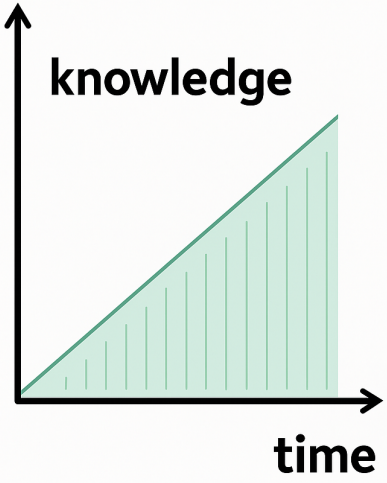
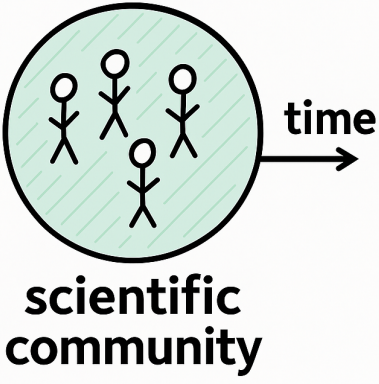
How to Write a Paper

Why do we Write Papers?





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- Synthesize new ideas:
  inspiration comes more often than not when reading the work of others

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- **Conclusions**: Takeaways: Can we build upon this work? If so, how? Ideas for future work?

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- **Industry**: Documentation, design document, white paper, website

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Examples are Crucial

- Help reader to check whether they understood something
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- *Finding good examples is extremly difficult, but worth it!*

The Baseline Idea

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Balance Clarity and Flow

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- **(1)** connects better to the previous sentence: "black hole"
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Avoid Wordy Phrases

- Avoid wordy phrases:

❌	✅
the reason for, due to the fact that, this is	because, since, why
despite the fact that, regardless of the fact that	although, even though
in the event that	if
on the occasion of	when
it is crucial that	must, should
is able to	can
it is possible that	may, might, can, could
prior to	before
does not have	lacks

Figures Matter

- Figures are an integral part of communication

Amazon Redshift and the Case for Simpler Data Warehouses

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Abstract

Amazon Redshift is a fast, fully managed, petabyte-scale data warehouse solution that makes it simple and cost-effective to efficiently analyze large volumes of data using existing business intelligence tools. Since launching in February 2013, it has been Amazon Web Service's (AWS) fastest growing service, with many thousands of customers and many petabytes of data under management.

Amazon Redshift's pace of adoption has been a surprise to many participants in the data warehousing community. While Amazon Redshift was priced disruptively at launch, available for as little as $1000/TB/year, there are many open-source data warehousing technologies and many commercial data warehousing engines that provide free editions for development or under some usage limit. While Amazon Redshift provides a modern MPP, columnar, scale-out architecture, so too do many other data warehousing engines. And, while Amazon Redshift is available in the AWS cloud, one can build data warehouses using EC2 instances and the database engine of one's choice with either local or network-attached storage.

In this paper, we discuss an oft-overlooked differentiating characteristic of Amazon Redshift – simplicity. Our goal with Amazon Redshift was not to compete with other data warehousing engines, but to compete with non-consumption. We believe the vast majority of data is collected but not analyzed. We believe, while most database vendors target larger enterprises, there is little correlation in today's economy between data set size and company size. And, we believe the models used to procure and consume analytics technology need to support experimentation and evaluation. Amazon Redshift was designed to bring data warehousing to a mass market by making it easy to buy, easy to tune and easy to manage while also being fast and cost-effective.

1. Introduction

Many companies augment their transaction-processing database systems with data warehouses for reporting and analysis. Analysts estimate the data warehouse market segment at 1/3 of the overall relational database market segment ($14B vs. $42B for software licenses and support), with an 8-11% compound annual growth rate (CAGR)[1]. While this is a strong growth rate for a large, mature market, over the past ten years, analysts also estimate data storage at a typical enterprise growing at 30-40%. CAGR. Over the past 12-18 months, new market research has begun to show an increase to 50-60%, with data doubling in size every 20 months.

