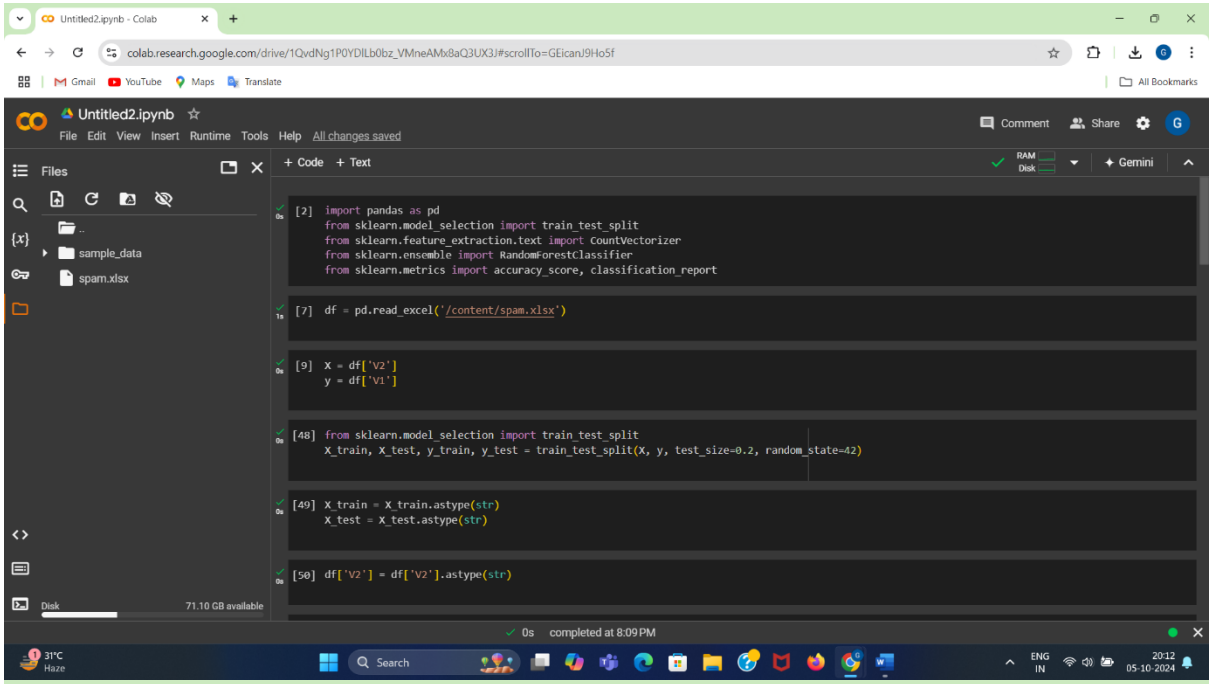
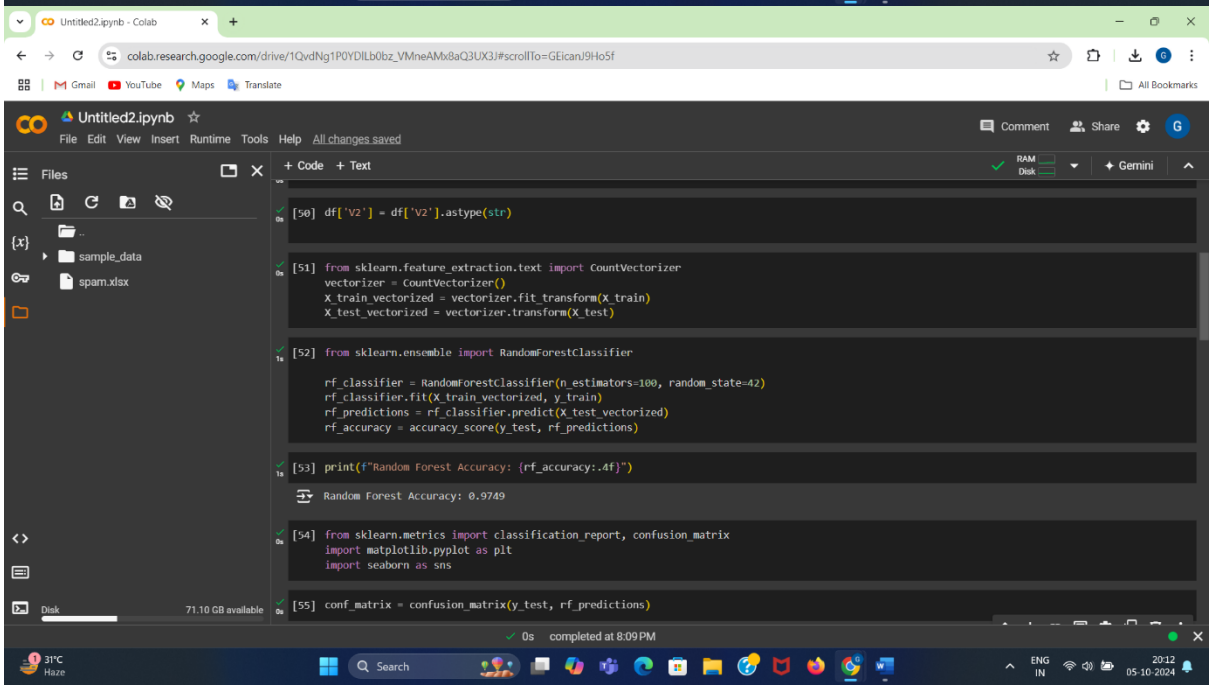
