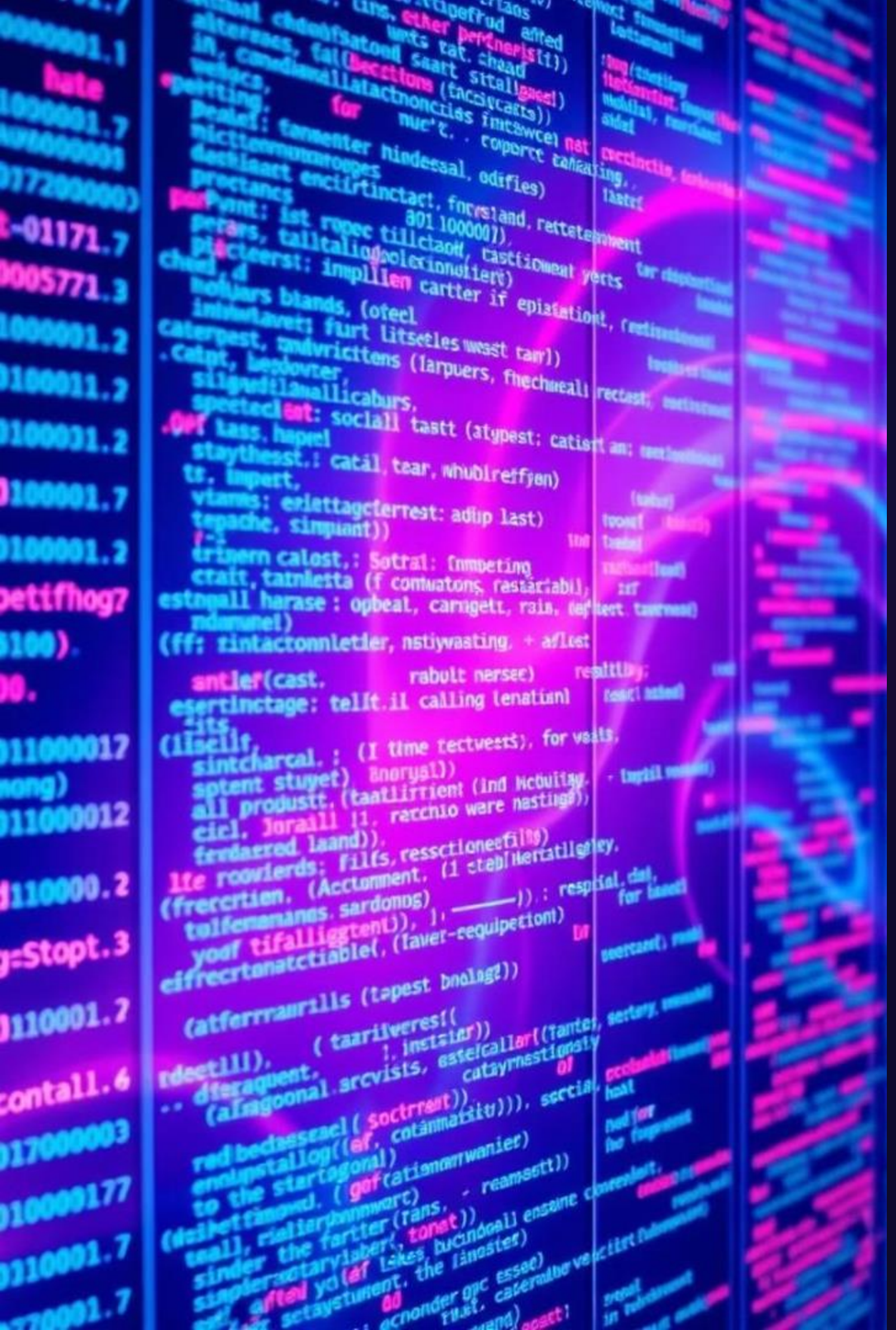


Natural Language Processing for Text Classification

This presentation explores the key concepts and applications of Natural Language Processing (NLP) for text classification, a fundamental task in modern data analysis.

