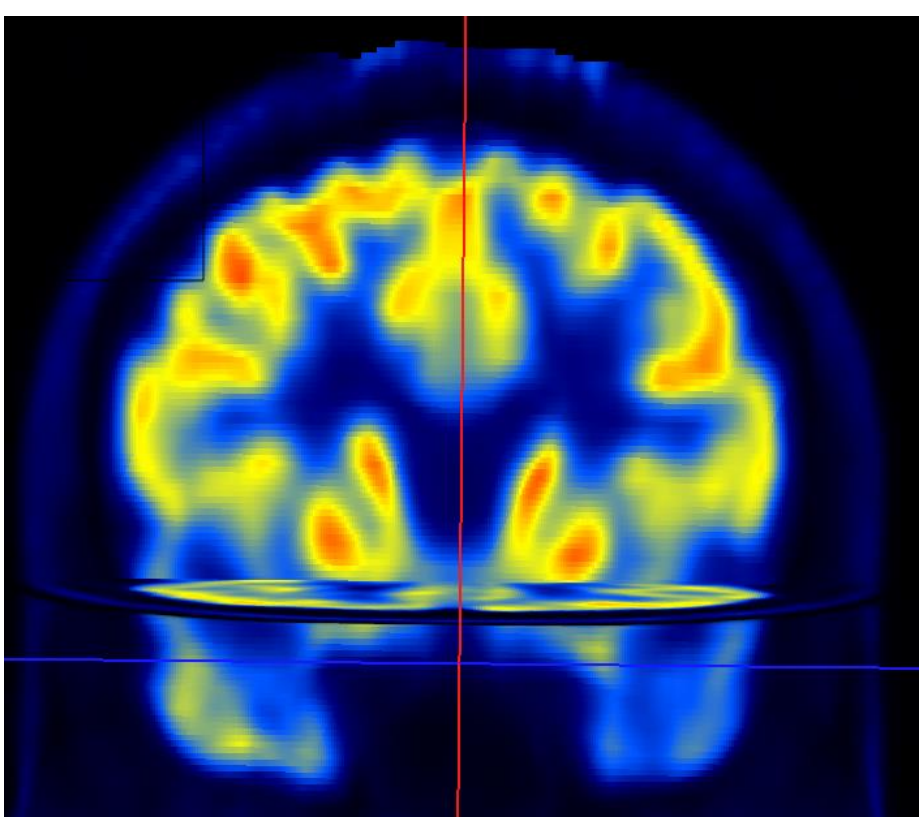# Machine Learning Techniques Based on ^{18}F–FDG PET Radiomics Identifying Patients With Temporal Lobe Epilepsy