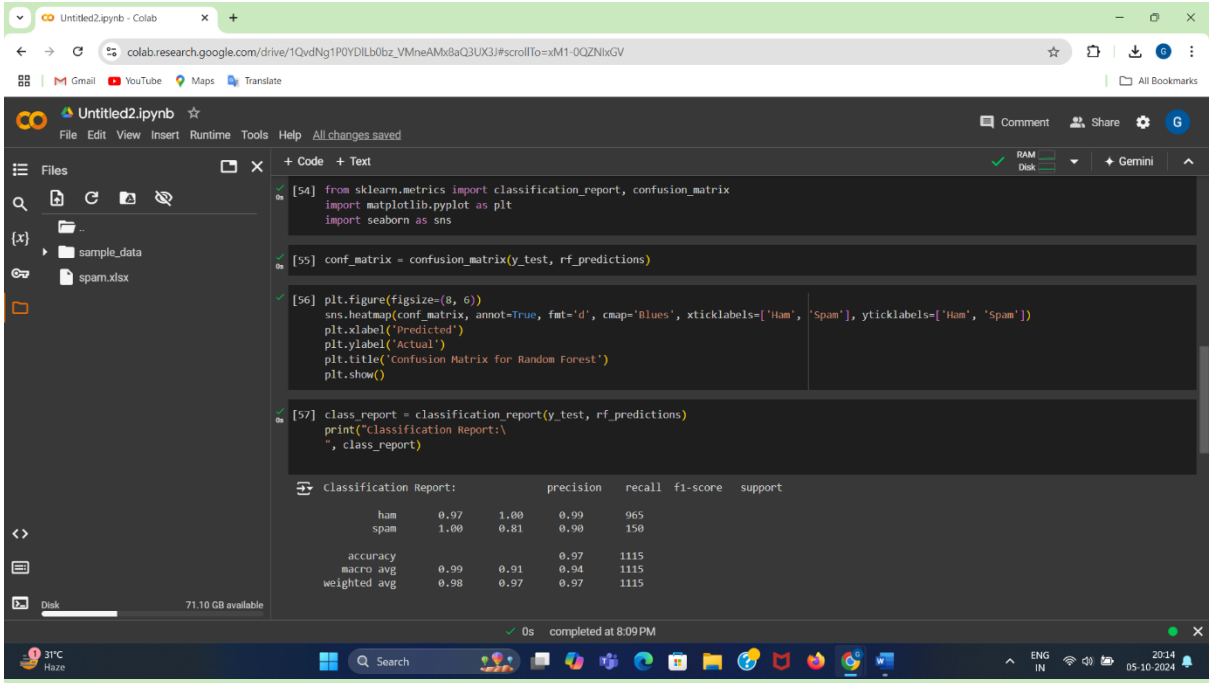
