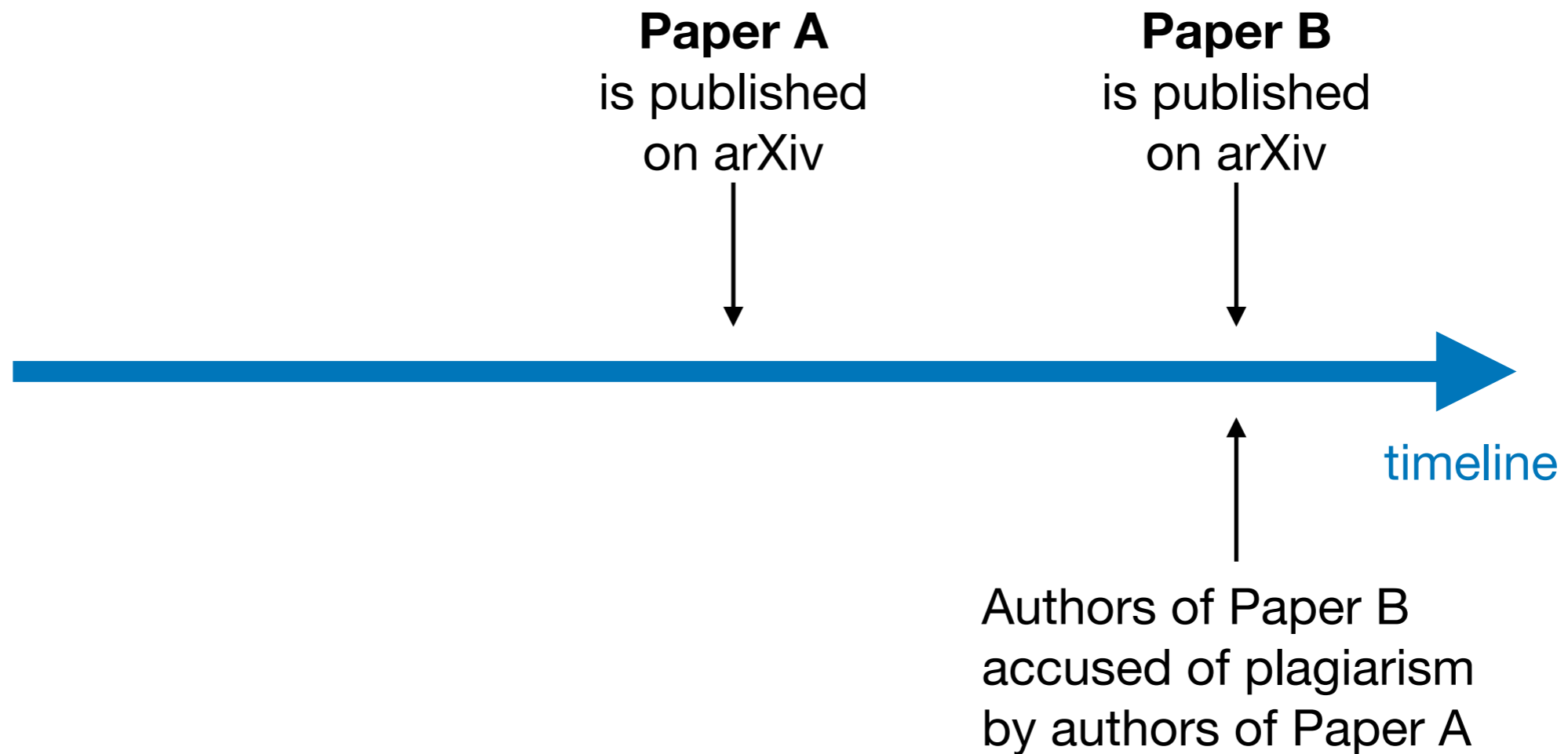
Best paper nomination!

