APPENDIX B

## \*\*\* Sensitivity Analysis of the Name-Prism Tool \*

We have done a sensitivity analysis and studied what affect the threshold has on the main outcomes of interest (model coefficients). In this analysis we set three unique thresholds for all ethnicities (0.7, 0.8, and 0.9). Then, we selected a random sample of 100 developers (25 of each ethnicity) from our dataset and identify the number of false negatives and false positives of the Name-Prism tool for each threshold.

##################### MODEL Threshold 0.7 #################

### All Ethnicities (threshold 0.7), Excluding unknowns (Submitters) #####

### and Submitter as random effect #####

                              Estimate Std. Error z value Pr(>|z|)

(Intercept) 2.310e+00 1.651e-02 139.908 < 2e-16 \*\*\*

repo\_pr\_tenure\_mnth -7.904e-03 5.648e-03 -1.399 0.1617

repo\_pr\_popularity 9.081e-02 8.887e-03 10.219 < 2e-16 \*\*\*

repo\_pr\_team\_size 0.000e+00 8.960e-03 0.000 1.0000

perc\_external\_contribs -4.696e-02 4.469e-03 -10.508 < 2e-16 \*\*\*

prs\_succ\_rate 1.876e-01 3.391e-03 55.324 < 2e-16 \*\*\*

pr\_files\_changed -3.569e-04 1.971e-05 -18.108 < 2e-16 \*\*\*

prs\_main\_team\_member1 1.436e-01 2.357e-02 6.095 1.10e-09 \*\*\*

prs\_popularity 8.744e-02 4.953e-03 17.653 < 2e-16 \*\*\*

prs\_watched\_repo1 7.768e-02 6.985e-03 11.122 < 2e-16 \*\*\*

prs\_followed\_pri1 1.264e-01 9.188e-03 13.756 < 2e-16 \*\*\*

prs\_tenure\_mnth 5.508e-02 3.911e-03 14.081 < 2e-16 \*\*\*

pr\_comments\_counts -1.003e-03 2.470e-03 -0.406 0.6847

pr\_num\_commits -2.197e-01 2.499e-03 -87.896 < 2e-16 \*\*\*

**prs\_eth\_7Black -8.904e-02 5.187e-02 -1.717 0.0860 .**

**prs\_eth\_7API -8.775e-02 1.315e-02 -6.674 2.49e-11 \*\*\***

**prs\_eth\_7Hispanic -6.647e-02 1.910e-02 -3.481 0.0005 \*\*\***

prs\_experience -7.344e-02 7.258e-03 -10.118 < 2e-16 \*\*\*

pr\_nth 5.163e-01 6.915e-03 74.661 < 2e-16 \*\*\*

prs\_continentAsia -1.053e-01 1.525e-02 -6.906 4.99e-12 \*\*\*

prs\_continentAfrica -2.128e-01 5.174e-02 -4.113 3.91e-05 \*\*\*

prs\_continentSouth America -7.459e-02 2.933e-02 -2.543 0.0110 \*

prs\_continentAntarctica -6.099e-01 5.151e-01 -1.184 0.2364

prs\_continentUnknown -1.006e-01 1.227e-02 -8.193 2.55e-16 \*\*\*

prs\_continentEurope 7.475e-02 1.073e-02 6.967 3.24e-12 \*\*\*

prs\_continentOceania 5.374e-02 2.559e-02 2.100 0.0357 \*

prs\_pri\_same\_nationalityDifferent -1.995e-01 9.507e-03 -20.984 < 2e-16 \*\*\*

prs\_pri\_same\_nationalityUnknown 2.337e-03 1.109e-02 0.211 0.8331

intra\_branch1 2.524e-01 1.349e-02 18.713 < 2e-16 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ethnicity** | **False Positives** | **True Positives** | **True Negative** | **False Negatives** |
| **White** | 5 | 20 | 0 | 0 |
| **Black** | 12 | 13 | 0 | 0 |
| **Hispanic** | 0 | 25 | 0 | 0 |
| **API** | 2 | 23 | 0 | 0 |