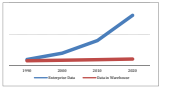

Figure 1: Data Analysis Gap in the Enterprise [10]

This implies most data in an enterprise is "dark data"[2]: data that is collected but not easily analyzed. We see this as unfortunate. If our customers didn't see this data as having value, they would not retain it. Many companies are trying to become increasingly data-driven. And yet, not only is most data already dark, the overall data landscape is only getting darker. Storing this data in NoSQL stores and/or Hadoop is one way to bridge the gap for certain use cases. However it doesn't address all scenarios.

In our discussions with customers, we found the "analysis gap" between data being collected and data available for analysis as due to four major causes.

1. Cost – Most commercial database solutions capable of analyzing data at scale require significant up-front expense. This is hard to justify for large datasets with unclear value.
2. Complexity – Database provisioning, maintenance, backup, and tuning are complex tasks requiring specialized skills. They require IT involvement and cannot easily be performed by line of business data scientists or analysts.
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We see each of the above issues only increasing with data set size. To take one large-scale customer example, the Amazon Retail team collects about 5 billion web log records daily (2TB/day,

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ACM 978-1-4503-2758-9/15/05.
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In this paper, we discuss an oft-overlooked differentiating characteristic of Amazon Redshift – simplicity. Our goal with Amazon Redshift was not to compete with other data warehousing engines, but to compete with non-consumption. We believe the vast majority of data is collected but not analyzed. We believe, while most database vendors target larger enterprises, there is little correlation in today's economy between data set size and company size. And, we believe the models used to procure and consume analytics technology need to support experimentation and evaluation. Amazon Redshift was designed to bring data warehousing to a mass market by making it easy to buy, easy to tune and easy to manage while also being fast and cost-effective.

1. Introduction

Many companies augment their transaction-processing database systems with data warehouses for reporting and analysis. Analysts estimate the data warehouse market segment at 1/3 of the overall relational database market segment ($4-6B vs. $40B for software licenses and support), with an 8-11% compound annual growth rate (CAGR)[1]. While this is a strong growth rate for a large, mature market, over the past ten years, analysts also estimate data storage at a typical enterprise growing at 30-40% CAGR. Over the past 12-18 months, new market research has begun to show an increase to 50-60%, with data doubling in size every 20 months.

Figure 1: Data Analysis Gap in the Enterprise [10]

This implies most data in an enterprise is "dark data"[2]: data that is collected but not easily analyzed. We see this as unfortunate. If our customers didn't see this data as having value, they would not retain it. Many companies are trying to become increasingly data-driven. And yet, not only is most data already dark, the overall data landscape is only getting darker. Storing this data in NoSQL stores and/or Hadoop in one way to bridge the gap for certain use cases. However it doesn't address all scenarios.

In our discussions with customers, we found the "analysis gap" between data being collected and data available for analysis as due to four major causes:

1. Cost – Most commercial database solutions capable of analyzing data at scale require significant up-front expense. This is hard to justify for large datasets with unclear value.
2. Complexity – Database provisioning, maintenance, backup, and tuning are complex tasks requiring specialized skills. They require IT involvement and cannot easily be performed by line of business data scientists or analysts.
3. Performance – It is difficult to grow a data warehouse without negatively impacting query performance. Once built, IT teams sometimes discourage augmenting data or adding queries as a way of protecting current reporting SLAs.
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We see each of the above issues only increasing with data set size. To take one large-scale customer example, the Amazon Retail team collects about 5 billion web log records daily (2TB/day,

[1] Forecast data combined from IDC, Gartner, and 451 Research.
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First page figure ✅

Figures Matter

- Figures are an integral part of communication
- Many people only look at figures and captions
- Papers are recognized by graphs: Add a first page figure
- Figures are equally important as text
- Text should discuss the takeaways of a figure

Amazon Redshift and the Case for Simpler Data Warehouses

Anurag Gupta, Deepak Agarwal, Derek Tan, Jakub Kulesza, Rahul Pathak, Stefano Stefani, Vidhya Srinivasan

Amazon Web Services

Abstract

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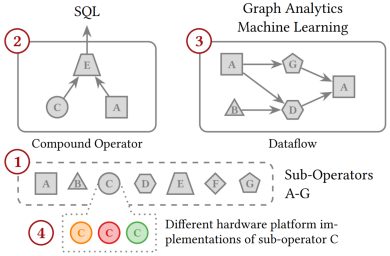

Figure 1: Sub-operators ① build more complex data operations ② or dataflows ③, where each sub-operator can be implemented on multiple hardware platforms ④.

