DA5402 MLOps Lab Project

arXiv Paper Classifier App User Manual

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1 Introduction

The arXiv Paper Classifier is an application that automatically categorizes research papers into 10 academic disciplines based on their title and abstract. It uses machine learning to analyze the content of papers and predict the most likely category. This user manual provides instructions on how to use the application, including uploading papers, viewing predictions, and providing feedback to improve the system.

2 Dataset

arXiv-10 dataset:dataset link

Benchmark dataset for abstracts and titles of 100,000 ArXiv scientific papers. This dataset contains 10 classes and is balanced (exactly 10,000 per class)

3 Getting Started

3.1 Accessing the Application

The arXiv Paper Classifier can be accessed through your web browser at: `http://localhost:8501`

3.2 System Requirements

- A modern web browser (Chrome, Firefox, Safari, or Edge)
- Internet connection
- PDF files of research papers for classification

4 Main Features

The application has two main tabs:

- **Upload Paper**: For uploading and classifying your research papers
- **Sample Predictions**: For viewing example predictions on sample papers

5 Classifying a Paper

5.1 Uploading a PDF

To classify a research paper:

1. Click on the **Upload Paper** tab
2. Click the **Choose a PDF file** button
3. Select a PDF file from your computer
4. Wait for the system to process the paper (usually takes a few seconds)

5.2 Viewing Classification Results

After uploading, the system will display:

- The predicted category (e.g., Computer Science, Mathematics)
- The confidence level of the prediction
- The processing time
- The extracted title and abstract

5.3 Providing Feedback

If the prediction is incorrect, you can help improve the system:

1. Click the **No, it's incorrect** button
2. Select the correct category from the dropdown menu
3. Click **Submit Correction**

Your feedback will be used to improve the classification model. When enough feedback is collected, the system automatically retrains to become more accurate.

6 Exploring Sample Predictions

To see how the system performs on example papers:

1. Click on the **Sample Predictions** tab
2. Browse through the sample papers organized by category
3. Each sample shows:
    - Paper title and abstract
    - True category
    - Predicted category
    - Whether the prediction was correct
4. The overall accuracy is displayed at the top

7 Visualize Grafana Dashboard

1. Install the grafana docker image
2. Start the container by ”docker start grafana”
3. Import the provided dashboard JSON in the github repository to visualize:
    - API requests count
    - API Request latency
    - Unique app user count
    - System resource usage

The grafana dasboard should look like this:

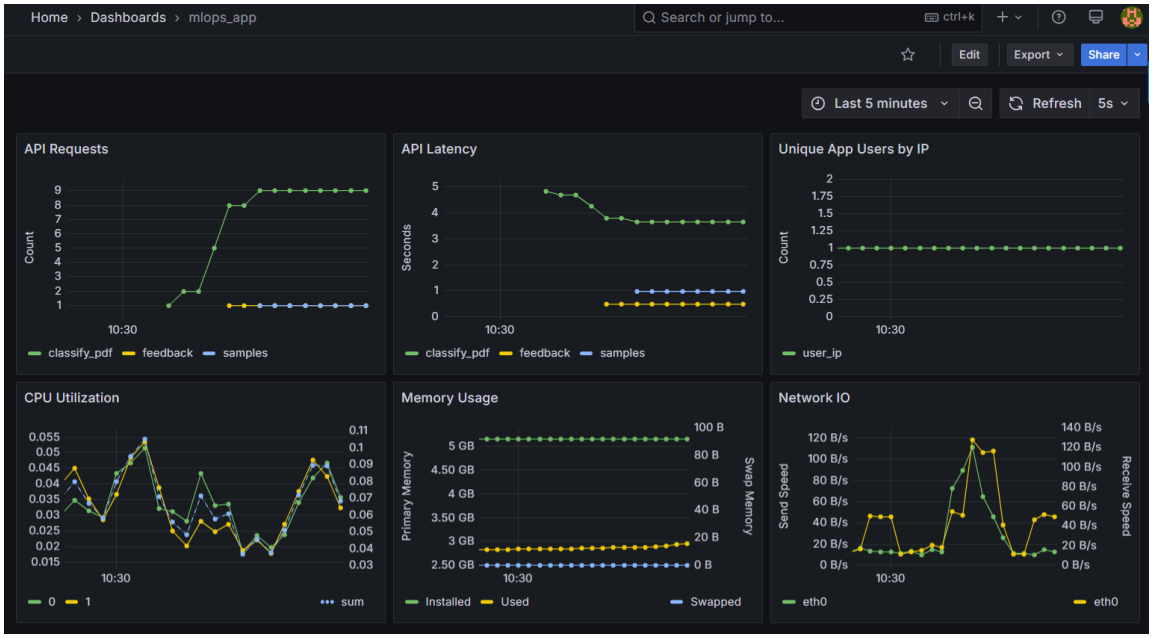

Figure 1: Grafana Dashboard for visualizing app and system related metrics

8 Understanding the Categories

The system classifies papers into 10 academic categories:

- **Astrophysics**: Studies of celestial objects and phenomena
- **Condensed Matter Physics**: Study of the physical properties of condensed phases of matter
- **Computer Science**: Study of computation, algorithms, and information
- **Electrical Engineering and Systems Science**: Study of electrical systems and related fields
- **High Energy Physics - Phenomenology**: Study of phenomena in high-energy physics

- **High Energy Physics - Theory**: Theoretical aspects of high-energy physics
- **Mathematics**: Study of numbers, quantities, shapes, and patterns
- **Physics (General)**: General physics topics not covered by other categories
- **Quantum Physics**: Study of quantum mechanics and quantum systems
- **Statistics**: Study of data collection, analysis, interpretation, and presentation

9 Troubleshooting

9.1 Common Issues

- **PDF Upload Fails**: Ensure your PDF is not corrupted and is less than 200MB
- **Text Extraction Error**: Some PDFs may have security restrictions or be image-based, making text extraction difficult
- **Classification Error**: Very technical or interdisciplinary papers may be harder to classify

9.2 Error Messages

- **"Could not extract title and abstract"**: The system couldn't find text in your PDF
- **"Error processing PDF"**: There was a problem analyzing your document
- **"Model not loaded"**: The backend service may be restarting

10 Tips for Best Results

- Use PDFs with clear, extractable text (not scanned images)
- Ensure the paper has a clear title and abstract
- Academic papers in standard formats work best

- Provide feedback when predictions are incorrect to help improve the system

11 Privacy and Data Usage

When you upload a paper:

- Only the title and abstract are extracted and used for classification
- The system does not store the full text of your papers
- Feedback data (corrections) is stored to improve the model
- No personal information is collected

12 Technical Information

For technically inclined users, the system:

- Uses a BERT-Tiny deep learning model for classification
- Continuously improves through user feedback
- Automatically retrains when enough feedback is collected
- Monitors performance metrics through Prometheus and Grafana

13 Contact and Support

For questions, feedback, or support:

- GitHub Repository: https://github.com/YashG2003/arXiv_papers_classification_app
- Report issues through the GitHub Issues page