Does Personality Predict Achievement?
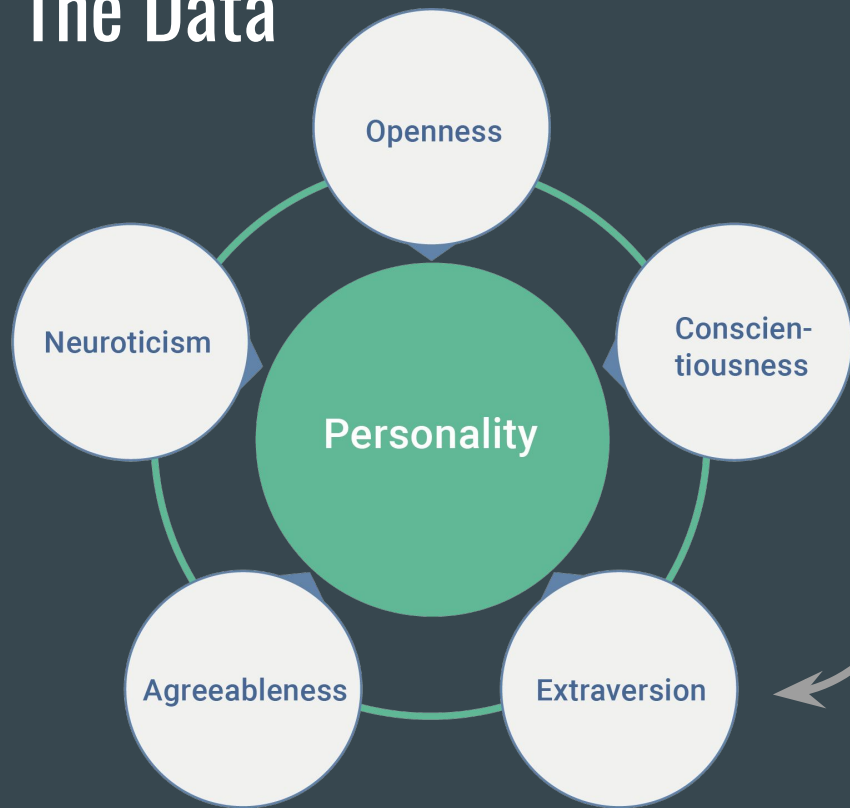
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May 16th, 2018

Overview

- Data Exploration
- Goal Choice
- Model Comparison
- Extensions
- Takeaways

The Data

Openness
Conscien-tiousness
Neuroticism
Personality
Agreeableness
Extraversion

Grit

"I finish whatever I begin."

"I am the life of the party."

"What is your marital status?"

