Predicting MBTI using Multi-layer Perceptrons

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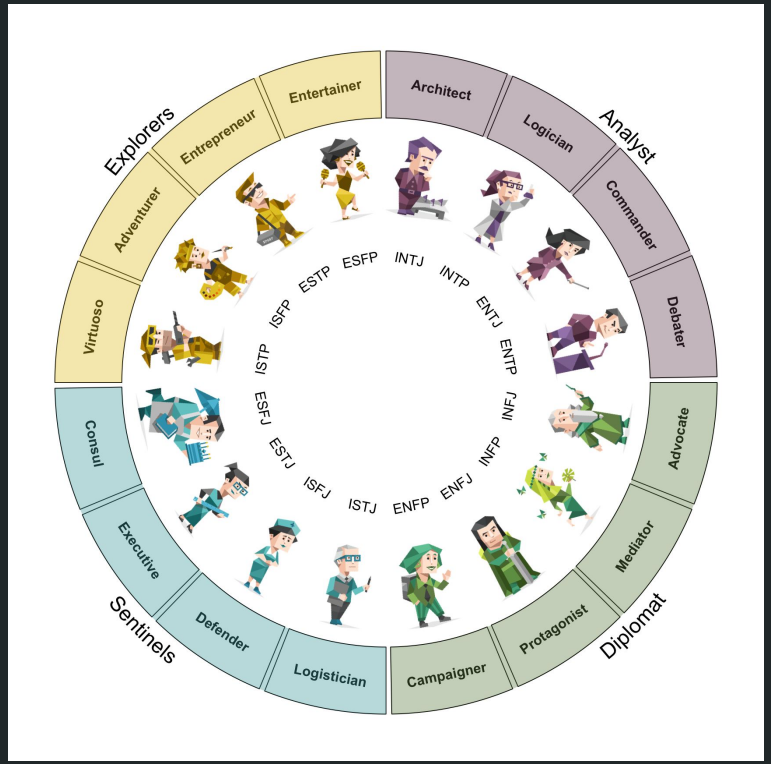
Introduction

- MBTI relies on self-reporting
- NLP for classification
- Using data from personalitycafe.com
  - Type - user reported
  - Text - collection of posts for that user
- Approach: TF-IDF (Term Frequency and Inverse Document Frequency)

