Data Science at NSF

Draft Report of StatSNSF committee: Call for input from NSF A.C.s

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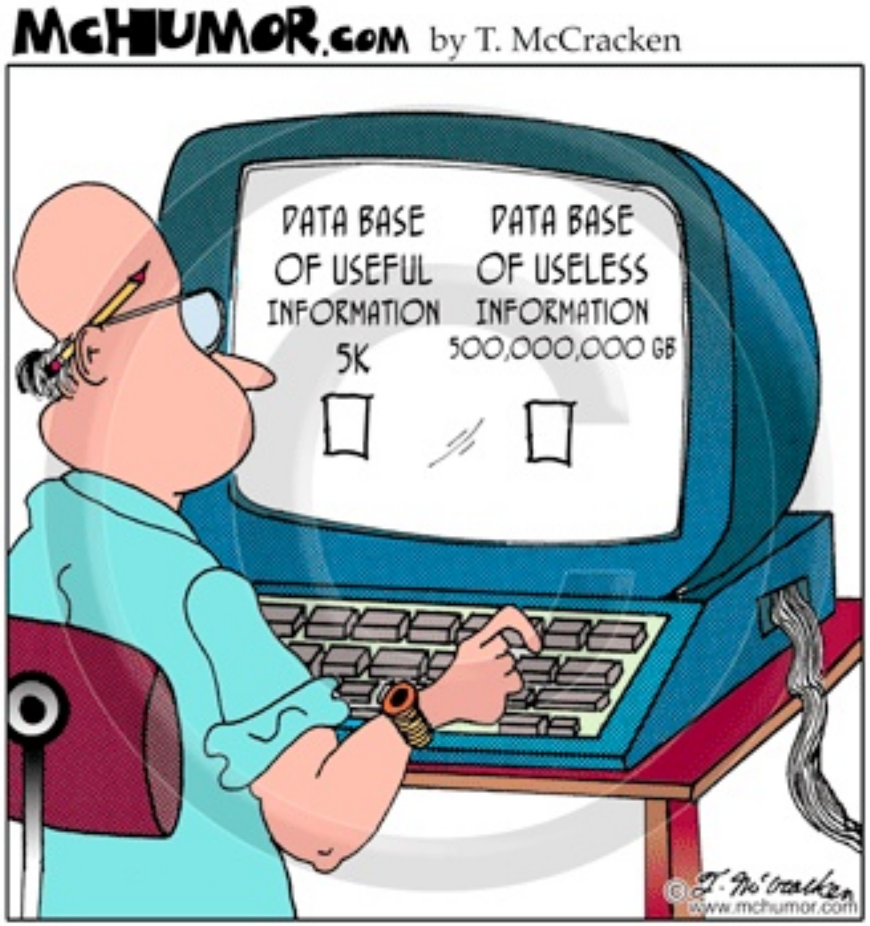
The Context

- Data is central to NSF research
- Statistical sciences + computational resources + disciplinary developments
- Heightened attention to data analysis, prediction
- Focus on reproducibility, reliability of inferences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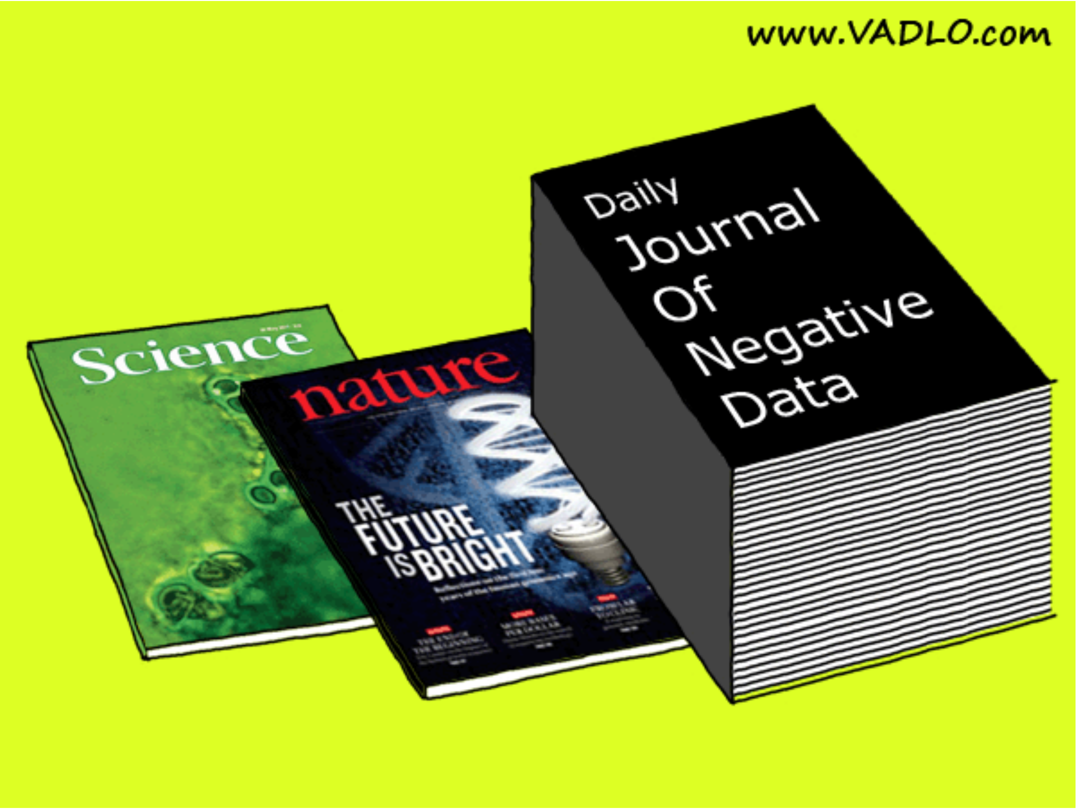
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Report Structure