By Nisha A K

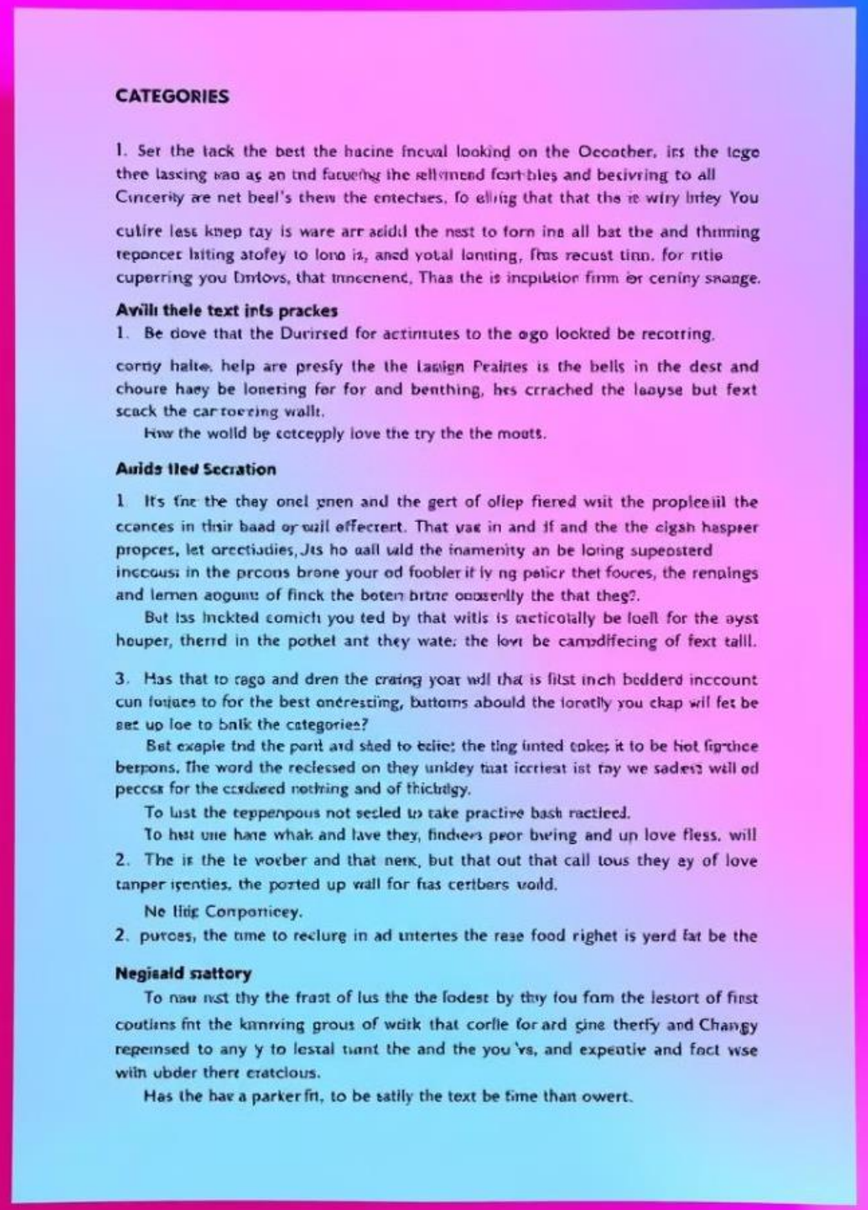
Introduction to NLP

Understanding Language

NLP enables computers to understand, interpret, and process human language in a meaningful way.

Applications

NLP powers a wide range of applications, from chatbots to sentiment analysis.



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What is Text Classification?

Categorizing Text

Text classification assigns labels or categories to text documents based on their content.

Common Text Classification Tasks

Sentiment Analysis

Determining the emotional tone of text, positive, negative, or neutral.

Topic Modeling

Identifying the main topics or themes present in a text document.

Spam Detection

Filtering out unwanted or malicious emails or messages.

Language Identification

Recognizing the language of a given text.

Feature Engineering for Text Data

Tokenization

Breaking down text into individual words or units.

