

Literature Research Primer

Alexander Hück

28.04.2021

Disclaimer

A guide to conduct (and write) a *literature review*, see [1].



1. Basic search strategies for scholarly sources
2. Basic usage of academic search engines

Approaching Literature Research

Specialized search engines typically offer more features and relevant scholarly sources compared to plain Google.

- ▶ Abstract preview
- ▶ Citing: What references are used in the article?
- ▶ Cited by: Who cited the article (i.e., more recent works)?
- ▶ What are the related articles?
- ▶ Many exist, see [Wikipedia list](#).
 - ▶ Google Scholar, IEEE Xplore, ACM ...

Literature search is an iterative process.

- 1. Breadth-first search using known terms**
 - ▶ Open all papers that appear relevant from the results
 - ▶ Go a couple result pages deep
 - 2. Focused deepening search**
 - ▶ Identify relevance of previous results, then use their related work section and citations and read them
- ▶ Use step 2 to refine your search terms
 - ▶ Go back to step 1 periodically



Taken from [2]:

0. Be aware of state-of-art works (in your area)
 1. **Snowballing**: Look at their citations (Citing)
 2. **Backtracking**: Look at works citing them (Cited by)
 3. Use results of 1 and 2 and **repeat the step 2** a few times.
- ▶ This results in a network of important papers in your area



Independent of your starting point, familiarize yourself with the field-specific jargon during your search.

- ▶ In an article, use provided *keywords* and background/related work sections
- ▶ You can use these terms to help further focus your search
 - ▶ **Machine learning** vs. **backprobagation** vs. **rprop AND backprobagation**

Skim over key sections, ask yourself if the paper is relevant to you.

- ▶ Read the abstract
- ▶ Read the introduction and the conclusion
- ▶ (Read the paper)

Look up the (main or common) author(s) of relevant papers.

- ▶ Often researchers focus on a few key areas (same topics)

Look at conference of relevant paper

- ▶ Conferences are organized by topic/domain
 - ▶ Other papers in the conference proceedings may be relevant

Google Scholar

Academic search engine that offers

- ▶ Advanced search, see [3] and [4]
 - ▶ Keyword search with operators (AND, OR, NOT) and functions (author, intitle)
- ▶ For each search result
 - ▶ *Related articles* : Similar articles
 - ▶ *Cited by* : Articles citing the result

Google Scholar
algorithmic differentiation
SIGN IN

Articles
About 76.900 results (0,05 sec)
My profile
My library

Any time

Since 2021

Since 2020

Since 2017

Custom range...

Sort by relevance

Sort by date

include patents

include citations

Create alert

[BOOK] Evaluating derivatives: principles and techniques of algorithmic differentiation

[A Griewank](#), [A Walther](#) - 2008 - SIAM

The advent of high-speed computers and sophisticated software tools has made the computation of derivatives for functions defined by evaluation programs both easier and more important. On one hand, the dependence of certain program outputs on certain input ...

☆ 99 Cited by 3558 Related articles All 8 versions Import into BibTeX ⌕

Fast Greeks by algorithmic differentiation

[L Capriotti](#) - Available at SSRN 1619626, 2010 - papers.ssrn.com

Abstract We show how **Algorithmic Differentiation** can be used to implement efficiently the Pathwise Derivative method for the calculation of option sensitivities with Monte Carlo. The main practical difficulty of the Pathwise Derivative method is that it requires the **differentiation** ...

☆ 99 Cited by 79 Related articles All 7 versions Web of Science: 20 Import into BibTeX ⌕

[PDF] semanticscholar.org

The connection between the complex-step derivative approximation and algorithmic differentiation

[J Martins](#), [P Sturdza](#), [J Alonso](#) - 39th Aerospace Sciences Meeting and ... 2001 - arc.aiaa.org

This paper presents improvements to the complexstep derivative approximation method which increase its accuracy and robustness. These improvements unveil the connection to **algorithmic differentiation** theory. The choice between these two methods then hinges on a ...

