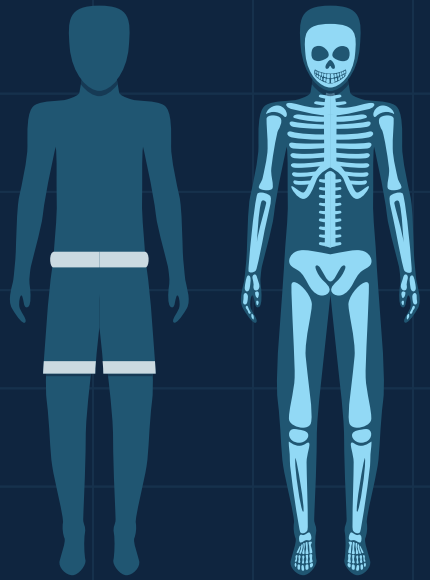
Detection of Pneumonia from Chest X-ray Images

Georgios Karagounis-MTN2310
Angeliki Kostopoulou-MTN2316

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ
UNIVERSITY OF PIRAEUS
DEMOKRITOS
NATIONAL CENTRE FOR SCIENTIFIC RESEARCH

10cm

Table of contents

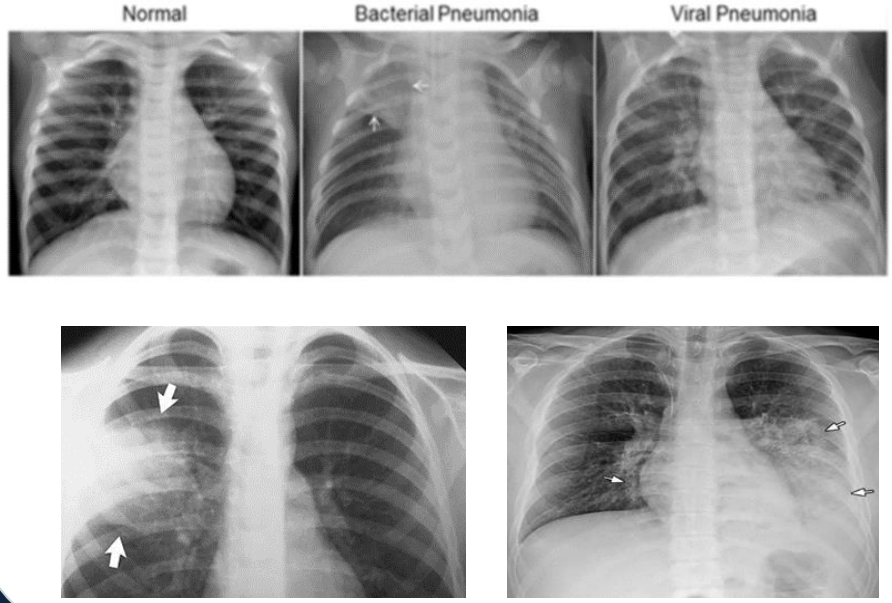


10cm

Introduction

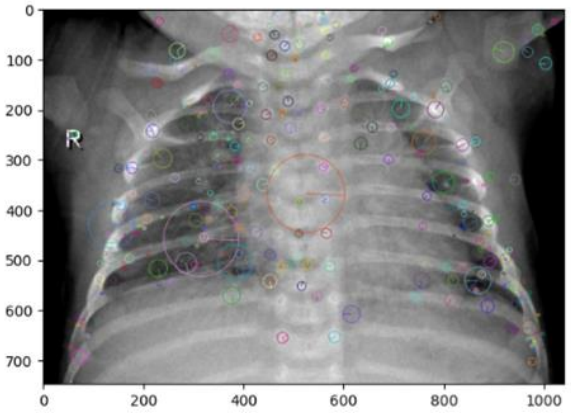
- Pneumonia has been directly responsible for a huge number of deaths all across the globally.
- Early detection of pneumonia is essential for effective treatment and improved patient outcomes.
- Developing accurate pneumonia detection algorithms requires large amounts of high-quality labeled data, which can be difficult to obtain.
- Machine learning has emerged as a powerful tool for detecting and diagnosing pneumonia from medical images such as chest X-rays.

