Seminar Large-scale Data Engineering (LDE)
01 Structure of Scientific Papers

Dr.-Ing. Patrick Damme
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Big Data Engineering (DAMS Lab)

Last update: Oct 13, 2024

[**Credit:** Based on "Introduction to Scientific Writing"/ "01 Structure of Scientific Papers" by Matthias Boehm (TU Graz, winter 2021/22)]

Announcements/Org

- **Hybrid Setting with Optional Attendance**
  - In-person in MAR 0.015
  - Virtual via zoom
    https://tu-berlin.zoom.us/j/67376691490?pwd=NmlvWTM5VUVWRjU0UGI2bXhBVkxzQT09

About Me

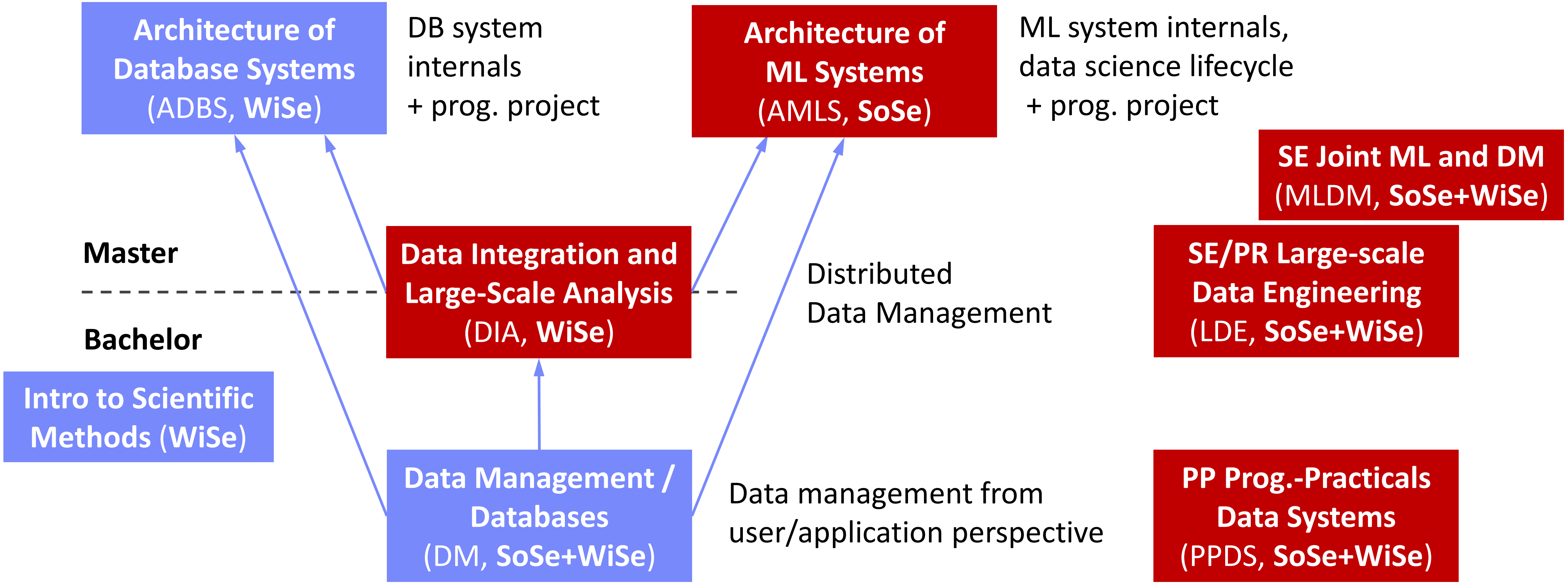
- **Since 10/2022: Postdoc at TU Berlin**, Germany
  - FG Big Data Engineering (DAMS Lab) headed by Prof. Matthias Böhm
  - Continuing work on integrated data analysis pipelines
  - Research interests in the fields of database and ML systems (especially compiler & runtime techniques, extensibility)

- **2021-2022: Postdoc at TU Graz & Know-Center GmbH**, Austria
  - Data Management group headed by Prof. Matthias Böhm
  - Started work on integrated data analysis pipelines

- **2015-2020: PhD student at TU Dresden**, Germany
  - Dresden Database Research Group headed by Prof. Wolfgang Lehner
  - PhD thesis on making complex analytical database queries more efficient through lightweight compression of intermediate results

MorphStore & TVL

FG Big Data Engineering (DAMS Lab) – Teaching



Agenda

- **Course Organization, Outline, and Deliverables**
- **Structure of Scientific Papers**
- **List of Seminar Topics**

Course Organization, Outline, and Deliverables

Large-scale Data Engineering: Module Overview

20+5 seats in total

bachelor + master

#41086: LDE Seminar + Project (12 ECTS) – 12 students

#41095: Seminar LDE (3) – 13 students – bachelor-only

#41183: Project LDE (9 ECTS) – 7 students – bachelor-only

Mon, 14:00-16:00
MAR 0.015 & zoom

Seminar LDE

- Reading & writing scientific papers
- Giving presentations on papers
- Summary paper
- Presentation
- Lecturer & seminar mentor