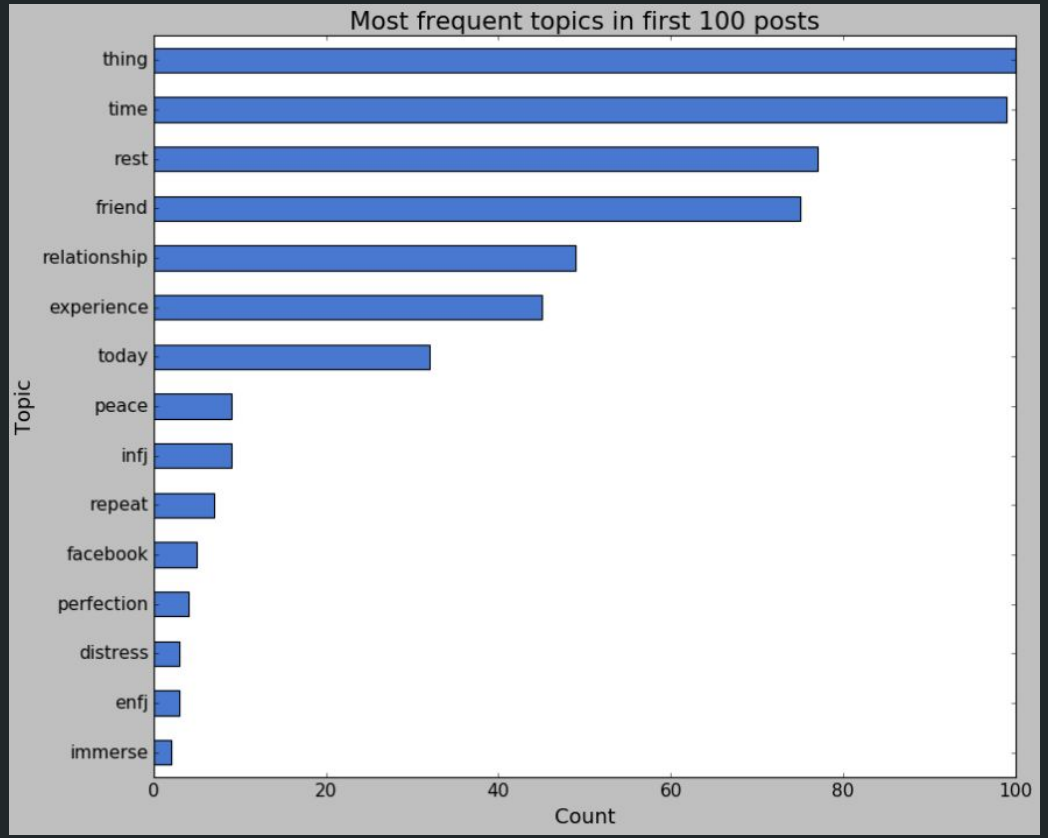


Data

- Problem 1: Class imbalance
  - Not representative of (generally accepted) population distributions
  - Artificial reproportioning vs. coefficient-based class normalization
- Problem 2: Non-meaningful text
  - Cleaning and lemmatizing
  - Direct mentions of MBTI codes