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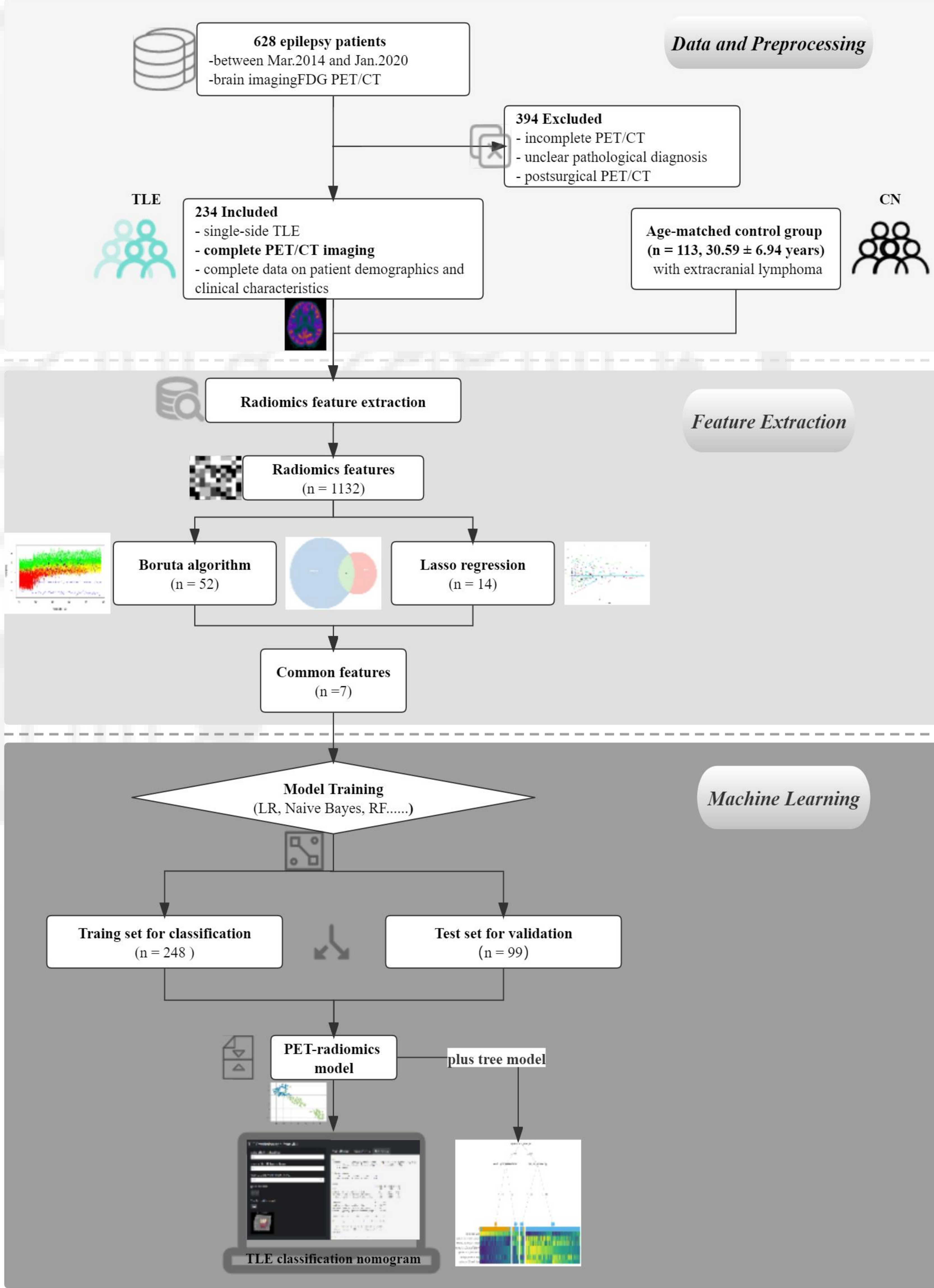
Introduction

In patients with drug-resistant temporal lobe epilepsy (TLE), ^{18}F-fluorodeoxyglucose positron emission tomography (FDG-PET) is frequently employed in the presurgical evaluation to localise the seizure onset zone. Our study aims to investigate the clinical application of ^{18}F-FDG PET radiomics features for temporal lobe epilepsy and apply the machine learning methods to create a radiomics-based model for differentiating TLE patients and identify laterality of the seizure onset zone accurately.

Results

Table 1: Performance comparison of eleven machine learning algorithms

ML	Accuracy	AUC	Recall	Prec.	F1-score	Kappa	MCC	APC
Lr	0.948	0.984	0.941	0.985	0.959	0.889	0.899	0.994
Nb	0.913	0.977	0.898	0.977	0.931	0.810	0.826	0.991
Lda	0.936	0.977	0.924	0.984	0.949	0.862	0.873	0.992
Rf	0.918	0.977	0.924	0.962	0.938	0.816	0.829	0.992
Et	0.936	0.977	0.924	0.984	0.949	0.862	0.873	0.993
Gbc	0.878	0.973	0.907	0.922	0.909	0.716	0.732	0.990
Lbm	0.889	0.973	0.924	0.922	0.919	0.737	0.749	0.990
Knn	0.936	0.969	0.924	0.985	0.949	0.864	0.877	0.985
Ada	0.866	0.947	0.899	0.915	0.901	0.684	0.704	0.981
Qda	0.803	0.905	0.832	0.898	0.846	0.539	0.566	0.947
Dt	0.889	0.878	0.907	0.938	0.918	0.746	0.761	0.913

Figure 2: Nomogram of optimal Logistic Regression algorithm and web application online (https://bit.ly/3tWAGPR)

Methods

Figure 1: Workflow diagram: PET imaging preprocessing, feature extraction and selection, data splitting and machine learning

