Project 3: Face Social Traits and Political Election Analysis by SVM

Biancheng Wang

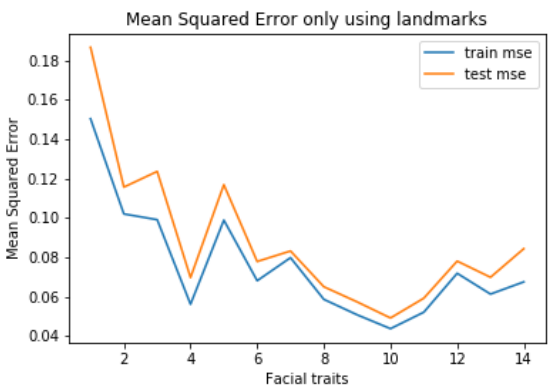
Part 1: Face Social Traits Regression

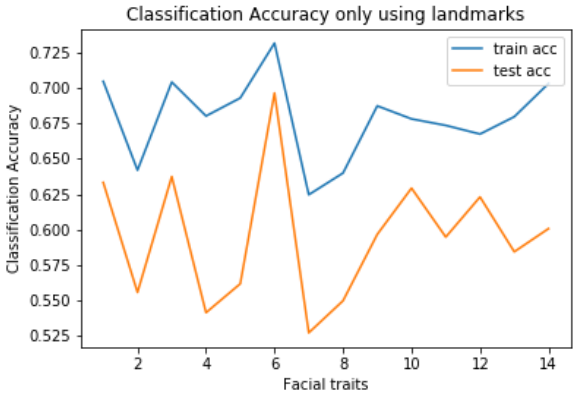
1.1 Classification by Landmarks

In this part, we only use landmarks to fit Support Vector Regression model with RBF kernel. We scale the landmark feature to [0,1] before training and perform a 5-fold cross validation to choose parameters. When calculating accuracy, we set the means of social traits as thresholds. The table below shows the parameters we choose.

Trait Number	C	Epsilon	Gamma
1	500	0.1	0.0001
2	1	0.1	0.01
3	500	0.1	0.0001
4	0.1	0.1	0.1
5	0.1	0.1	0.1
6	10	0.1	0.001
7	0.01	0.1	0.1
8	1000	0.1	0.00001
9	1000	0.01	0.00001
10	100	0.01	0.0001
11	1000	0.001	0.00001
12	500	0.1	0.00001
13	1	0.0001	0.01
14	5000	0.1	0.00001

Then we plot the mean squared errors and classification accuracy by only using landmarks. The means of MSE for the training and testing are 0.07579 and 0.08838 while the mean of accuracy for training and testing are 0.6793 and 0.5952.





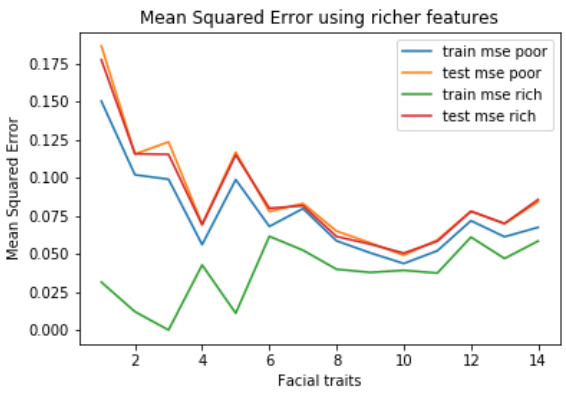
1.2 Classification by Rich Features

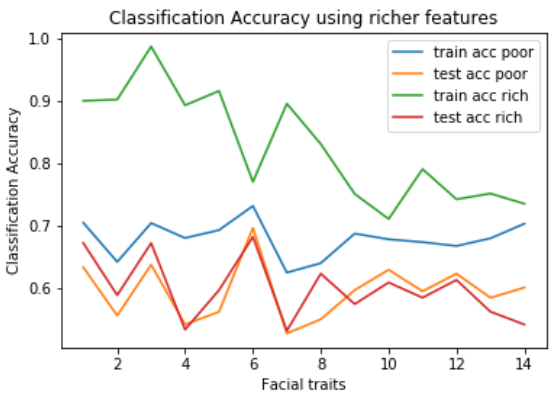
Here, we use both landmarks and HOG features to fit Support Vector Regression model with RBF kernel. The HOG feature we use is a 14*14*32 vector. Besides, we still use a 5-fold cross validation to choose parameters and use the same way to calculate the accuracy. The parameters we choose are shown in the table below.

