AutoML Presentation

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Datasets

- **iris:** Iris dataset containing measurements of iris flowers (multiclass classification)
- **digits:** Digits dataset containing 8x8 images of handwritten digits (multiclass classification)
- **wine:** Wine dataset containing attributes of different types of wine (multiclass classification)
- **breast_cancer:** Breast cancer dataset containing features of tumor cells (binary classification)

Dataset	Number of Rows	Number of Features	Number of Classes
iris	150	4	3
digits	1797	64	10
wine	178	13	3
breast_cancer	569	30	2

Models

KNN: The prediction is based on the majority of the k-nearest neighbors.
RandomForest: Builds multiple decision trees and merges their predictions to improve accuracy and control overfitting.
XGBoost: An efficient and scalable implementation of gradient boosting framework.

Hyperparameter Sampling Algorithms

Random Search: Randomly sampling from predefined hyperparameter grid. The library used was RandomizedSearchCV from sklearn.
Bayesian Search: Tree-structured Parzen Estimator (TPE) method which is a type of bayesian optimisation. The library used was Hyperopt.

KNN

Parameter	Range
n_neighbors	2-30
weights	uniform, distance
p	1, 2

RandomForest

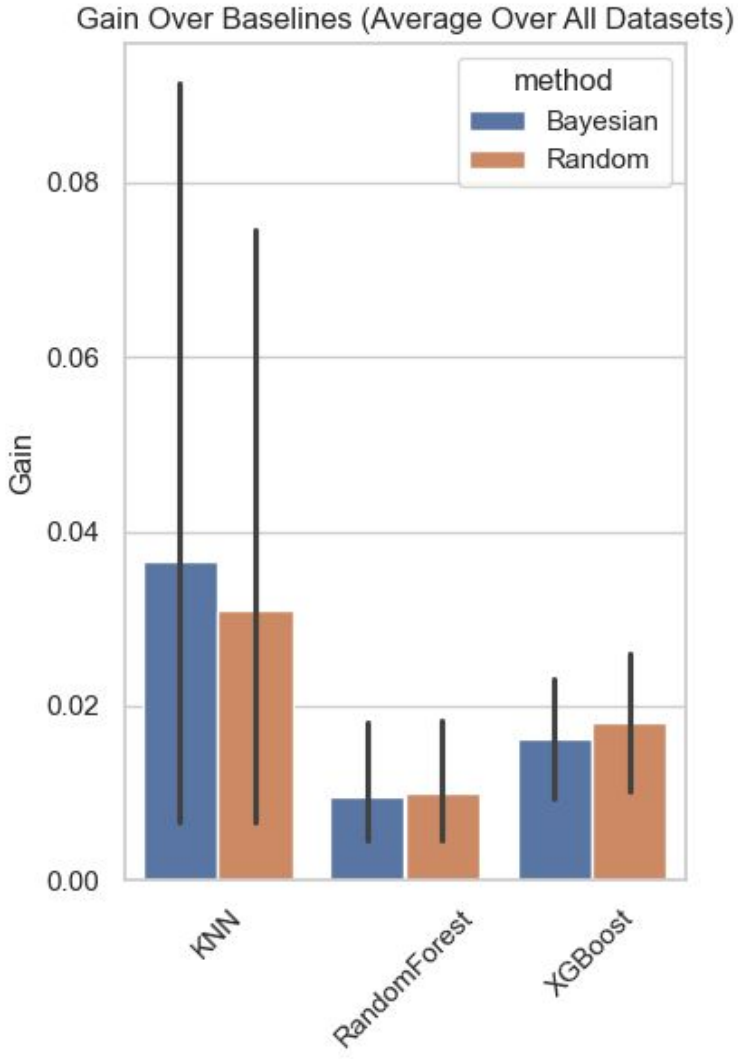
Parameter	Range
n_estimators	100-2000
max_depth	10-100
min_samples_split	2-10
min_samples_leaf	1-10
bootstrap	True, False

