CS 528 Project 4

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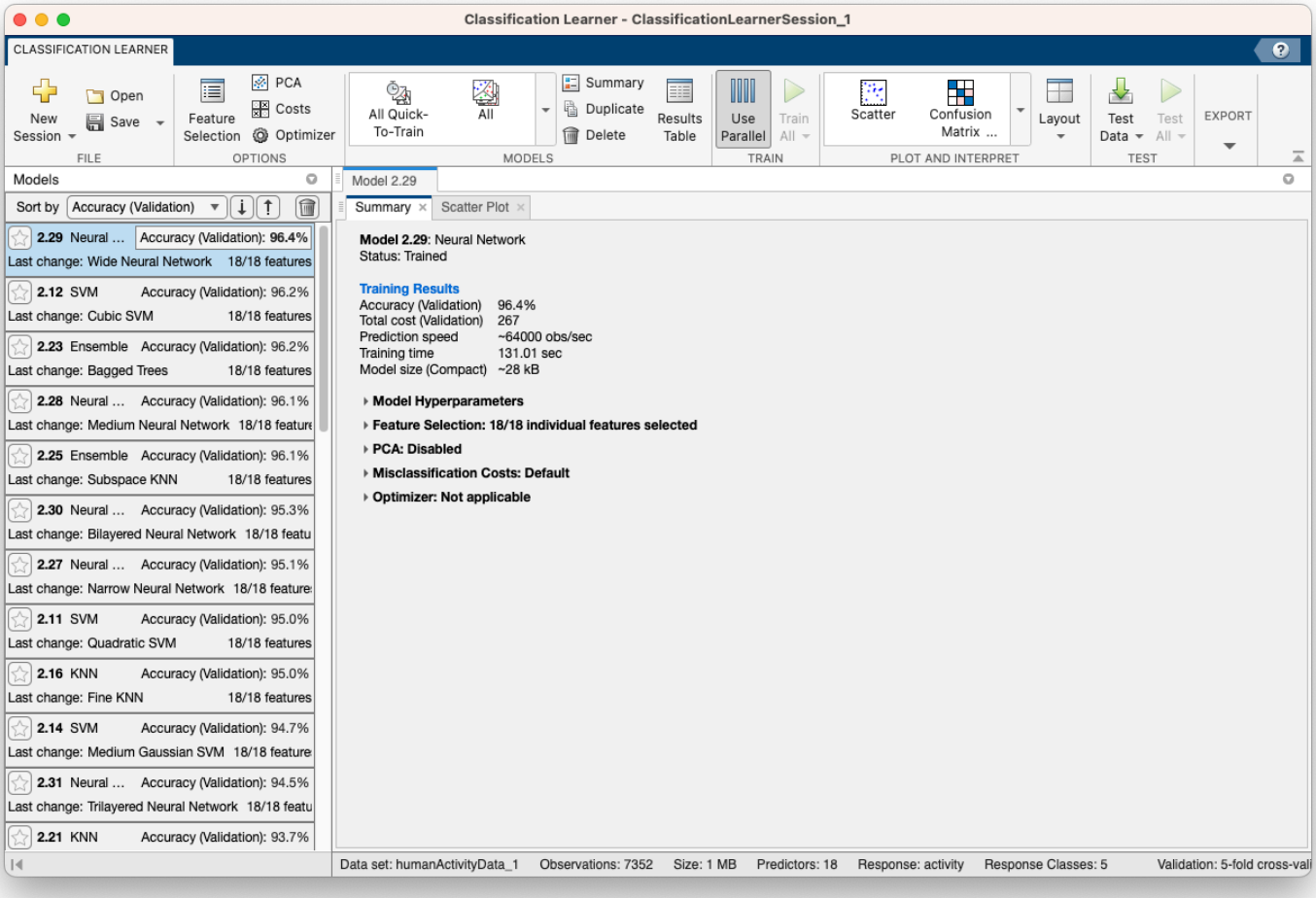
Most Accurate Classifiers and their Accuracy