Demographics

Classification Goal

Predict College Attendance from Personality and Grit Data

| Data | Class Split | Class Balance | Outcome Measures |

Data
- Personality
- Grit Score
- Demographics

Class Split / Class Balance / Outcome Measures

- High-school or Less — n = 58%
- College or More — n = 42%
  → Accuracy, AUC

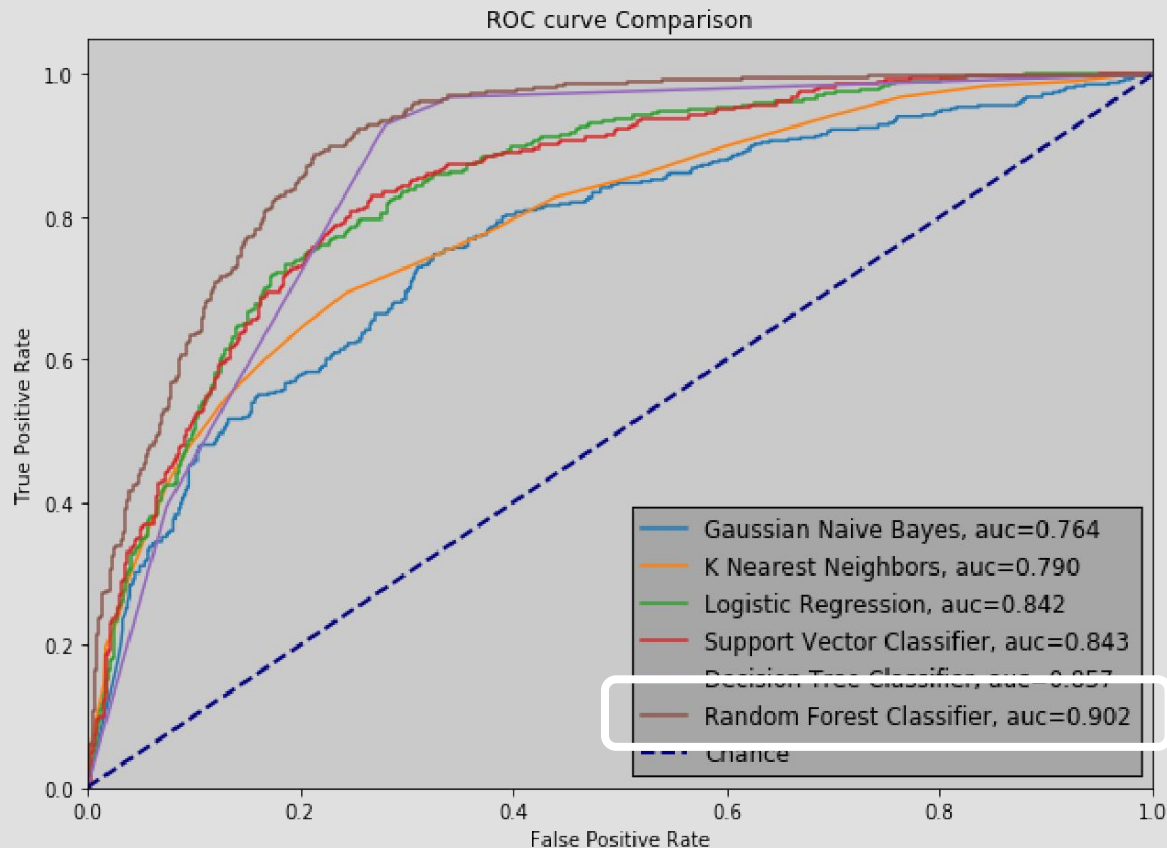- College or Less — n = 86%
- Graduate Degree — n = 14%
  → F1, AUC

Classification I Model Comparison

Accuracy:

Naive Bayes: .548
K Nearest Neighbors: .452
Logistic Regression: .772
Support Vectors: .774
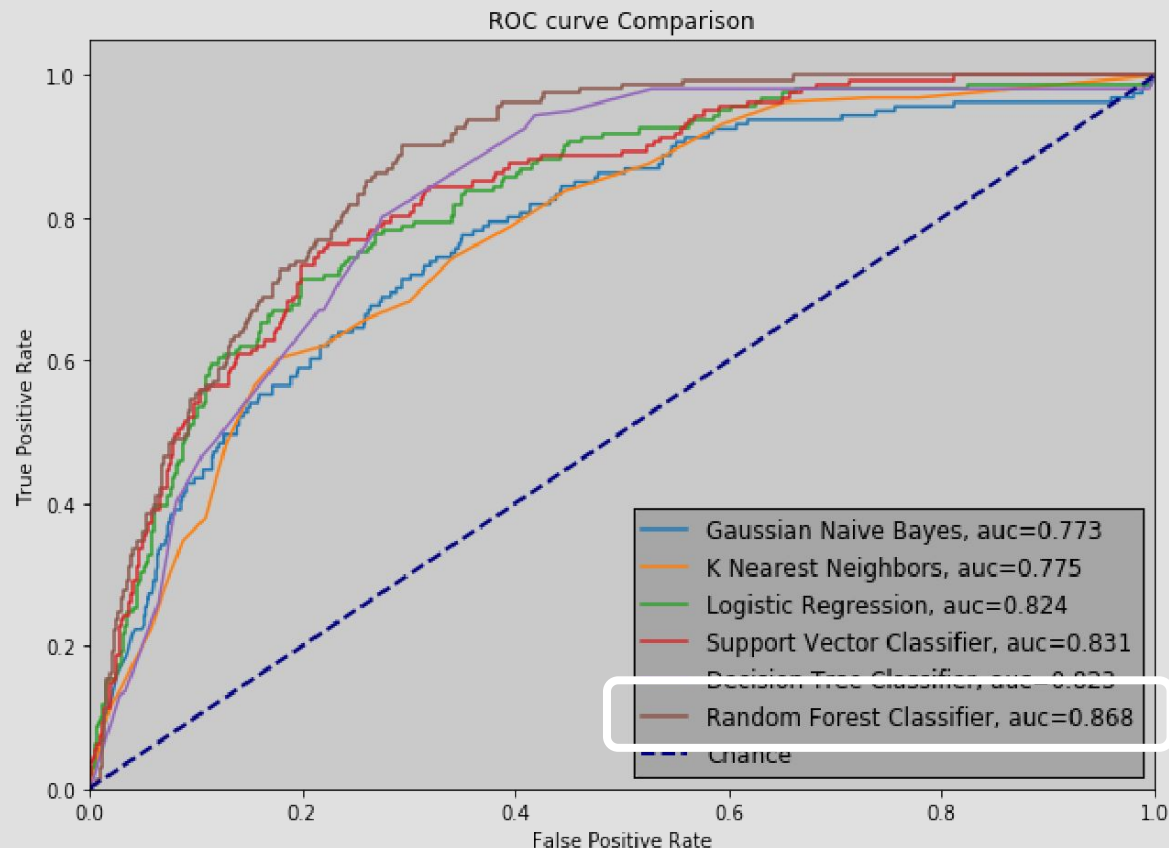Decision Trees: .807
Random Forests: .822

ROC curve Comparison

Classification II Model Comparison

F1 Score:

Naive Bayes:	.41
K Nearest Neighbors:	.81
Logistic Regression:	.85
Support Vectors:	.84
Decision Trees:	.79
Random Forests:	.84

ROC curve Comparison

Where in the Data

- Important Features Analysis from the Random Forest model highlights Big5 and Grit.

- PCA demonstrated similar results, showing that the strongest component in the data was the Extraversion/Grit/Conscientiousness while the next strongest was Neuroticism.

Conclusions

Modeling grit and personality can predict educational achievement with a high degree of success.

This result is robust even in the presence of class imbalance on the scale of a 90/10 split.

Future Directions

- Personality and Grit are not fixed so this prediction becomes an invitation!

- How do Environmental Factors contribute?

- Need to account for participant age in the model.

Fin!