##################### MODEL Threshold 0.8 ############

### All Ethnicities (threshold 0.8), Excluding unknowns ###########

### Submitter as random effect ###########

Estimate Std. Error z value Pr(>|z|)

(Intercept) 2.244e+00 1.781e-02 126.028 < 2e-16 \*\*\*

repo\_pr\_tenure\_mnth 1.115e-02 6.327e-03 1.763 0.07792 .

repo\_pr\_popularity 0.000e+00 9.871e-03 0.000 1.00000

repo\_pr\_team\_size 1.397e-02 9.926e-03 1.407 0.15931

perc\_external\_contribs -2.672e-02 5.027e-03 -5.315 1.06e-07 \*\*\*

prs\_succ\_rate 1.810e-01 3.905e-03 46.358 < 2e-16 \*\*\*

pr\_files\_changed -3.558e-04 2.459e-05 -14.468 < 2e-16 \*\*\*

prs\_main\_team\_member1 1.609e-01 2.625e-02 6.130 8.81e-10 \*\*\*

prs\_popularity 8.320e-02 5.663e-03 14.691 < 2e-16 \*\*\*

prs\_watched\_repo1 7.134e-02 7.996e-03 8.922 < 2e-16 \*\*\*

prs\_followed\_pri1 1.741e-01 1.050e-02 16.578 < 2e-16 \*\*\*

prs\_tenure\_mnth 3.237e-02 4.756e-03 6.806 1.00e-11 \*\*\*

pr\_comments\_counts 1.268e-03 2.877e-03 0.441 0.65931

pr\_num\_commits -2.112e-01 2.915e-03 -72.454 < 2e-16 \*\*\*

**prs\_eth\_8Black -5.498e-02 9.627e-02 -0.571 0.56793**

**prs\_eth\_8API -1.093e-01 1.521e-02 -7.182 6.89e-13 \*\*\***

**prs\_eth\_8Hispanic -6.831e-02 2.226e-02 -3.068 0.00215 \*\***

prs\_experience -7.051e-02 8.209e-03 -8.589 < 2e-16 \*\*\*

pr\_nth 4.983e-01 7.878e-03 63.248 < 2e-16 \*\*\*

prs\_continentAsia -7.518e-02 1.810e-02 -4.153 3.28e-05 \*\*\*

prs\_continentAfrica -1.817e-01 6.147e-02 -2.956 0.00312 \*\*

prs\_continentSouth America -6.040e-02 3.485e-02 -1.733 0.08311 .

prs\_continentAntarctica 1.758e-01 8.670e-01 0.203 0.83932

prs\_continentUnknown 8.721e-02 1.439e-02 6.062 1.35e-09 \*\*\*

prs\_continentEurope 7.107e-02 1.170e-02 6.075 1.24e-09 \*\*\*

prs\_continentOceania 5.147e-02 2.770e-02 1.858 0.06314 .

prs\_pri\_same\_nationalityDifferent -2.011e-01 1.056e-02 -19.047 < 2e-16 \*\*\*

prs\_pri\_same\_nationalityUnknown -1.955e-01 1.308e-02 -14.946 < 2e-16 \*\*\*

intra\_branch1 2.944e-01 1.538e-02 19.147 < 2e-16 \*\*\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ethnicity** | **False Positives** | **True Positives** | **True Negative** | **False Negatives** |
| **White** | 2 | 17 | 3 | 3 |
| **Black** | 10 | 10 | 2 | 3 |
| **Hispanic** | 0 | 21 | 0 | 4 |
| **API** | 2 | 18 | 0 | 5 |

##################### MODEL Threshold 0.9 #####################

### All Ethnicities (threshold 0.9), Excluding unknowns (Submitters) #####

### Without same\_eth, and Submitter as random effect #####

Estimate Std. Error z value Pr(>|z|)