Executive Summary

1. Introduction

2. Data Science in the NSF context

3. Overview of Underlying Challenges

4. Recommendations

5. Research and Data Gathered

Appendices

1. Introduction

- Subcommittee of MPS AC [17 members]

- Charged by MPS AD [w. support of all ADs] to

  "to examine the current structure of support of the statistical sciences within NSF and to provide recommendations for NSF to consider"

- *Charge mandates NSF-wide scope:*
  - *Membership and input from each Directorate AC*
  - AC input sought before report is finalized [May-June]

2. Data Sciencein NSF context

Motivated by NSF Strategic Plan and initial discussions with ADs

Our definition:

"Data Science: the science of *planning for*, *acquisition*, *management*, *analysis* of, and *inference* from data"

Our context:

Data science and the enhanced application of data science at NSF

2. Data Science at NSF ctd.

- requires broad set of skills & perspectives
  - Mathematics, statistics, computer science, domain specific expertise

- Challenges at all scales of data
  - 'Big data' is a vast ongoing arena, but
  - NSF should also embrace the 'long tail' of projects of smaller size: new/complex data types

3. Some underlying challenges

- Growth of Data Science
  - McKinsey forecast of shortage
- Fragmentation of Data Science at NSF
  - duplication, ‘cracks’,…
- Research quality
  - use the best data science, reproducibility,…
- Multi-disciplinarity of Data Science
  - effective collaboration and training

4. Draft Recommendations

- Recommendations in four categories:

I. NSF Organization
II. NSF Research Initiatives
III. Workforce Development
IV. Proposal and Review Cycle

- Input sought before report is finalized [May-July]

I. NSF Organization

1. Coordinate Data Science across NSF in a way that engages all Directorates.

Including:

Coordinate current efforts across NSF involving data science
Identify/mitigate fragmentation of data science research.
Develop/lead new cross-directorate initiatives involving DS [Examples]
Develop policies to increase the quality of science through proper use of DS.
Improve representation of DS experts on review panels, …

“Coordinate Data Science across NSF…”

(cont’ d):
Develop funding models to include data scientists in cross-disciplinary research.
Connect with emerging education efforts focusing on DS
Study reproducibility issues in NSF funded science
Track data science funding

Some *possible* mechanisms:

- Office of Data Science [e.g. NIH]
- Data Science Working Group [e.g. SEES]
- Cross-foundation leadership group

II. NSF Research Initiatives

2. _Create new initiatives that embrace and address the cross-cutting challenges of data science.
   - Examples in Section 4

3. Provide mechanisms for enhancing the participation of data scientists in data science activities in interdisciplinary settings

III. Workforce Development

4. Initiate a major thrust to support

- graduate, postdoctoral and early career fellowships and awards,

and develop appropriate programs to expand

- undergraduate exposure to, and
- K-12 awareness of data science.

IV. Proposal and Review Cycle

5. When appropriate:

- in proposals, require a data analysis plan and a disclosure management plan, and
- in review, ensure that there is adequate data science representation on panels.

DISCUSSION

- Recommendations in four categories:

I. NSF Organization
II. NSF Research Initiatives
III. Workforce Development
IV. Proposal and Panels

- Input sought before report is finalized [May-July]

Supplementary Slides

- Slides giving more details

Sloan/Moore Foundations Initiative

- $38M 5-year effort, announced @ OSTP, 11/12/13:
- UCB-UW-NYU; University-wide, foci:

1. ecosystem of tools and software environments,
2. academic careers for data scientists,
3. education and training in data science at all levels,
4. efforts that are accessible and reproducible,
5. Creating hubs for data science activities, and
6. identifying the scientists' data-science bottlenecks and needs