Ground_Truth_Data for AI

Towards Sustainable AI

Dossier

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EXECUTIVE SUMMARY

1. EXECUTIVE SUMMARY

Lorem ipsum **dolor sit amet**, consectetur adipiscing elit. Aliquam eu nibh non tortor maximus tincidunt. Sed pellentesque lacus a metus pellentesque, vel ultrices leo pulvinar. Ut finibus ipsum ornare, vehicula mauris id, pulvinar enim. Proin in neque elit. Duis eget tempus turpis. Ut consectetur lacinia augue pulvinar bibendum. Nulla sed nulla ut mauris consequat egestas ac et orci.

Integer venenatis, *lectus a dapibus vehicula*, diam odio rutrum ante, at dictum erat lorem et sapien.

Suspendisse potenti :

- pellentesque habitant morbi tristique
- senectus et netus et malesuada fames ac turpis egestas
- ut sit amet ultricies nisl
- etiam laoreet condimentum lacus et elementum

Sed vehicula quis ligula non fermentum. Pellentesque semper ligula gravida "C_i", bibendum dui ut, semper nibh. Quisque a risus porta, fermentum velit vitae, pellentesque felis.

Suspendisse potenti. Aliquam id metus in purus imperdiet aliquam eu ut dolor :

$$\alpha_{i+1} = \frac{A_{i+1}}{S_{i+1}} \tag{1.1}$$
$$= \frac{A_i + \Delta A_i}{S_i + \Delta S_i} \tag{1.2}$$
$$= \frac{A_i + \Delta A_i}{S_i + \frac{\Delta A_i}{\alpha_i}} \tag{1.3}$$
$$= \alpha_i * \frac{A_i + \Delta A_i}{\alpha_i * S_i + \Delta A_i} \tag{1.4}$$
$$= \alpha_i \tag{1.5}$$

Vestibulum luctus consectetur vestibulum. Duis ullamcorper ligula nec mauris viverra rhoncus. Aliquam auctor est accumsan odio vehicula ornare.

> Duis et metus auctor, fringilla nulla non, dapibus felis **??**.

Morbi ipsum dui, rutrum et cursus a, porta eu ligula. Nulla lobortis leo eget odio bibendum rhoncus. Maecenas posuere nulla nec felis viverra blandit.

Sit amet elementum tortor malesuada quis. Quisque pellentesque nisl quis augue interdum vehicula. Nunc nec dictum sem. Nunc venenatis elementum hendrerit.

> Pellentesque ut justo arcu. Fusce cursus luctus tortor eu venenatis.

Maecenas viverra dui vitae eros tristique, porta elementum mi aliquam. Cras sodales erat et molestie auctor. Phasellus mauris eros, bibendum sit amet rhoncus id, bibendum ut velit.

TECHNOLOGY

2. DATA REDUCTION

2.1. THE GOAL

The aim of data reduction is to simplify a dataset while preserving its key information. This can typically be accomplished by either reducing the number of features or the number of samples. Our approach will concentrate on the more challenging task of reducing the sample size.

2.2. NEED FOR DATA SIZE REDUCTION

With data being collected at an unprecedented pace, data reduction plays a critical role in boosting training efficiency. By reducing the number of samples, we create a simpler yet representative dataset, which can alleviate memory and computation constraints. This not only enhances sustainability by lowering energy consumption but also contributes to significant energy savings.

2.3. REGULAR METHODS FOR REDUCING SAMPLE SIZE

Sample reduction is typically achieved through instance selection, which involves choosing a representative subset of data samples that retain the original dataset's properties. Existing methods can be categorized into wrapper and filter methods. Filter methods select instances based on scoring functions, such as selecting border instances that often shape the decision boundary. Wrapper methods, on the other hand, select instances based on model performance, considering their interaction with the model. Additionally, instance selection techniques can address data imbalance issues by undersampling the majority class, such as with random undersampling. Recent advancements have incorporated reinforcement learning to optimize undersampling strategies. However, these regular methods neither achieve the data size reduction nor the accuracy level that our data size reduction approach can deliver.

