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WITH MASK AND WITHOUT MASK FACE CLASSIFICATION

Minor Project report

Head of transformed numpy dataset

```
array([[[0.84705882, 0.83137255, 0.84313725, ..., 0.83529412,
         0.83921569, 0.83921569],
        [0.84705882, 0.83137255, 0.84313725, ..., 0.83529412,
         0.83921569, 0.83921569],
        [0.84705882, 0.83137255, 0.84313725, ..., 0.83529412,
         0.83921569, 0.83921569],
        ...,
        [0.99607843, 1.        , 1.        , ..., 1.        ,
         1.        , 1.        ],
        [0.99607843, 0.96078431, 0.99215686, ..., 1.        ,
         1.        , 1.        ],
        [0.98431373, 0.98431373, 0.95294118, ..., 1.        ,
         1.        , 1.        ]],

       [[0.44313725, 0.42352941, 0.42352941, ..., 0.91764706,
         0.91372549, 0.91372549],
        [0.40392157, 0.42352941, 0.42352941, ..., 0.91764706,
         0.91764706, 0.91764706],
        [0.41960784, 0.4       , 0.41176471, ..., 0.92156863,
         0.92156863, 0.92156863],
        ...,
        [0.65098039, 0.6745098 , 0.7254902 , ..., 0.54901961,
         0.67843137, 0.70588235],
        [0.74901961, 0.74117647, 0.74901961, ..., 0.76078431,
         0.74901961, 0.70588235],
```