Mon, 16:00-18:00
MAR 0.015 & zoom

Project LDE

- Building & evaluating prototypes
- Giving presentations on prototypes
- Prototype design/impl/tests/doc
- Presentation
- Project mentors

→ In the context of systems for data engineering, data management, machine learning

→ In combination: Ideal preparation for a bachelor/master thesis with our group

Course Organization

- **General Contact Person**
  - Dr.-Ing. Patrick Damme (patrick.damme@tu-berlin.de)
- **Course Website**
  - https://pdamme.github.io/teaching/2024-25_winter/lde/lde_winter2024-25.html
  - One site for seminar and project
  - All material, schedule, **deadlines**
- **ISIS course**
  - https://isis.tu-berlin.de/course/view.php?id=39897
  - Announcements, discussion forum, polls for topic selection
- **Language**
  - Lectures and slides: **English**
  - Communication: **English**/**German**
  - Submitted paper and presentation: **English**
  - **Informal language** (first name is fine), immediate feedback is welcome

Semester Schedule & Deadlines

- **Three Introductory Lectures** (optional)
  - Oct 14: Structure of Scientific Papers
  - Oct 21: Scientific Reading and Writing
  - Oct 28: Experiments, Reproducibility, and Giving Presentations
- **Self-organized Seminar Work**
  - Office hours for any questions (optional)
- **Final Presentations** (mandatory)
  - Jan 20, 14:00-18:00: Session #1
  - Jan 27, 14:00-18:00: Session #2
  - Earlier than in previous semesters in response to students' feedback in course evaluation
- **List of Seminar Topics**
  - Presented today, take your time to select afterwards
- **Topic Selection**
  - **Deadline: Oct 31, 23:59 CET** (in 2½ weeks)
  - Ranked list of **5 topics** via poll on the ISIS course
  - Global topic assignment based on preferences
  - **Notification of assigned topics: Nov 04** (in 3 weeks)
- **Submission of Summary Paper**
  - **Deadline: Jan 13, 23:59 CET** (in 13 weeks)
  - Summary paper (PDF) by email to Patrick Damme
- **Submission of Presentation Slides**
  - **Deadline: The day before you present, 23:59 CET**
  - Presentation slides (PDF) by email to Patrick Damme

Seminar Deliverables

- **Individual Seminar Work**
  - 1 student = 1 paper, no teamwork
- **Summary Paper** (in English)
  - Read and understand selected paper
  - Search for related work to provide some context
  - Write summary paper (**4 pages**, excl. references)
    - including related work
    - make sure relation to umbrella topic is conveyed
  - LaTeX with given template
- **Presentation**
  - Summarize your paper
  - **15 min talk + 5 min discussion** (stay in time)
  - Audience: engage in the discussion
- **Grading**
  - Graded portfolio exam
  - **#41086 (seminar + project)**
    - 25 pts: summary paper
    - 15 pts: presentation
    - 50 pts: design/impl/tests/doc
    - 10 pts: presentation
  - **#41095 (seminar-only)**
    - 65 pts: summary paper
    - 35 pts: presentation
- **Academic Honesty / No Plagiarism**
  (incl LLMs like ChatGPT)

LaTeX Paper Template

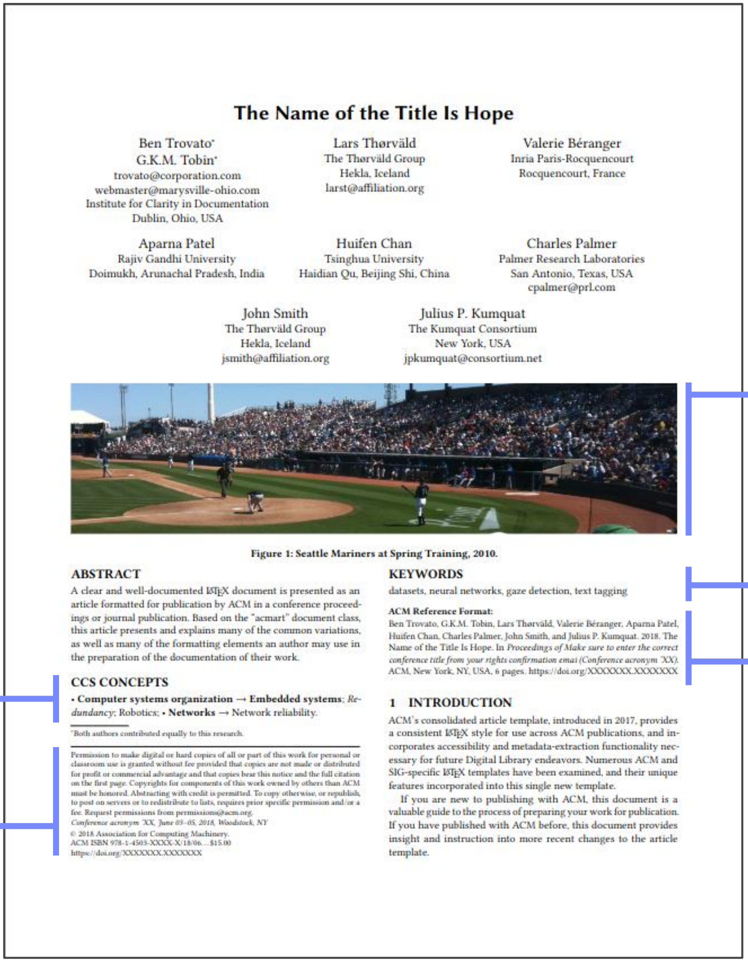
- **Obtain the Template**
  - https://www.acm.org/publications/proceedings-template
  - Download the ZIP archive **`acmart-primary.zip`** and unpack it
- **Select the Right Template**
  - The archive contains all ACM templates
  - Use the **sigconf document class**
- **The Easiest Way to Set up Your Own Document**
  - Copy just the required files to a new directory
  - Rename the .tex and .bib file as you like (and adapt the **`\bibliography{}`**)
  - Open the .tex file in a text/LaTeX editor
  - Remove example contents, replace it by yours (title, authors, sections, paragraphs, figures, etc.)
  - Replace the .bib contents by your BibTeX entries

```
acmart-primary/
  samples/
    sample-base.bib
    sample-sigconf.tex
    …
  acmart.cls
  ACM-Reference-Format.bst
  …
```

```
lde-summary-paper/
  literature.bib
  summary-paper.tex
  acmart.cls
  ACM-Reference-Format.bst
```