(Intercept) 2.247e+00 1.878e-02 119.649 < 2e-16 \*\*\*

repo\_pr\_tenure\_mnth 2.292e-02 6.673e-03 3.435 0.000594 \*\*\*

repo\_pr\_popularity 8.206e-02 1.041e-02 7.884 3.16e-15 \*\*\*

repo\_pr\_team\_size 7.343e-18 1.057e-02 0.000 1.000000

perc\_external\_contribs -5.882e-02 5.378e-03 -10.937 < 2e-16 \*\*\*

prs\_succ\_rate 1.897e-01 4.110e-03 46.143 < 2e-16 \*\*\*

pr\_files\_changed -3.512e-04 2.446e-05 -14.362 < 2e-16 \*\*\*

prs\_main\_team\_member1 1.379e-01 2.775e-02 4.971 6.65e-07 \*\*\*

prs\_popularity 7.974e-02 5.941e-03 13.424 < 2e-16 \*\*\*

prs\_watched\_repo1 7.798e-02 8.442e-03 9.237 < 2e-16 \*\*\*

prs\_followed\_pri1 1.319e-01 1.112e-02 11.865 < 2e-16 \*\*\*

prs\_tenure\_mnth 4.737e-02 4.855e-03 9.755 < 2e-16 \*\*\*

pr\_comments\_counts -3.991e-04 2.994e-03 -0.133 0.893970

pr\_num\_commits -2.113e-01 3.043e-03 -69.432 < 2e-16 \*\*\*

**prs\_eth\_9Black -6.474e-02 1.010e-01 -0.641 0.521563**

**prs\_eth\_9API -1.059e-01 1.606e-02 -6.595 4.26e-11 \*\*\***

**prs\_eth\_9Hispanic -8.226e-02 2.594e-02 -3.171 0.001521 \*\***

prs\_experience -6.903e-02 8.640e-03 -7.990 1.35e-15 \*\*\*

pr\_nth 4.994e-01 8.267e-03 60.414 < 2e-16 \*\*\*

prs\_continentAsia -9.123e-02 1.875e-02 -4.865 1.15e-06 \*\*\*

prs\_continentAfrica -1.999e-01 6.774e-02 -2.952 0.003159 \*\*

prs\_continentSouth America -2.165e-02 4.269e-02 -0.507 0.612041

prs\_continentAntarctica -1.084e+00 5.929e-01 -1.828 0.067614 .

prs\_continentUnknown -1.096e-01 1.490e-02 -7.354 1.92e-13 \*\*\*

prs\_continentEurope 6.715e-02 1.251e-02 5.366 8.05e-08 \*\*\*

prs\_continentOceania 6.321e-02 3.018e-02 2.094 0.036244 \*

prs\_pri\_same\_nationalityDifferent -1.981e-01 1.131e-02 -17.515 < 2e-16 \*\*\*

prs\_pri\_same\_nationalityUnknown 2.262e-02 1.352e-02 1.673 0.094419 .

intra\_branch1 2.788e-01 1.614e-02 17.277 < 2e-16 \*\*\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ethnicity** | **False Positives** | **True Positives** | **True Negative** | **False Negatives** |
| **White** | 1 | 16 | 4 | 4 |
| **Black** | 4 | 4 | 8 | 9 |
| **Hispanic** | 0 | 12 | 0 | 13 |
| **API** | 1 | 12 | 1 | 11 |

We can see that the coefficients for perceptible Hispanic developers are stable and always negative in the three models. The coefficients for perceptible API and Black developers are stable in the models with threshold 0.8 and 0.9 and always negative in the three models. Moreover, for perceptible Hispanic and API developers the results of the three models are always statistically significant and there is no statistically significance for perceptive Black developers in any of the models.

Besides the stability of the variables, we have analyzed the number of false positives and negatives. When choosing the threshold 0.7, the number of false negatives is 0 but, the number of false positive is the highest. Contrary, when choosing the threshold 0.9, the number of false positives is the lowest but, the numbers of false negative is the highest.

Therefore, we chose the threshold 0.8 because the number of false positives and false negatives are balanced when comparing with 0.7 and 0.9