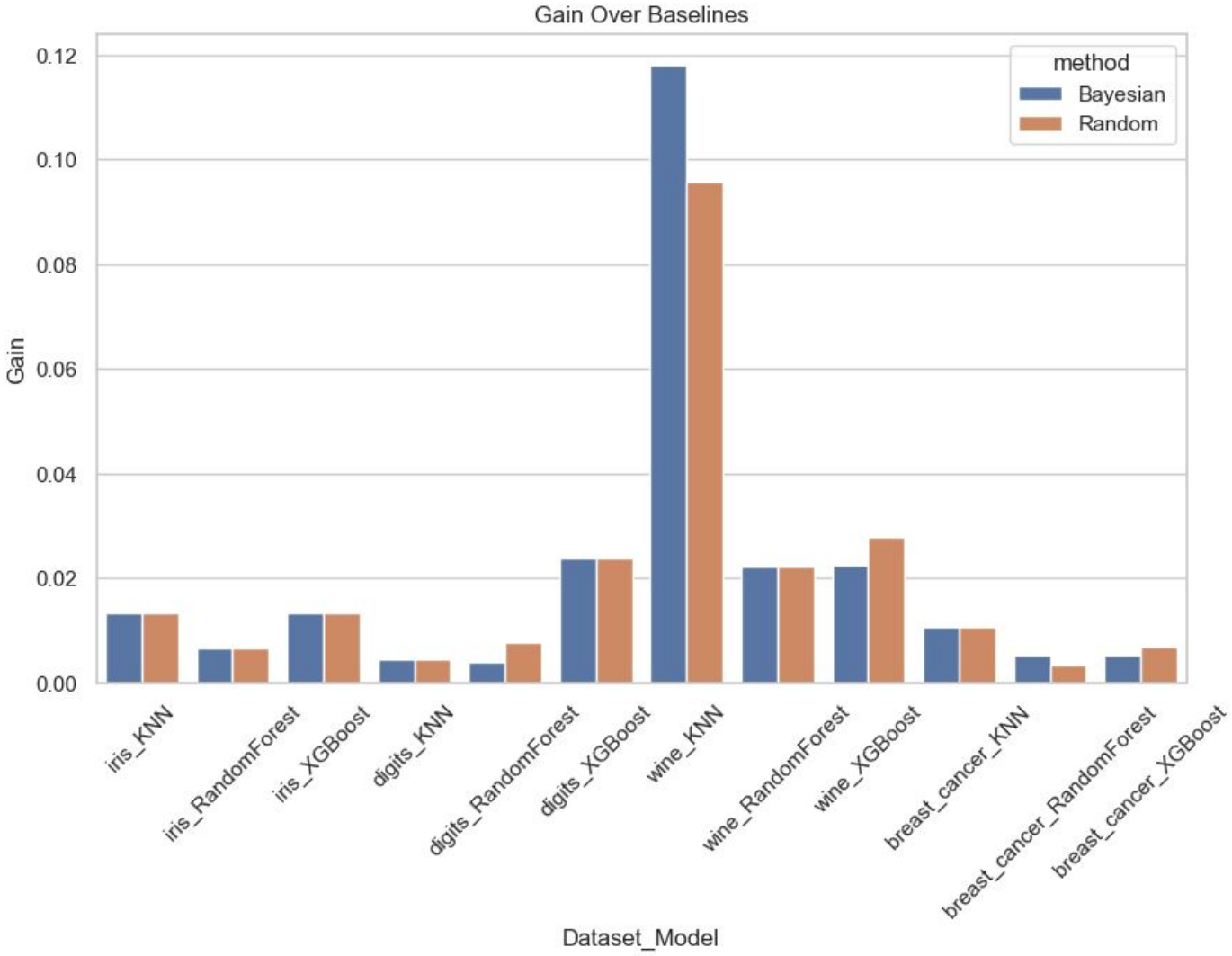
XGBoost

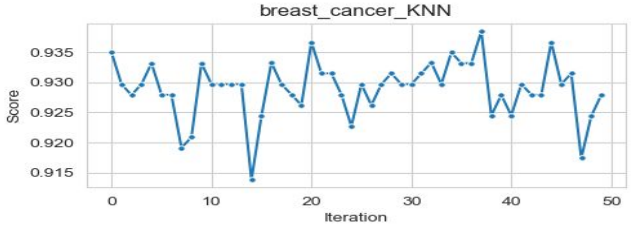
Parameter	Range
n_estimators	50-1000
max_depth	1-9
learning_rate	0.01-0.3
subsample	0.5-1.0
colsample_bytree	0.5-1.0

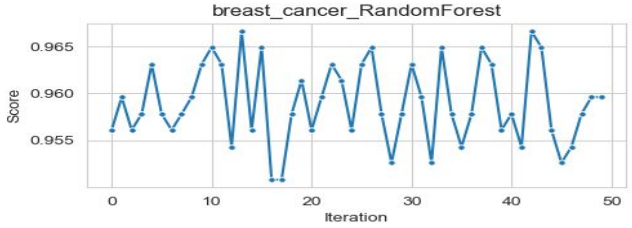
Methodology

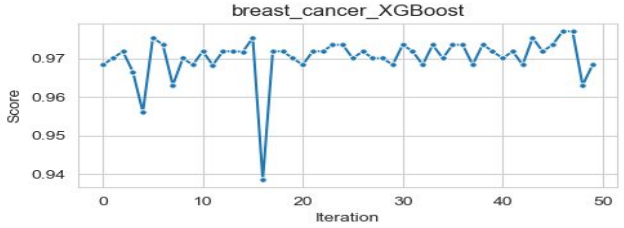
There are: **4 datasets x 3 models x 50 trials**
The optimized metric is **accuracy**.
Each trial is evaluated on a **5-fold cross validation** split.