LaTeX Paper Template

ACM acmart template
document class sigconf (double-column)



The Name of the Title Is Hope

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Figure 1: Seattle Mariners at Spring Training, 2010.

ABSTRACT

A clear and well-documented LaTeX document is presented as an article formatted for publication by ACM in a conference proceedings or journal publication. Based on the "acmart" document class, this article presents and explains many of the common variations, as well as many of the formatting elements an author may use in the preparation of the documentation of their work.

CCS CONCEPTS

• **Computer systems organization** → **Embedded systems**; *Redundancy*; Robotics; • **Networks** → Network reliability.

*Both authors contributed equally to this research.

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https://doi.org/XXXXXXX.XXXXXXX

KEYWORDS

datasets, neural networks, gaze detection, text tagging

ACM Reference Format:
Ben Trovato, G.K.M. Tobin, Lars Thørväld, Valerie Béranger, Aparna Patel, Huifen Chan, Charles Palmer, John Smith, and Julius P. Kumquat. 2018. The Name of the Title Is Hope. In *Proceedings of Make sure to enter the correct conference title from your rights confirmation emai (Conference acronym 'XX).* ACM, New York, NY, USA, 6 pages. https://doi.org/XXXXXXX.XXXXXXX

1 INTRODUCTION

ACM's consolidated article template, introduced in 2017, provides a consistent LaTeX style for use across ACM publications, and incorporates accessibility and metadata-extraction functionality necessary for future Digital Library endeavors. Numerous ACM and SIG-specific LaTeX templates have been examined, and their unique features incorporated into this single new template.

If you are new to publishing with ACM, this document is a valuable guide to the process of preparing your work for publication. If you have published with ACM before, this document provides insight and instruction into more recent changes to the article template.

CCS concepts
(ACM Computing Classification System)
Select concepts at http://dl.acm.org/ccs.cfm
and insert generated code:

```
%%
%% The code below is generated by the tool at http://dl.acm.org/ccs.cfm.
%% Please copy and paste the code instead of the example below.
%%
\begin{CCSXML}
<ccs2012>
 <concept>
  <concept_id>10010520.10010553.10010562</concept_id>
  <concept_desc>Computer systems organization~Embedded systems</concept_desc>
  <concept_significance>500</concept_significance>
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  <concept_id>10010520.10010575.10010755</concept_id>
  <concept_desc>Computer systems organization~Redundancy</concept_desc>
  <concept_significance>300</concept_significance>
 </concept>
 <concept>
```

Copyright notice
Just keep as it is (ignore the dummy data)

Teaser image
Not required (especially no photograph)

Keywords
Specify meaningful keywords

```
%% Keywords. The author(s) should pick words that accurately describe
%% the work being presented. Separate the keywords with commas.
\keywords{datasets, neural networks, gaze detection, text tagging}
```

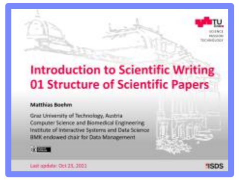
ACM reference format
Just keep as it is (ignore the dummy data)

Portfolio Exam Registration

- **Portfolio exam registration: Nov 04 – Dez 02**
  - Binding registration in Moses/MTS
  - Including selection of seminar presentation date (first-come-first-serve)
- **Portfolio exam de-registration**
  - **Until 3 days before the first graded exam part**
    - Modules “LDE”/”Seminar LDE”: until **Jan 10**
    - Module “Project LDE”: until **Feb 14**
    - De-register yourself in Moses/MTS
  - **With sufficient reason: Until the day of the exam**
    - In case of sickness etc.
    - Modules “LDE”/”Seminar LDE”: until **Jan 12**
    - Module “Project LDE”: until **Feb 16**
- **Missing deadlines/exam without de-registration**
  - Zero points in the respective exam part (!)
  - **Approach us early in case of problems**
- **If you don’t want to take LDE anymore**
  - Let me know asap to give students in the queue a chance to fill in

Structure of Scientific Papers

In Computer Science (Data Management)



