CSCA 5622 Supervised Learning Final Project

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Banknote Authentication

Lohweg, V. (2012). Banknote Authentication [Dataset]. UCI Machine Learning Repository. https://doi.org/10.24432/C55P57.

https://github.com/brle1242/CSCA-5622-Supervised-Learning-Final-Project

Data was extracted from images that were taken from genuine and forged banknote-like specimens.

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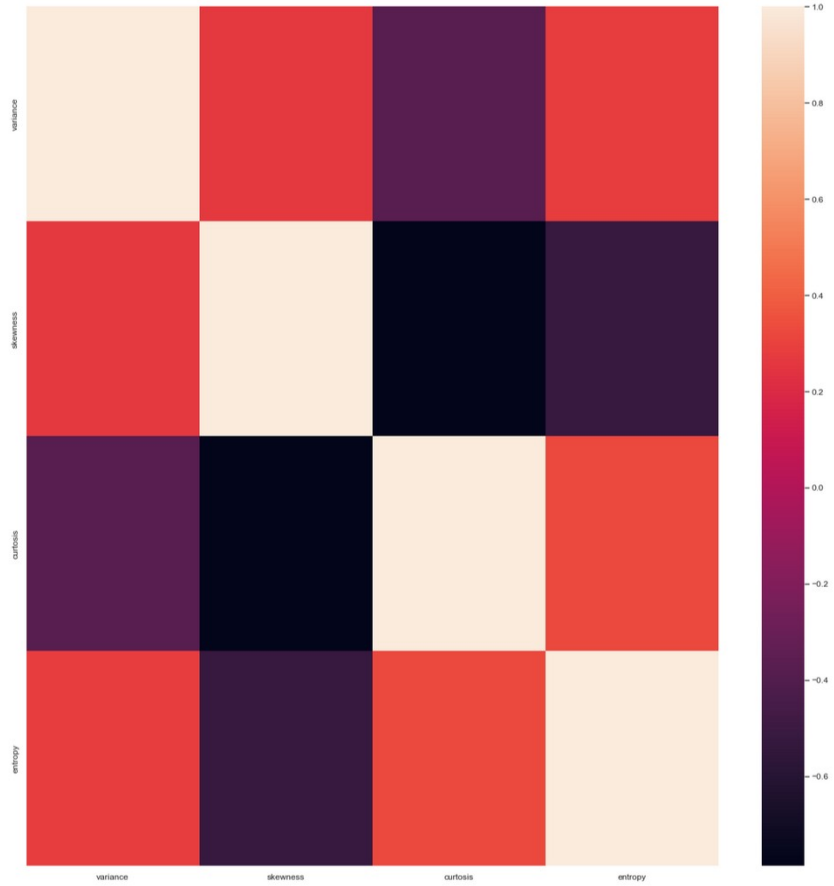
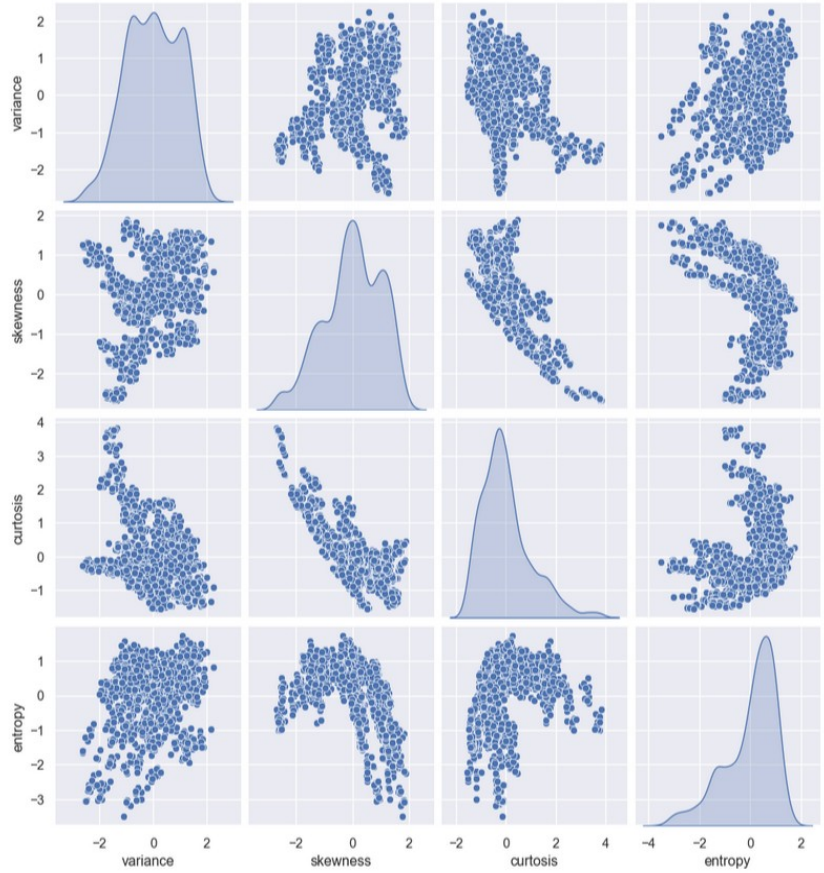
This data was precleaned, but I did explorativ analysis:

- correlation matrix
- pair plot

Correlation Matrix



Pair Plot


variance
skewness
curtosis
entropy
variance
skewness
curtosis
entropy

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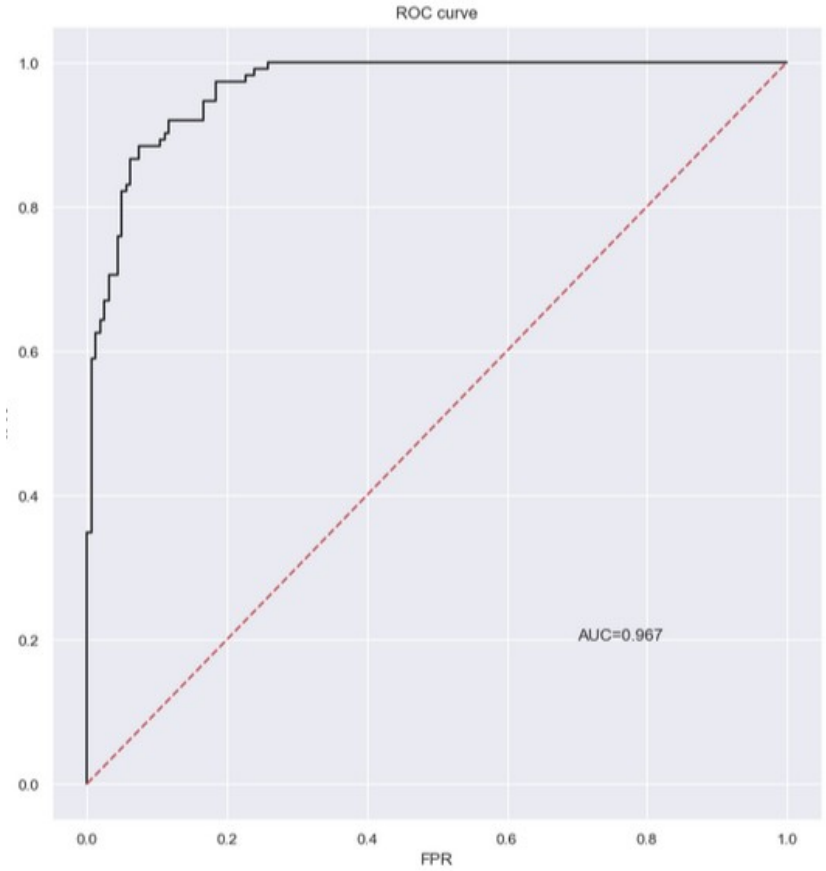
First Attempt: Logistic Regression, without Skewness

- ~89.1% accurate

ROC Curve (Without Skewness)