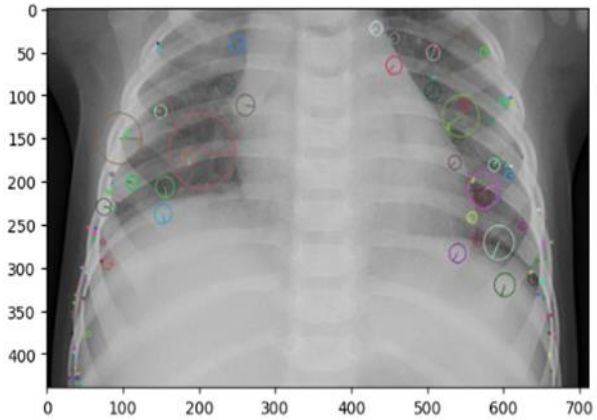
Introduction



10cm

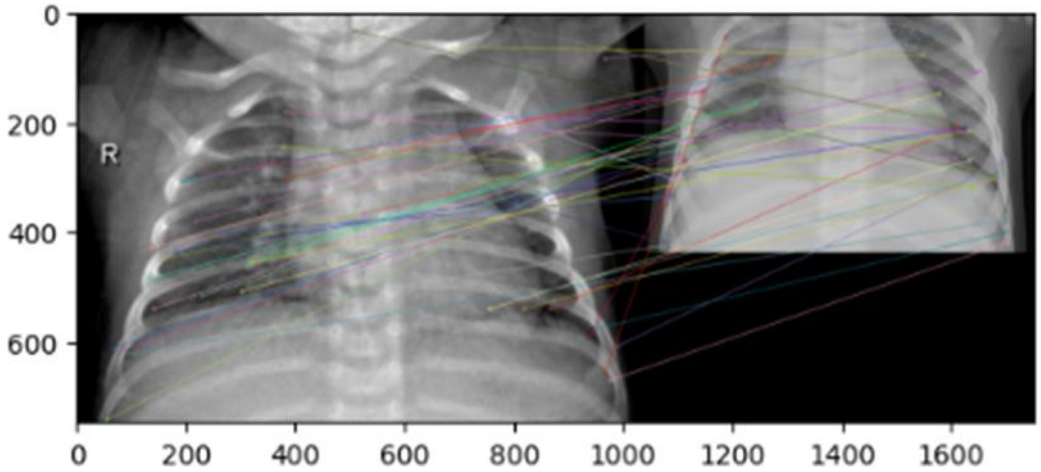
SIFT Algorithm





10cm

SIFT Algorithm



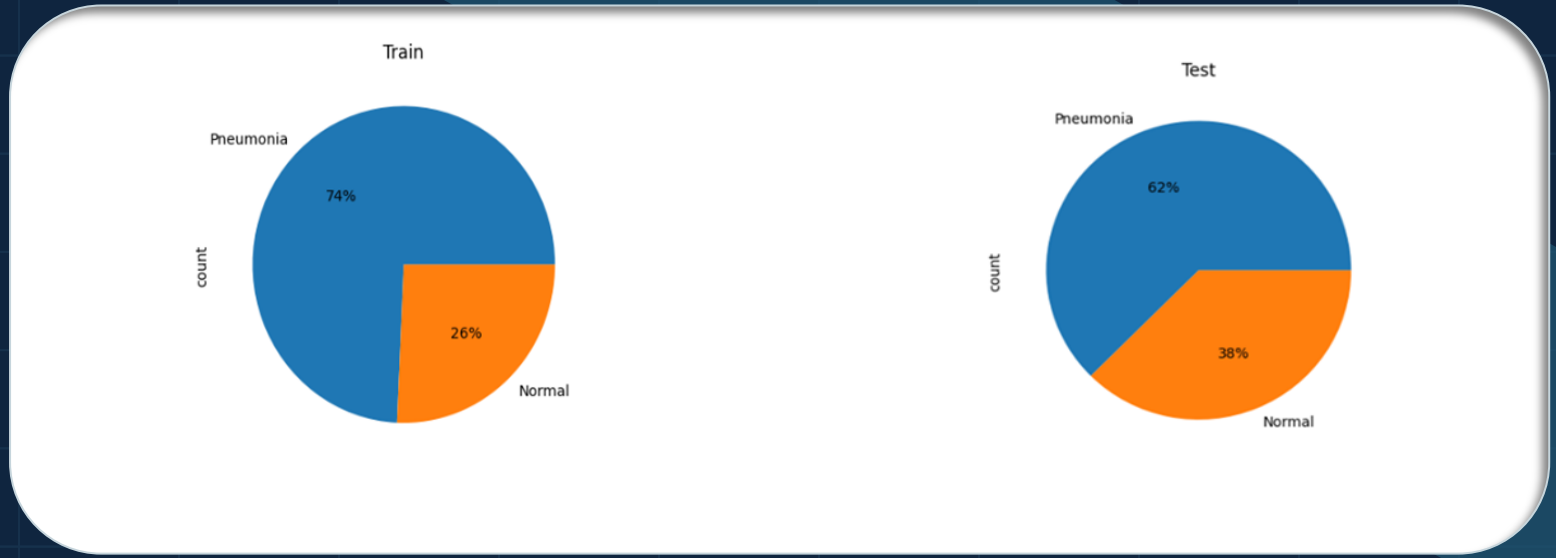
10cm

Dataset

- Dataset consists of 5856 images of chest X-rays of which 4273 are pneumonia images and 1583 are normal chest X-ray images.
- A total of 80% of the data are used for training, producing 4642 images (3418 images of pneumonia and 1224 normal images)
- 15% of the data are used for testing, producing 919 images (641 cases of pneumonia and 278 normal images),
- the final 5% of the data are used for validation (214 cases of pneumonia and 81 non-pneumonia images).