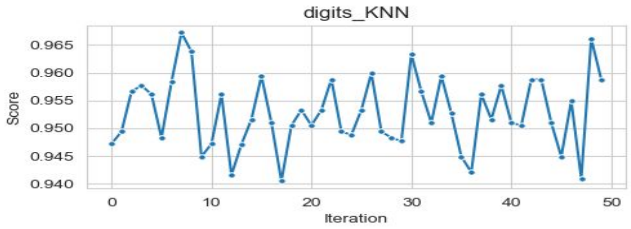

Gain Over Baselines (Average Over All Datasets)
method
Bayesian
Random
Gain
0.00
0.02
0.04
0.06
0.08
KNN
RandomForest
XGBoost

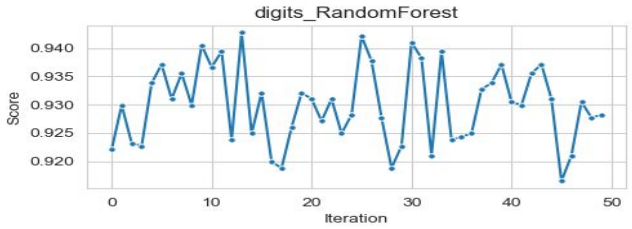

Gain Over Baselines
method
Bayesian
Random
Gain
0.12
0.10
0.08
0.06
0.04
0.02
0.00
iris_KNN
iris_RandomForest
iris_XGBoost
digits_KNN
digits_RandomForest
digits_XGBoost
wine_KNN
wine_RandomForest
wine_XGBoost
breast_cancer_KNN
breast_cancer_RandomForest
breast_cancer_XGBoost
Dataset_Model

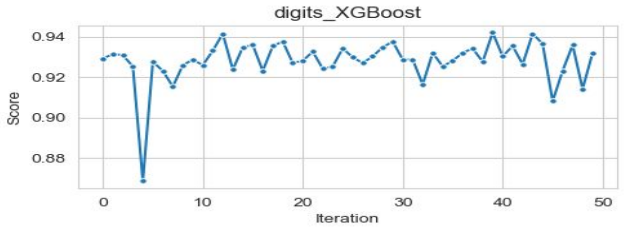

breast_cancer_KNN
Score
Iteration

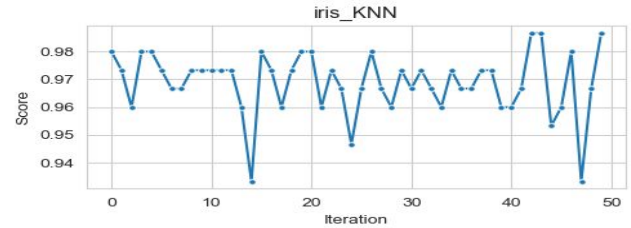

breast_cancer_RandomForest
Score
Iteration

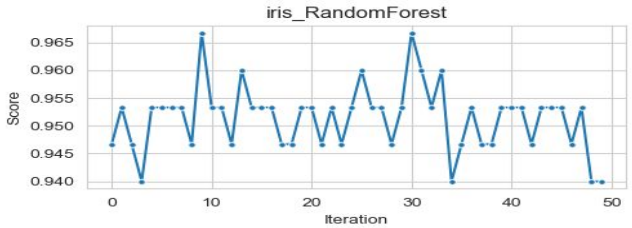

breast_cancer_XGBoost
Score
Iteration


digits_KNN
Score
Iteration

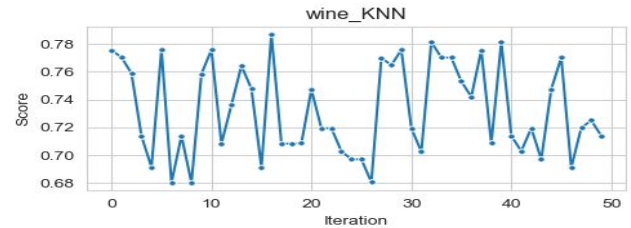

digits_RandomForest
Score
Iteration

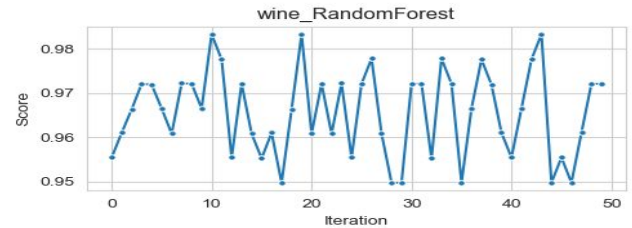

digits_XGBoost
Score
Iteration

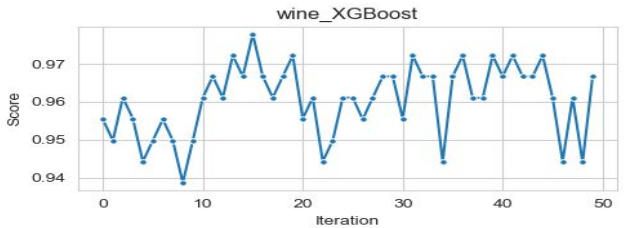

iris_KNN
Score
Iteration


iris_RandomForest
Score
Iteration


iris_XGBoost
Score
Iteration


wine_KNN
Score
Iteration


wine_RandomForest
Score
Iteration


wine_XGBoost
Score
Iteration