Synthetic Data Evaluation Report

This report details the quality, privacy and utility evaluation metrics gained from the synthetic data, and visualisations to help interpret them.

Metrics Summary

Privacy Metrics	Score	Quality Metrics	Score	Utility Metrics	Score
Exact Matches	1.0	Boundary Adherence	1.0	Similarity	0.88
Detection	0.0	Coverage	0.94	Correlation	0.74
Inference Protection	0.19	Complement	0.7	ML Efficacy	0.05
Singling Risk	0.15	nan	nan	nan	nan
Linkability Risk	0.01	nan	nan	nan	nan
Inference Risk	0.07	nan	nan	nan	nan

Synthetic Data Categorisation Level: Correlated Synthetic Data

Correlated Synthetic Data is categorised as the highest risk due to capturing information about relationships and patterns between variables. Therefore, the privacy metrics should be evaluated carefully to ensure individuals arent at risk of being identifiable.

What are the Synthetic Data Categorisation Levels?

Synthetic data exists on a spectrum of low to high fidelity depending on how similar it is to the real data. We can categorise these levels of fidelity as below:

Level 0 (Random Synthetic Data)
Values which are randomly generated, without using the real data or metadata.

Level 1 (Metadata Synthetic Data)
Random data which is generated based on real metadata such as data types, value ranges etc.

Level 2 (Structural Synthetic Data)
Generated by a synthesiser to mimic the structure of the real data, but without capturing the relationships between attributes.

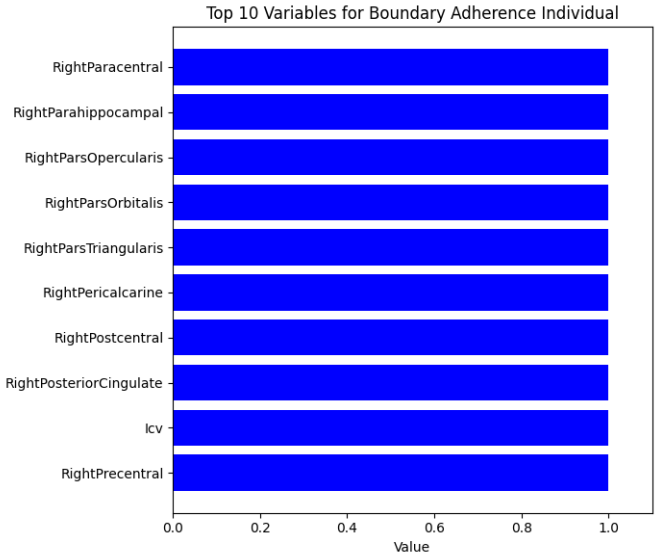
Level 3 (Statistical Synthetic Data)
Roughly keeps the same summary statistics such as mean, median, standard deviation etc.

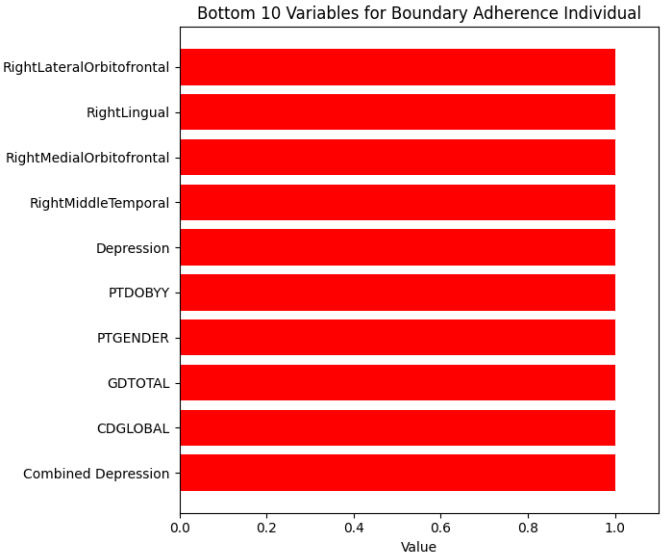
Level 4 (Correlated Synthetic Data)
Relationships and correlations between variables are captured.

Level 5 (Augmented Data)
Real data is adjusted or nearest neighbours is used to create highly realistic data points which are just slightly different to the real data.