- Additional features
  - Emotion vectors
  - TextBlob sentiment - polarity, subjectivity

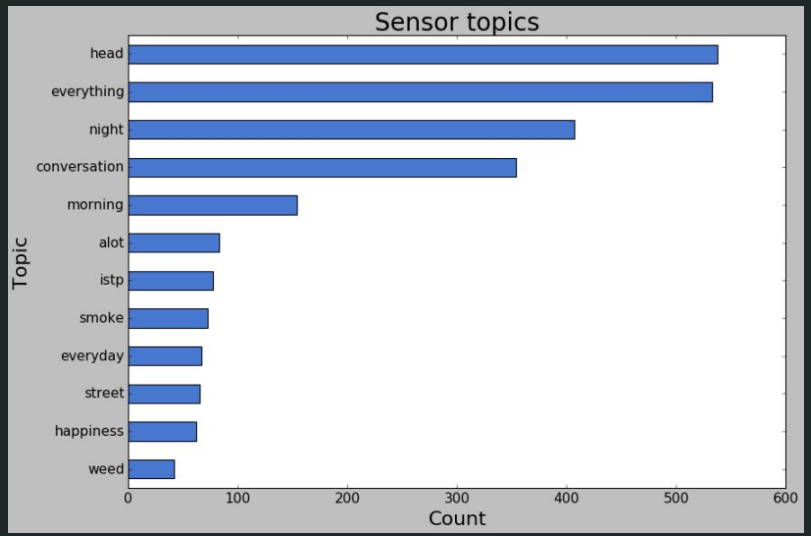
Topic modeling

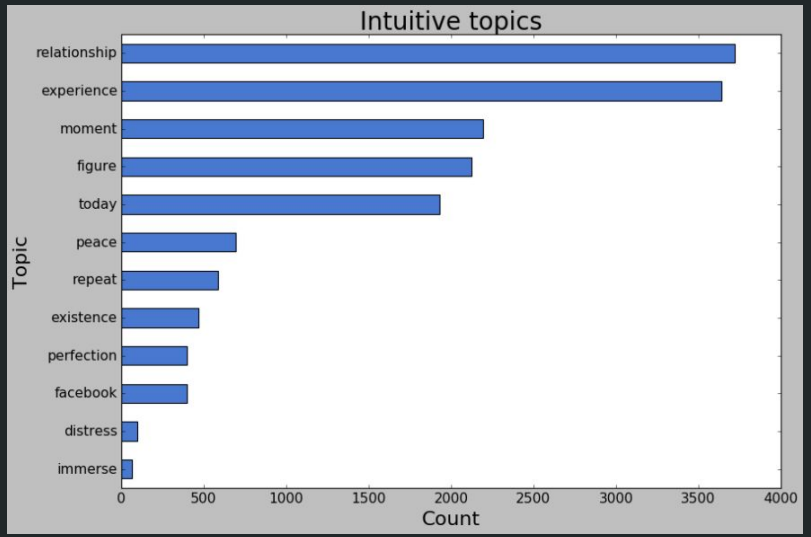
- First 100 samples
- General trends in the forum
- “time”, “relationship”, “experience”
- Discussions tended toward the abstract



