On the Origin(s) of the Term “Big Data”

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Abstract: I investigate the origin(s) of the term “Big Data,” in industry and academics, and in computer science and econometrics. The term probably originated in lunch-table conversations at Silicon Graphics Inc. (SGI) in the mid 1990s, in which John Mashey figured prominently. The first significant (and independent) academic references are arguably Weiss and Indurkhya (1998) in computer science and Diebold (2000) in econometrics. An unpublished 2001 research note by Douglas Laney at Gartner enriched the concept significantly. Big Data the phenomenon continues unabated.

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1 Introduction

The Big Data phenomenon, by which I mean explosive growth in data volume, velocity, and variety, is at the heart of modern science. Indeed the necessity of grappling with Big Data, and the desirability of unlocking the information hidden within it, is now a key theme in all the sciences – arguably the key scientific theme of our times. Parts of my field of econometrics, to take a tiny example, are working furiously to develop methods for learning from the massive amount of tick-by-tick financial market data now available. In response to a question like “How big is your dataset?” in a financial econometric context, an answer like “90 observations on each of 10 variables” would have been common fifty years ago, but now it’s comically quaint. A modern answer is likely to be a file size rather than an observation count, and it’s more likely to be 200 GB than the 5 KB (say) of fifty years ago. Moreover, someone reading this in twenty years will surely have a good laugh at my implicit assertion that a 200 GB dataset is large. Indeed in other disciplines like physics, 200 GB is already small. The large hadron collider experiments that led to discovery of the Higgs boson, for example, produce a petabyte of data (10^{15} bytes) per second.

2 Looking Backward

My interest in the historical origins of the term “Big Data” was piqued in 2012 when Marco Pospiech, at the time a Ph.D. student studying the Big Data phenomenon at the Technical University of Freiberg, informed me in private correspondence that he had traced the use of the term (in the modern sense) to my paper, “Big Data’ Dynamic Factor Models for Macroeconomic Measurement and Forecasting,” presented at the Eighth World Congress of the Econometric Society in Seattle in August 2000, and subsequently published as Diebold (2003).

Intrigued, I did a bit more digging. As regards my paper, what’s true with near certainty is that it is the first academic reference to Big Data in a title or abstract in the statistics, econometrics, or additional x-metrics (insert your favorite x) literatures. But deeper investigation reveals that the situation is more nuanced than it first appears: the origins of

\[1\] Big Data is similarly central to modern business.
\[2\] For an overview, see Andersen et al. (2013).
\[3\] And of course the assertion that 200 GB is large by today’s standards is with reference to my field of econometrics.
\[4\] The November 2000 post-conference working paper, Diebold (2000), is available at http://www.ssc.upenn.edu/~fdiebold/papers/paper40/temp-wc.PDF
\[5\] Moreover, as progressively more searches find nothing, it’s becoming progressively more likely that it’s the first reference in those literatures, whether in the title, abstract or elsewhere.
the term are intriguing and a bit murky, involving both industry and academics, computer science and econometrics. I play a very early role, but I am not alone.

I stumbled on the term Big Data innocently enough, via discussion of two papers that took a new approach to macro-econometric dynamic factor models (DFMs), Reichlin (2003) and Watson (2003), presented back-to-back in an invited session of the 2000 World Congress of the Econometric Society. Older dynamic factor analyses included just a few variables, because parsimony was essential for tractability of numerical likelihood optimization. The new work by Reichlin and Watson, in contrast, showed how DFMs could be estimated using principal components, thereby dispensing with numerical optimization and opening the field to analysis of much larger datasets while nevertheless retaining a likelihood-based approach. My discussion had two overarching goals. First, I wanted to contrast the old and new macro-econometric DFM environments. Second, I wanted to emphasize that the driver of the new macro-econometric DFM developments matched the driver of many other recent scientific developments: explosive growth in available data. To that end, I wanted a concise term that conjured a stark image. I came up with “Big Data,” which seemed apt and resonant and intriguingly Orwellian (especially when capitalized), and which helped to promote both goals.

But I was not alone. There are issues of Big Data interpretation and context, and things get murkier if one includes unpublished and/or non-academic references. Academics were aware of the emerging phenomenon but not the term. Conversely, a few pre-2000 references, both academic and non-academic, are intriguing but ultimately unconvincing, using the term but not thoroughly aware of the phenomenon.

On the academic side, Tilly (1984) mentions Big Data, but his article is not about the Big Data phenomenon and demonstrates no awareness of it; rather, it is a discourse on whether statistical data analyses are of value to historians. On the non-academic side, the margin comments of a computer program posted to a newsgroup in 1987 mention a programming technique called “small code, big data.” Fascinating, but off-mark. Next, Eric Larson provides an early popular-press mention in a 1989 Washington Post article about firms that assemble and sell lists to junk-mailers. He notes in passing that “The keepers of Big Data say they do it for the consumer’s benefit.” Again fascinating, but again off-mark. Finally, a 1996 PR Newswire, Inc. release mentions network technology “for CPU clustering and

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6See, for example, Massive Data Sets: Proceedings of a Workshop, Committee on Applied and Theoretical Statistics, National Research Council (National Academies Press, 1997), http://www.nap.edu/catalog.php?record_id=5505.

7See https://groups.google.com/forum/?fromgroups#!msg/comp.sources.misc/d3EXP4D.VK8/x7WrVBm5FGfJ.