10cm

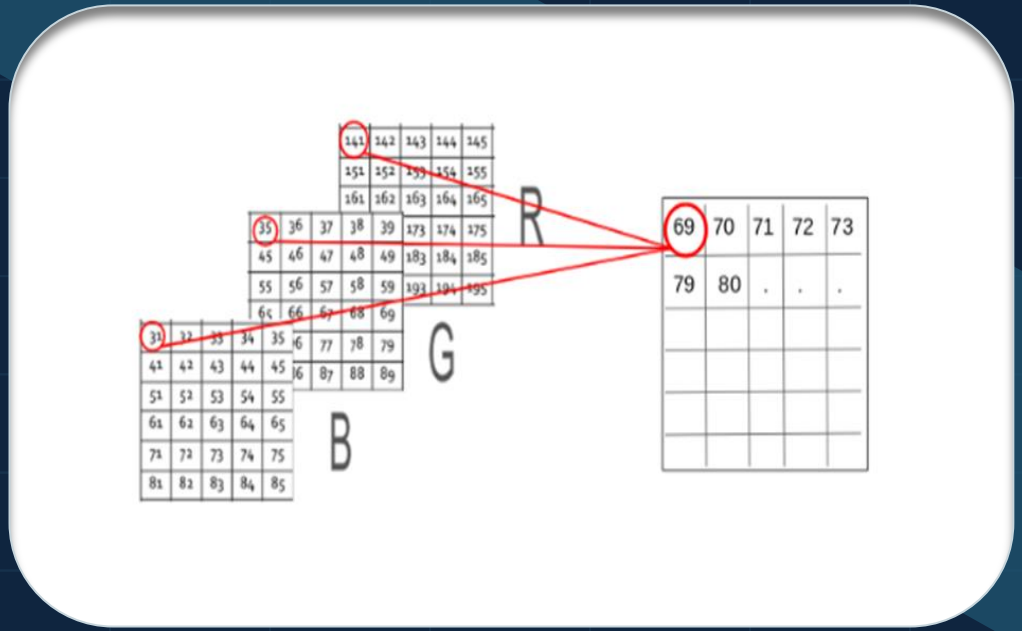
Dataset



10cm

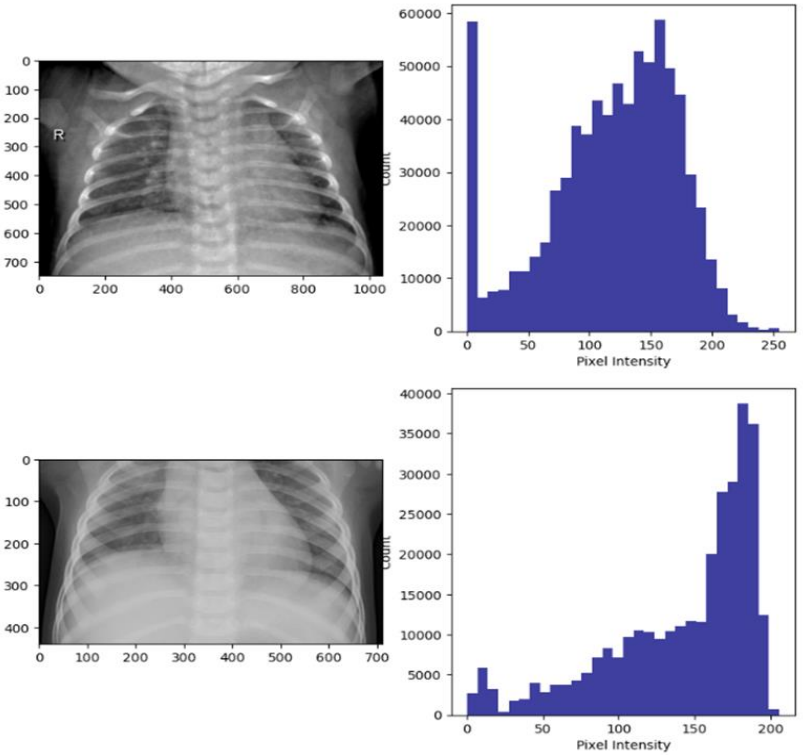
Feature Extraction

- Resize images to 64 x 64 pixels.
- We get three channels (r,g,b).
- Mean Pixel Value of Channels.
- Normalize data to have zero mean and unit variance.