2.4. CHALLENGES

The challenges of data reduction are twofold. First, selecting the most representative data or projecting data into a low-dimensional space with minimal information loss is complex. While learning-based methods can partially address these challenges, they often require substantial computational resources, particularly with very large datasets. Consequently, achieving both high accuracy and efficiency is difficult. Second, data reduction can potentially amplify data bias, raising fairness concerns.

3. VALIDATION TESTS

3.1. INTRODUCTION

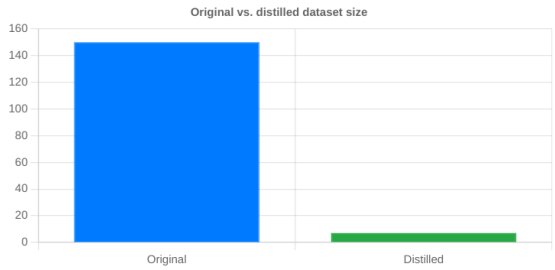
In the realm of data science and machine learning, the efficiency and effectiveness of data processing are often contingent upon the size and manageability of the datasets in use. The burgeoning volume of data necessitates innovative methods for reducing dataset size without compromising the integrity and utility of the data. This chapter focuses on validation tests for a revolutionary data size reduction method, applied to four well-known datasets: the Iris dataset, the Wine dataset, the Breast Cancer dataset, and the MNIST dataset.

3.2. TESTS DONE

3.2.1. Iris Dataset

The Iris dataset, introduced by Ronald A. Fisher in 1936, is a staple in the field of machine learning and statistics. It consists of 150 instances of iris flowers, each described by four features: sepal length, sepal width, petal length, and petal width. These features are used to classify the flowers into three species: Iris-setosa, Iris-versicolor, and Iris-virginica. The simplicity and clarity of the Iris dataset make it an ideal candidate for demonstrating basic principles of data size reduction.

Dataset	Accuracy
Original	97.4%
Distilled	94.7%



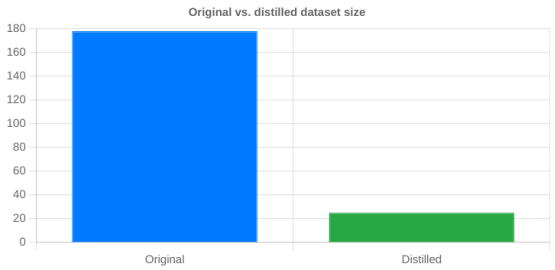
3.2.2. Wine Dataset

The Wine dataset is derived from the results of a chemical analysis of wines grown in the same region in Italy but derived from three different cultivars. It contains 178 instances with 13 attributes including alcohol content, malic acid, ash, and others. This dataset is often used for classification problems and serves as an excellent test bed for validating data reduction techniques due to its moderate size and complexity.

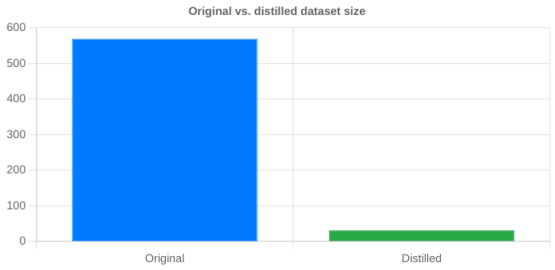
3.2.3. Breast Cancer Dataset

The Breast Cancer Wisconsin dataset, created by Dr. William H. Wolberg, is used for binary classification tasks in predicting the malignancy of breast cancer samples. It comprises 569 instances, each with 30 numeric features representing characteristics of cell nuclei present in a digitized image of a fine needle aspirate of a breast mass. This dataset is critically important for medical research and diagnostics, making the preservation of data quality essential during size reduction.