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

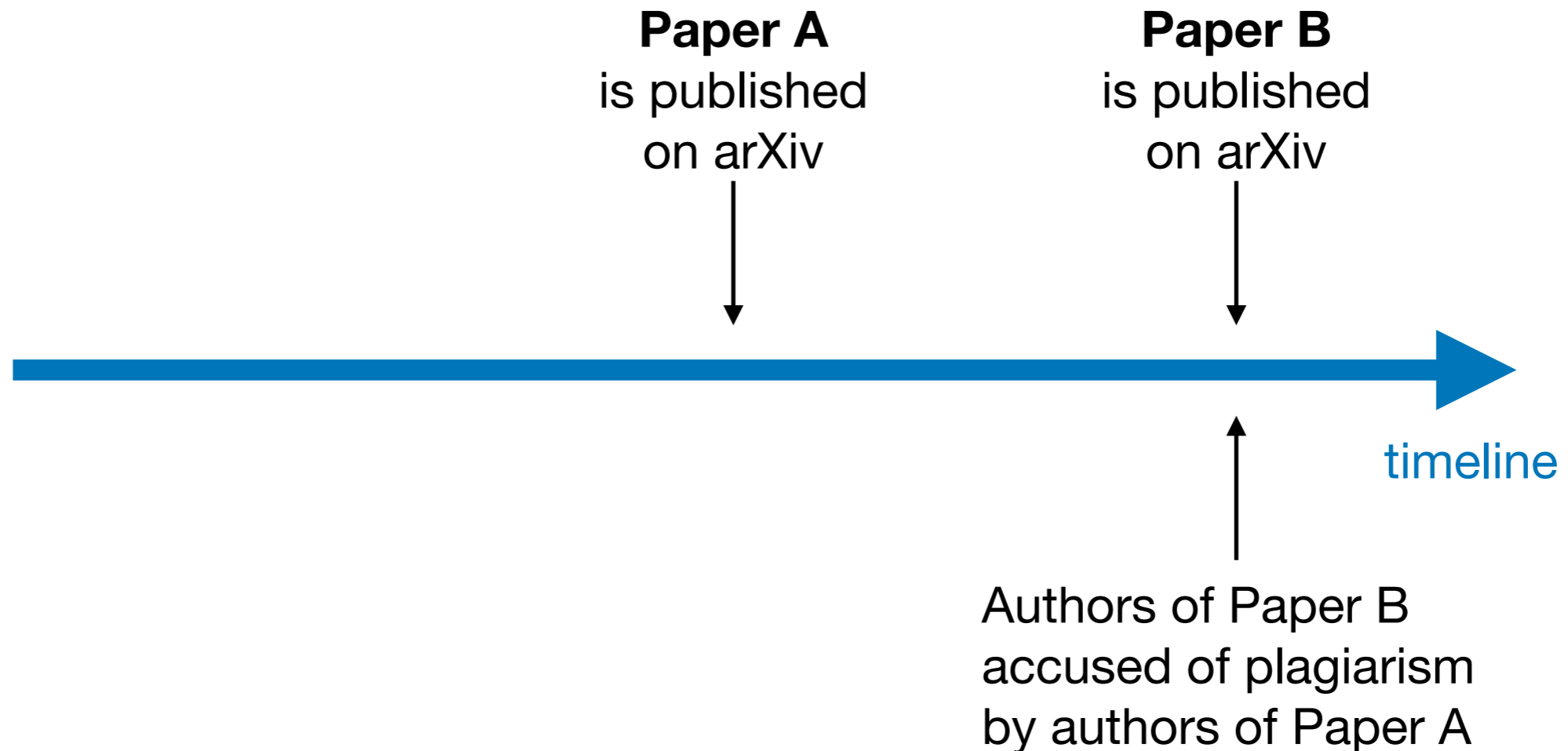
Interesting plagiarism story



Interesting plagiarism story

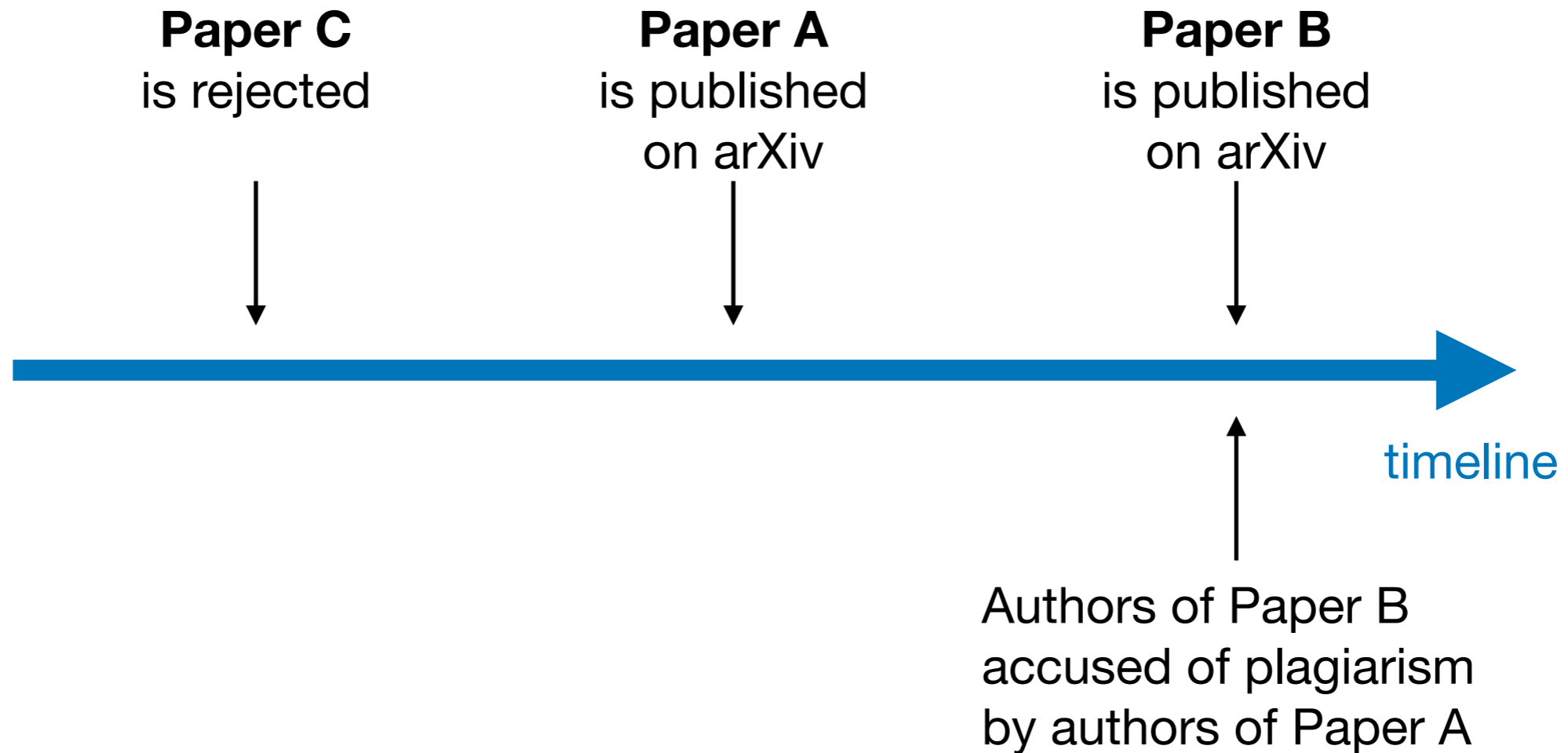