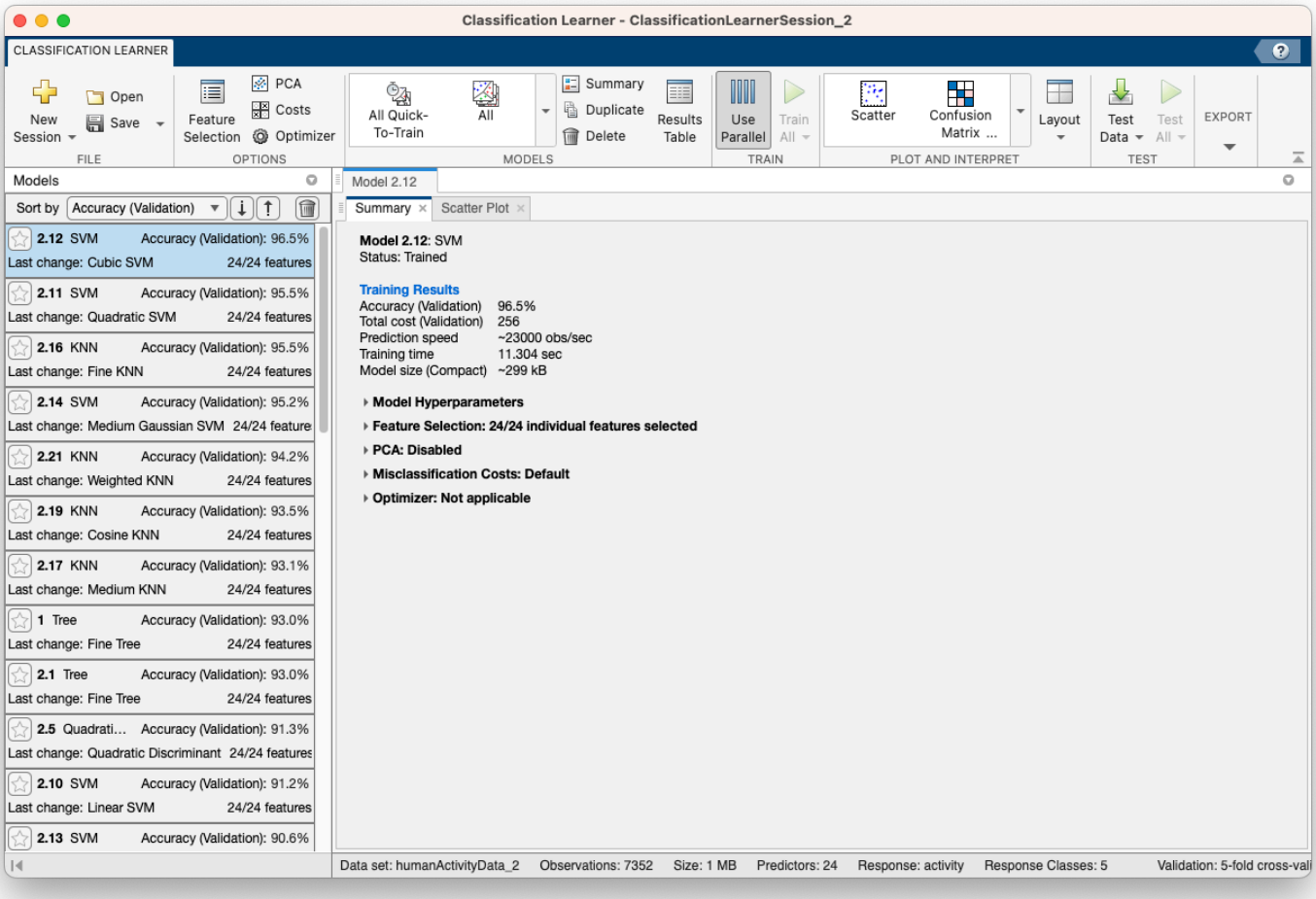
1. Three original features (mean, PCA and Standard deviation)