Dataset	Accuracy
Original	97.8%
Distilled	95.6%



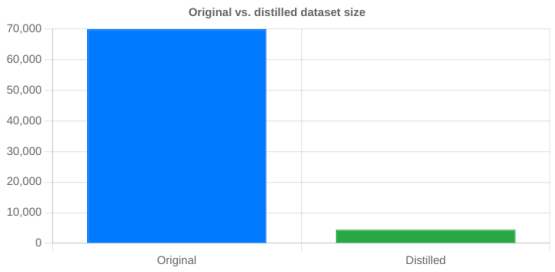
Dataset	Accuracy
Original	96.5%
Distilled	95.1%



3.2.4. MNIST Dataset

The MNIST dataset is a large collection of handwritten digits, commonly used for training various image processing systems. It includes 60,000 training examples and 10,000 testing examples, each represented by a 28x28 grayscale image of a digit (0-9). The high dimensionality and substantial size of the MNIST dataset present significant challenges for data size reduction, thus providing a rigorous test for our proposed method.

Dataset	Accuracy
Original	97.7%
Distilled	93.7%



MARKET

4. HENDRERIT SAPIEN

4.1. SED ULTRICES

4.1.1. Donec pellentesque

Tempus ipsum, vitae condimentum nisi efficitur id. In velit mauris, auctor eget sapien nec, viverra mattis neque. Nunc vel commodo nunc, eget cursus ex.

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4.1.2. Euismod sodales

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4.1.3. Pellentesque a nulla

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4.2. SED ULTRICES

4.2.1. Donec pellentesque

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4.2.2. Euismod sodales

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BUSINESS MODEL

5. HENDRERIT SAPIEN

5.1. SED ULTRICES

5.1.1. Donec pellentesque

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5.2. SED ULTRICES

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5.2.3. Pellentesque a nulla

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TEAM

6. HENDRERIT SAPIEN

FUNDING

7. FUNDS REQUIREMENTS AND APPLICATIONS

7.1. SED ULTRICES

7.1.1. Donec pellentesque

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7.1.3. Pellentesque a nulla

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7.2. SED ULTRICES

7.2.1. Donec pellentesque

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7.2.2. Euismod sodales

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APPENDICES

8. VESTIBULUM COMMODO

INTEGER SEMPER DICTUM TELLUS

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Curabitur sit amet fermentum mi.
Morbi convallis purus eu fermentum accumsan, mauris felis consequat ipsum.
Ut sollicitudin sit amet tellus et mollis.

A PORTTITOR ORCI FAUCIBUS SIT AMET

Vivamus et sapien vitae lacus ornare suscipit vitae id mauris:

Vivamus in dui arcu.
Morbi vitae dolor libero.
Tellus est, pellentesque at ultrices non, consectetur sit amet augue.
Suspendisse elementum mollis nisl at aliquam.

9. ETIAM FACILISIS

9.1. IPSUM PRIMIS

In faucibus orci luctus et ultrices posuere cubilia curae; Aliquam nunc ipsum, sollicitudin ut tempus consectetur, fermentum at lectus.

Nullam molestie viverra **??** augue sit amet gravida.

9.1.1. Mauris pellentesque

Massa sagittis malesuada

Symbol	Unit	Description
g	m/s^2	nisi in mollis gravida

9.1.2. Nulla massa

Quis imperdiet

Symbol	Unit	Description
Q_p	t/h	consectetur tortor

Magna lectus

Symbol	Unit	Description
τ_a	$^\circ C$	integer mollis bibendum gravida
f_s	$/jour$	vestibulum porta urna at ex dignissim tincidunt

9.1.3. Nam vitae

Nibh a lacus tincidunt efficitur

Symbol	Unit	Description
X_n	m	venenatis nisi
Y_n	m	integer malesuada eu ligula nec pharetra
Z_n	m	fusce non elit lectus

LIST OF FIGURES

LIST OF TABLES