[**Credit:** Based on “Introduction to Scientific Writing”/ ”01 Structure of Scientific Papers” by Matthias Boehm (TU Graz, winter 2021/22)]

Overview Types of Scientific Writing

- **Classification of Scientific/Technical Documents**
  - Formal vs informal writing, cumulative?, single vs multi-author, archival vs non-archival publications
- **Scientific Writing Skills are crucial**
  - Different types of docs share many similarities

/

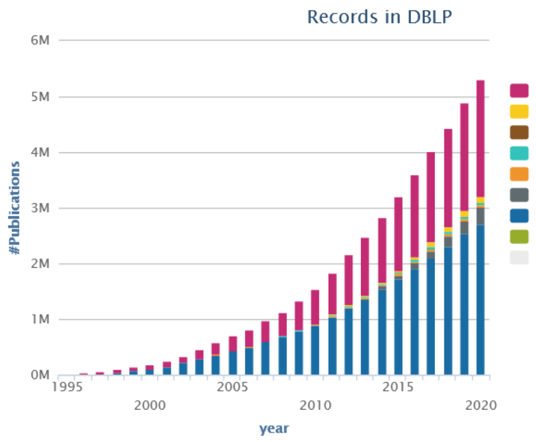
- **Monographs**
  - BS Thesis
  - MS Thesis
  - PhD Thesis
  - Habilitation
- **Scientific Papers**
  - by pub. channel
    - Preprint
    - Conference
    - Journal
    - Tech Report
  - by contents
    - Research
    - Industry
    - Survey
    - E&A
    - Vision
    - Demo
- **Others**
  - Grant Proposal
  - Design doc
  - White Paper
  - Blog
  - Website

Preparation

- **Know your Audience**

- **Get your Workflow in Order**
  - Writing: **LaTeX** (e.g., Overleaf, TeXnicCenter), **versioning** (e.g., git), **templates**
  - Plotting: **R** (e.g., plot, ggplot), **Python** (e.g., matplotlib, seaborn), **Gnuplot**, **LaTeX** (e.g., pgfplots)
  - Figures: e.g., MS Visio/**MS Powerpoint**, **Inkscape** → pdf, eps, svg (vector graphics)

- **Mindset: Quality over Quantity**
  - Aim for top-tier conferences/journals (act as filter)
  - Make the paper useful for others (ideas, evidence, code)



Paper Writing and Publication Process

- **Research – Writing Cycle**
  - Read lots of papers
  - ~~Idea → Research → Writing → Document~~
  - Idea → Writing/Research → Document
  - Incremental refinement of drafts
- **Paper Submission Cycle**
  - Blind vs double-blind submission
  - Revisions and Camera-ready
  - **Similar: bachelor/master** thesis
    → drafts to advisor / final version

- **Example: SIGMOD 2024: Paper Submission Round 2**
  - **April 15, 2023**: Paper submission
  - **May 26 - 28, 2023**: Author feedback phase
  - **June 20, 2023**: Notification of accept/reject/review again
  - **July 20, 2023**: Revised paper submission
  - **August 23, 2023**: Final notification of accept/reject
  - **tba, 2023**: Camera ready due

[Recommended Reading]

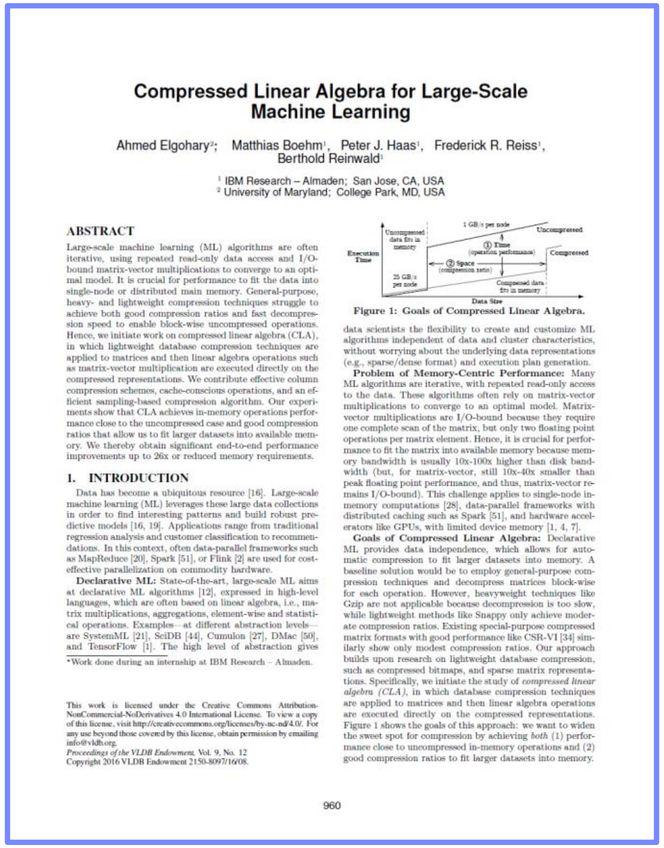
[Eamonn Keogh: How to do good research, get it published in SIGKDD and get it cited!, **KDD 2009**]


How to do good research, get it published in SIGKDD and get it cited!
Eamonn Keogh