Interesting plagiarism story



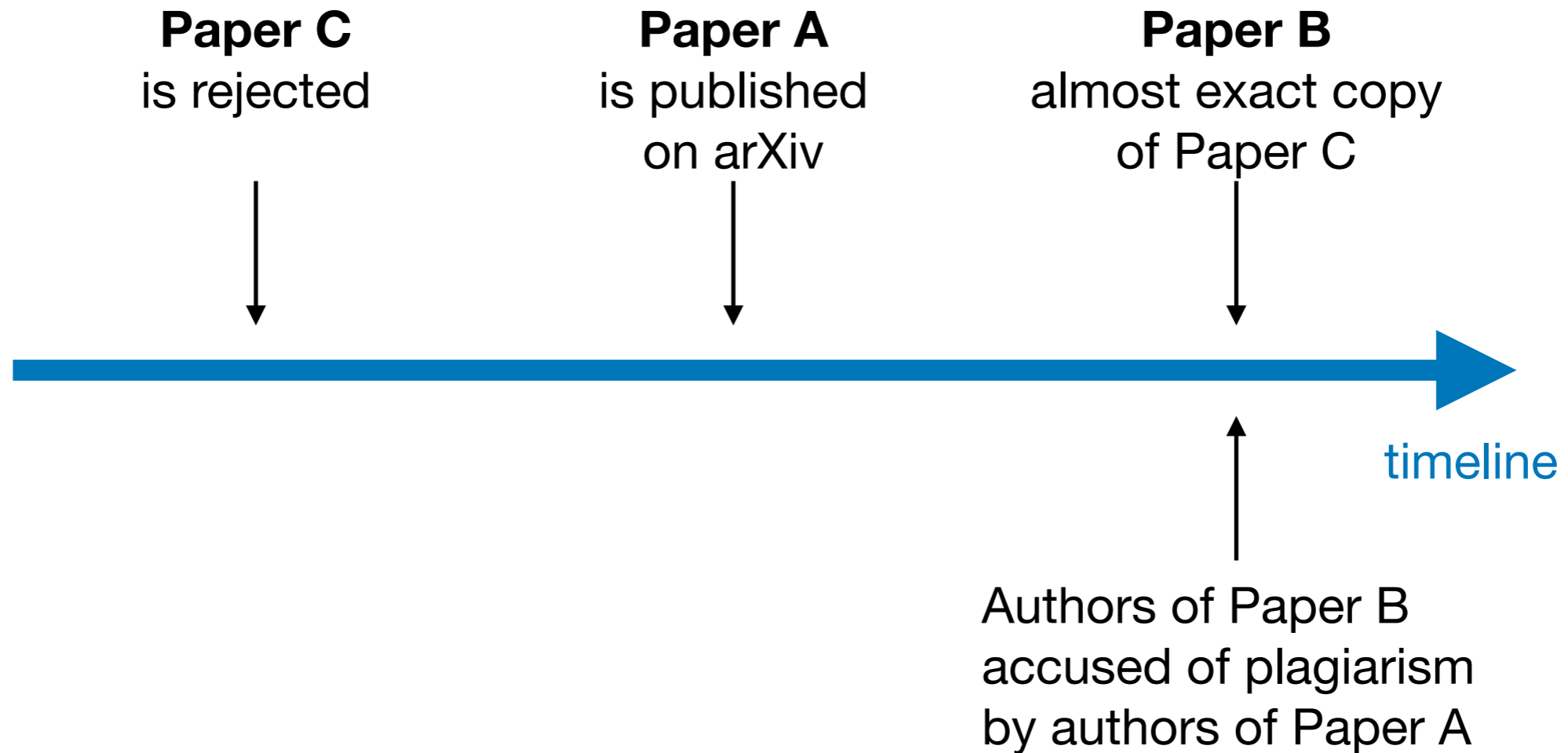
https://www.reddit.com/r/MachineLearning/comments/pvgpfl/ndr_alleged_plagiarism_of_improve_object/

