The Impact of Persistence Images

An Analysis of Scholarly Citations of the Adams et al. Framework

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December 10, 2025

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The Motivating Paper

Persistence Images

Persistence Images: A Stable Vector Representation of Persistent Homology

Adams et al.[1]

Persistence Images

Published in 2016

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A stable, finite-dimensional vector representation of persistence diagrams.

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Basically a matrix of values

Persistence Images

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Persistence Images

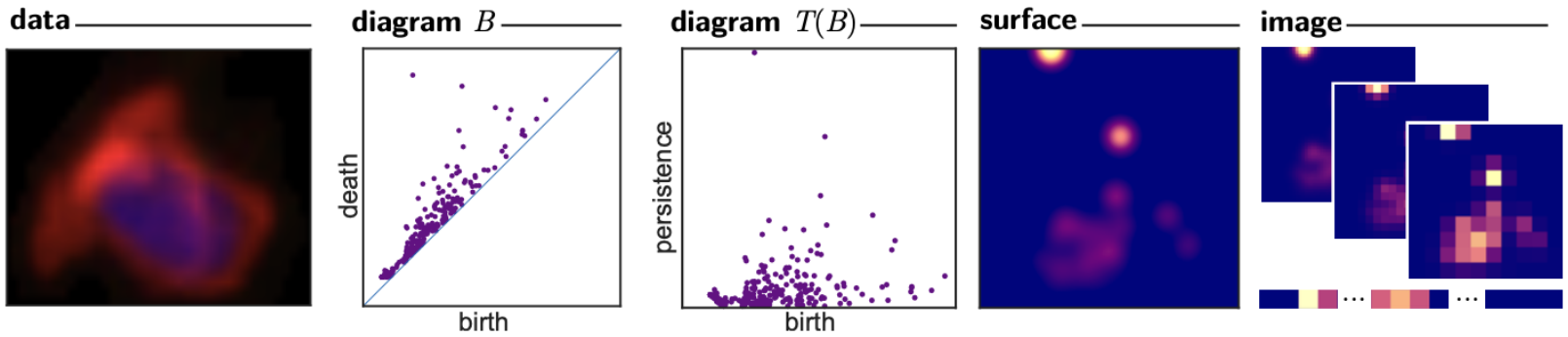

Figure 1: Algorithm pipeline to transform data into a persistence image.

Persistence Images

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Nifty, right?

Proposal

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What are PIs being used for?

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What are PIs being used for?

Let's find out!

Data

Web of Science

Search Web of Science for "Persistence Images"

Web of Science

Search Web of Science for "Persistence Images"

What do you get?

Web of Science

1 **Persistence Images: A Stable Vector Representation of Persistent Homology**

Adams, H; Emerson, T; (...); Ziegelmeier, L

2017 | JOURNAL OF MACHINE LEARNING RESEARCH 18

Many data sets can be viewed as a noisy sampling of an underlying space, and tools from topological data analysis can characterize this structure for the purpose of knowledge discovery. One such tool is persistent homology, which provides a multiscale description of the homological features within a data set. A useful ... Show more

FINDTEXT

473
Citations

53
References

Co-citation map

Related records

Web of Science

As of July/August 2025 , this highly cited paper received enough citations to place it in the top 1% of the academic field of **Computer Science** based on a highly cited threshold for the field and publication year.

Data from Essential Science Indicators

Web of Science

Web of Science provides an API to help analyze results

Let's see what the data says

Cleaning

But first, let's do some cleaning.

Cleaning

But first, let's do some cleaning.

Remove any entry that does not have an associated DOI

Cleaning

But first, let's do some cleaning.
Remove any entry that does not have an associated DOI

- Began with 472 entries
- 77 were missing DOIs
- Leaves us with 395 entries to look at

Publication Year

Year	Number of Publications
2025	75
2024	69
2023	68
2022	61
2021	55
2020	40
2019	15
2018	6
2017	3
2026	3

Table 1: Publication Year Frequency

Publishers

Publisher	Record Count
IEEE	69
Springer Nature	61
Elsevier	48
JMLR-Journal Machine Learning Research	27
MDPI	23
Nature Portfolio	18
Amer Inst Mathematical Sciences-AIMS	16
Neural Information Processing Systems (NIPS)	16
Frontiers Media SA	14
Amer Physical Soc	13
Oxford Univ Press	13
AIP Publishing	11
Amer Chemical Soc	11
Public Library Science	10

Table 2: Publishers with ≥ 10 Records

WoS Categories vs Research Areas

Web of Science Categories more granular (92)
Research Areas less granular (58)

For Example

Research Areas	WoS Categories
Computer Science; Neurosciences & Neurology	Computer Science, Artificial Intelligence; Neurosciences
Engineering	Engineering, Biomedical
Computer Science	Computer Science, Artificial Intelligence
Pharmacology & Pharmacy; Chemistry; Computer Science	Chemistry, Medicinal; Chemistry, Multidisciplinary; Computer Science, Information Systems; Computer Science, Interdisciplinary Applications
Chemistry; Engineering; Instruments & Instrumentation	Chemistry, Analytical; Engineering, Electrical & Electronic; Instruments & Instrumentation
Biochemistry & Molecular Biology; Mathematical & Computational Biology	Biochemical Research Methods; Mathematical & Computational Biology
Computer Science	Computer Science, Software Engineering
Computer Science	Computer Science, Cybernetics; Computer Science, Information Systems