[Simon Peyton Jones: How to write a great research paper, MSR Cambridge]


How to write a great research paper
Simon Peyton Jones
Microsoft Research, Cambridge

Running Example



Compressed Linear Algebra for Large-Scale Machine Learning

Ahmed Elgohary[2]*, Matthias Boehm[1], Peter J. Haas[1], Frederick R. Reiss[1], Berthold Reinwald[1]

[1] IBM Research – Almaden; San Jose, CA, USA
[2] University of Maryland; College Park, MD, USA

ABSTRACT

Large-scale machine learning (ML) algorithms are often iterative, using repeated read-only data access and I/O-bound matrix-vector multiplications to converge to an optimal model. It is crucial for performance to fit the data into single-node or distributed main memory. General-purpose, heavy- and lightweight compression techniques struggle to achieve both good compression ratios and fast decompression speed to enable block-wise uncompressed operations. Hence, we initiate work on compressed linear algebra (CLA), in which lightweight database compression techniques are applied to matrices and then linear algebra operations such as matrix-vector multiplication are executed directly on the compressed representations. We contribute effective column compression schemes, cache-conscious operations, and an efficient sampling-based compression algorithm. Our experiments show that CLA achieves in-memory operations performance close to the uncompressed case and good compression ratios that allow us to fit larger datasets into available memory. We thereby obtain significant end-to-end performance improvements up to 26x or reduced memory requirements.

1. INTRODUCTION

Data has become a ubiquitous resource [16]. Large-scale machine learning (ML) leverages these large data collections in order to find interesting patterns and build robust predictive models [16, 19]. Applications range from traditional regression analysis and customer classification to recommendations. In this context, often data-parallel frameworks such as MapReduce [20], Spark [51], or Flink [2] are used for cost-effective parallelization on commodity hardware.

Declarative ML: State-of-the-art, large-scale ML aims at declarative ML algorithms [12], expressed in high-level languages, which are often based on linear algebra, i.e., matrix multiplications, aggregations, element-wise and statistical operations. Examples—at different abstraction levels—are SystemML [21], SciDB [44], Cumulon [27], DMac [50], and TensorFlow [1]. The high level of abstraction gives data scientists the flexibility to create and customize ML algorithms independent of data and cluster characteristics, without worrying about the underlying data representations (e.g., sparse/dense format) and execution plan generation.

*Work done during an internship at IBM Research – Almaden.

Proceedings of the VLDB Endowment, Vol. 9, No. 12
Copyright 2016 VLDB Endowment 2150-8097/16/08.

Figure 1: Goals of Compressed Linear Algebra.

Problem of Memory-Centric Performance: Many ML algorithms are iterative, with repeated read-only access to the data. These algorithms often rely on matrix-vector multiplications to converge to an optimal model. Matrix-vector multiplications are I/O-bound because they require one complete scan of the matrix, but only two floating point operations per matrix element. Hence, it is crucial for performance to fit the matrix into available memory because memory bandwidth is usually 10x-100x higher than disk bandwidth (but, for matrix-vector, still 10x-40x smaller than peak floating point performance, and thus, matrix-vector remains I/O-bound). This challenge applies to single-node in-memory computations [28], data-parallel frameworks with distributed caching such as Spark [51], and hardware accelerators like GPUs, with limited device memory [1, 4, 7].

Goals of Compressed Linear Algebra: Declarative ML provides data independence, which allows for automatic compression to fit larger datasets into memory. A baseline solution would be to employ general-purpose compression techniques and decompress matrices block-wise for each operation. However, heavyweight techniques like Gzip are not applicable because decompression is too slow, while lightweight methods like Snappy only achieve moderate compression ratios. Existing special-purpose compressed matrix formats with good performance like CSR-VI [34] similarly show only modest compression ratios. Our approach builds upon research on lightweight database compression, such as compressed bitmaps, and sparse matrix representations. Specifically, we initiate the study of *compressed linear algebra (CLA)*, in which database compression techniques are applied to matrices and then linear algebra operations are executed directly on the compressed representations. Figure 1 shows the goals of this approach: we want to widen the sweet spot for compression by achieving *both* (1) performance close to uncompressed in-memory operations and (2) good compression ratios to fit larger datasets into memory.

960

- **Example paper used in the following**
  - Ahmed Elgohary, **Matthias Boehm**, Peter J. Haas, Frederick R. Reiss, Berthold Reinwald: **Compressed Linear Algebra** for Large-Scale Machine Learning. **PVLDB 2016**

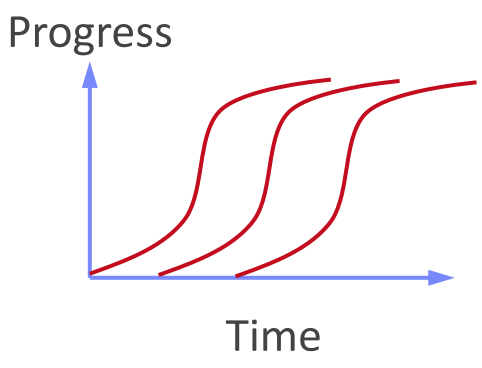
[Ahmed Elgohary, Matthias Boehm, Peter J. Haas, Frederick R. Reiss, Berthold Reinwald: Scaling Machine Learning via Compressed Linear Algebra. **SIGMOD Record 2017 46(1)**]

