Talk Summary/Highlights

Consider the difference between discussing "Bad Science" versus discussing "Bad Scientists."

We could ask what is science? Oxford's English Dictionary defines science as, "the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment." Can you have "bad science" or simply things that are called science or scientific but that are not. Consider a proof attempt that has a logical error within it, thus claiming to "prove" a false statement. Would you call that "bad math" or something else?

What are scientists? "A person who is studying or has expert knowledge of one or more of the natural or physical sciences." Just as people exist across a spectrum from good to bad, and might allow an agenda to shape their behaviors, so do scientists. This is not a new issue (https://xkcd.com/2650/) but is it a more common one today?

We perhaps need to consider the difference between accidentally bad and outright dishonesty. The end result might be the same, but perhaps the former will be easier to identify or prevent. There have been researchers who have just straight-up falsified data, deleted parts of data that did not support their claims over the years (or are suspected to have done so). You can view an example list at https://en.wikipedia.org/wiki/List_of_scientific_misconduct_incidents

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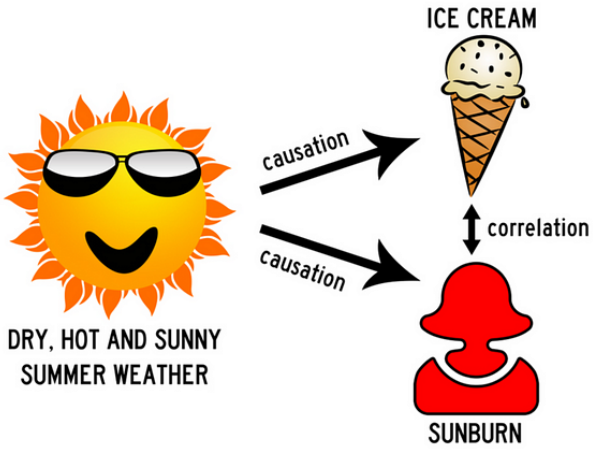
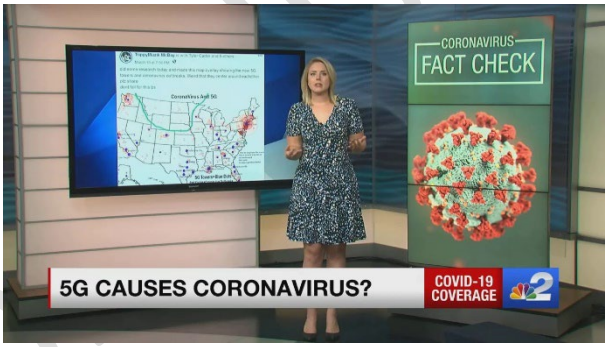
Ethics becomes a question to explore. When thinking about ethics and scientists, it is perhaps not always clear-cut. Would you call it ethical for a researcher to…

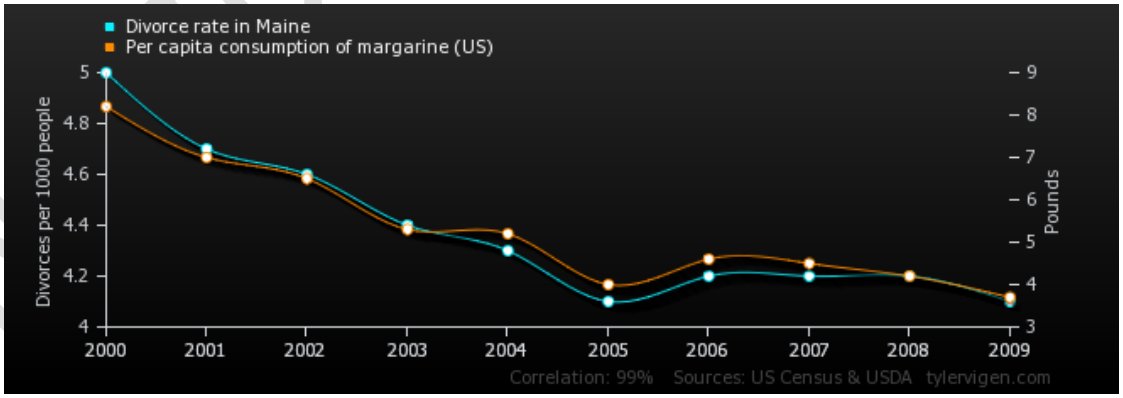
- …release a paper one year presenting a new and more robust security protocol only to release a paper the next year showing that same protocol is subject to attack like all the others had been?
- …design a project to be intentionally incomplete to lead into a follow-up project?
- …add constraints to make a problem easier to solve even though it removes it from the reality of application domains?
- …claim causation based on mathematical correlation?

Opinions vary, and motivation and patterns often come up in the discussion of these. https://xkcd.com/2677/

When it comes down to something such as correlation versus causation, the structure of how the study was run and the data collected is integral to the difference. Does ice cream cause sunburn? Did 5G cell towers cause COVID-19 outbreaks? Does eating margarine cause people in Maine to get divorced?







https://xkcd.com/1138/

How hard would it be to design a study that would "prove" a headline "Controlled trials show Bunsen burners make things colder" via being a bad scientist? Try it.

When undertaking research, a literature review is an important step. What happens when bad science is published and found out later to have been bad science? Should computer scientists be designing a digital publication framework that would make it easier to find and read original sources and make paper retractions recursive? Have you ever read something that was a poorly-worded summary and came out with the wrong "understanding" of a concept? Have you ever cited a result that was actually invalid, where the cited result had far more citations than the correction? If you answered "no" are you certain? How?

How do you share negative/neutral results? Imagine you run a study comparing your new AI algorithmic approach to the best existing one. Which of the following results should be published? The new AI is statistically significantly more accurate. The new AI is statistically significantly less accurate. There is no statistically significant difference between the existing and the new on any of our metrics.

Do computer scientists have an obligation to report "negative" or "non" results? Should there be a specific place for this? Clearly(?) not a conference? Something like arXiv? Would people read such results?

Consider research projects that overlapped the 18 months between March 2020 and September 2021. How much impact could the COIVD-19 lockdowns have had on the resulting research data? What unusual trends might exist due to things aside from the research in question? Should all such studies have an * for "does not generalize to contexts other than a global pandemic" on them?

It is said that we have a replication crisis. In a study from 2015, 100 published experimental and correlational studies "replicated" and while 97% of the original articles reported significant results, only 36% of the replications did (so 39% of the replicated works matched the originals).
www.science.org/doi/10.1126/science.aac4716

In 2017, 28 influential studies with strong statistically significant results "replicated" 14/28 (25%) of the replications had such results osf.io/ux3eh/

In 2018, 21 social science studies that had been published in Nature between 2010 and 2015 were "replicated" and only13/21 (62%) of the replications matched the original results. tinyurl.com/NatureReplication2018

An idea that has been mentioned is to let authors know that a random subset of accepted papers will be subjected to replication. There have even been some papers exploring how people behave if they are informed that their honesty is important, and when they are told. Unfortunately, an author on those papers has been accused of systematically falsifying the data on which the papers were based, supposedly to the great surprise of even their co-authors.

Being a good scientist takes work and thought. As you read the work of others, look for the signs of people being bad scientists (even if unintentionally). Do a little "homework" on the authors and the publications, as well as who else has cited the work. As you work on your own projects, be thoughtful about being a good scientist. Ask yourself whether your work could be replicated based on your methods and a description of them. Ask a colleague for a "sanity check" on your research question, approach, and goals.