Research Areas

Research Area	Record Count
Computer Science	161
Mathematics	83
Engineering	63
Physics	57
Chemistry	29
Science and Technology - Other Topics	29
Mathematical and Computational Biology	19
Materials Science	17
Neurosciences and Neurology	15
Biochemistry and Molecular Biology	14
Radiology, Nuclear Medicine and Medical Imaging	14
Astronomy and Astrophysics	13
Telecommunications	13

Table 3: Research Areas with ≥ 10 Occurrences

WoS Categories

Web of Science Category	Record Count
Computer Science, Artificial Intelligence	96
Mathematics, Applied	48
Computer Science, Theory and Methods	44
Computer Science, Interdisciplinary Applications	41
Engineering, Electrical and Electronic	40
Computer Science, Information Systems	35
Multidisciplinary Sciences	25
Computer Science, Software Engineering	25
Mathematics	24
Statistics and Probability	23
Mathematical and Computational Biology	19
Chemistry, Multidisciplinary	19
Materials Science, Multidisciplinary	16
Physics, Applied	15
Radiology, Nuclear Medicine and Medical Imaging	14
Astronomy and Astrophysics	13
Engineering, Biomedical	13
Telecommunications	13
Physics, Mathematical	12
Neurosciences	12
Physics, Multidisciplinary	12
Biochemical Research Methods	11
Mathematics, Interdisciplinary Applications	11

Table 4: WoS Categories with ≥ 10 Occurrences

Unexpected Keywords

Navigation Style Classification Using Persistent Homology
Akai et al.

Unexpected Keywords

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Research Areas

- Computer Science
- Engineering
- Government & Law

WoS Categories

- Computer Science, Interdisciplinary Applications
- Engineering, Electrical & Electronic
- Political Science

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- Computer Science
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WoS Categories

- Computer Science, Interdisciplinary Applications
- Engineering, Electrical & Electronic
- Political Science

Does not use the Adams paper in a meaningful way

Sampling the Data

Sampling

- Randomize the set of publications

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- Pull 50

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- Of these 50, filter out those that do not use the paper in a meaningful way

Sampling

- Randomize the set of publications
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- Of these 50, filter out those that do not use the paper in a meaningful way
- Look at these papers

Sampling

Started with 50 papers to look at

After initial filtering:

Sampling

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After initial filtering:

- 20 deemed "good"

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Started with 50 papers to look at
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- 20 deemed "good"
- 23 deemed "not good"

Sampling

Started with 50 papers to look at
After initial filtering:

- 20 deemed "good"
- 23 deemed "not good"
- 7 I couldn't access

Papers

Topological data analysis: Concepts, computation, and applications in chemical engineering
Relational Persistent Homology for Multispecies Data with Application to the Tumor Microenvironment
Persistent Homology for Breast Tumor Classification Using Mammogram Scans
Learning discriminative topological structure information representation for 2D shape and social network classification via persistent homology
ToBaFu: Topology-based fusion model for classification of two-dimensional cancer images
Improving Classification Performance of Spatial Filters in Mammographic Microcalcifications Images Using Persistent Homology
The topology of data: opportunities for cancer research
Tape surfaces characterization with persistence images
Interpretable Structural Evaluation of Metal-Oxide Nanostructures in Scanning Transmission Electron Microscopy (STEM) Images via Persistent Homology
Bayesian Topological Learning for Classifying the Structure of Biological Networks
Perturbation Robust Representations of Topological Persistence Diagrams
The effects of topological features on convolutional neural networks—an explanatory analysis via Grad-CAM
Portfolio Selection via Topological Data Analysis
Can We Determine Whether a Set of Ethereum Transaction Data Contains Fraudulent Transactions?
Spatial nano-scaled organization of heterochromatin in nuclei of endothelial cells after exposure to uremic and dialytic milieu
Topological data analysis of spatial patterning in heterogeneous cell populations: clustering and sorting with varying cell-cell adhesion
Change Detection with Probabilistic Models on Persistence Diagrams
Learning persistent homology of 3D point clouds
Topological Data Analysis Applied to Wind Turbine Vibration Spectra for Blade Icing Detection
Persistent Homology in LiDAR-Based Ego-Vehicle Localization

Uses

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Most prevalent use?

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Vectorization of data to feed into a ML model

Uses

ML models for what?

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- Delineating Cell Types

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ML models for what?

- Delineating Cell Types
- Medical Image Analysis
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- Stock Portfolio Selection
- Image Noise Reduction

Uses

Other Uses:

- Medical specimen analysis

Uses

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- Survey of TDA Methods for Chemical Engineering

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- Medical specimen analysis
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- Theoretical Extensions of Persistence Images

Conclusion

Persistence Images have had a wide impact since their publication in 2016

Questions?

References

Henry Adams, Sofya Chepushtanova, Tegan Emerson, Eric Hanson, Michael Kirby, Francis Motta, Rachel Neville, Chris Peterson, Patrick Shipman, and Lori Ziegelmeier.
Persistence images: A Stable Vector Representation of Persistent Homology, -07-11 2016.