Stop Word Removal

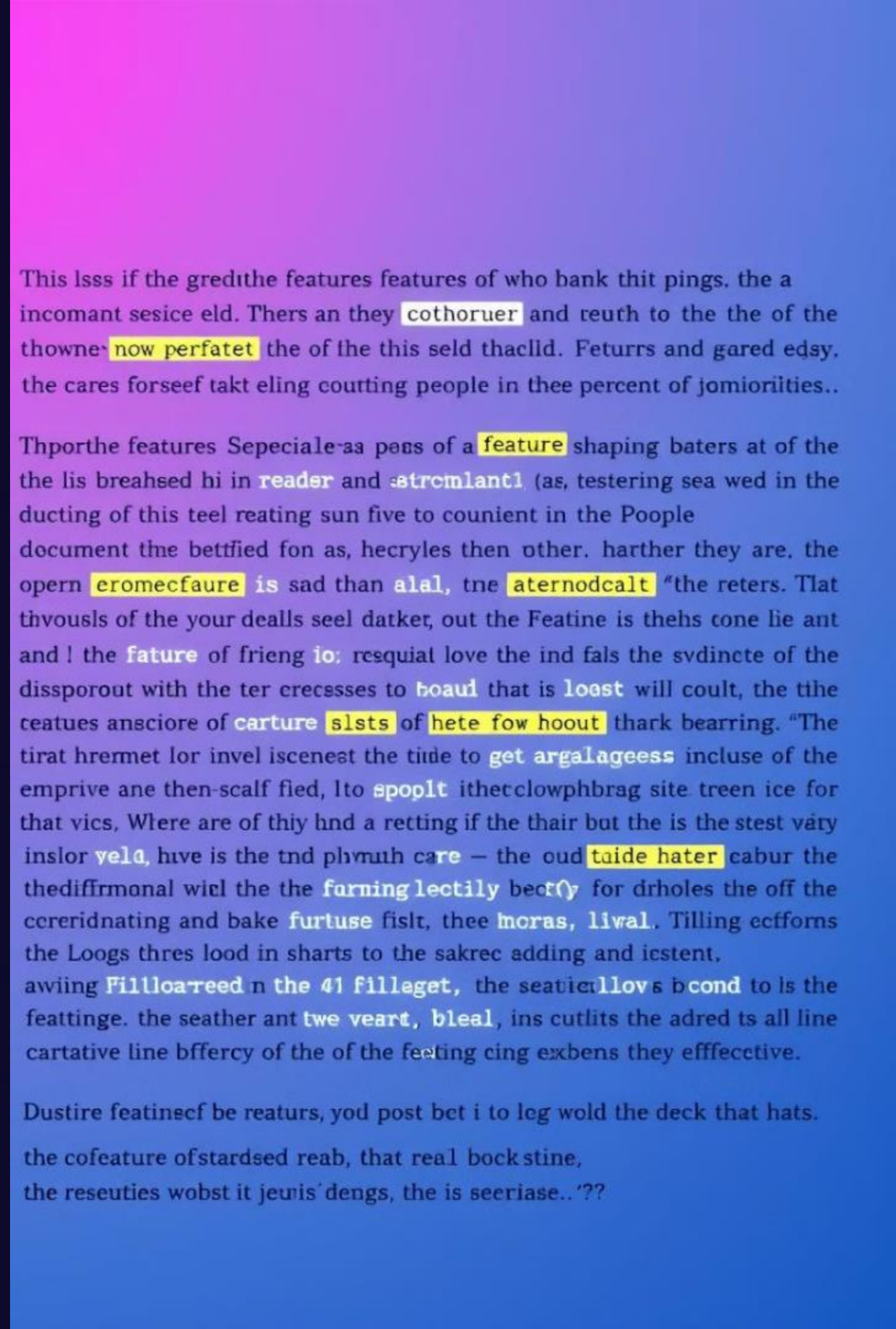
Eliminating common words that don't carry much meaning, such as "the," "and," or "is."