☆ 99 Cited by 125 Related articles All 10 versions Import into BibTeX ⌕

[PDF] academia.edu

[BOOK] The art of differentiating computer programs: an introduction to algorithmic differentiation

[U Naumann](#) - 2011 - SIAM

"How sensitive are the values of the outputs of my computer program with respect to changes in the values of the inputs? How sensitive are these first-order sensitivities with respect to changes in the values of the inputs? How sensitive are the second-order ...

☆ 99 Cited by 315 Related articles All 6 versions Import into BibTeX ⌕

[PDF] rwth-aachen.de

Related searches

adjoint algorithmic differentiation
algorithmic differentiation **principles and techniques**
algorithmic differentiation **greeks**
algorithmic differentiation **cva**

algorithmic differentiation **sensitivity**
algorithmic differentiation **python**
algorithmic differentiation **implicit function theorem**
algorithmic differentiation **evaluating derivatives**

  SIGN IN

Articles About 141 results (0,05 sec)  My profile  My library

Any time
Since 2021
Since 2020
Since 2017
Custom range...

High-performance derivative computations using [codipack](#)
[M.Sagebaum, T.Albring, NR.Gauger](#) - ACM Transactions on ..., 2019 - [dl.acm.org](#)
There are several AD tools available that all implement different strategies for the reverse mode of AD. The most common strategies are primal value taping (implemented eg by ADOL-C) and Jacobian taping (implemented eg by Adept and dco/c++). Particularly for ...
[☆](#) [🔗](#) [Cited by 74](#) [Related articles](#) [All 3 versions](#) [Web of Science: 3](#) [🔗](#)

[\[PDF\] acm.org](#)
[Full View](#)

Any time

Since 2021

Since 2020

Since 2017

Custom range...

Sort by relevance

Sort by date

include citations

Create alert

High-performance derivative computations using codipack

Search within citing articles

Effective adjoint approaches for computational fluid dynamics

[GKW Kenway, CA Mader, P He...](#) - Progress in Aerospace ..., 2019 - Elsevier

The adjoint method is used for high-fidelity aerodynamic shape optimization and is an efficient approach for computing the derivatives of a function of interest with respect to a large number of design variables. Over the past few decades, various approaches have ...

☆ 99 Cited by 66 Related articles All 6 versions Web of Science: 25 🔗

A review of automatic differentiation and its efficient implementation

[CC Margossian](#) - Wiley interdisciplinary reviews: data mining ..., 2019 - Wiley Online Library

Derivatives play a critical role in computational statistics, examples being Bayesian inference using Hamiltonian Monte Carlo sampling and the training of neural networks. Automatic differentiation (AD) is a powerful tool to automate the calculation of derivatives ...

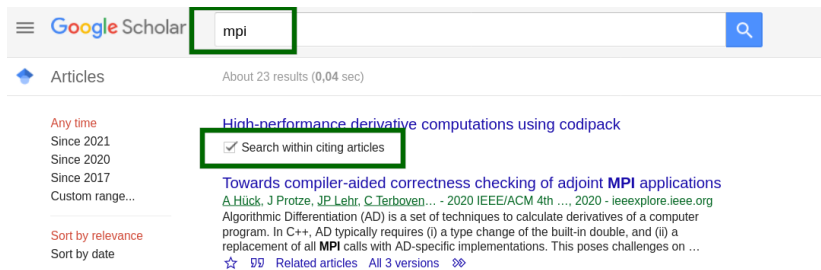
☆ 99 Cited by 56 Related articles All 4 versions Web of Science: 6 🔗

ADAPT: algorithmic differentiation applied to floating-point precision tuning

[H Menon, MQ Lam, D Osei-Kuffuor...](#) - ... Conference for High ..., 2018 - ieeexplore.ieee.org

HPC applications use floating point arithmetic operations extensively to solve computational problems. Mixed-precision computing seeks to use the lowest precision data type that is sufficient to achieve a desired accuracy, improving performance and reducing power ...