Neural Network: 96.4% Accuracy



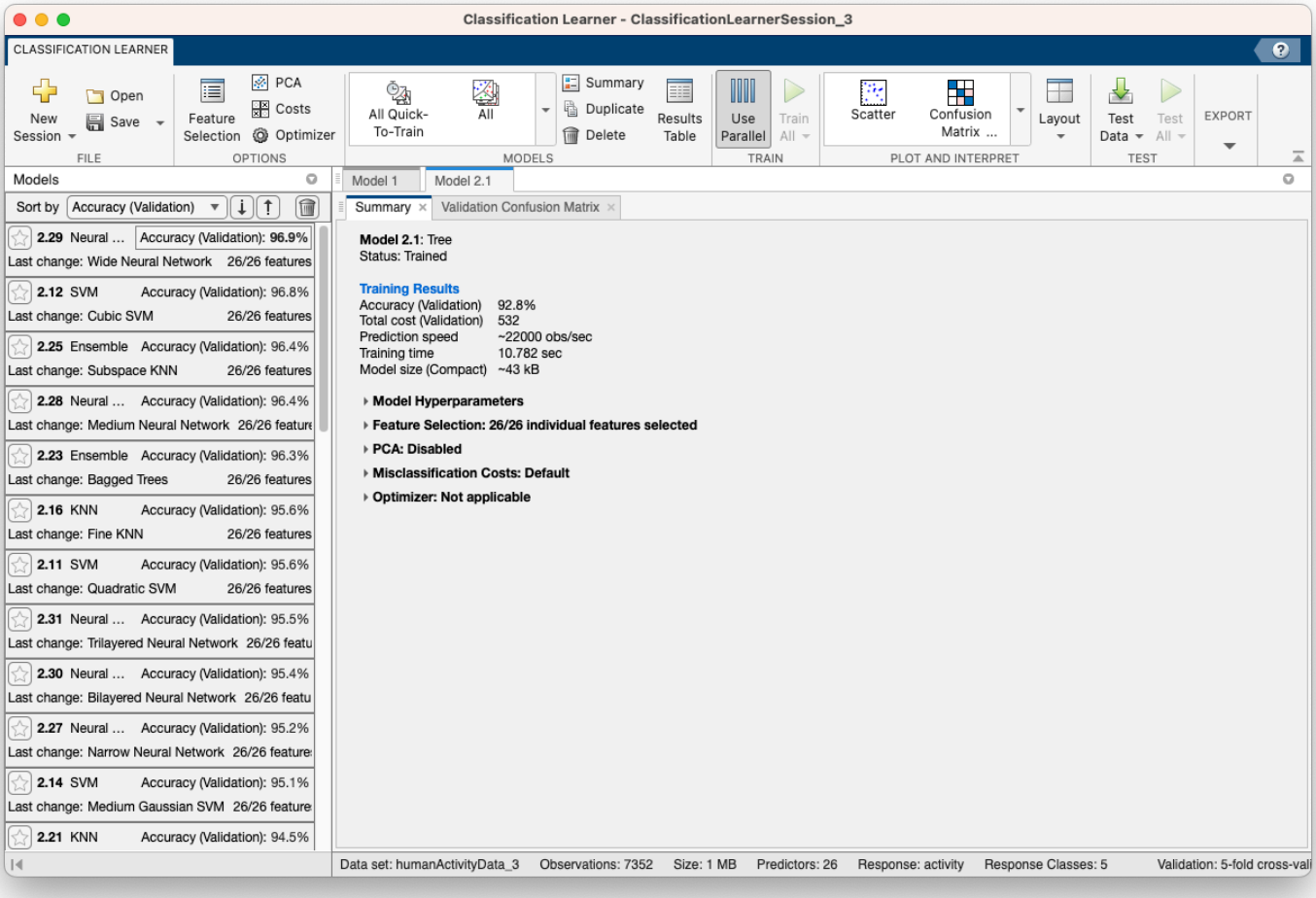
2. Three original features (mean, PCA, Standard deviation) and also Average Absolute Difference (i.e. 4 features in total)