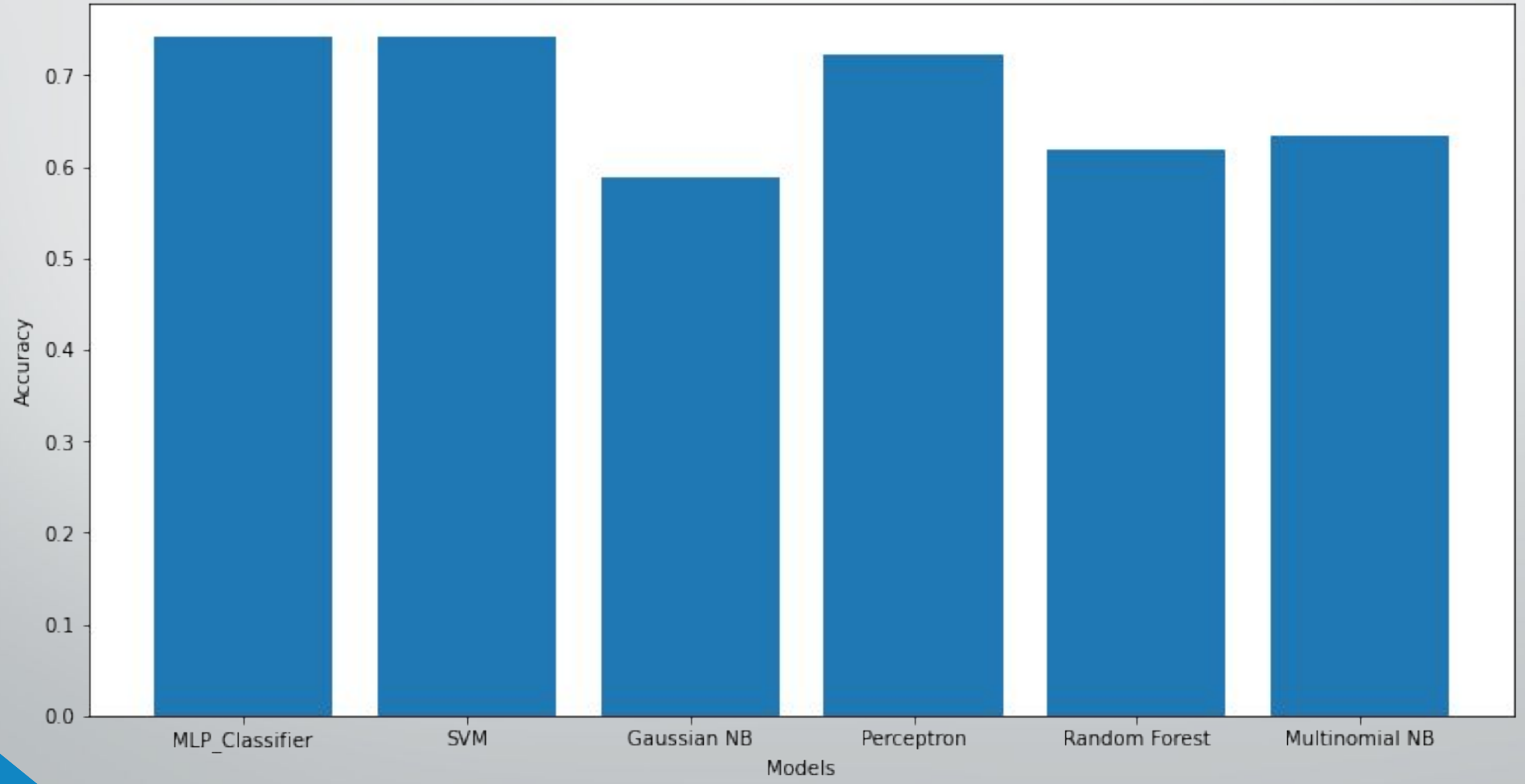
Preprocessing of dataset

- *Converting image to numpy arrays.*
- *Using CV2 gray scale conversion.*
- *Dividing the dataset by 255 to normalize the values.*
- *Removing NULL values and removing unwanted columns.*
- *Using Select k Best model to account for required features using chi – square parameter.*

Accuracies of different models

- *Accuracy of Perceptron :* 0.7225806451612903
- *Accuracy of SVC :* 0.7419354838709677
- *Accuracy of MLP :* 0.7096774193548387
- *Accuracy of Multinomial:* 0.6344086021505376
- *Accuracy of Random Forest:* 0.6215053763440860

