

BAYESIAN INFERENCE ON MNIST DATASET

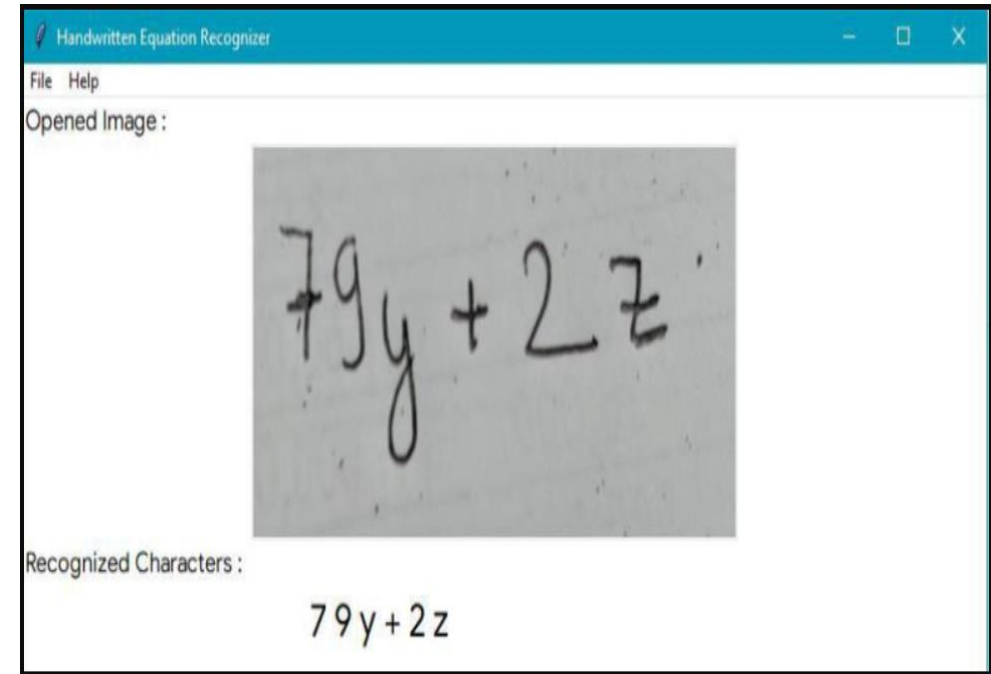
BY
DEVIKA BYLAPUDI



BUSINESS USECASE

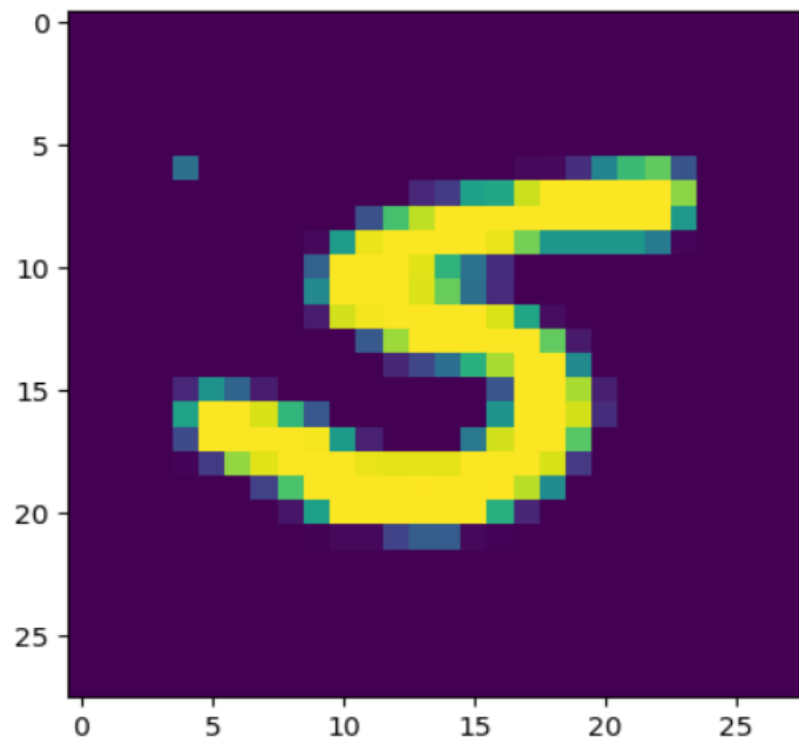
REAL TIME FEEDBACK IN ACADEMICS:

- Real-time feedback in education, especially when integrated with handwriting recognition technology, can transform the learning experience for students.
- As students write their answers, the system can instantly analyze their handwriting and content, providing immediate corrections or suggestions.
- Instead of waiting for a teacher to grade assignments, students receive continuous assessment throughout their work.
- Teachers can access real-time data on student performance, identifying common errors or misconceptions across the class.
- Allows them to tailor instruction and address specific needs in subsequent lessons.