Topic modeling

- Comparing topics for binary dimensions
- Intuitives vs. sensors



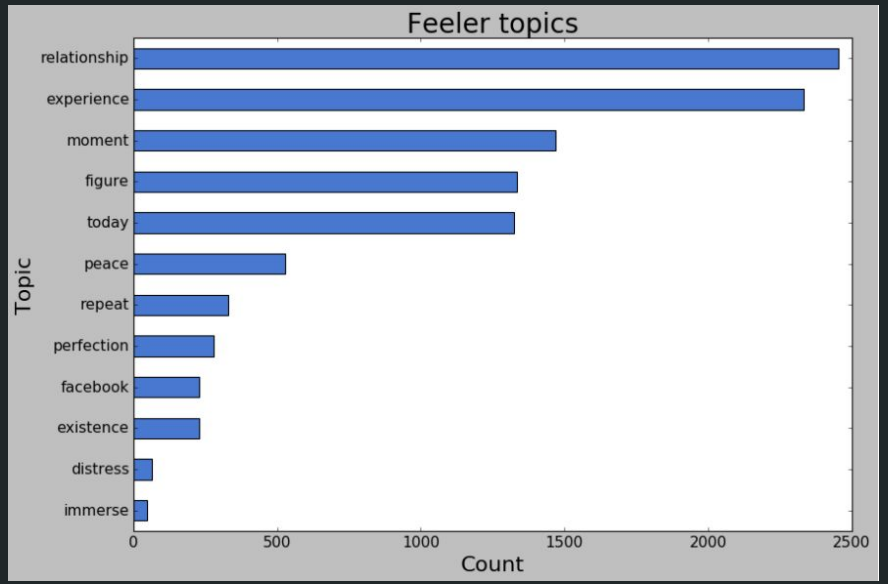


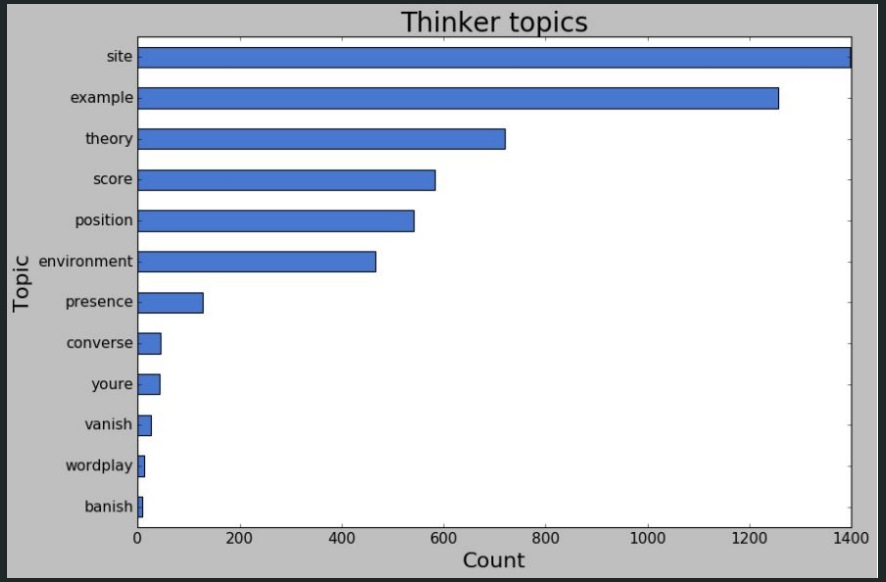
I: relationship, peace, existence, perfection