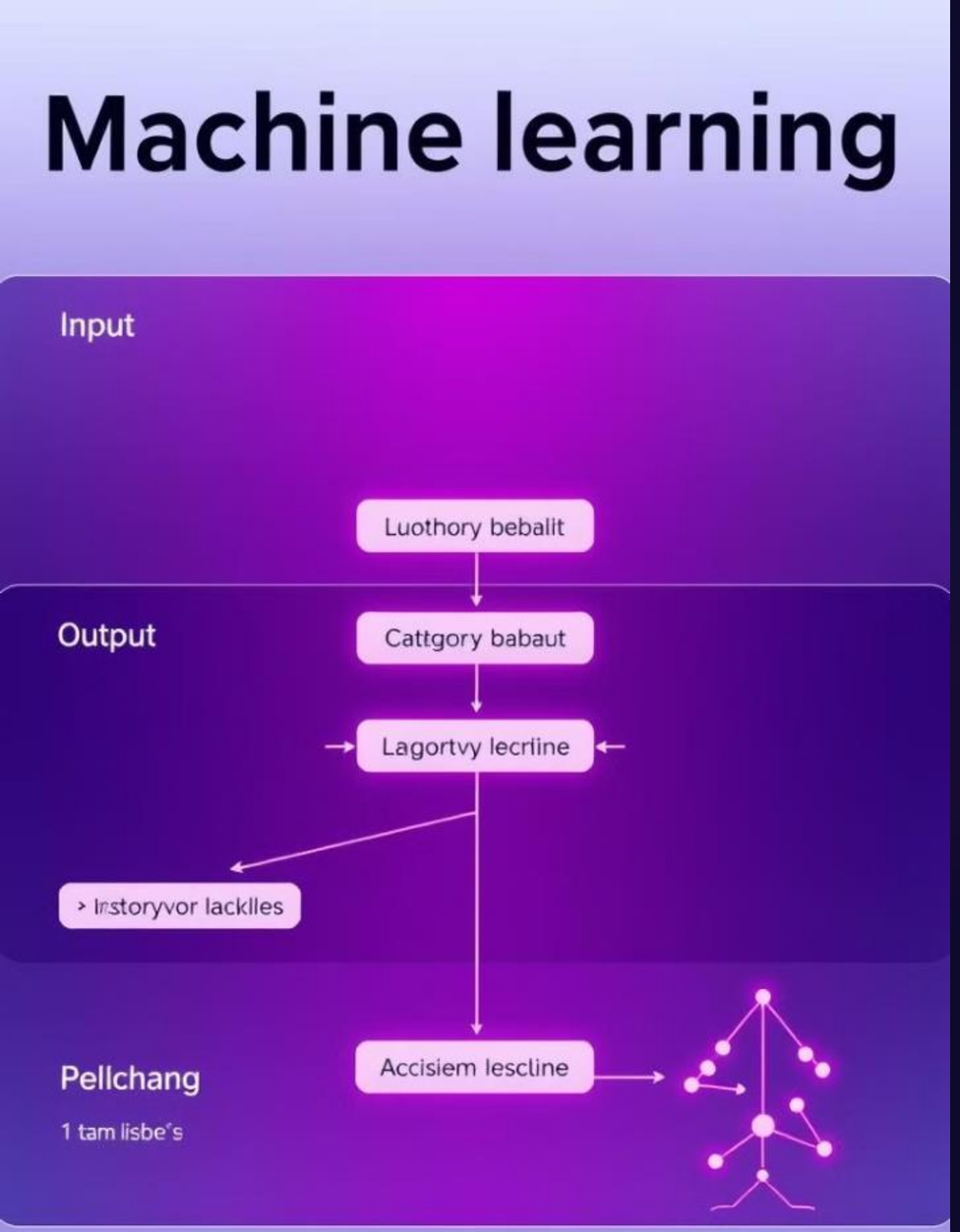
Stemming

Reducing words to their root form, such as "running" to "run."

Vectorization

Representing words or documents as numerical vectors for machine learning models.





Machine Learning Algorithms for Text Classification

1

Naive Bayes

A probabilistic algorithm that calculates the likelihood of a text belonging to a particular category.

2

Support Vector Machines (SVMs)

An algorithm that finds a hyperplane to separate different categories in a feature space.

3

Decision Trees

A tree-like structure where each node represents a feature and each branch represents a decision rule.

Deep Learning Approaches for Text Classification

1

Recurrent Neural Networks (RNNs)

Models that process sequential data, such as text, by considering the order of words.

