An Explainable Machine Learning Approach of PET Imaging for Individualized Predictions of Seizure Outcomes after Temporal Lobe Epilepsy Surgery

2022 GDMA Nuclear Medicine Annual Conference

Huanhua Wu
Prof. Hao Xu*

The First Affiliated Hospital of Jinan University

2022-11-30

Introduction

The Data

The Model

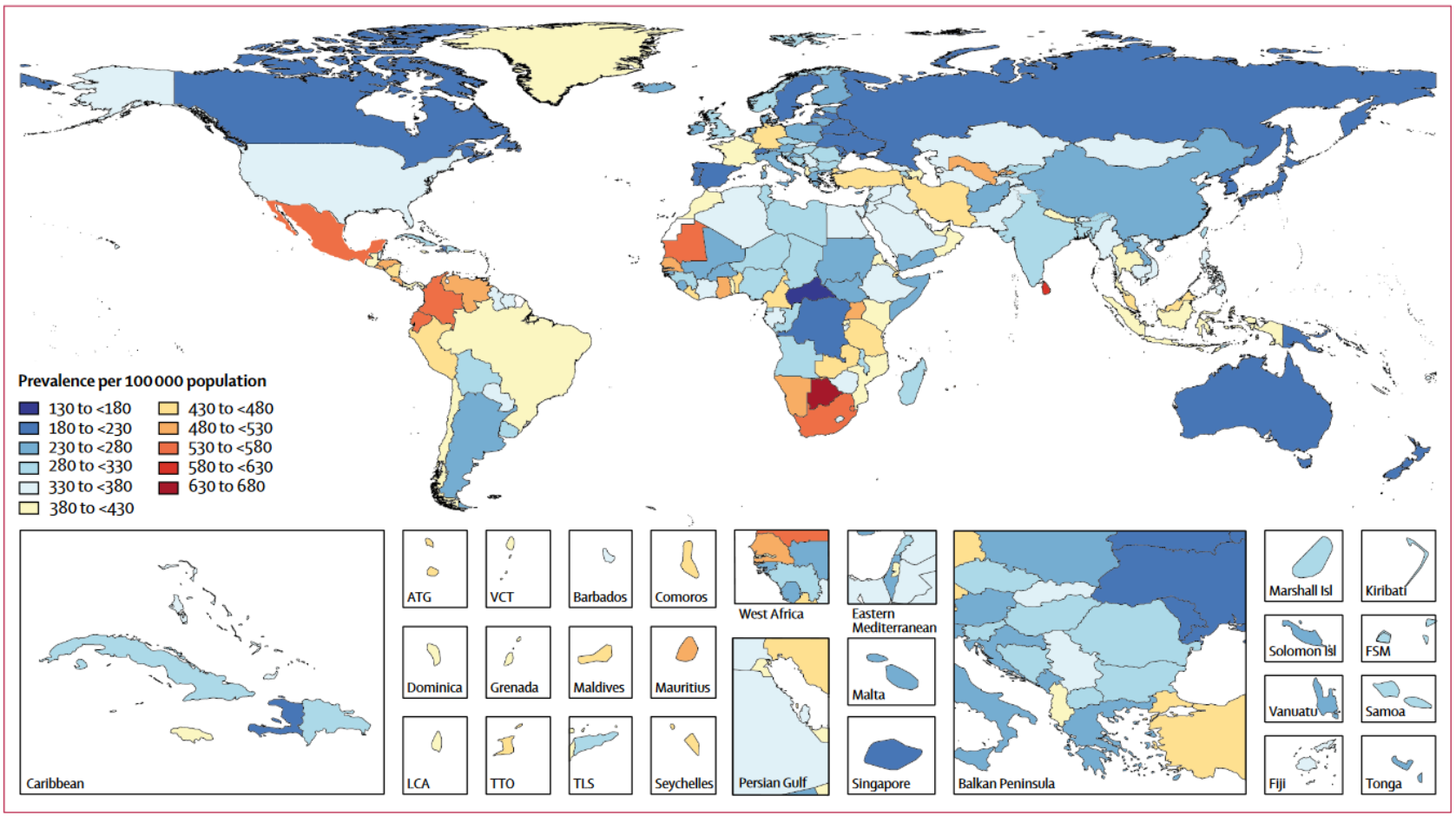
The Explanation

Conclusion

Introduction

Background

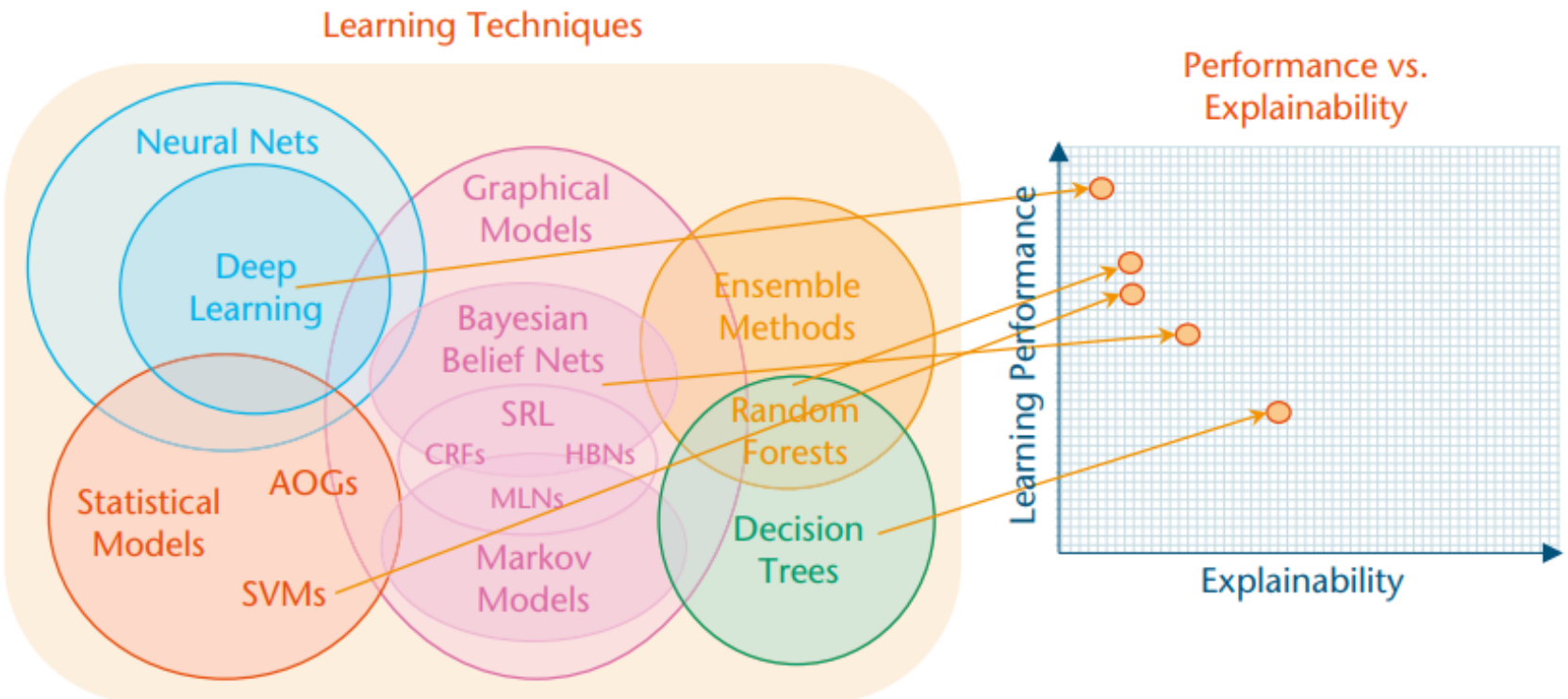
Epilepsy epidemiology



Prevalence per 100000 of idiopathic epilepsy, 2016(Beghi et al., 2019)

Aims

- Focuses on examining the interpretability of machine learning models rather than just building a short-term recurrence prediction model (aka XAI).



Learning Performance Versus Explainability Trade-Off(Gunning and Aha, 2019)

The Data

GDMA 2022 12月2-4日 December 4-6 中国·深圳 Shenzhen, China

广东省医学会核医学学术年会

The Model

Benchmark

This text is centered.

benchmark /

- KNN
- “ ” 5
- AUC
- AUC

.

PipeOp PipeOps %>>% Graph

- PipeOp, %>>% gunion() ppl()
- Graph$plot()
- as_learner(Graph)

- ……
-
-

1.