☆ 99 Cited by 22 Related articles All 5 versions 🔗



Google Scholar

Articles About 23 results (0,04 sec)

Any time
Since 2021
Since 2020
Since 2017
Custom range...

Sort by relevance
Sort by date

Search within citing articles

[High-performance derivative computations using codipack](#)
A. Hück, J. Protze, J.P. Lehr, C. Terboven... - 2020 IEEE/ACM 4th ..., 2020 - [ieeexplore.ieee.org](#)

Algorithmic Differentiation (AD) is a set of techniques to calculate derivatives of a computer program. In C++, AD typically requires (i) a type change of the built-in double, and (ii) a replacement of all MPI calls with AD-specific implementations. This poses challenges on ...

☆ Related articles All 3 versions

Clicking on **Search within citing articles** filters down the total list according to your search terms, e.g., **mpi**.

► Note: Does not apply to *Related articles*

Other Academic Search Engines

Microsoft Academic

algorithmic differentiation



Sign up / Sign in

FILTER BY: ⓘ

Time

1899-2021

Top Topics

- Automatic differenti...
- Computer science
- Artificial intelligence
- Algorithm
- Mathematics
- Mathematical optim...
- Applied mathematics
- Computation
- Pattern recognition
- Nonlinear system

MORE

Publication Types

- Journal publications
- Repository publicati...
- Other
- Conference publicat...

Result accuracy: ☆☆☆☆☆

Showing 1-10* of 50,000+
(2.31 seconds)

VIEW

SORT BY RELEVANCE ⓘ

Automatic differentiation in PyTorch 7,258 citations*

2017

Adam Paszke, Sam Gross, Soumith Chintala, Gregory Chanan, Edward Yang
see all 10 authors

Automatic differentiation Computer science View More (2+)

automatic differentiation ("algorithmic differentiation")

The Concrete Distribution: A Continuous Relaxation of Discrete Random Variables 1,102 citations* for all 793 citations*

2016 INTERNATIONAL CONFERENCE ON LEARNING REPRESENTATIONS

Chris J. Maddison¹, Andriy Mnih¹, Yee Whye Teh²
¹ Google, ² University of Oxford

Discrete-time stochastic process Random graph View More (9+)

The reparameterization trick enables optimizing large scale stochastic computation graphs via gradient descent. The essence of the trick is to refactor each stochastic node into a differentiable function of its parameters and a random variable with fixed distribution. After refactoring, the gradient... View Full Abstract

automatic differentiation ("algorithmic differentiation")

The Concrete Distribution: A Continuous Relaxation of Discrete Random Variables 309 citations*

2016 ARXIV: LEARNING

Chris J. Maddison¹, Andriy Mnih¹, Yee Whye Teh²
¹ Google, ² University of Oxford

Automatic differentiation

In mathematics and computer algebra, automatic differentiation (AD), also called algorithmic differentiation, computational differentiation, auto-differentiation, or simply autodiff, is a set of techniques to numerically evaluate the derivative of a function specified by a computer program. AD explo... MORE

PARENT TOPICS

Algorithm Machine learning Calculus

CHILD TOPICS

Operator overloading

RELATED TOPICS

Deep learning

Backpropagation

Chain rule View More (17+)

Google Scholar vs. **MS Academic**

- ▶ Each paper has it's own subpage with Abstract
 - ▶ *References, Cited by* and *Related articles*
 - ▶ Not sure if *Cited by* can be searched
- ▶ Has a graph of related topics, i.e., parent and child topics
 - ▶ Algorithmic Differentiation (AD) -> child("Operator Overloading")
 - ▶ Note: A related topic is not only focused on AD