Interesting plagiarism story



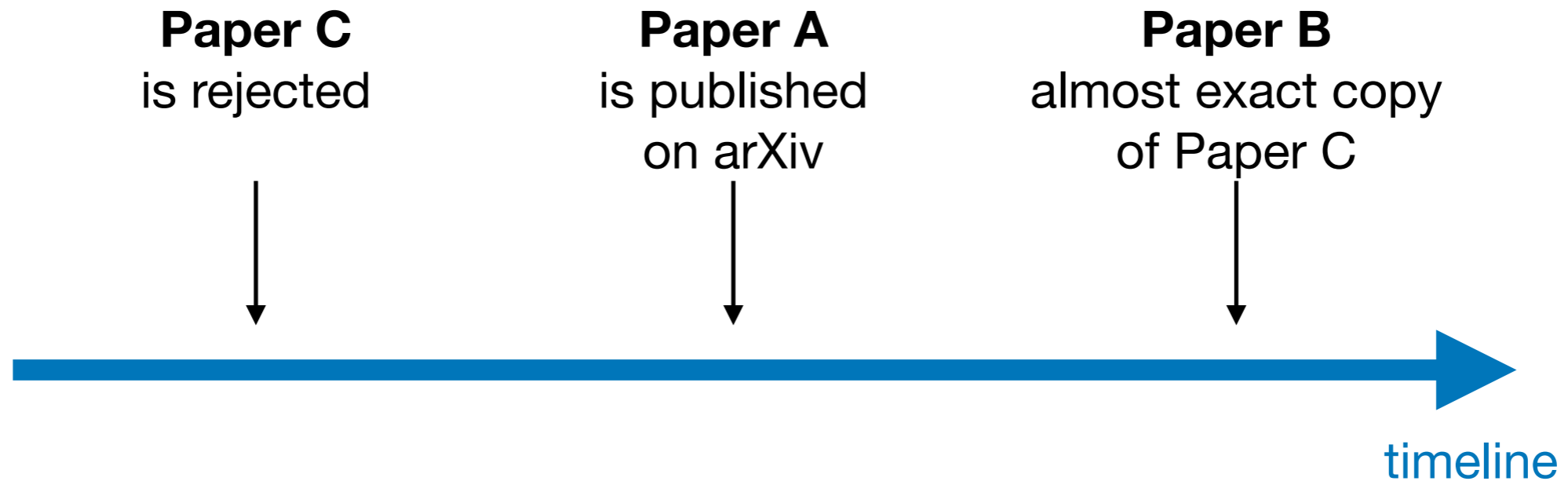
https://www.reddit.com/r/MachineLearning/comments/pvgpfl/ndr_alleged_plagiarism_of_improve_object/