Discussion & Conclusion

This work serves as a proof-of-concept for the prospective value of PET radiomic characteristics in TLE patients. A prospective study with a large population is still needed to quantify the PET radiomics nomogram in the future.
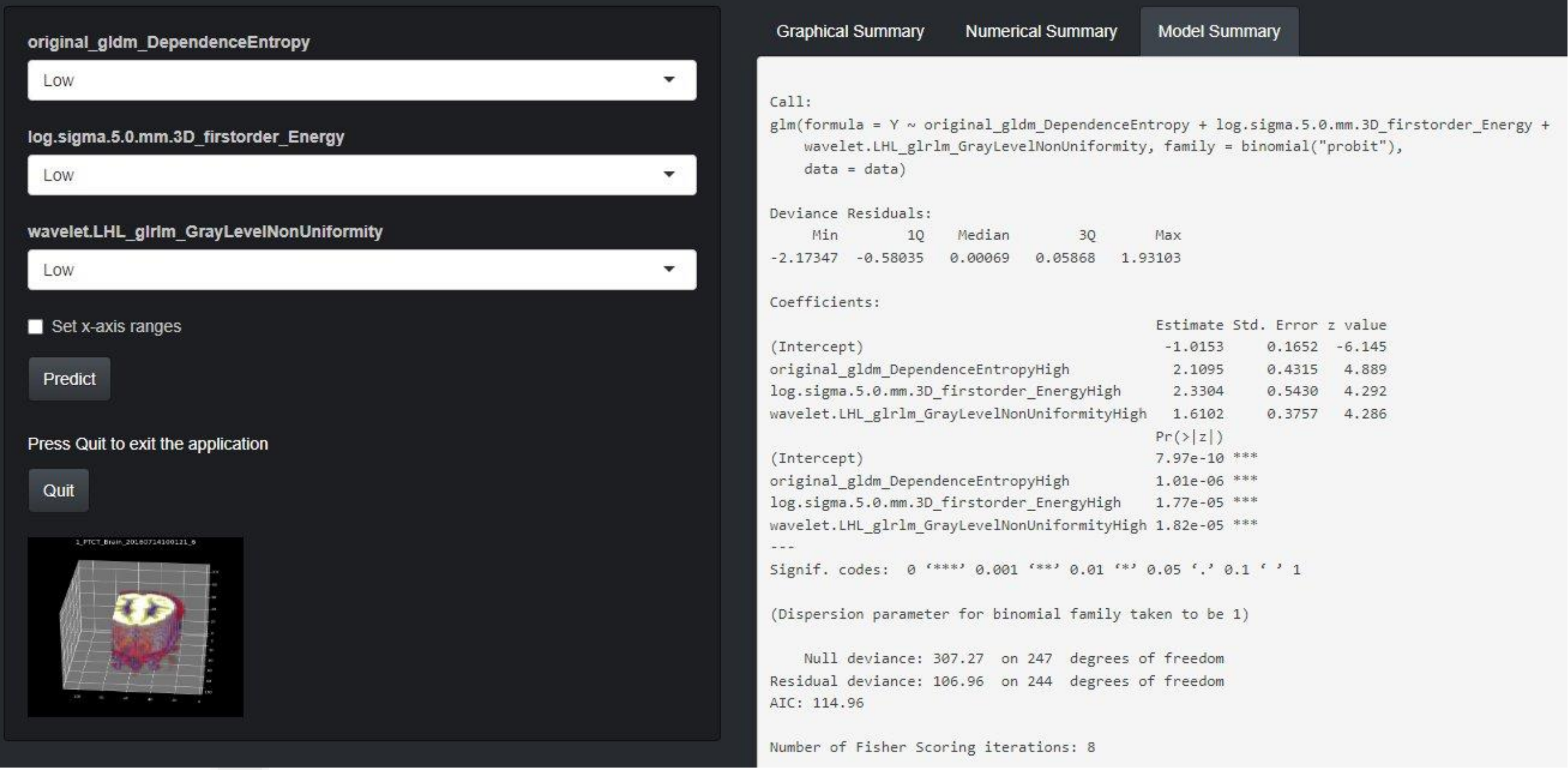
Bibliography

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[2] Zhou H, Zhang W, Tan Z, et al. Localizing Epileptic Foci Before Surgery in Patients With MRI-Negative Refractory Epilepsy Using Statistical Parameter Mapping and Three-Dimensional Stereotactic Surface Projection Based on 18F-FDG PET[J]. Frontiers in Bioengineering and Biotechnology, 2021, 9.

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