(Quality) Boundary Adherence Scores

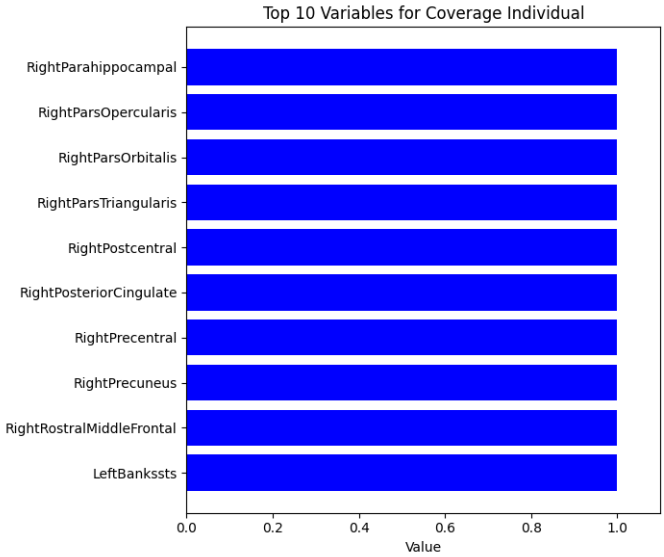
Boundary adherence measures whether values stay within the original min/max ranges of the data. (0.0: means none of the attributes have the same min/max ranges, 1.0: means all attributes have the same min/max ranges)

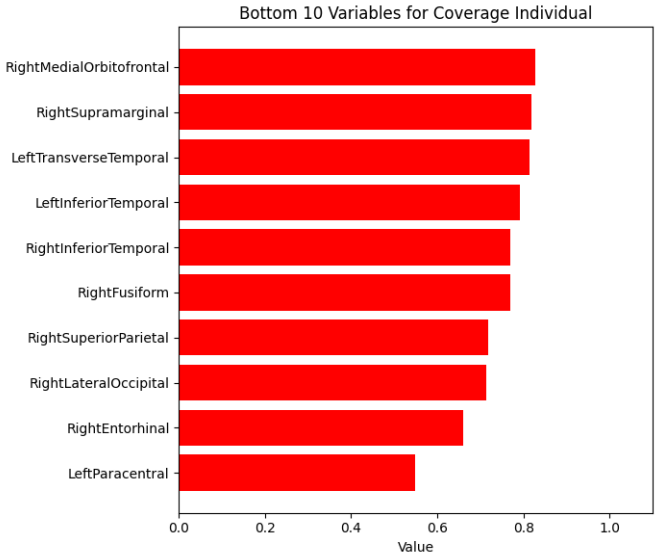




(Quality) Coverage Scores

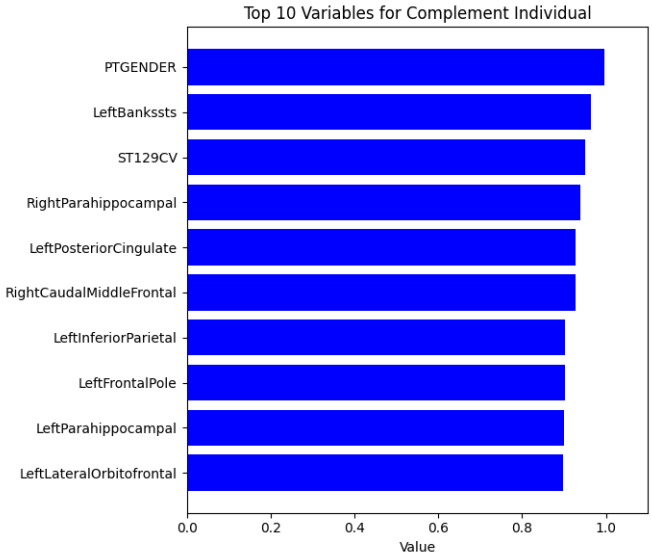
Coverage measures whether the whole range of values are represented. (0.0: means none of the values are represented, 1.0: means all values are represented)

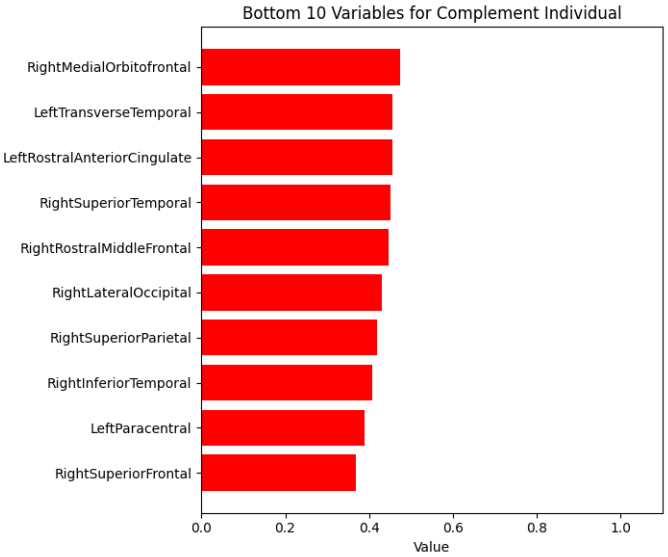




(Quality) Complement Scores

Complement measures whether the distributions look the same. (0.0: means the distributions are as different as they can be, 1.0: means the distributions are exactly the same)





(Utility) Similarity Scores

Statistic similarity measures how similar the summary statistics are such as mean and standard deviation. (0.0: means the summary statistics are extremely different to each other, 1.0: means the summary statistics are exactly the same)