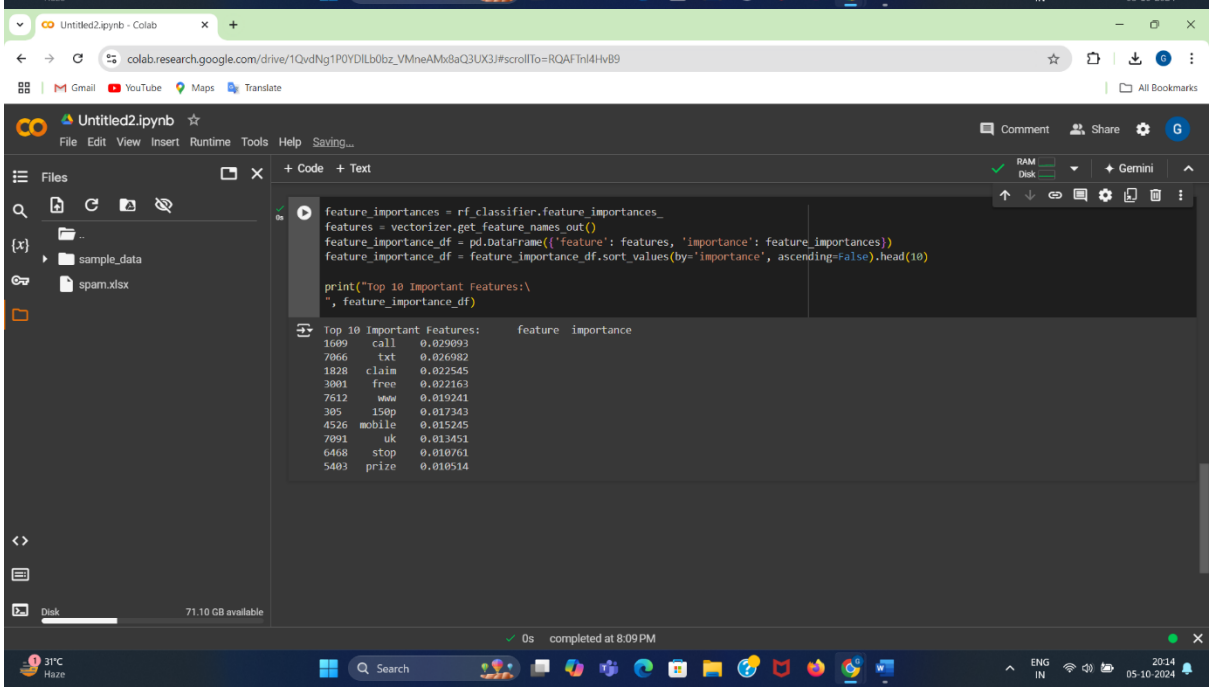
# Spam Detection Project