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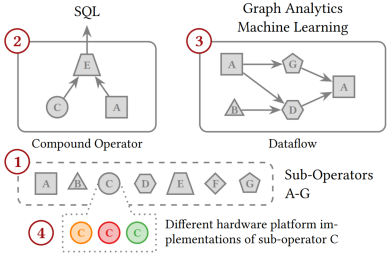

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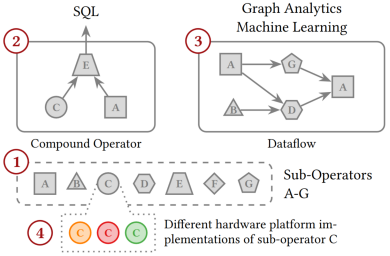

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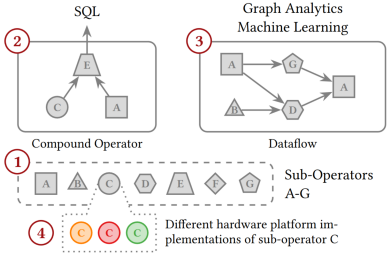

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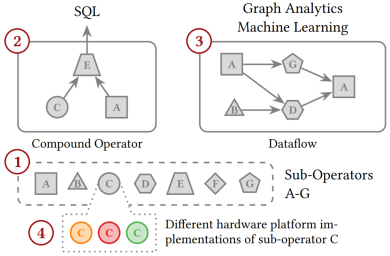

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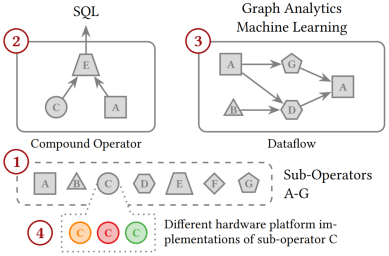

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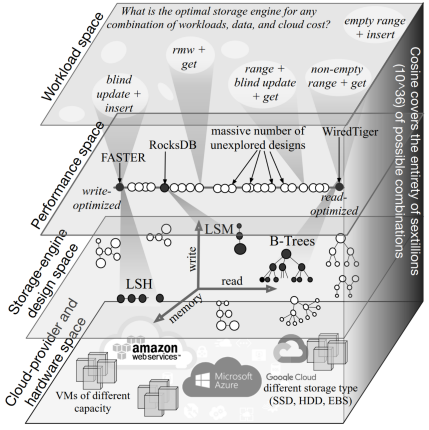

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Complex figure ❌

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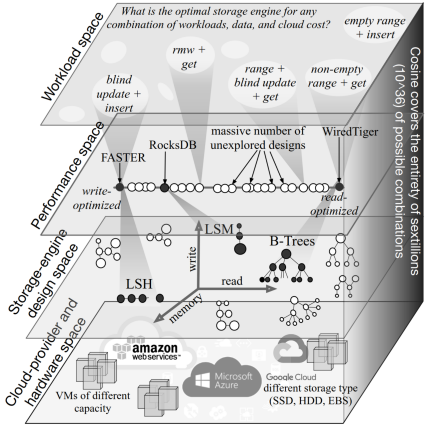

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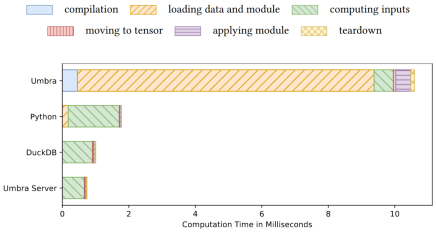

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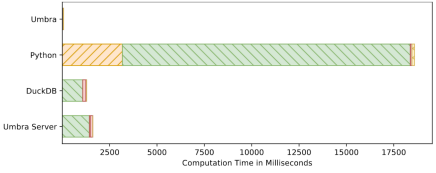

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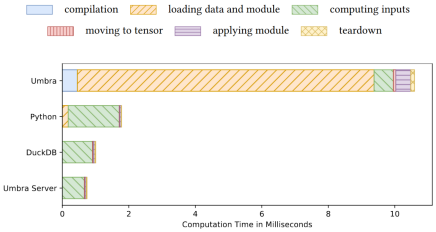