10cm

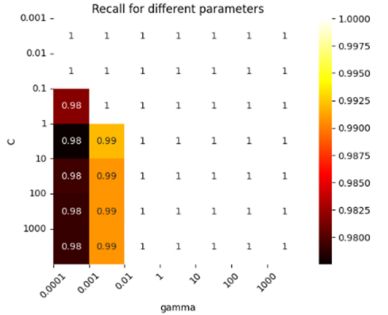
Pixel intensity

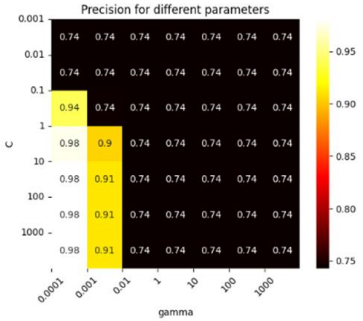


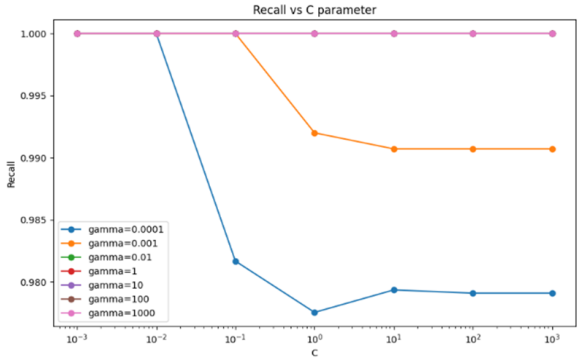
10cm

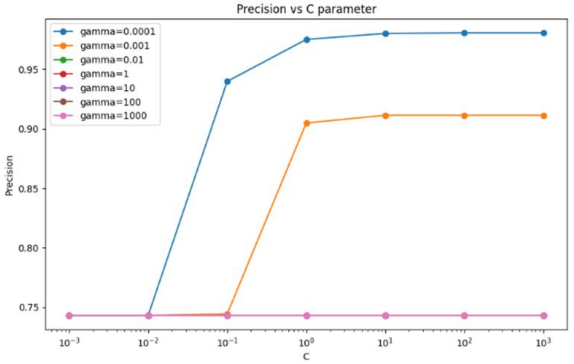
Hyperparameter Tuning for svm with rbf kernel

The hyperparameters we want to adjust in this case are C and gamma. As we can see the best option is C=100 and gamma=0.0001.





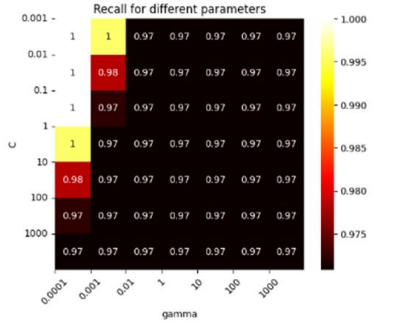


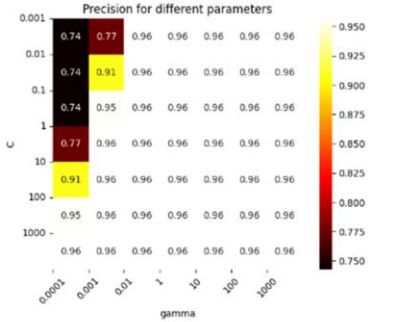


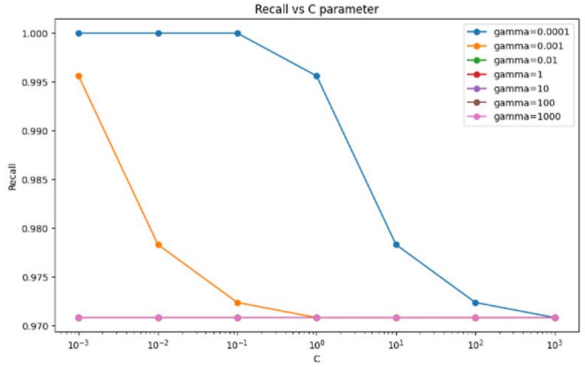
10cm

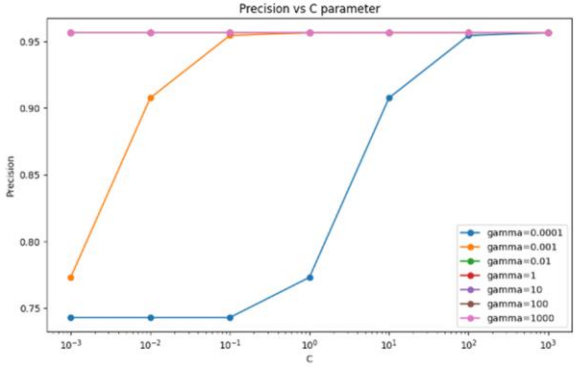
Hyperparameter Tuning for svm with polynomial kernel

The hyperparameters we want to adjust in this case are C and gamma. As we can see the best option is C=1 and gamma=0.001.