I have used the random forest classification model to detect spam vs ham messages.



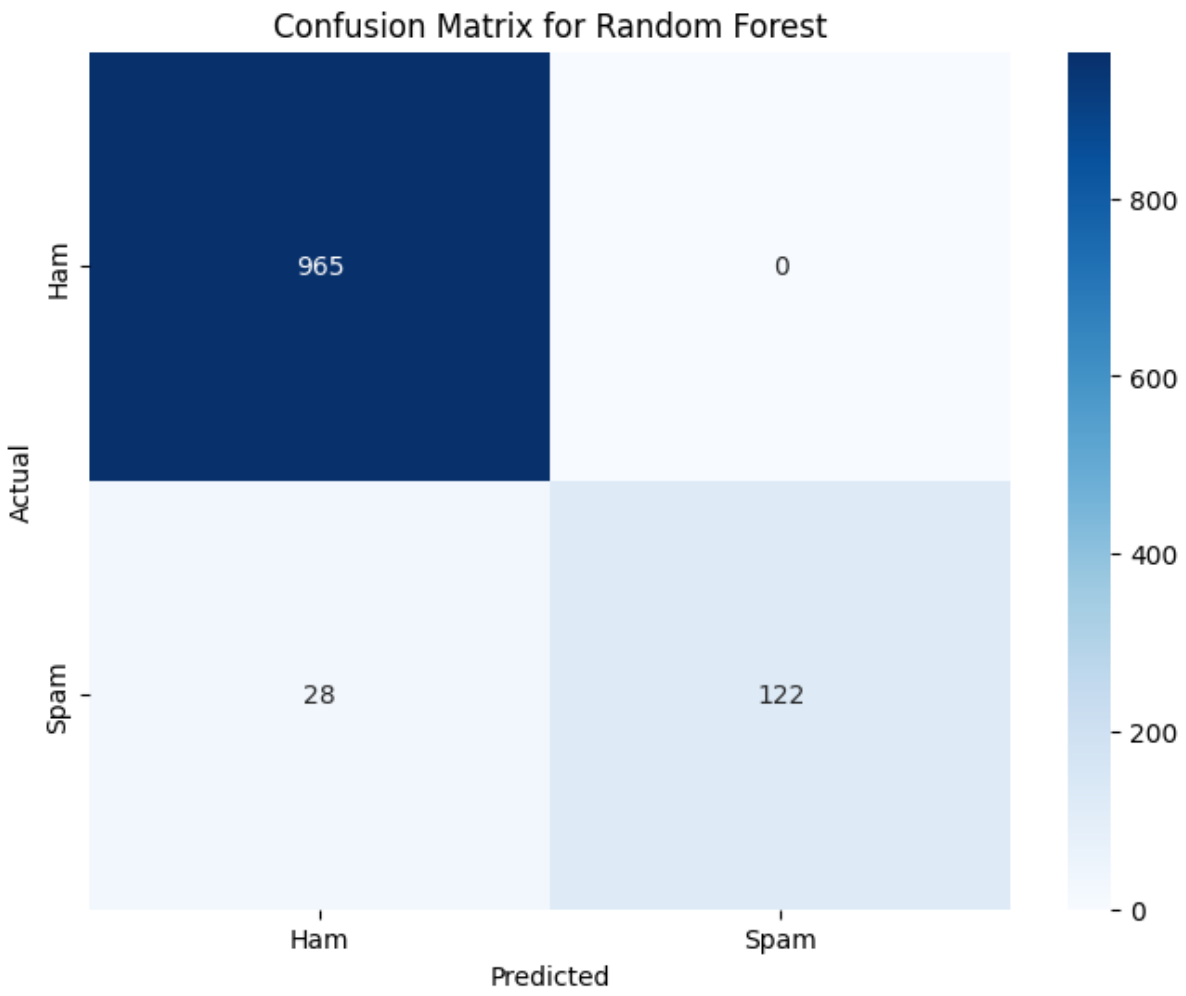



The random forest model achieved an accuracy of 97.49%.

Conclusions:

1) This confusion matrix was generated:




The confusion matrix shows excellent performance in classifying ham messages (all 965/965 correct) and decent performance for spam (122/150).

2) Classification report.

| | precision | recall | F1-score | Support |
|---|---|---|---|---|
| ham | 0.97 | 1.00 | 0.99 | 965 |
| spam | 1.00 | 0.81 | 0.90 | 150 |
| accuracy | | | 0.97 | 1115 |
| macro avg | 0.99 | 0.91 | 0.94 | 1115 |
| weight avg | 0.98 | 0.97 | 0.97 | 1115 |

- The model achieves 97% precision and 100% recall for ham messages.
- For spam messages, it has 100% precision but 81% recall.
- Overall accuracy is 98%, so very strong performance.

3) Top 10 important features.

| | features | importance |
|---|---|---|
| 1609 | call | 0.029093 |
| 7066 | txt | 0.026982 |
| 1828 | claim | 0.022545 |
| 3001 | free | 0.022163 |
| 7612 | www | 0.019241 |
| 305 | 150p | 0.017343 |
| 4526 | mobile | 0.015245 |

| | | |
|---|---|---|
| 7091 | uk | 0.013451 |
| 6468 | stop | 0.010761 |
| 5403 | prize | 0.010514 |

The top features for classification include words commonly associated with spam, such as "txt," "call," "claim," and "prize."