SVM: 96.5% Accuracy



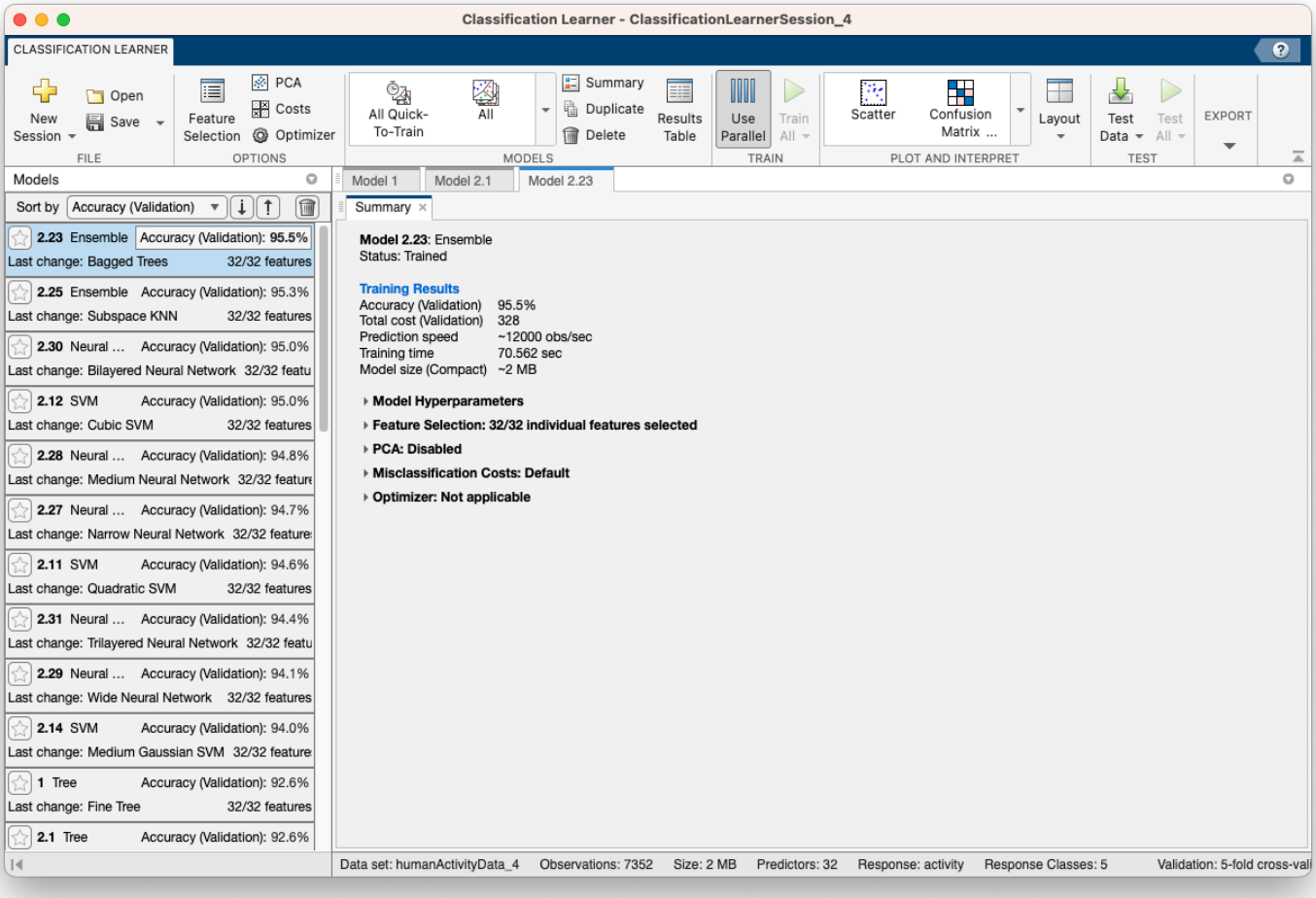
3. Three original features (mean, PCA, Standard deviation) and also Average Absolute Difference and Average Resultant Acceleration (i.e. 5 features in total)