8See Eric Larson, “They’re Making a List: Data Companies and the Pigeonholing of America,” Washington Post, July 27, 1989.
Big Data applications...” Still off-mark, neither reporting on the Big Data phenomenon nor demonstrating awareness of it, instead reporting exclusively on a particular technology, the so-called high-performance parallel interface.

There is, however, some pre-2000 (non-academic, unpublished) activity that is spot-on. In particular, Big Data the term, coupled with awareness of Big Data the phenomenon, was clearly percolating at Silicon Graphics (SGI) in the mid 1990s. John Mashey, retired former Chief Scientist at SGI, produced a 1998 SGI slide deck entitled “Big Data and the Next Wave of InfraStress,” which demonstrates clear awareness of Big Data the phenomenon. Related, SGI ran an ad that featured the term Big Data in Black Enterprise (March 1996, p. 60), several times in Info World (starting November 17, 1997, p. 30), and several times in CIO (starting February 15, 1998, p. 5). Clearly then, Mashey and the SGI community were on to Big Data early, using it both as a unifying theme for technical seminars and as an advertising hook.

There is also at least one more relevant pre-2000 Big Data reference in computer science. It is subsequent to Mashey et al., but interestingly, it comes from the academic as opposed to industry part of the computer science community, and it not only uses the term but also demonstrates some awareness of the phenomenon. Weiss and Indurkhya (1998), in particular, note that “... very large collections of data ... are now being compiled into centralized data warehouses, allowing analysts to make use of powerful methods to examine data more comprehensively. In theory, ‘Big Data’ can lead to much stronger conclusions for data-mining applications, but in practice many difficulties arise.”

Finally, arriving on the scene later but also going beyond previous work in compelling ways, Laney (2001) highlighted the “Three V’s” of Big Data (Volume, Variety and Velocity) in an unpublished 2001 research note at META Group. Laney’s note is clearly relevant, and it goes beyond my exclusive focus on volume, producing a significantly enriched conceptualization of the Big Data phenomenon. In short, if Laney arrived slightly late, he nevertheless brought more to the table.

The rest, as they say, is history. As described by Cannadine (2020):

In 2012, Big Data entered the mainstream when it was discussed at the World Economic Forum in Davos. In March that year, the American government pro-

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9 http://static.usenix.org/event/usenix99/invited_talks/mashey.pdf
10 Mashey notes in private communication that the deck was for a “living talk” and hence updated regularly, so that the 1998 version is not the earliest. The earliest deck of which he is aware (and hence I am aware) is from 1997.
11 META is now part of Gartner.
12 http://goo.gl/Bo3GS
vided $200 million in research programs for Big Data computing. Soon afterward, the term was included in the Oxford English Dictionary for the first time.

Indeed Big Data is now not only a phenomenon and a well-known term, but also a discipline.

At first pass, Big Data as a discipline sounds like marketing fluff, as do other information technology sub-disciplines with catchy names like “artificial intelligence,” “data mining”, “neural networks”, and “machine learning.” Indeed it’s hard to resist smirking when told that major firms are rushing to create new executive titles like “Vice President for Big Data.” But as I have argued, the phenomenon behind the term is very real, so it may be natural and desirable for a corresponding new business discipline to emerge, whatever its executive titles.

On the other hand, if Big Data is arguably a new business discipline, it’s still not obvious that it’s a new scientific discipline. Skeptics will argue that traditional disciplines like computer science and statistics are perfectly capable of confronting the new phenomenon, so that Big Data is not a new discipline, but rather just a box drawn around some traditional ones. But it’s hard not to notice that the whole of the emerging Big Data (or “data science”) discipline seems greater than the sum of its parts. That is, by drawing on perspectives from a variety of traditional disciplines, Big Data is not merely taking us to bigger traditional places; rather, it’s taking us to very new places, unimaginable only a short time ago. Indeed one could argue that Big Data is emerging as a major interdisciplinary triumph.

3 Looking Forward

We are now confronted with both Big Data opportunities and Big Data pitfalls. Cannadine (2020) highlights some of the opportunities:

... it isn’t so much the data that’s important, it’s what you do with it that counts. With the evolution of Big Data came ... new ways of analyzing the new data sets to which we now have access. As a result, Big Data has been hailed for its potential to improve decision-making in fields from business to medicine, allowing judgments and evaluations to be based increasingly on information and analysis rather than intuition and insight.

On the other hand, pitfalls lurk, for example, in the emergence of Orwellian surveillance. Cannadine (2020) takes a somewhat sanguine view:

13Steve Lohr reports the title “Vice President for Big Data” in his New York Times piece, at http://www.nytimes.com/2012/08/12/business/how-big-data-became-so-big-unboxed.html
‘Knowledge is Power’ wrote Sir Francis Bacon; but perhaps the modern day equivalent is ‘Data is Power’. [Today] ...the term ‘dataveillance’ ... show[s] how the model of statecraft is changing in the Big Data era. Today, surveillance tracks individuals through their data, and there is a race for data in the way that there was once a race for oil.

Orwell himself, in contrast, sketched a more chilling scenario in his classic novel, 1984, published in 1949:

Always eyes watching you and the voice enveloping you. Asleep or awake, indoors or outdoors, in the bath or bed – no escape. Nothing was your own except the few cubic centimeters in your skull.

Time will reveal how Big Data opportunities and pitfalls evolve, but there is no turning back.

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