L03b Image Classification with SVM

Objective:

To understand and implement a basic machine learning algorithm (Support Vector Machine) for the task of image classification.

You will find the Jupyter file as an attachment on Canvas below these instructions. You need to download the file. Once you have downloaded it, you can work locally or upload it into Studio Lab.

Tools:

- Jupyter Notebook
- Libraries: scikit-learn, matplotlib, numpy, tensorflow

Dataset:

We will use the famous CIFAR-10 dataset, which contains images of 10 different classes (airplanes, cars, birds, cats, deer, dogs, frogs, horses, ships, and trucks). This dataset is widely used and is perfect for beginners due to its simplicity and the fact that it doesn't require high computational power.

Tasks:

Data Exploration and Preparation:

1. **Load the CIFAR-10 dataset.**
2. **Visualize some images from the dataset.**
3. **Convert the images to grayscale and flatten them.**
4. **Split the dataset into training and testing sets.**

Model Training:

1. **Understand the concept of Support Vector Machine (SVM).**
2. **Train an SVM classifier using the training set.**

Model Evaluation:

1. **Make predictions on the testing set.**

2. **Evaluate the model's performance using accuracy.**
3. **Visualize some predictions along with their true labels.**

What you need to submit

Deliverable: Reflective Journal

Objective: Document your learning and insights from the lab on image classification using the Support Vector Machine (SVM) algorithm with the CIFAR-10 dataset.

Contents & Structure:

Reflection on Learning:

- Describe your understanding of the SVM algorithm and its application in image classification.
- Reflect on the data preparation steps, model training, and evaluation process.
- Discuss challenges faced, how you addressed them, and insights from the model's performance.

Responses to Lab Questions:

- Provide detailed answers to the questions included in the Jupyter notebook.
- Demonstrate comprehension and critical thinking about the lab's concepts.

Inclusion of Visuals:

- Enhance your journal with images from the lab (output, visualizations, etc.).
- Ensure visuals are relevant and add clarity or support to your narrative.

Critical Analysis & Referencing:

- Critically engage with the lab material, analyzing results and considering the algorithm's applicability to different scenarios.
- Reference all sources of information, ideas, or quotes used in your journal.
- Include in-text citations and a reference list in the required formatting style.

Formatting and Submission:

- Compile your journal in a clear, organized manner with headings, subheadings, and bullet points.

- Proofread to ensure it's well-written and free of errors.
- Name your document as L03_StudentName_ITAI_1378 (replace StudentName with your name).

Additional Notes:

- Ensure your work is authentic and original, reflecting your personal learning journey.
- Use reputable sources for references to support your work.
- Engage critically with the material, using references to enhance your discussion and demonstrate your engagement with the material and related resources.

Your reflective journal is not just a summary of the lab but an opportunity to critically reflect on what you've learned, how you've applied it, and how the concepts might be relevant in different contexts. It's also a chance to practice academic writing and referencing, important skills in your learning journey.

Patricia