S: conversation, night/morning, smoke, weed

Topic modeling

- Thinkers vs. feelers



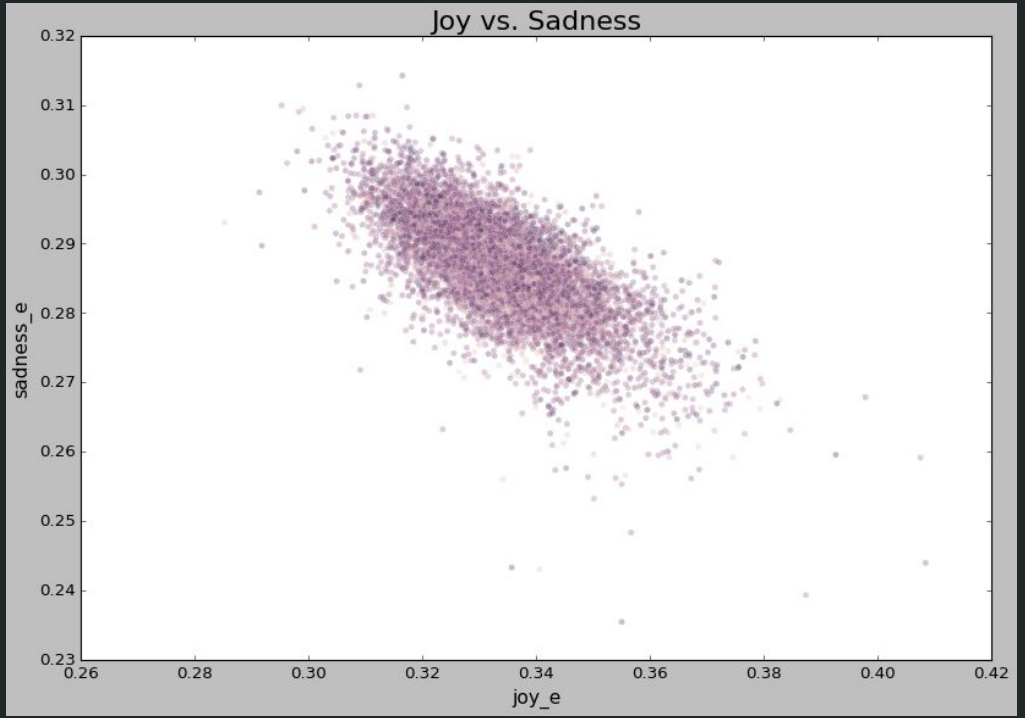


T: example, theory, score, position

F: relationship, experience, peace

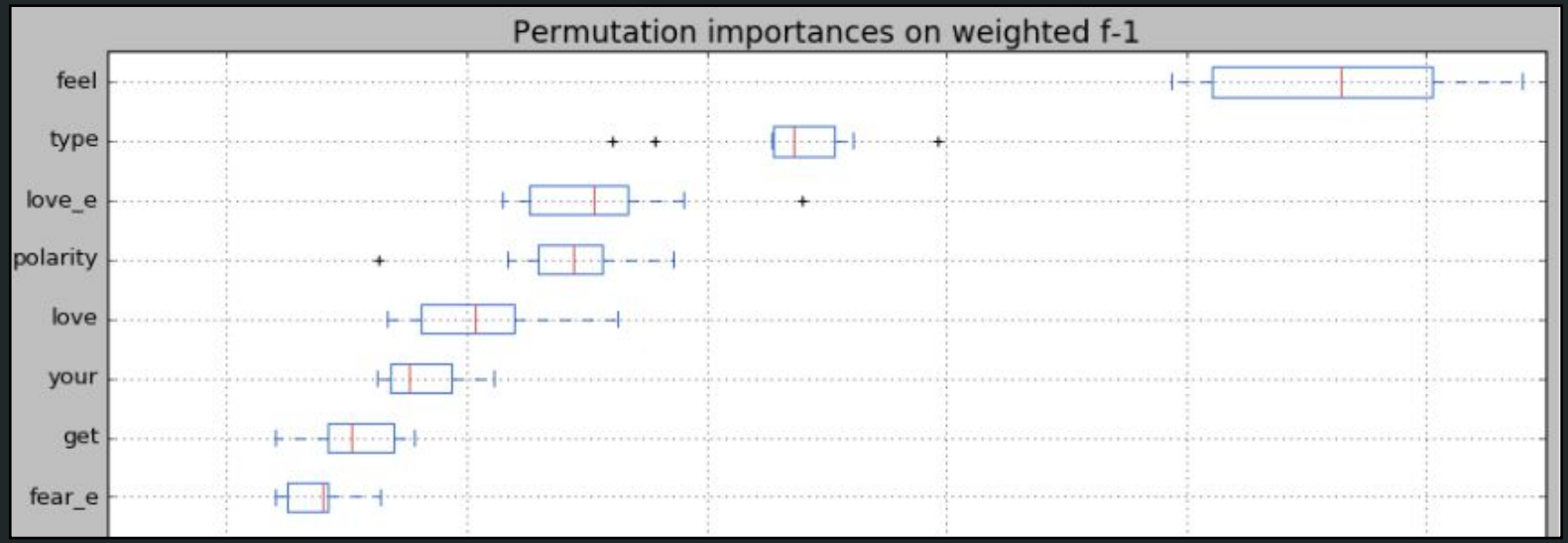
Sentiment analysis

- Logistic regression based on a text/emotion dataset
  - Anger, fear, joy, love, sadness, surprise
  - Class imbalance: joy and sadness represented ~60% of samples
  - Overall accuracy: 36.2%
- Semantic understanding of joy vs. sadness



Feature importance

- Random Forest permutation importance
- Newly engineered emotion features proved effective



Model selection

Classifier	Accuracy (untuned)	Accuracy (after hyperparameter tuning)
Random Forest	53.57	54.08
K-Nearest Neighbors	33.53	x
Naive Bayes	20.62	x
MLP (Multi-layer Perceptron)	52.74	55.26