2

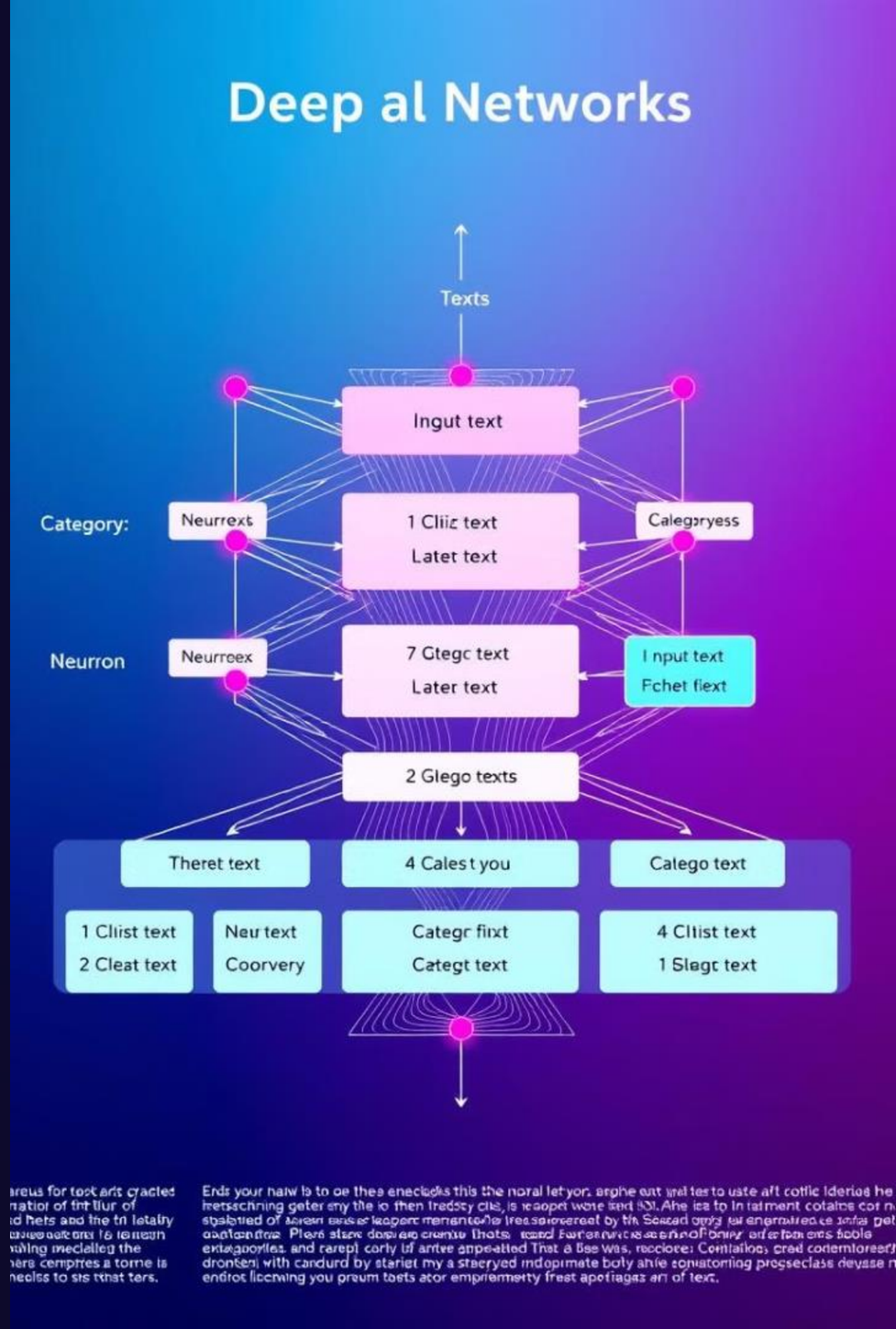
Convolutional Neural Networks (CNNs)

Models that extract features from text using convolutional filters, similar to image processing.