Trait Number	C	Epsilon	Gamma
1	10	0.1	0.01
2	1	0.1	0.1
3	10	0.01	0.1
4	0.1	0.01	0.1
5	1	0.1	0.1
6	500	0.001	0.00001
7	0.1	0.001	0.1
8	1	0.0001	0.01
9	1000	0.1	0.00001
10	500	0.1	0.00001
11	1	0.1	0.01
12	500	0.1	0.00001
13	1000	0.1	0.00001
14	100	0.1	0.0001

The means of MSE for the training and testing are 0.03811 and 0.08687 while the mean of accuracy for training and testing are 0.8270 and 0.5989. Both the MSE and classification accuracy are better than the ones we get only using landmarks.

Again, we plot the mean squared errors and classification accuracy by using richer features. We get a large improvement for the training but only a slight improvement for the testing. There might be some overfitting issue even we have tuned the parameters. We think it is reasonable since what we get here are quite close to the original paper,





Part 2: Election Outcome Prediction

2.1 Direct Prediction by Rich Features

In this section, we use both landmarks and HOG features we used in 1.2 to train a RankSVM to classify the election outcome. We build models for senators and governors separately.

For the senator model, we choose C as 0.0001 and get a 0.7417 training accuracy and a 0.5909 testing accuracy. For the governor model, we choose C as 1 and get a 1.0 training accuracy and a 0.5712 testing accuracy.

2.2 Prediction by Face Social Traits

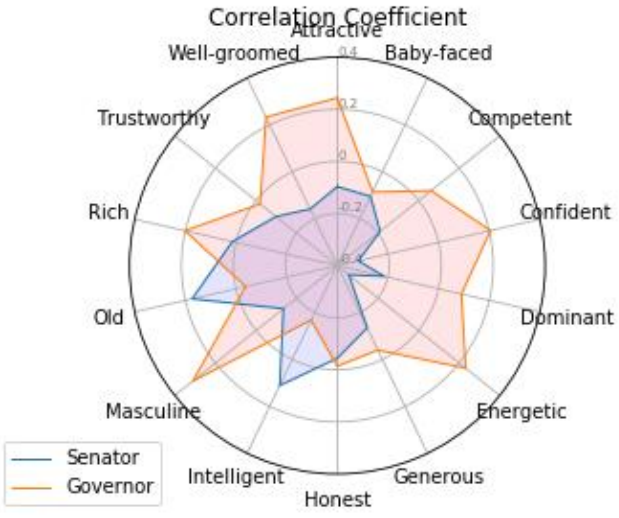
In this section, we consider a two-layer-model in which we first project each facial image in a 14-dimensional attribute space using the classifiers trained in 1.2 and second perform binary classification of the election outcome in the obtained feature space.

For the senator model, we choose C as 100 and get a 0.7459 training accuracy and a 0.6076 testing accuracy. For the governor model, we choose C as 1000 and get a 0.7541 training accuracy and a 0.6227 testing accuracy.

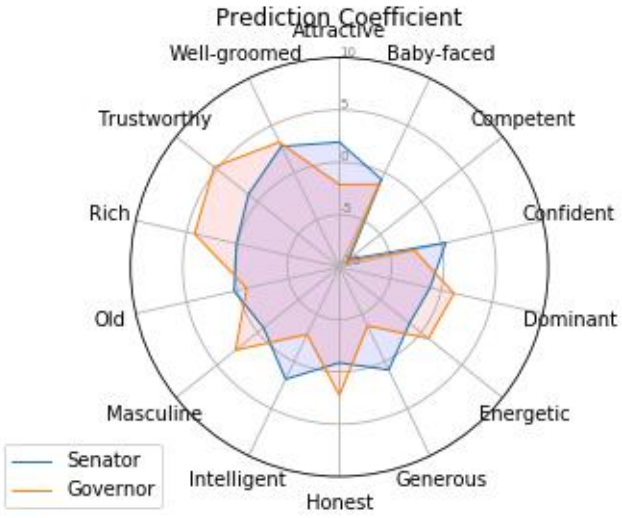
It seems that this method gets a little better testing accuracy than direct prediction and direct prediction may still suffer from overfitting especially in the governor model.

2.3 Analysis of Results

We plot the radar plot for the correlation coefficients of each of the predicted facial attributes with the actual election outcomes and we get quite similar findings to the original paper. Based on the correlation, for a senator, Old and Intelligent are the most important facial attributes leading to the outcome success while Masculine, Energetic, Attractive, Well-groomed, Confident and Rich are the most important facial attributes leading to the outcome success for a governor.



Also, we plot the radar plot for the coefficients of our trained RankSVM model below. Based on this, we can find that Intelligent and Well-groomed contribute a lot to the senator's election success. For a governor, Trustworthy, Rich, Well-groomed and Masculine are the most important ones. Those are a little different from the results we get above.



Therefore, we think Intelligent is the most important social trait leading to a senator's election success while Rich, Well-groomed and Masculine are important for a governor's election success.