Bibliography

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- https://www.researchgate.net/profile/Angela_Duckworth2/publication/23996619_Development_and_validation_of_the_Short_Grit_Scale_GRIT-S/links/558fc09908aed6ec4bf53a53/Development-and-validation-of-the-Short-Grit-Scale-GRIT-S.pdf
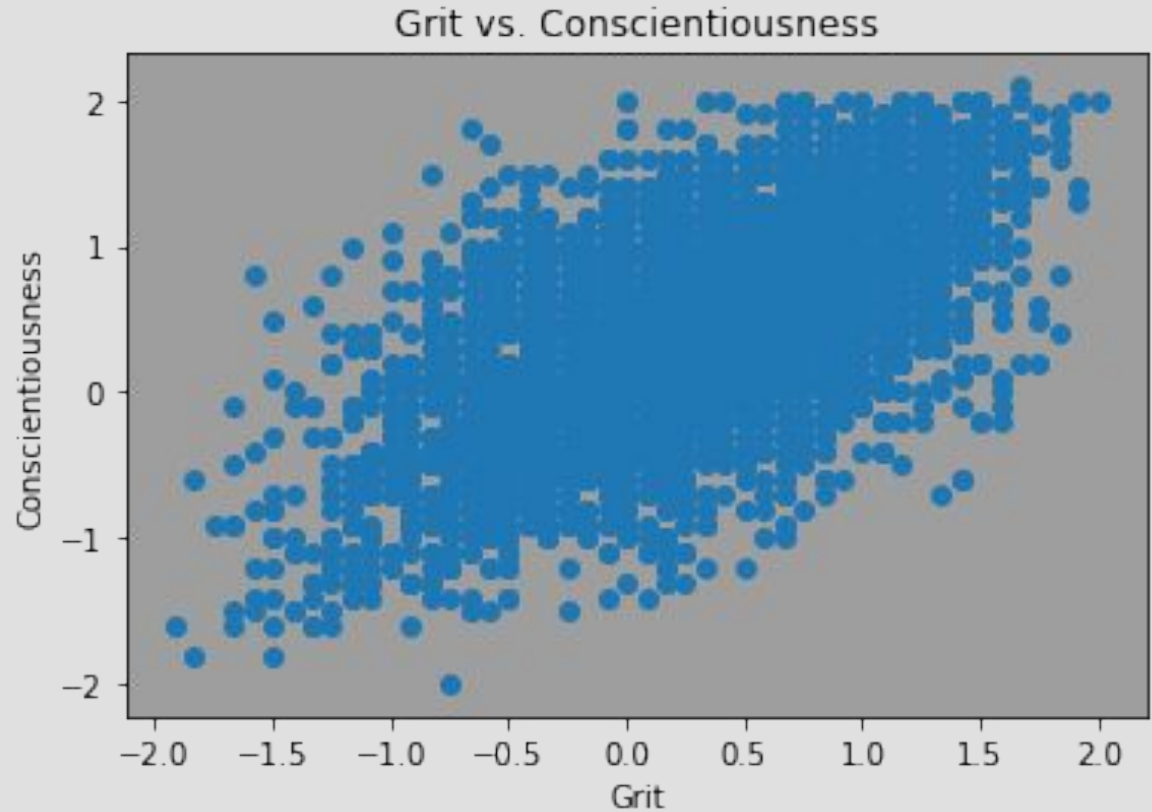
Apendix

	Extroversion	Neuroticism	Agreeableness	Conscientiousness	Openness	Grit	education
Extroversion	-1.000000	0.244148	-0.304687	-0.078548	-0.194371	0.213217	-0.091097
Neuroticism	0.244148	-1.000000	0.099333	0.221347	0.095454	-0.365692	0.106094
Agreeableness	-0.304687	0.099333	-1.000000	-0.152076	-0.132328	0.265656	-0.125256
Conscientiousness	-0.078548	0.221347	-0.152076	-1.000000	-0.070978	0.626328	-0.165805
Openness	-0.194371	0.095454	-0.132328	-0.070978	-1.000000	0.092906	-0.146254
Grit	0.213217	-0.365692	0.265656	0.626328	0.092906	-1.000000	0.225595
education	-0.091097	0.106094	-0.125256	-0.165805	-0.146254	0.225595	-1.000000