High-Performance Derivative Computations using CoDiPack

2019 ACM Transactions on Mathematical Software | Volume: 45, Issue: 4, pp 1-26 | DOI: 10.1145/3356900

Max Sagebaum , Tim Albring , Nicolas R. Gauger

Kaiserslautern University of Technology

 16 References  73 Citations*

Abstract

There are several AD tools available that all implement different strategies for the reverse mode of AD. The most common strategies are primal value taping (implemented e.g. by ADOL-C) and Jacobian taping (implemented e.g. by Adept and dco/c++). Particular for Jacobian taping, recent advances using expression templates make it very attractive for large scale software. However, the current implementations are either closed source or miss essential features and flexibility. Therefore, we present the new AD tool CoDiPack (Code Differentiation Package) in this paper. It is specifically designed for minimal memory consumption and optimal runtime, such that it can be used for the differentiation of large scale software. An essential part of the design of CoDiPack is the modular layout and the recursive data structures which not only allow the efficient implementation of the Jacobian taping approach but will also enable other approaches like the primal value taping or new research ideas. We will finally present the performance values of CoDiPack on a generic PDE example and on the SU2 code.

Other Links

Website(s): arxiv-vanity.com | arxiv.org | dblp.uni-trier.de | dl.acm.org

Other Versions

High-Performance Derivative Computations using CoDiPack

2017 [arXiv: Mathematical Software](https://arxiv.org/abs/1708.02625)

Related Topics

 Expression templates  Data structure  Automatic differentiation [View More \(7+\)](#) 

FOLLOW

CLAIM

”





SEMANTIC SCHOLAR

algorithmic differentiation

Search Q

Sign In

Create Free Account

About 5,490,000 results for "algorithmic differentiation"

Fields of Study

Date Range

Has PDF

Publication Type

Author

Journals & Conferences

Sort by Relevance



Evaluating derivatives - principles and techniques of algorithmic differentiation, Second Edition

A. Griewank, A. Walther · Computer Science · Frontiers in applied mathematics · 2000

TLDR Algorithmic, or automatic, differentiation (AD) is a growing area of theoretical research and software development concerned with the accurate and efficient evaluation of derivatives for function evaluations given as computer programs. [Expand](#)

2,588 PDF · View via Publisher · Save · Alert · Cite · Research Feed

An introduction to algorithmic differentiation

A. Gebremedhin, A. Walther · Computer Science · Wiley Interdiscip. Rev. Data Min. Knowl. Discov. · 24 October 2019

TLDR We provide an introduction to AD and present its basic ideas and techniques, some of its most important results, the implementation paradigms it relies on, and a few of the major open problems in the area. [Expand](#)

3 · View on Wiley · Save · Alert · Cite · Research Feed

Index handling and assign optimization for Algorithmic Differentiation reuse index managers

Max Sagebaum, Johannes Blühdorn, N. Gauger · Computer Science · ArXiv · 23 June 2020

TLDR In this paper, we present both approaches, how to implement them, and discuss their advantages, disadvantages and properties of the resulting Algorithmic Differentiation type. [Expand](#)

1 PDF · View PDF on arXiv · Save · Alert · Cite · Research Feed

Eigen-AD: Algorithmic Differentiation of the Eigen Library

P. Peltzer, J. Lotz, U. Naumann · Computer Science · ICCS · 28 November 2019

TLDR In this work, the C++ linear algebra library Eigen1 is used as a base software implementing linear algebra operations for which derivatives are to be computed using Algorithmic Differentiation (AD) by overloading. [Expand](#)

2 PDF · View PDF on arXiv · Save · Alert · Cite · Research Feed

Automatic differentiation

In mathematics and computer algebra, automatic differentiation (AD), also called algorithmic differentiation or computational differentiation, is a set of techniques to... [Expand](#)

CREATE ALERT

EXPLORE TOPIC

44 Related topics

- ADMB
- AMPL
- APMonitor
- Artificial intelligence

[VIEW ALL](#)

Google Scholar vs. **Semantic Scholar**

- ▶ Each paper has it's own subpage with Abstract
 - ▶ *References, Cited by and Related articles*
 - ▶ *Cited by* can be searched
- ▶ Some papers also have list of topics including explanation
 - ▶ May be inaccurate

DOI: 10.1145/3356900 • Corpus ID: 40379512

High-Performance Derivative Computations using CoDiPack

Max Sagebaum · Tim Albring · N. Gauger · Published 2019 · Computer Science · ACM Transactions on Mathematical Software (TOMS)