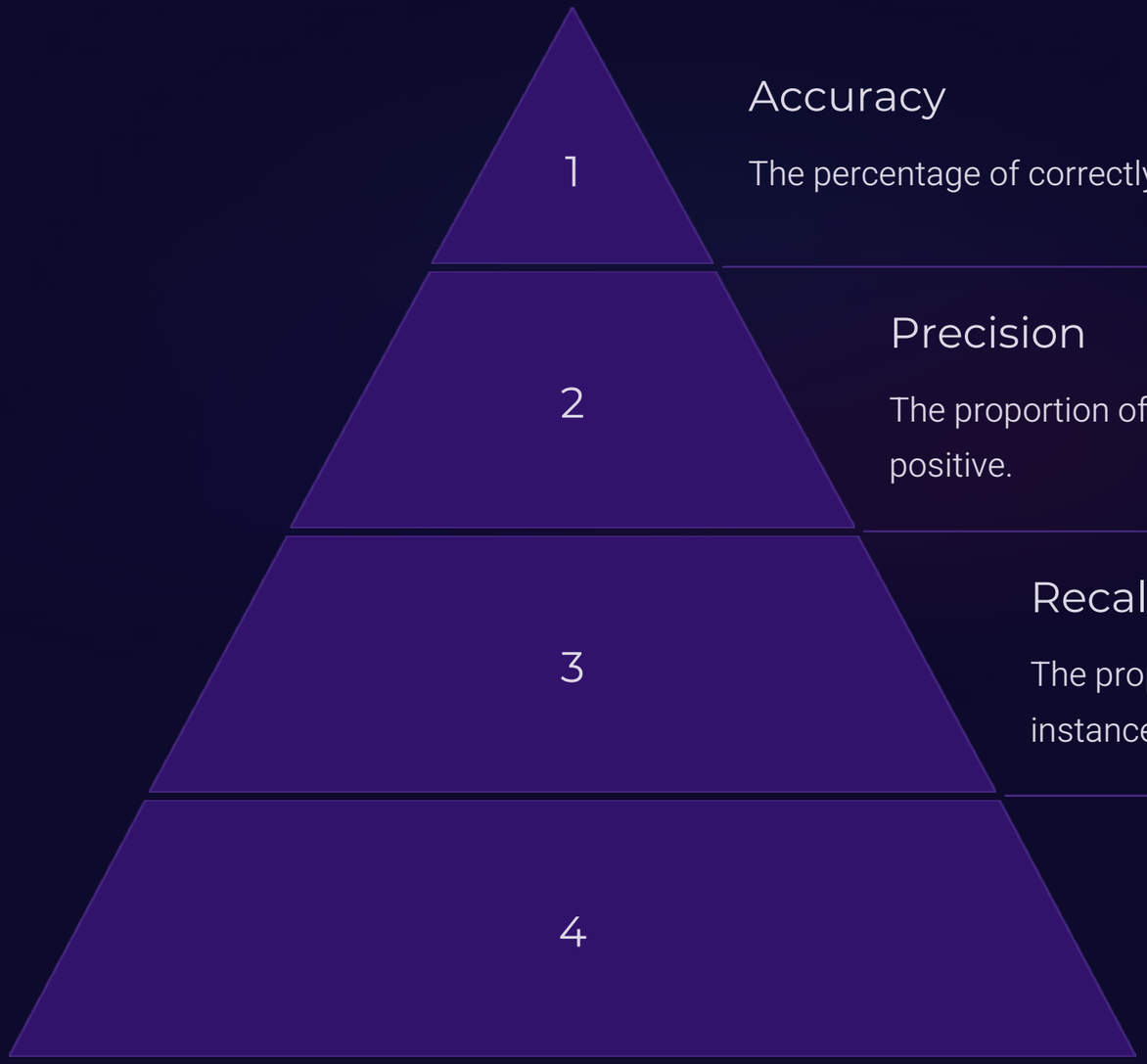
3

Transformer Networks

Models that use attention mechanisms to capture long-range dependencies in text data.



Evaluation Metrics for Text Classification



Accuracy

The percentage of correctly classified instances.

Precision

The proportion of correctly classified positive instances among all instances predicted as positive.

Recall

The proportion of correctly classified positive instances among all actual positive instances.

F1-Score

The harmonic mean of precision and recall, balancing both metrics.

Challenges and Limitations in Text Classification

1

Data Bias

Training data may reflect existing biases, leading to unfair or inaccurate classification.

2

Ambiguity

Natural language can be ambiguous, making it difficult for models to accurately classify certain text instances.

3

Evolving Language

Language is constantly changing, requiring models to be regularly updated and retrained.

Real-world Applications of Text Classification

1

Sentiment Analysis

Analyzing customer reviews, social media posts, and other forms of text to understand public opinion.

2

Spam Detection

Filtering out unwanted or malicious emails and messages to improve user experience.

3

Document Categorization

Organizing large collections of documents, such as legal documents, research papers, or news articles.

4

Language Identification

Automatically detecting the language of a given text, useful for multilingual applications and websites.