[Ahmed Elgohary, Matthias Boehm, Peter J. Haas, Frederick R. Reiss, Berthold Reinwald: Compressed Linear Algebra for Large-Scale Machine Learning. **VLDB Journal 2018 27(5)**]

[Ahmed Elgohary, Matthias Boehm, Peter J. Haas, Frederick R. Reiss, Berthold Reinwald: Compressed Linear Algebra for Large-Scale Machine Learning. **Commun. ACM 2019 62(5)**]

Ideas and Topic Selection

- **Problem-Oriented Research**
  - Focus on problem/observation first, not your solution
  - **Discuss early ideas** with collaborators and friends
  - Develop your taste for good research topics
  - Topic selection needs time → **pipeline model**



- **Ex. Compressed Linear Algebra**
  - **Problem:** Iterative ML algorithms + memory-bandwidth-bound operations
    → crucial to fit data in memory → automatic lossless compression
  - **Sub-problems:** #rows>>#cols, column correlation, column characteristics
    → column-wise compression w/ heterogeneous encoding formats

Prototypes and Experiments

- **Worst Mistake: Schrödinger's Results**
  - Postpone implementation and experiments till last before the deadline
  - No feedback, no reaction time (experiments require many iterations)
  - **Karl Popper:** falsifiability of scientific results
- **Continuous Experiments**
  - Run experiments during survey / prototype building
  - Systematic experiments → observations and ideas for improvements
  - Don't be afraid of throwíng away prototypes that don't work
- **Ex. Compressed Linear Algebra**
  - Data characteristics inspired overall design of encoding schemes
  - Initially slow compression → dedicated sampling schemes and estimators
  - Initially slow compressed operations → cache-conscious operations, selected operations with better asymptotic behavior

Prototypical Structure of a Scientific Paper

- **Title & Authors**
- **Sections and Subsections**
  - Abstract → short overview of problem and solution (part of meta data)
  - Introduction → context, problem, contributions
  - Background / Preliminaries → necessary background for understanding
  - Main Part → your technical core contributions
  - Main Part 2
  - Experiments → setting, micro benchmarks, end-to-end benchmarks
  - Related Work → areas of related work, differences to your own work
  - Conclusions → summary, conclusions, and future work
  - Acknowledgments → funding agencies, helpful people beyond co-authors
  - References → list of other works referenced throughout the paper
  - (Appendix) → any additional contents (e.g., proves of theorems, more results)

Title and Authors

- **List of Authors**
  - E.g., by contribution (main, …, advisor)
  - E.g., by last name
  - Affiliations, contact (corresponding author)

- **Title**
  - Descriptive yet concise
  - Short name if possible → easier to cite and discuss

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[1] IBM Research – Almaden; San Jose, CA, USA
[2] University of Maryland; College Park, MD, USA

SPOOF: Sum-Product Optimization and Operator Fusion for Large-Scale Machine Learning

Tarek Elgamal[2]*, Shangyu Luo[3]*, Matthias Boehm[1], Alexandre V. Evfimievski[1], Shirish Tatikonda[4]*, Berthold Reinwald[1], Prithviraj Sen[1]

[1] IBM Research – Almaden; San Jose, CA, USA
[2] University of Illinois; Urbana-Champaign, IL, USA
[3] Rice University; Houston, TX, USA
[4] Target Corporation; Sunnyvale, CA, USA

MNC: Structure-Exploiting Sparsity Estimation for Matrix Expressions

Johanna Sommer, IBM Germany
Matthias Boehm, Graz University of Technology
Alexandre V. Evfimievski, IBM Research – Almaden
Berthold Reinwald, IBM Research – Almaden
Peter J. Haas, UMass Amherst

SliceLine: Fast, Linear-Algebra-based Slice Finding for ML Model Debugging

Svetlana Sagadeeva*, Graz University of Technology
Matthias Boehm, Graz University of Technology

sliceline

[**Credit:** sliceline, Silicon Valley, HBO]

Abstract

% 1. State the problem

Large-scale machine learning (ML) algorithms are often iterative, using repeated read-only data access and I/O-bound matrix-vector multiplications to converge to an optimal model. It is crucial for performance to fit the data into single-node or distributed main memory.

% 2. Say why it's an interesting problem

General-purpose, heavy- and lightweight compression techniques struggle to achieve both good compression ratios and fast decompression speed to enable block-wise uncompressed operations.

% 3. Say what your solution achieves

Hence, we initiate work on compressed linear algebra (CLA), in which lightweight database compression techniques are applied to matrices and then linear algebra operations such as matrix-vector multiplication are executed directly on the compressed representations. We contribute effective column compression schemes, cache-conscious operations, and an efficient sampling-based compression algorithm. Our experiments show that CLA achieves in-memory operations performance close to the uncompressed case and good compression ratios that allow us to fit larger datasets into available memory.

% 4. Say what follows from your solution

We thereby obtain significant end-to-end performance improvements up to 26x or reduced memory requirements.