There are several AD tools available that all implement different strategies for the reverse mode of AD. The most common strategies are primal value taping (implemented e.g. by ADOL-C) and Jacobian taping (implemented e.g. by Adept and dco/c++). Particularly for Jacobian taping, recent advances using expression templates make it very attractive for large scale software. However, the current implementations are either closed source or miss essential features and flexibility. Therefore, we present... [Expand](#)

[View on ACM](#) [arxiv.org](#)

[Save to Library](#) [Create Alert](#) [Cite](#) [Launch Research Feed](#)

Share This Paper [Twitter](#) [Facebook](#) [LinkedIn](#) [Email](#)

40 Citations

Highly Influential Citations ⓘ 3
Background Citations 6
Methods Citations 15

[View All](#)

[Abstract](#)

[Figures, Tables, and Topics](#)

[40 Citations](#)

[4 References](#)

[Related Papers](#)

Figures, Tables, and Topics from this paper



Figure 1

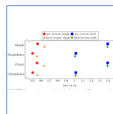


Figure 10

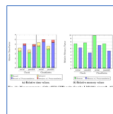


Figure 11



Figure 2

[View All 16 Figures & Tables](#)

- CoDi
- Memory management
- Preprocessor
- Expression templates
- Recursion
- Jacobi method
- GNU Compiler Collection
- Microsoft Outlook for Mac
- SU2 code
- User interface
- Memory bandwidth



One Citation

[Show Filters](#)[Clear](#)[Sort by Relevance](#)

Towards compiler-aided correctness checking of adjoint MPI applications

Alexander Hück, Joachim Protze, Jan-Patrick Lehr, Christian Terboven, C. Bischof, M. Müller · Computer Science · 2020 IEEE/ACM 4th International Workshop on Software Correctness for HPC Applications (Correctness) · 2020

Highly Influenced · View 5 excerpts, cites methods Save Alert Research Feed

Cites methods from "High-Performance Derivative Computations using..."

We apply the AD tool CoDiPack [11] and the AD MPI library MeDiPack [10] to the Coral LULESH benchmark.

For efficiency, modern AD tools use template metaprogramming and inlining of calls for the derivative computation, see [11].

Additional Excerpts

We chose these candidates as (i) they provide modern C++ implementations of the adjoint concept, including template meta-programming for efficiency, (ii) MeDiPack is the most feature-complete adjoint MPI library, and, also, (iii) due to our past experience with **CoDiPack** [18].

3) Main time-stepping compute loop: The main compute loop is augmented with API calls to **CoDiPack** for seeding and extracting the derivative values.

It required (i) the redeclaration of the global basic scalar alias Real t, (ii) the replacement of the MPI routines with corresponding MeDiPack calls, and, also, (iii) seeding and extraction routines calling the **CoDiPack** API for the adjoint computation.

Conclusion

Literature search takes time, and is an iterative process.

- ▶ Reserve appropriate chunks of time
- ▶ Learn to skim articles, too much to read otherwise
- ▶ Make use of search engines with *Cited by*, *Related articles*, or date-based filtering
- ▶ For more tips see [2] and [5]

References

[1]

H. Snyder, “Literature review as a research methodology: An overview and guidelines,” *Journal of Business Research*, vol. 104, pp. 333–339, 2019, doi: [10.1016/j.jbusres.2019.07.039](https://doi.org/10.1016/j.jbusres.2019.07.039).

[2]

“How to find related work efficiently.” [Online]. Available: <http://www.chaklam.com/node/15>.

[3]

“Google scholar help.” [Online]. Available: <https://scholar.google.com/scholar/help.html>.

[4]

“How to use google scholar.” [Online]. Available: <https://www.wur.nl/en/article/How-to-use-Google-Scholar.htm>.

[5]

“Tips for searching and managing related work.” [Online]. Available: https://cms.cispa.saarland/inputinference/3/Tips_for_Searching_and_Managing_Related_Work.