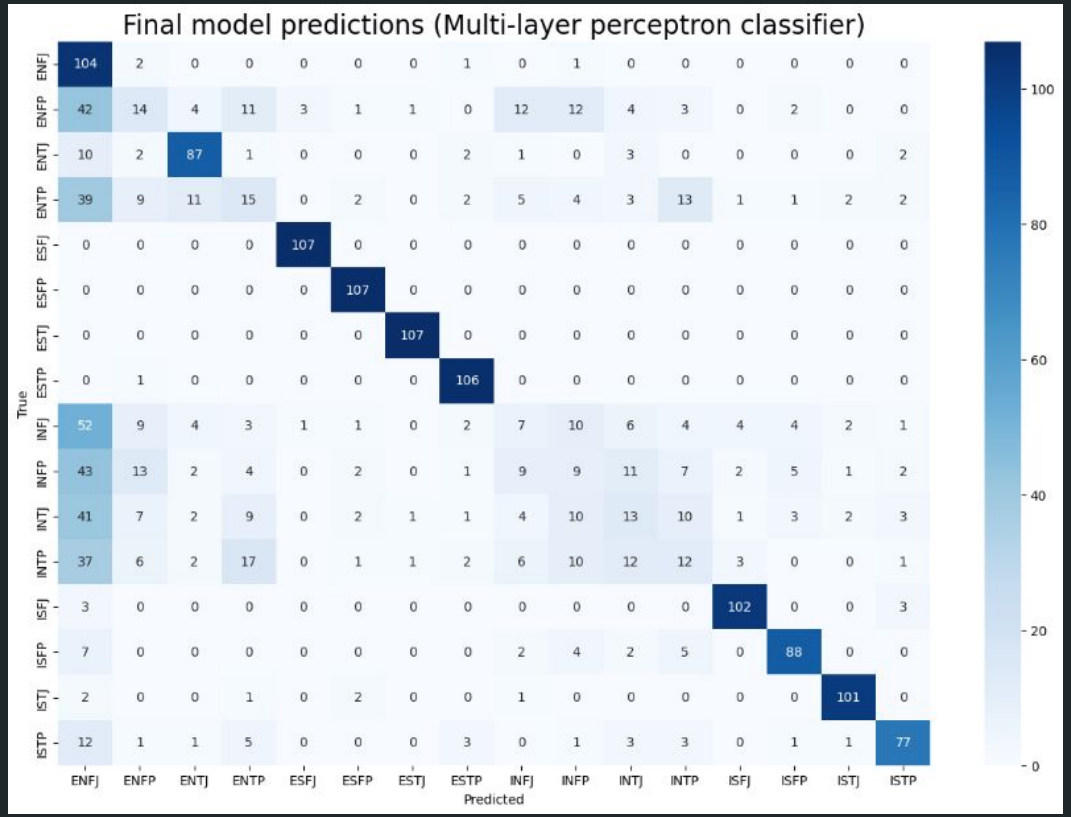
Final model

- Multi-layer perceptron classifier with 3 hidden layers
- Accuracy on test set: **57. 1 %**
- Performance by class:

	ENFJ	ENFP	ENTJ	ENTP	ESFJ	ESFP	ESTJ	ESTP	INFJ	INFP	INTJ	INTP	ISFJ	ISFP	ISTJ	ISTP
precision	0.82	0.22	0.76	0.28	0.95	0.91	0.96	0.88	0.16	0.15	0.22	0.24	0.85	0.76	0.84	0.74
recall	0.87	0.13	0.81	0.19	1.00	1.00	1.00	0.99	0.08	0.10	0.16	0.22	0.94	0.81	0.94	0.72
f1-score	0.84	0.16	0.78	0.23	0.97	0.95	0.98	0.93	0.11	0.12	0.18	0.23	0.89	0.79	0.89	0.73
support	108.00	109.00	108.00	109.00	107.00	107.00	107.00	107.00	110.00	111.00	109.00	110.00	108.00	108.00	107.00	108.00

Final model

- Great accuracy with minority classes (upsampled with class normalization)
- Lower accuracy with classes that were initially overrepresented (INFJ and INFP especially)
- Tradeoff