Apendix

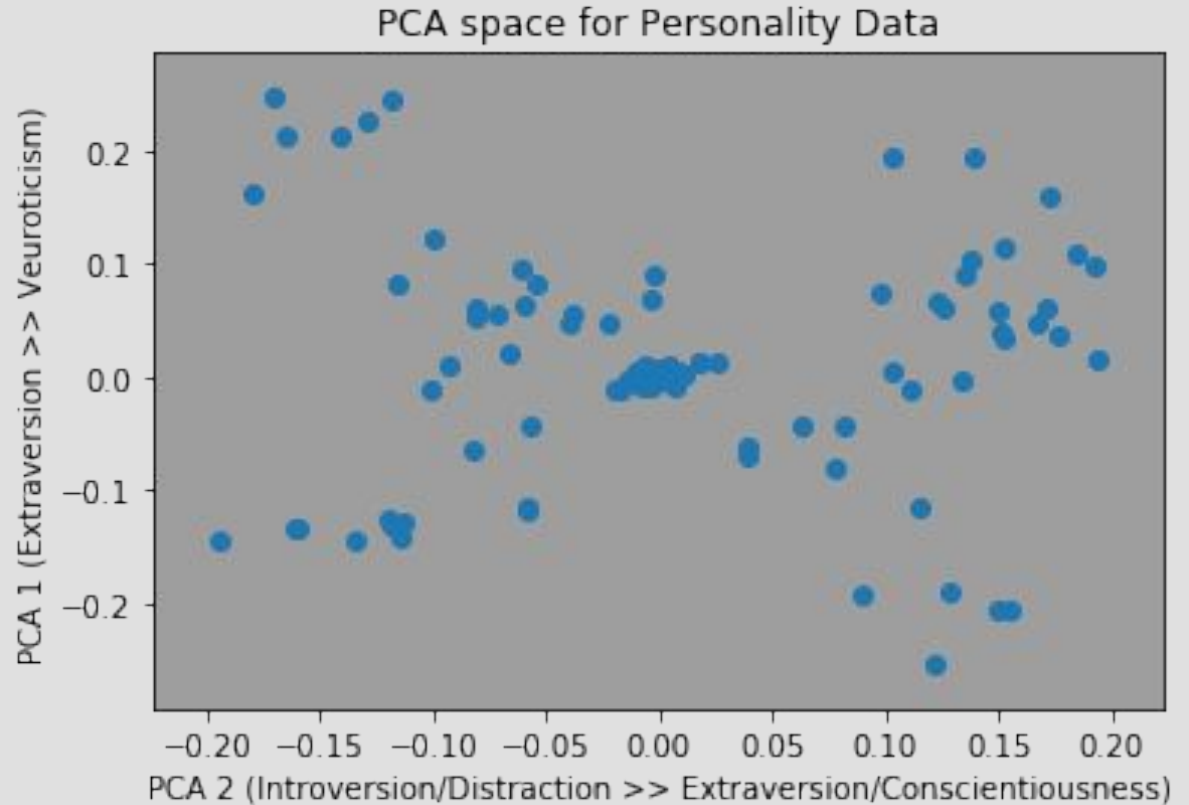Correlation between Grit and Conscientiousness

Correlation is 0.626

Grit vs. Conscientiousness

Apendix

First two components
(resulting from PCA)
plotted and labeled.

Interesting Clustering?

PCA space for Personality Data

Apendix

Highest feature Importance for Random Forest Features

Seem to show that the data we are interested in are the important features.

	Feature	Importance
105	Never married	0.046381
108	Voted_Yes	0.031366
109	Voted_No	0.031293
106	Currently married	0.031271
28	voted	0.029778
121	Openness	0.026947
122	Grit	0.025496
118	Neuroticism	0.023609
19	epistemology	0.023097
119	Agreeableness	0.022411
9	I_have_achieved_a_goal_that_took_years_of_work	0.022220
120	Conscientiousness	0.020105
117	Extroversion	0.019039

Apendix

Highest Coefficients for
Logistic Regression

...Really appear random.

	Coefficients	Feature
19	0.314944	epistemology
106	0.270395	Currently married
18	0.234294	paucity
24	0.217858	abysmal
53	0.204064	I_am_not_interested_in_other_peoples_problems
63	0.201689	I_get_chores_done_right_away
97	0.194644	Hindu
116	0.176249	engnat_no
60	0.173157	I_leave_my_belongings_around
110	0.170647	Asian