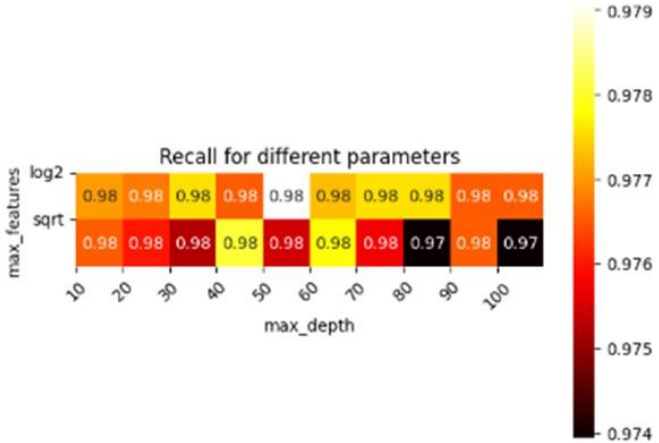


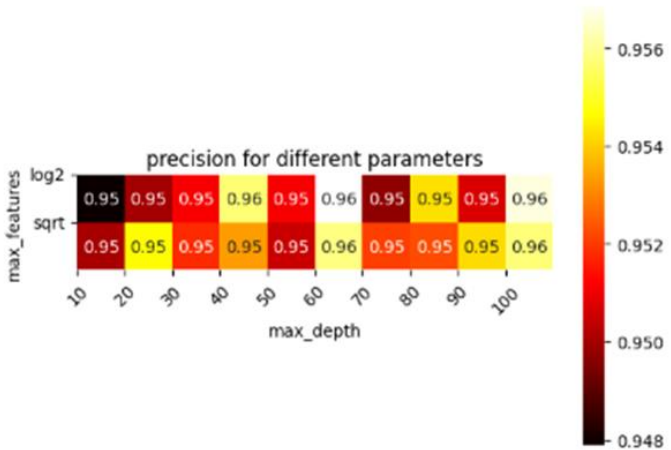


10cm

Hyperparameter Tuning for random forest

The hyperparameters we want to set in this case are max_features and max_depth. As we can see the best option is max_features = log2 and max_depth=50.

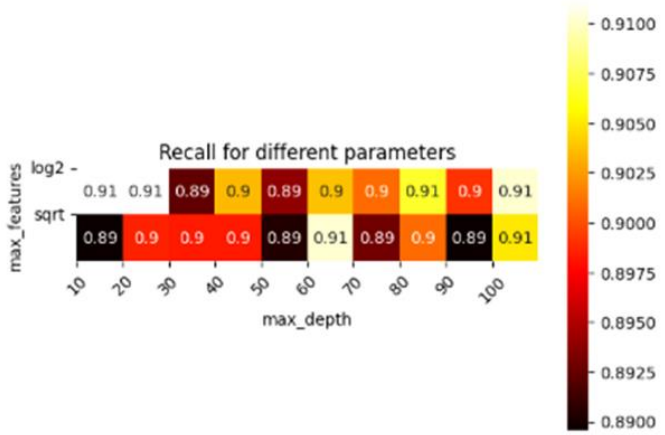


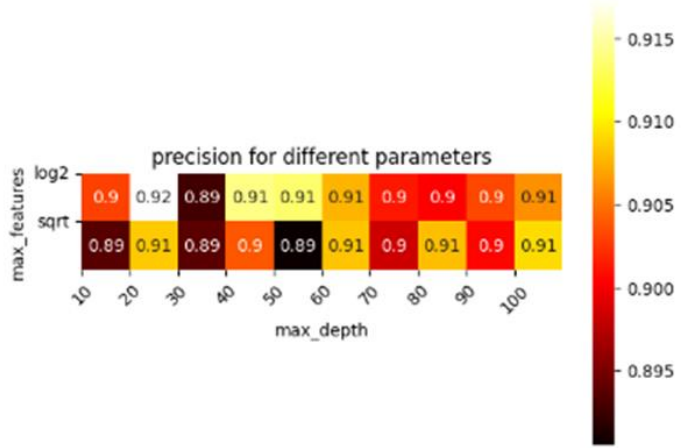


10cm

Hyperparameter Tuning for decision-tree

The hyperparameters we want to set in this case are max_features and max_depth.
As we can see the best option is max_features = log2 and max_depth=20.