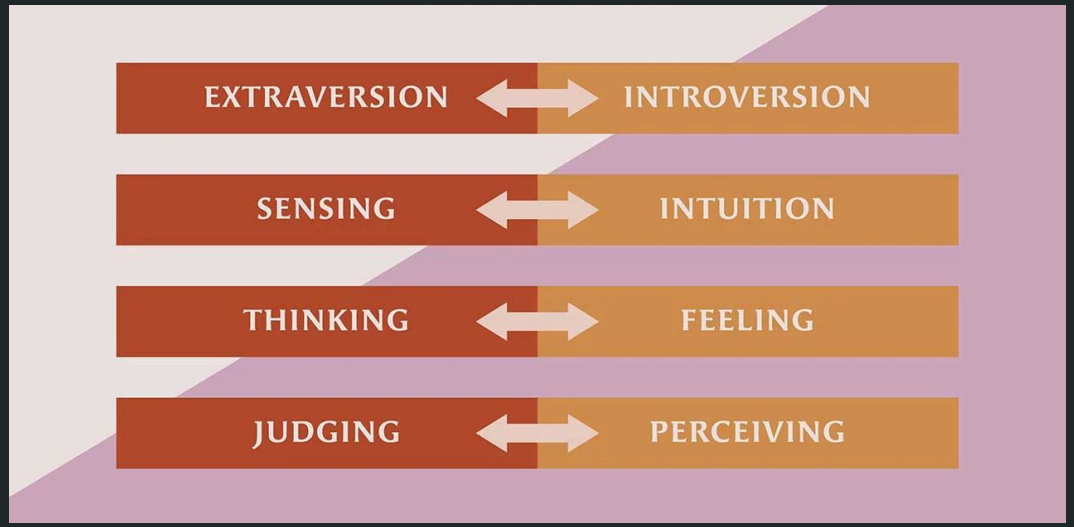


Reflections

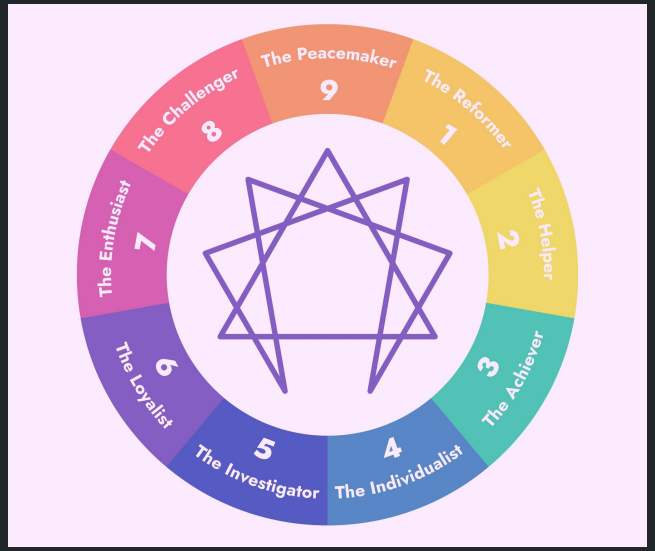
- Required tradeoff
  - Underpredicting/low accuracy on minority classes
  - Underpredicting/low accuracy on majority classes
- Online quizzes (indicators, questions)
  - ~50% of users will receive a different result on retest
  - Compared to 57% on MLP classification model
- Central problem: Self-reporting

Alternative approaches

- Combination of four binary classifiers
- Cognitive function theory



INTP = Ti > Ne > Si > Fe
ISTP = Ti > Se > Ni > Fe
ENTP = Ne > Ti > Fe > Si
ENFP = Ne > Fi > Te > Si
ISFP = Fi > Se > Ni > Te
INFP = Fi > Ne > Si > Te
INTJ = Ni > Te > Fi > Se
INFJ = Ni > Fe > Ti > Se
ESTJ = Te > Si > Ne > Fi
ENTJ = Te > Ni > Se > Fi
ESFJ = Fe > Si > Ne > Ti
ENFJ = Fe > Ni > Se > Ti
ISTJ = Si > Te > Fi > Ne
ISFJ = Si > Fe > Ti > Ne
ESTP = Se > Ti > Fe > Ni
ESFP = Se > Fi > Te > Ni


The Peacemaker
9
The Reformer
1
The Helper
2
The Achiever
3
The Individualist
4
The Investigator
5
The Loyalist
6
The Enthusiast
7
The Challenger
8


Artisan
Creative
Seeks out adventure
Risk taker
Guardian
Dependable
Traditional
Respects law and order
Idealist
Strives for personal growth
Passion for helping others
Believes in working together vs. individually
Rational
Problem solver
Values logic and intelligence
Motivated by improving or fixing things
verywell


Fi
"Valuing"
Fe
"Connecting"
Ti
"Reasoning"
Te
"Structuring"
Ni
"Knowing"
Ne
"Ideating"
Si
"Stabilizing"
Se
"Experiencing"

... & more!

References

MacCarthy, Libby. “Why Your Myers-Briggs Personality Type Is Meaningless.” Edited by Stacia Alexander, Psycom, HealthCentral LLC, 23 Feb. 2023, www.psycom.net/myers-briggs-personality-type.