Comparison of models



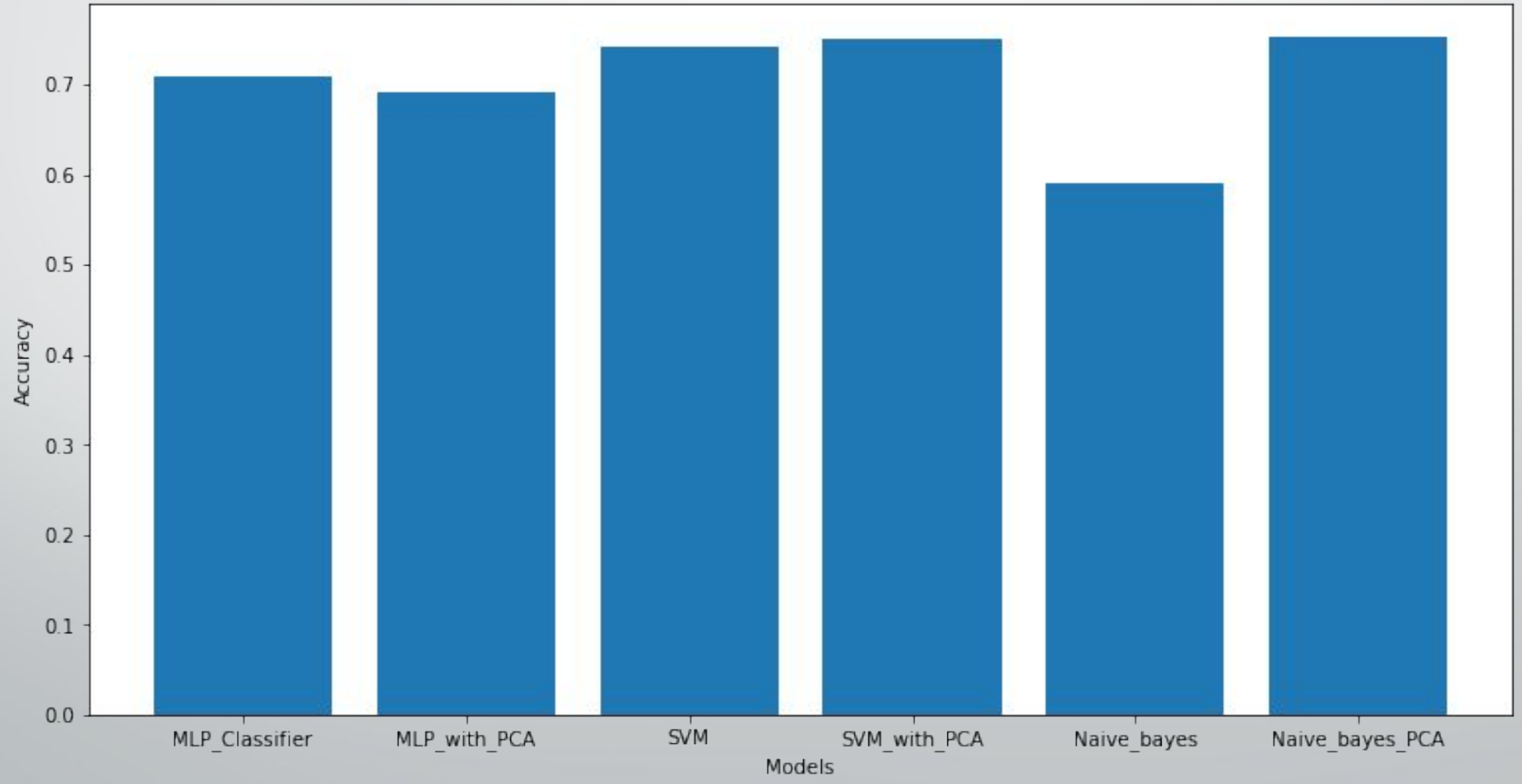
Analysis

- *SVC and MLP Classifier model gave good accuracy.*
- *Accuracy of Perceptron mode was also high.*
- *MLP requires rigorous training and needs proper tuning of number of hidden layers and number of nodes in each hidden layer.*
- *Gaussian naïve bayes and random forest model gave comparatively lower accuracies.*

Accuracies after applying PCA reduction

- *Accuracy of Gaussian NB:* 0.7526881720430108
- *Accuracy of Perceptron :* 0.7526881720430108
- *Accuracy of SVC :* 0.7505376344086021
- *Accuracy of MLP :* 0.6903225806451613
- *Accuracy of Random Forest:* 0.6107526881720430

Effect of PCA dimension reduction



Analysis

- *The accuracy of Naïve Bayes model increased heavily.*
- *Accuracy of Perceptron model also increased significantly.*
- *Accuracy of SVC and MLP changed slightly.*
- *Hence we can say that dimension reduction brings slight regularization effects for some model and allows proper training. This increases the accuracy of the model.*

Analysis of model performance

	Accuracy	Precision	Recall	F1_score
MLP_Classifier	0.709677	0.748837	0.922636	0.826701
SVM	0.741935	0.748373	0.988539	0.851852
Naive_bayes	0.589247	0.788321	0.618911	0.693419
MLP_with_PCA	0.690323	0.744630	0.893983	0.812500
SVM_with_PCA	0.750538	0.750538	1.000000	0.857494
Naive_bayes_with_PCA	0.752688	0.758850	0.982808	0.856429

Upon tuning some models

Perceptron model

	precision	recall	f1-score	support
0	0.16	0.03	0.04	116
1	0.75	0.95	0.84	349
accuracy			0.72	465
macro avg	0.45	0.49	0.44	465
weighted avg	0.60	0.72	0.64	465

SVC model

	precision	recall	f1-score	support
0	0.00	0.00	0.00	116
1	0.75	1.00	0.86	349
accuracy			0.75	465
macro avg	0.38	0.50	0.43	465
weighted avg	0.56	0.75	0.64	465

CONTRIBUTION OF TEAM MEMBERS

- *GAUTAM KUMAR (B19EE0.31)*
  - *Training and tuning of MLP classifier model and SVC model.*
  - *Analysing the effect of dimension reduction using PCA on different models.*
  - *Training of perceptron model and Random Forest model.*
- *CHIRAG JINDAL (B19CSE026)*
  - *Preprocessing and importing of entire dataset.*
  - *Training and tuning of Naive Bayesian model.*
  - *Analysis of recall, precision and F1 scores of different models.*

CONCLUSION

- *We learnt to do image classification using different models.*
- *We implemented models using pipeline and saw the effect of dimension reduction.*
- *We also saw the effects of tuning of hyperparameters.*
- *We learnt to tune neural network and hyperparameters of SVC model.*
- *We analysed the model performance under different set of parameters and finally gave the best parameters of result prediction.*