Interesting plagiarism story



https://www.reddit.com/r/MachineLearning/comments/pvgpfl/ndr_alleged_plagiarism_of_improve_object/

Interesting plagiarism story



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

“Guidelines for performing Systematic Literature Reviews in Software Engineering” by Barbara Kitchenham and Stuart Charters (2007)

<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



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

Thomas Herndon et al. (2013) identified errors in the spreadsheet which invalidated previous result



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

Thomas Herndon et al. (2013) identified errors in the spreadsheet which invalidated previous result

One of the errors: data for 5 out of 20 countries was not taken into account



<https://theconversation.com/the-reinhart-rogooff-error-or-how-not-to-excel-at-economics-13646>

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..



Summary

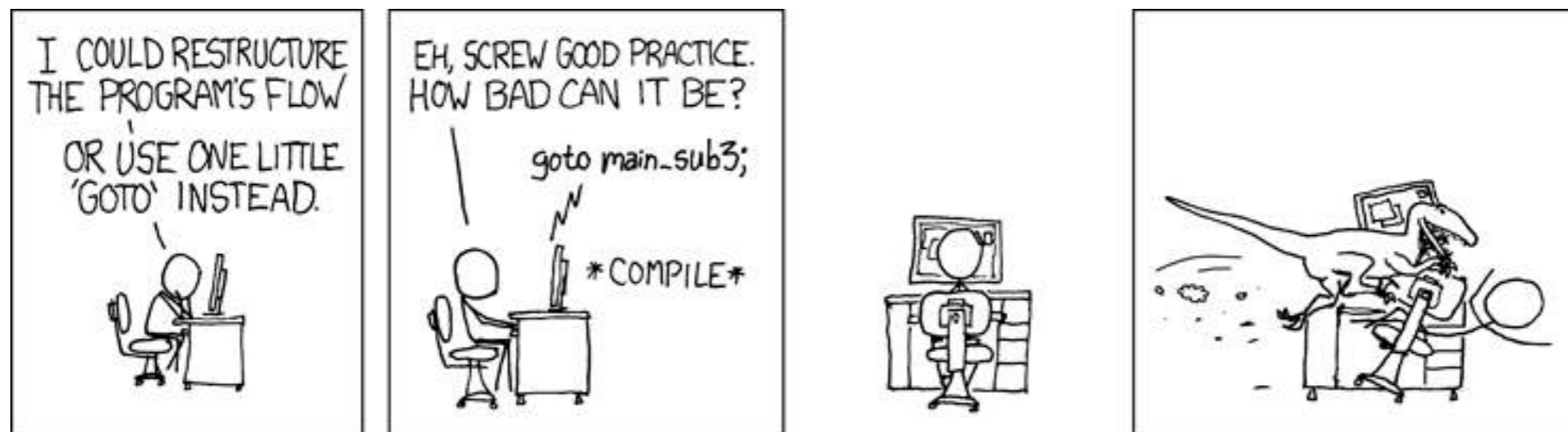
Novelty: thorough literature review is key

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/>