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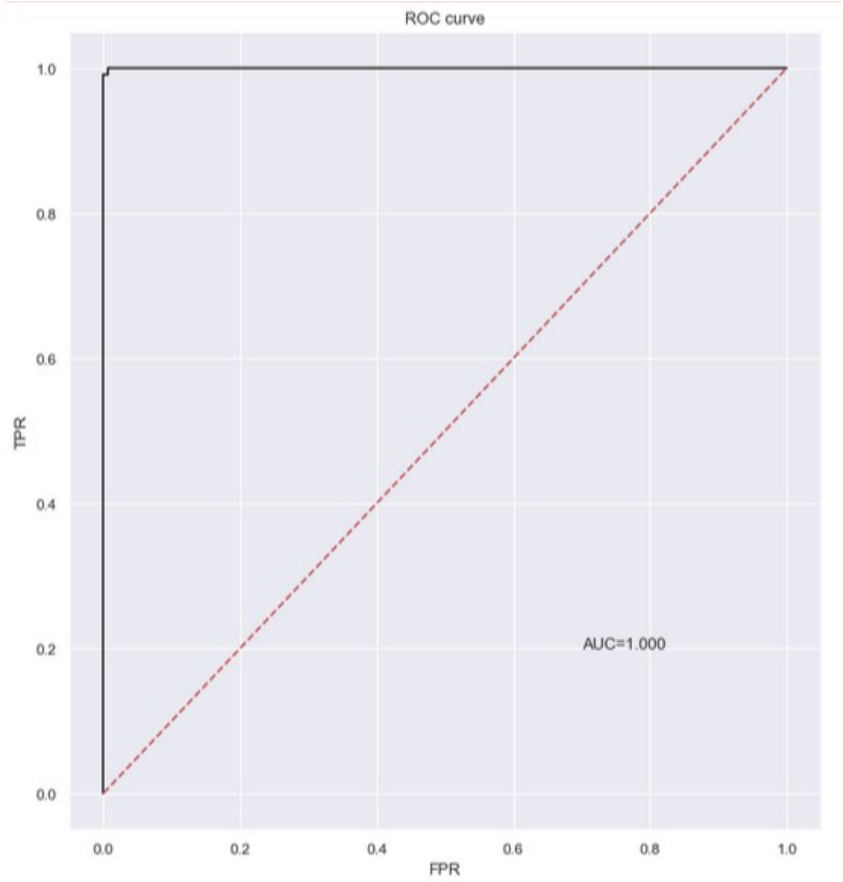
Second Attempt: Logistic Regression, with Skewness

- ~98.54% accurate

ROC Curve (With Skewness)



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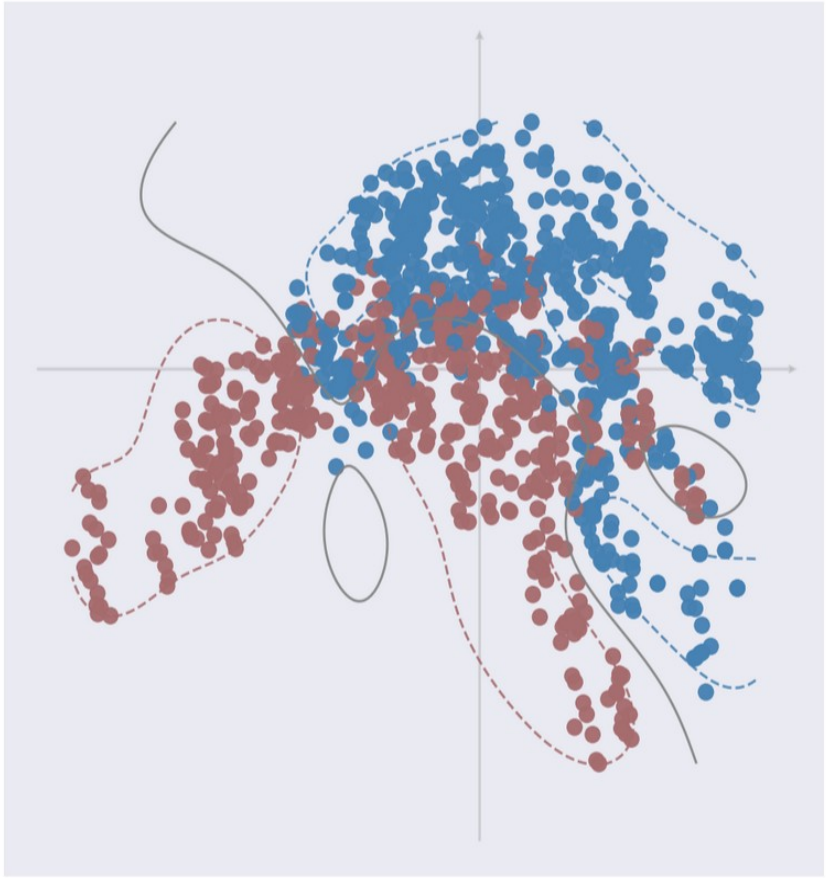
Can we do better?