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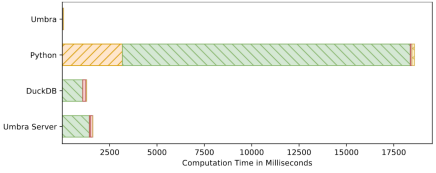

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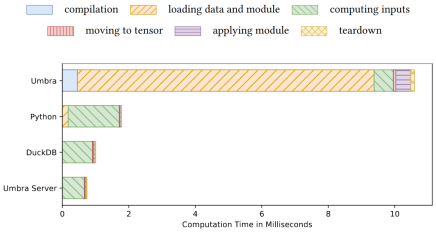

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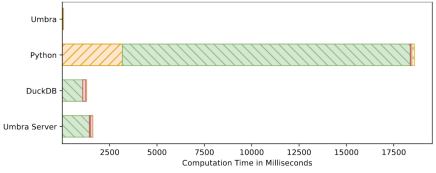

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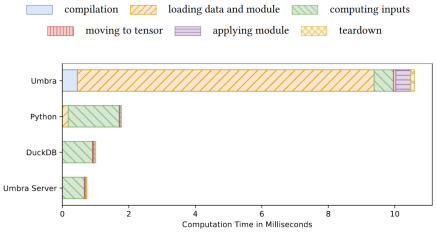

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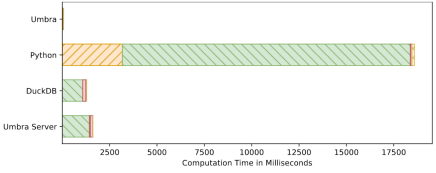

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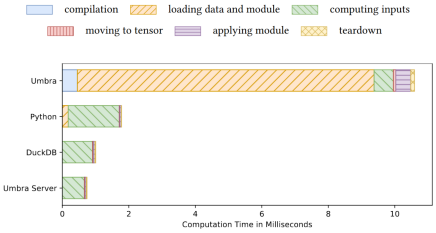

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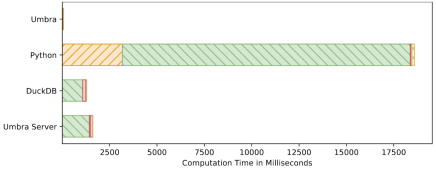

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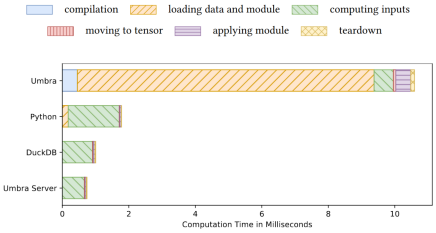

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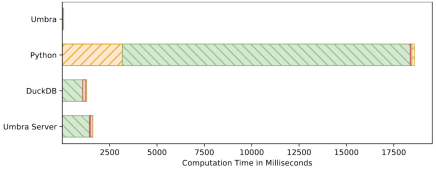

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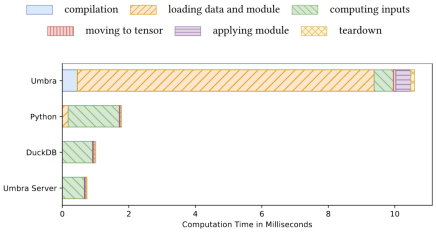

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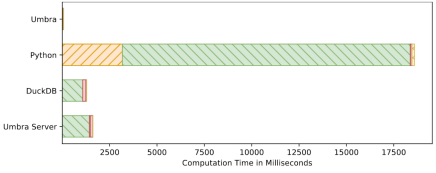

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Official ScanNet Benchmark

Method	avg IoU	Chair	Floor	Other Furniture	Picture	Sofa	Table	Wall	...
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  - Use syntax highlighting

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Further References

- Deirdre Nansen McCloskey, **Economical Writing**,Third Edition, 2019
- Joseph Williams, **Style: Toward Clarity and Grace**, Univ. of Chicago Press, 1990
- Justin Zobel, **Writing for Computer Science**, Springer, Third Edition, 2014
- Larry McEnerney, **The Craft of Writing Effectively** [link]
- Lorenz Froihofer, **Tips for scientific writing (for Germans)** [link]
- Lorenz Froihofer, **How to write a computer science paper** [link]

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