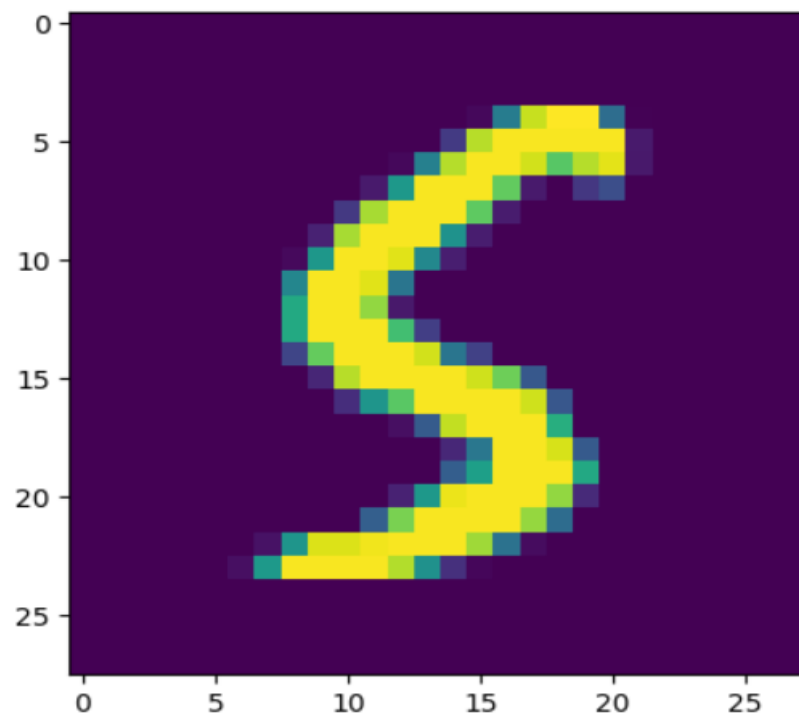


Representation of handwritten information captured as pixels written as a matrix

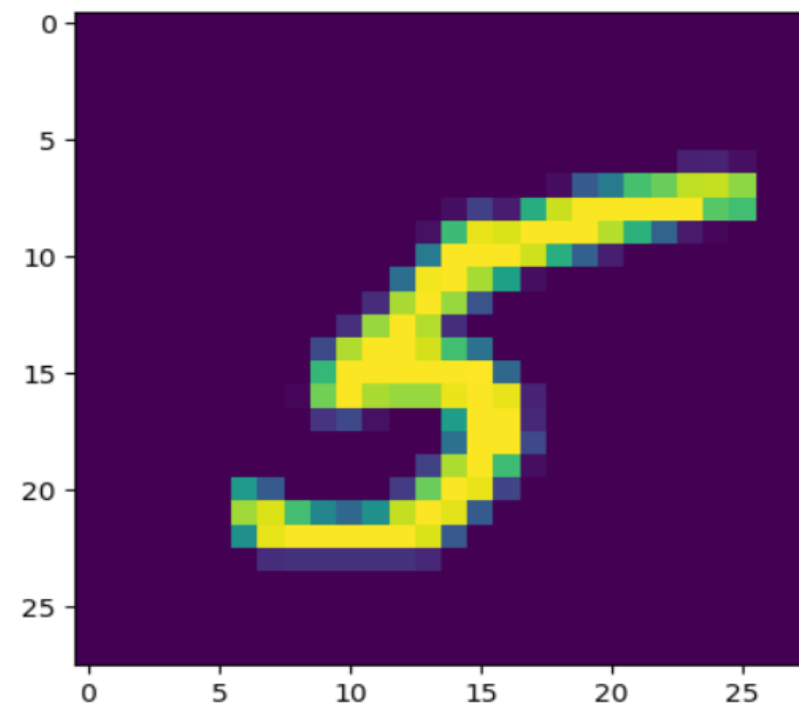
<matplotlib.image.AxesImage at 0x7915c18565c0>



<matplotlib.image.AxesImage at 0x7915b8ba7a30>



<matplotlib.image.AxesImage at 0x7915c19242e0>



Naïve Bayes Classifier:

Probabilistic classification algorithm based on Bayes' theorem. It's a simple yet effective technique often used for text classification, spam filtering.

- In Training Phase, the algorithm calculates the probability of each class (prior probability).
- For each class, it calculates the probability of each feature given that class (conditional probability).
- When a new data point is presented, the algorithm calculates the probability of each class given the features of the data point.
- The class with the highest probability is assigned to the new data point.

Accuracy of Training Data

```
[193] 1 accuracy(y,y_hat)
```

```
⇒ 0.6459833333333334
```

Accuracy of Testing Data

```
[ ] 1 accuracy(y,y_hat)
```

```
⇒ 0.9167
```

Non Naïve Bayes Classifier:

- Non-Naive Bayes classifier does not assume that features are independent of each other.
- Considers the relationships and dependencies between different features when making predictions.
- Accounts for feature dependencies by utilizing the full covariance matrix, offering a more thorough approach than the Naive Bayes classifier.
- Non-naive Bayes classifiers tend to be more computationally intensive than Naive Bayes because they have to model dependencies, requiring additional data and computational resources.

Accuracy of Training Data

```
✓ [181] 1 accuracy(y,y_hat_bayes)  
⇒ 0.78565
```

Accuracy of Testing Data

```
[ ] 1 accuracy(y,y_hat_bayes)  
⇒ 0.9675
```

SUMMARY:

- To provide the instance feedback for the students to offer instant feedback, supporting self-paced learning and skill reinforcement.
- Applied Models are Naïve Bayes and Non Naïve Bayes Classifier.
- Libraries used in the model : Pandas , NumPy , Matplotlib, SciPy.
- Feed the model with the training dataset, allowing it to learn by adjusting internal parameters based on the data.
- Use the model to make predictions on the test set and compare predictions to the actual labels to calculate metrics accuracy.

Q&A



THANK YOU