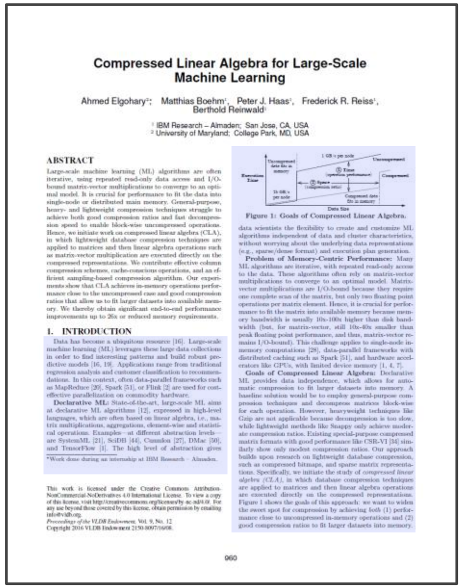
[Simon Peyton Jones: How to write a great research paper, MSR Cambridge]

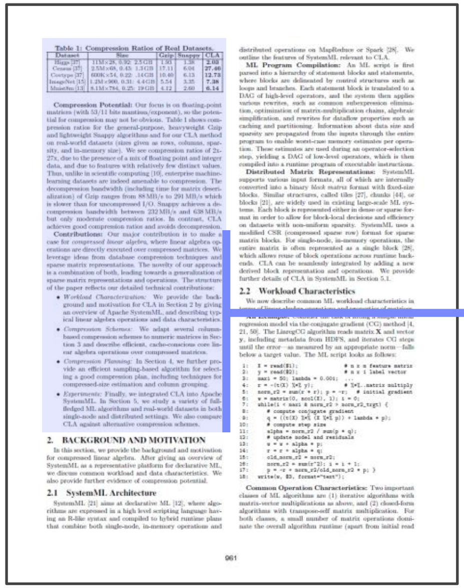
ABSTRACT

Large-scale machine learning (ML) algorithms are often iterative, using repeated read-only data access and I/O-bound matrix-vector multiplications to converge to an optimal model. It is crucial for performance to fit the data into single-node or distributed main memory. General-purpose, heavy- and lightweight compression techniques struggle to achieve both good compression ratios and fast decompression speed to enable block-wise uncompressed operations. Hence, we initiate work on compressed linear algebra (CLA), in which lightweight database compression techniques are applied to matrices and then linear algebra operations such as matrix-vector multiplication are executed directly on the compressed representations. We contribute effective column compression schemes, cache-conscious operations, and an efficient sampling-based compression algorithm. Our experiments show that CLA achieves in-memory operations performance close to the uncompressed case and good compression ratios that allow us to fit larger datasets into available memory. We thereby obtain significant end-to-end performance improvements up to 26x or reduced memory requirements.

Introduction

- **Prototypical Structure**
  - Context (1 paragraph)
  - Problems (1-3 paragraphs)
  - [Existing Work (1 paragraph)]
  - [Idea (1 paragraph)]
  - Contributions (1 paragraph)





Contributions: Our major contribution is to make a case for *compressed linear algebra*, where linear algebra operations are directly executed over compressed matrices. We leverage ideas from database compression techniques and sparse matrix representations. The novelty of our approach is a combination of both, leading towards a generalization of sparse matrix representations and operations. The structure of the paper reflects our detailed technical contributions:

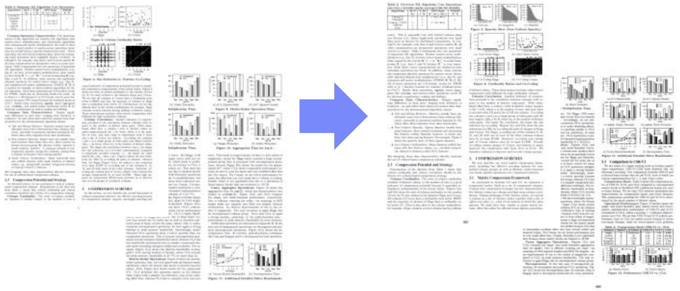
- *Workload Characterization:* We provide the background and motivation for CLA in Section 2 by giving an overview of Apache SystemML, and describing typical linear algebra operations and data characteristics.
- *Compression Schemes:* We adapt several column-based compression schemes to numeric matrices in Section 3 and describe efficient, cache-conscious core linear algebra operations over compressed matrices.
- *Compression Planning:* In Section 4, we further provide an efficient sampling-based algorithm for selecting a good compression plan, including techniques for compressed-size estimation and column grouping.
- *Experiments:* Finally, we integrated CLA into Apache SystemML. In Section 5, we study a variety of full-fledged ML algorithms and real-world datasets in both single-node and distributed settings. We also compare CLA against alternative compression schemes.