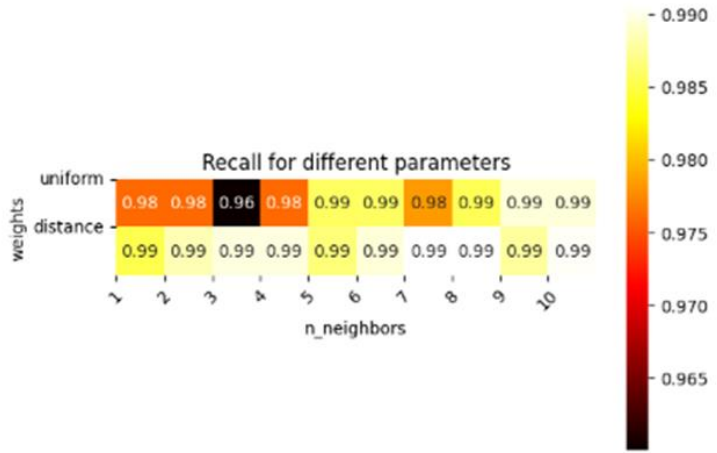


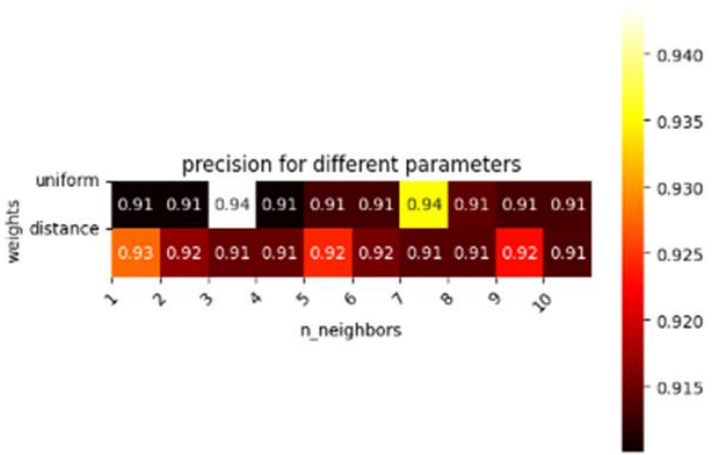


10cm

Hyperparameter Tuning for KNN

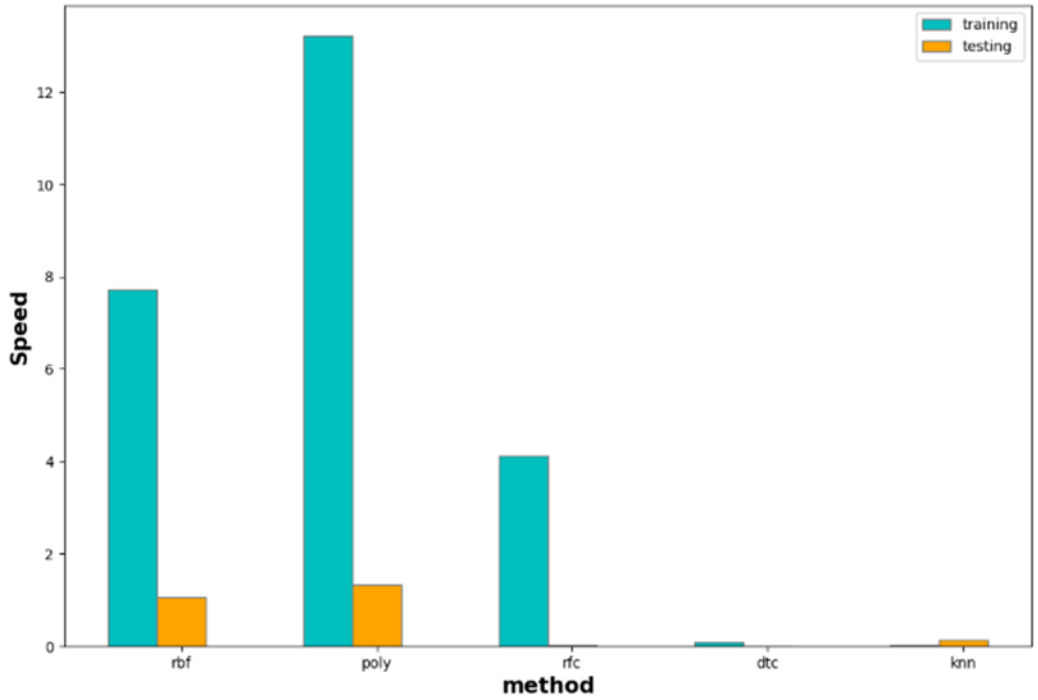
The hyperparameters we want to set in this case are n_neighbors and weights. As we can see the best option is n_neighbors=7 and weights= uniform.