- PipeOp
- %>>%
- PipeOp affect_columns Selector

The Explanation

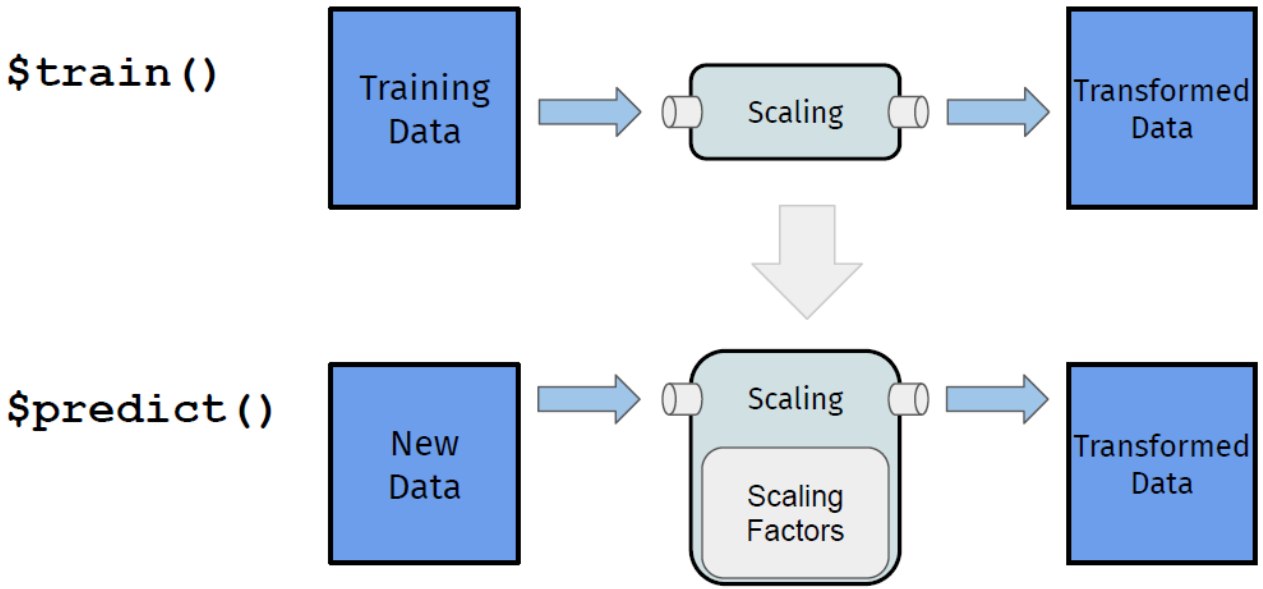

$train()
Training Data
Scaling
Transformed Data
$predict()
New Data
Scaling
Scaling Factors
Transformed Data

Figure 1:

- 3 KNN SVM Ranger
- method:
  ”grid_search” “random_search” gensa “nloptr”

.

1.

`mlr3filters`

(1)

Conclusion

con

(2)

" " `ranger` "impurity"

```
task$select()
```

2.

mlr3fselect

- fselect()
- auto_fselector(),
- fselect_nested()

.

R mlr3verse (?)

For more theoretical approaches to machine learning model explanation, see Interpretable Machine Learning: A Guide for Making Black Box Models Explainable,What Causes Heart Disease? Explaining the Model, refer to(Rajpurkar, 2021), (Marc Becker, 2022), (Molnar, 2022)

Email: wane199@outlook.com

GDMA 2022 12月2-4日 December 4-6 中国·深圳 Shenzhen, China

广东省医学会核医学学术年会

THANKS !

References I

Beghi, E., Giussani, G., Nichols, E., Abd-Allah, F., Abdela, J., Abdelalim, A., Abraha, H. N., Adib, M. G., Agrawal, S., Alahdab, F., et al. (2019). Global, regional, and national burden of epilepsy, 1990–2016: a systematic analysis for the global burden of disease study 2016. *The Lancet Neurology*, 18(4):357–375.

Gunning, D. and Aha, D. (2019). Darpa's explainable artificial intelligence (xai) program. *AI magazine*, 40(2):44–58.

Marc Becker, e. a. (2022). *mlr3book*.

Molnar, C. (2022). *Interpretable Machine Learning*. 2 edition.

Rajpurkar, P. S. (2021). *Deep Learning for Medical Image Interpretation*. Stanford University.