- Naive SVM accuracy 99.63%

SVM C=1 Gamma=1



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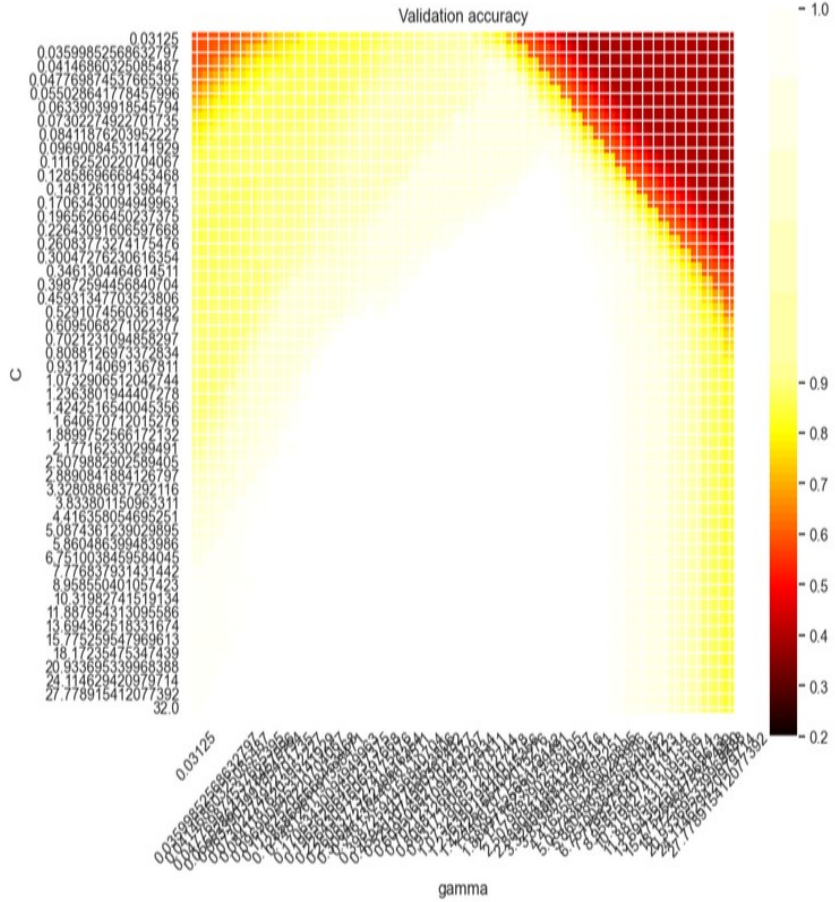
Can we do better?

- perform a grid search on SVM parameters
- generate a heat map

SVM Grid Search Heatmap



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Grid Search Results

- SVM with 100% accuracy on training and test data

SVM

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Should we keep looking?

- naive KNN scores 99.63% accurate on test data
- grid search on KNN reveals a model with 100% accuracy on training data and 99.63% accuracy on test data

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Reality of bank note authentication

- Complex business process
- False positives and negatives both cost time and money

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What model to use?

- All models performed well
- Keep it simple!
- Grid search KNN is simplest model with high accuracy