- **Introduction Matters**
  - **Anchoring**: most reviewers reach their opinion after reading introduction and motivation and then look for evidence

[Eamonn Keogh: How to do good research, get it published in SIGKDD and get it cited!, **KDD 2009**]

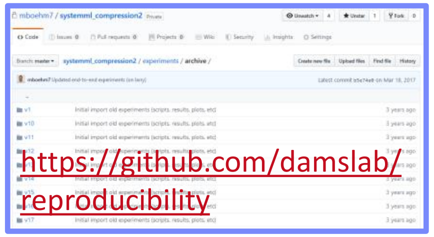
Writing the Paper (and more Experiments)

- **Easily Readable: Quality $\propto$ Time**
  - **Make it easy to skim the paper**
    → paragraph labels, self-explanatory figures (close to text), and structure
  - Avoid unnecessary formalism → as simple as possible
  - Shortening the text in favor of structure improves readability
  - **Ex. Compressed Linear Algebra**
    - Initial SIGMOD submission: **12+3 pages**
    - Final PVLDB submission: **12 pages**
      (+ more figures, experiments, etc.)



→ 02 Scientific Reading and Writing

- **Solid, Reproducible Experiments**
  - Create, use, and share dedicated benchmarks / datasets
  - Avoid weak baselines, start early w/ baseline comparisons
  - Automate your experiments as much as possible
  - Keep repository of all scripts, results, and used parameters



https://github.com/damslab/reproducibility

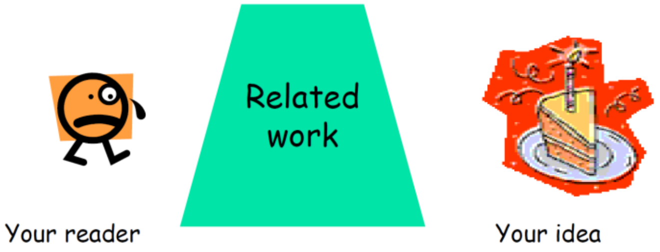
→ 03 Experiments, Reproducibility, and Giving Presentations

Related Work

- **Purpose of a “Related Work”-Section**
  - **Not** a mandatory task or to show you know the field
  - Put you work in context of related areas (~ 1 paragraph each)
  - Discuss closely related work
  - **Crisp separation from existing work** (what are the differences)

[Simon Peyton Jones: How to write a great research paper, MSR Cambridge]

- **Placement**
  - Section 2 or **Section n-1**
  - Throughout the paper



- **Give Credit**
  - Cite broadly, **give credit to inspiring ideas**, create connections
  - Honestly acknowledge **limitations of your approach**

References

- **Setup**
  - Use LaTeX **\cite**{} and BibTeX
  - Use a consistent source of bibtex entries (e.g., DBLP)

```
inproceedings{StonebrakerBPR11,
  author    = {Michael {Stonebraker et al.}},
  title     = {{The Architecture of SciDB}},
  booktitle = {{SSDBM}},
  year      = {2011}
}
```

VLDB2016.bib

```
\bibliographystyle{abbrv}
\bibliography{VLDB2016}
```

- **Different References Styles**
  - But, **not in footnotes** (unless required)
  - **8. REFERENCES**

[1] M. Abadi et al. TensorFlow: Large-Scale Machine Learning on Heterogeneous Distributed Systems. *CoRR*, 2016.

[2] A. Alexandrov et al. The Stratosphere Platform for Big Data Analytics. *VLDB J.*, 23(6), 2014.

References

[Al14] Alexandrov, A. et al.: The Stratosphere platform for big data J. 23/6, 2014.

[AS14] Arap, O.; Swany, M.: Offloading MPI Parallel Prefix Scan the NetFPGA. CoRR abs/1408.4939/, 2014.

References

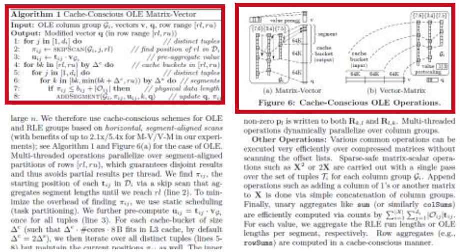
Jaume Amores. 2013. Multiple instance classification: Review, taxonomy and comparative study. *Artificial Intelligence*.

Dealing with Feedback / Criticism

- **Different Kinds of Feedback**
  - Casual discussion of early ideas
  - Comments on paper drafts
  - Reviewer comments (good and bad)

- Always welcome feedback/criticism
- Address all feedback w/ sincere effort

- **Example Compressed Linear Algebra**
  - SIGMOD Reviewer 2 (REJECT)
    - "The rewriting for q=Xv seems wrong: To compute q, one takes each row of the matrix X and multiplies it with the vector v."
  - PVLDB Reviewer 3 (WEAK ACCEPT)
    - "I kinda disagree with the broad definition of declarative ML […]."



[Matthias Boehm et al.: Declarative Machine Learning - A Classification of Basic Properties and Types. **CoRR 2016**.]

- **Paper Rebuttal and/or Revision**
  - **Rebuttal**: seriously consider all feedback (in doubt agree), and answer with facts / ideas how to address the comments
  - **Revision** (conditional accept): address all revision requests

List of Seminar Topics

See list at https://pdamme.github.io/teaching/2024-25_winter/lde/SeminarTopics.pdf

Summary and Q&A

- **Course Organization, Outline, and Deliverables**
- **Structure of Scientific Papers**
- **List of Seminar Topics (Proposals)**

- **Remaining Questions?**

- **Next Lectures**
  - 02 **Scientific Reading and Writing** [Oct 21]
  - 03 **Experiments, Reproducibility, and Giving Presentations** [Oct 28]