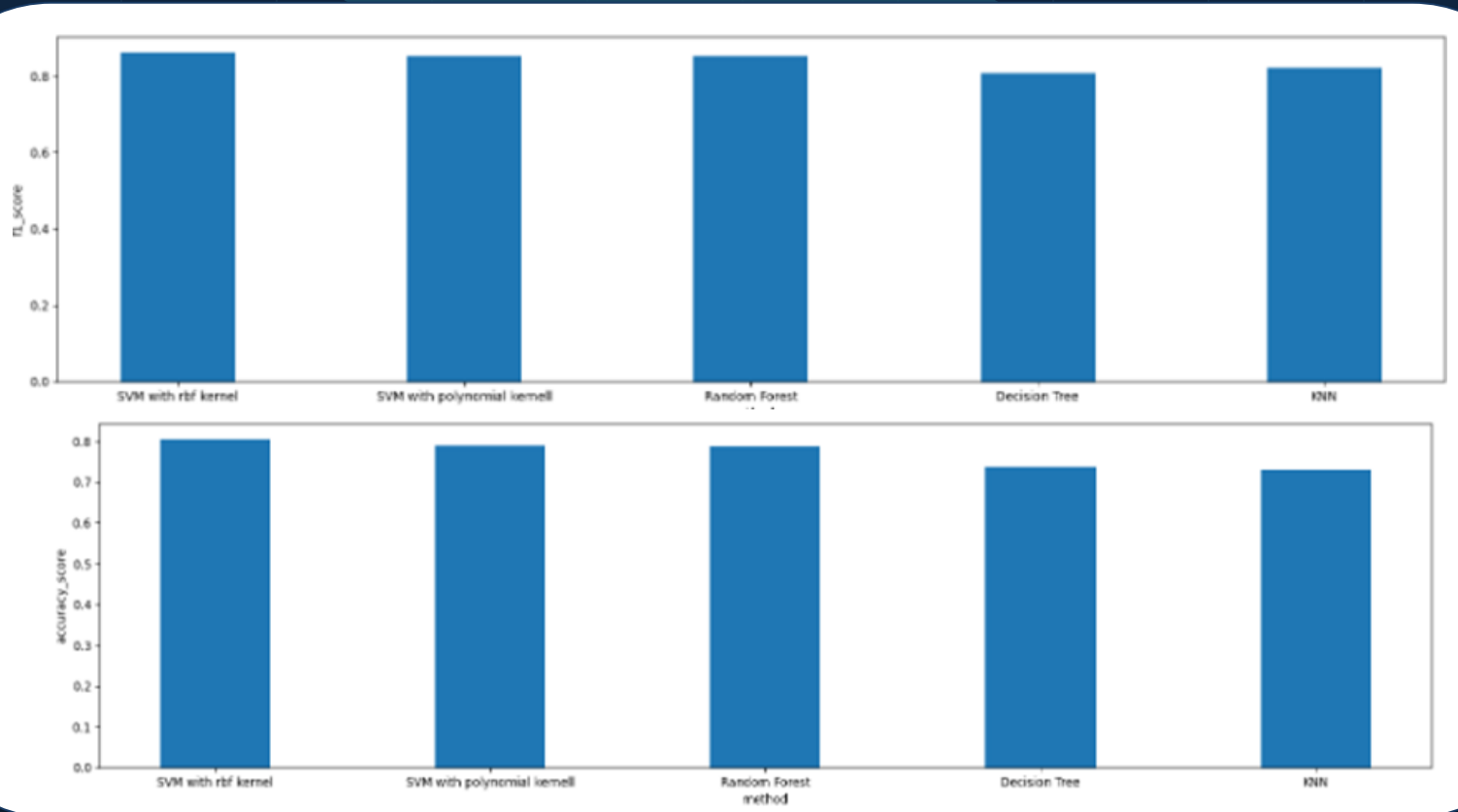
10cm

Model Selection



10cm

Model Selection

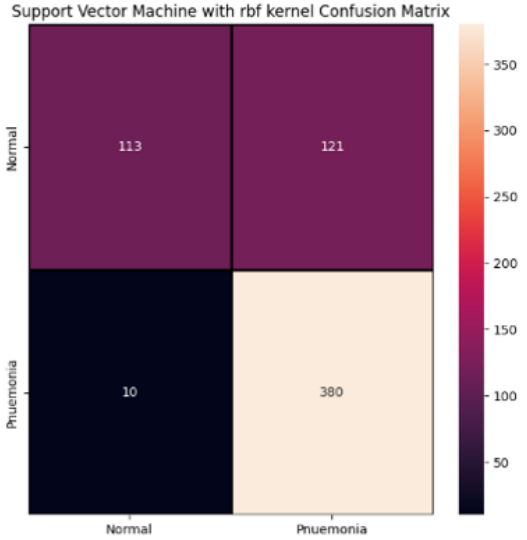


10cm

Model Selection

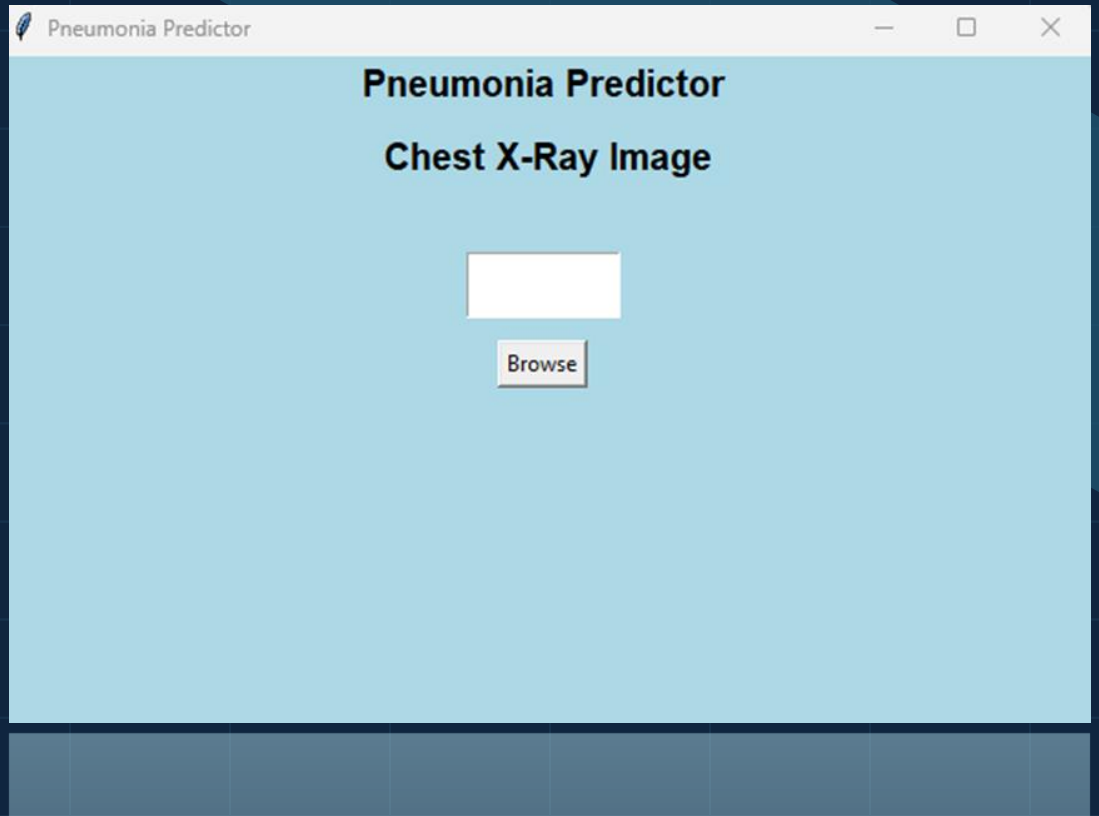
The model we choose is Svm with rbf kernel.

```
Support Vector Machine Classifier with rbf kernel
accuracy score is:0.8044871794871795
recall score is:0.9743589743589743
precision score is:0.7723577235772358
f1 score is:0.8616780045351473
Support Vector Machine Classifier with polynomial kernell
accuracy score is:0.7900641025641025
recall score is:0.9743589743589743
precision score is:0.7584830339321357
f1 score is:0.8529741863075196
Random Forest
accuracy score is:0.7916666666666666
recall score is:0.9897435897435898
precision score is:0.75390625
f1 score is:0.8558758314855877
Decision Tree
accuracy score is:0.6842948717948718
recall score is:0.8948717948717949
precision score is:0.691089108910891
f1 score is:0.7798882681564245
KNN
accuracy score is:0.7307692307692307
recall score is:0.9948717948717949
precision score is:0.7003610108303249
f1 score is:0.8220338983050848
```



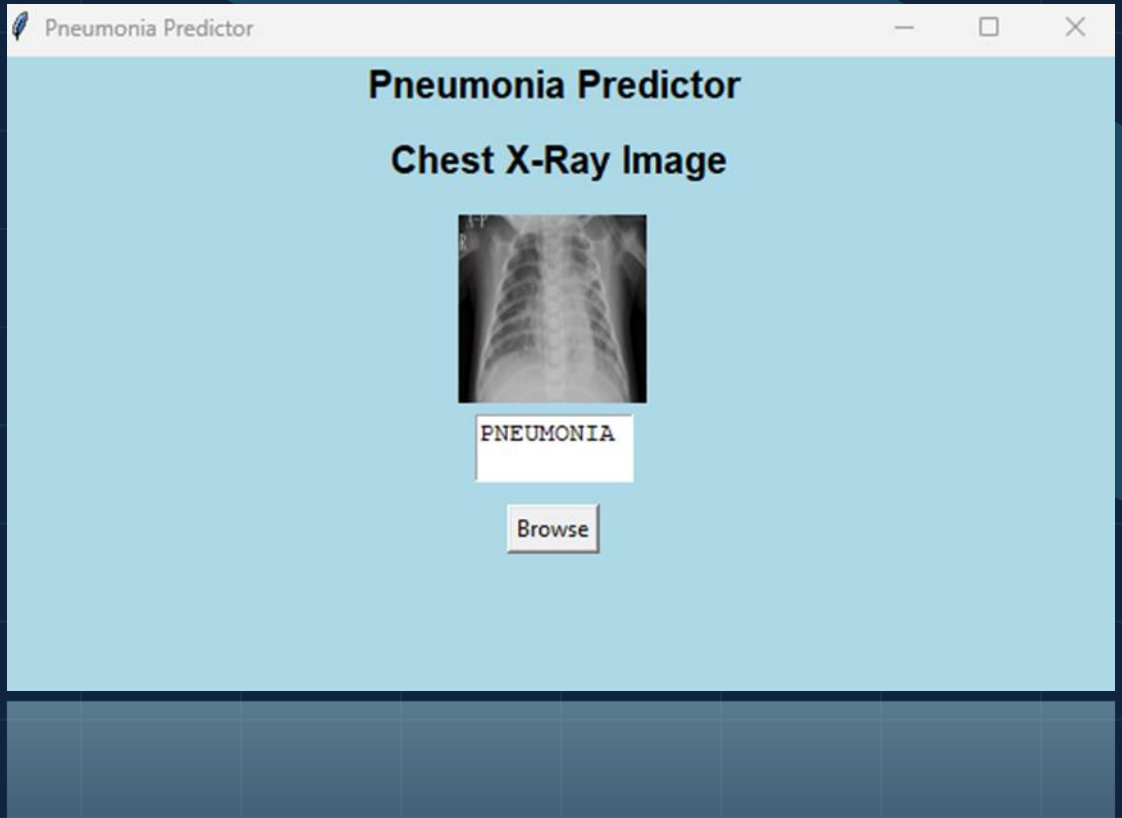
10cm

User interface



10cm

User interface



10cm

Thank You For Your Attention !