Tree: 92.8% Accuracy



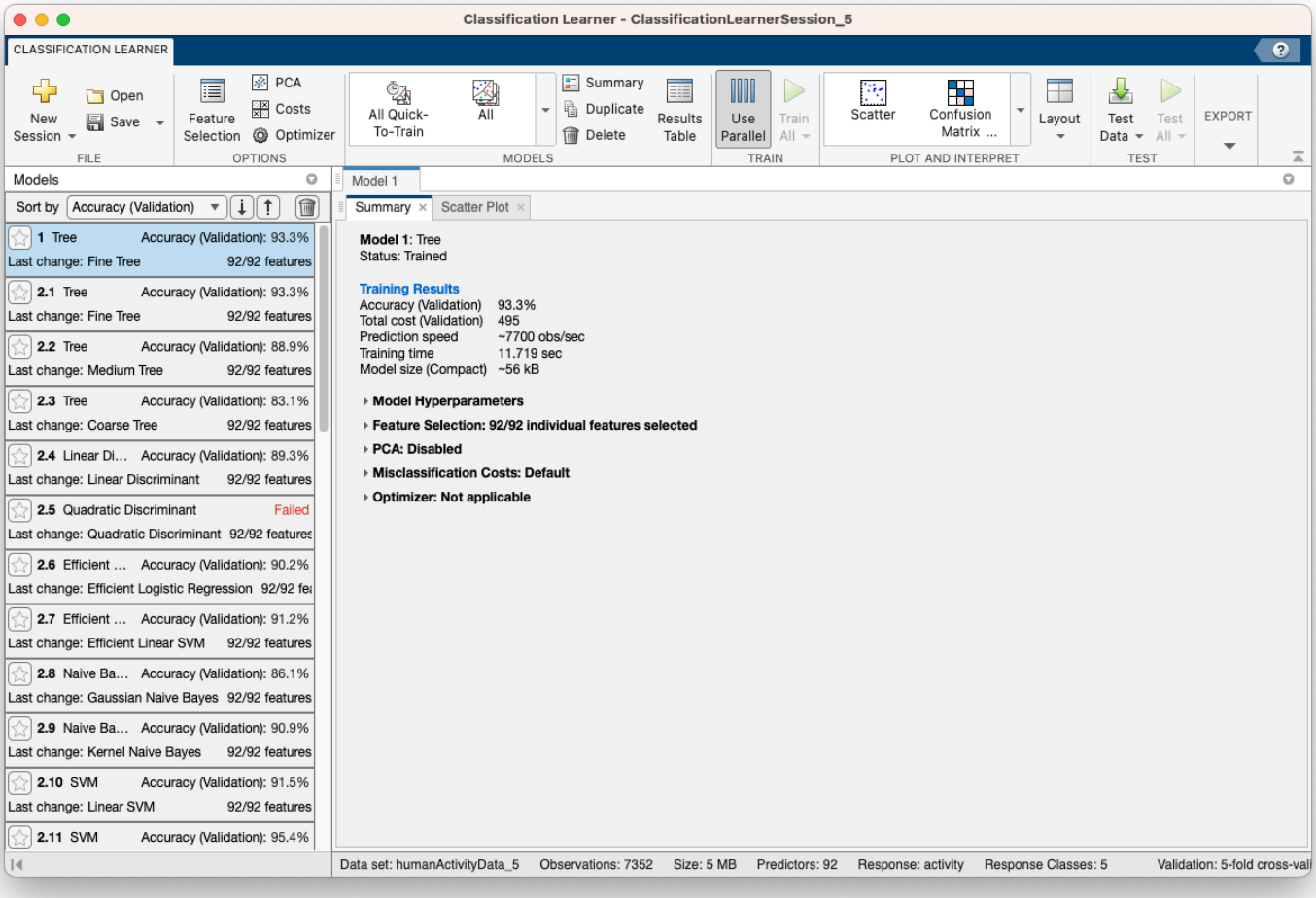
4. Three original features (mean, PCA, Standard deviation), and also Average Absolute Difference, Average Resultant Acceleration and Time Between Peaks (i.e. 6 features in total)

Ensemble: 95.5% Accuracy



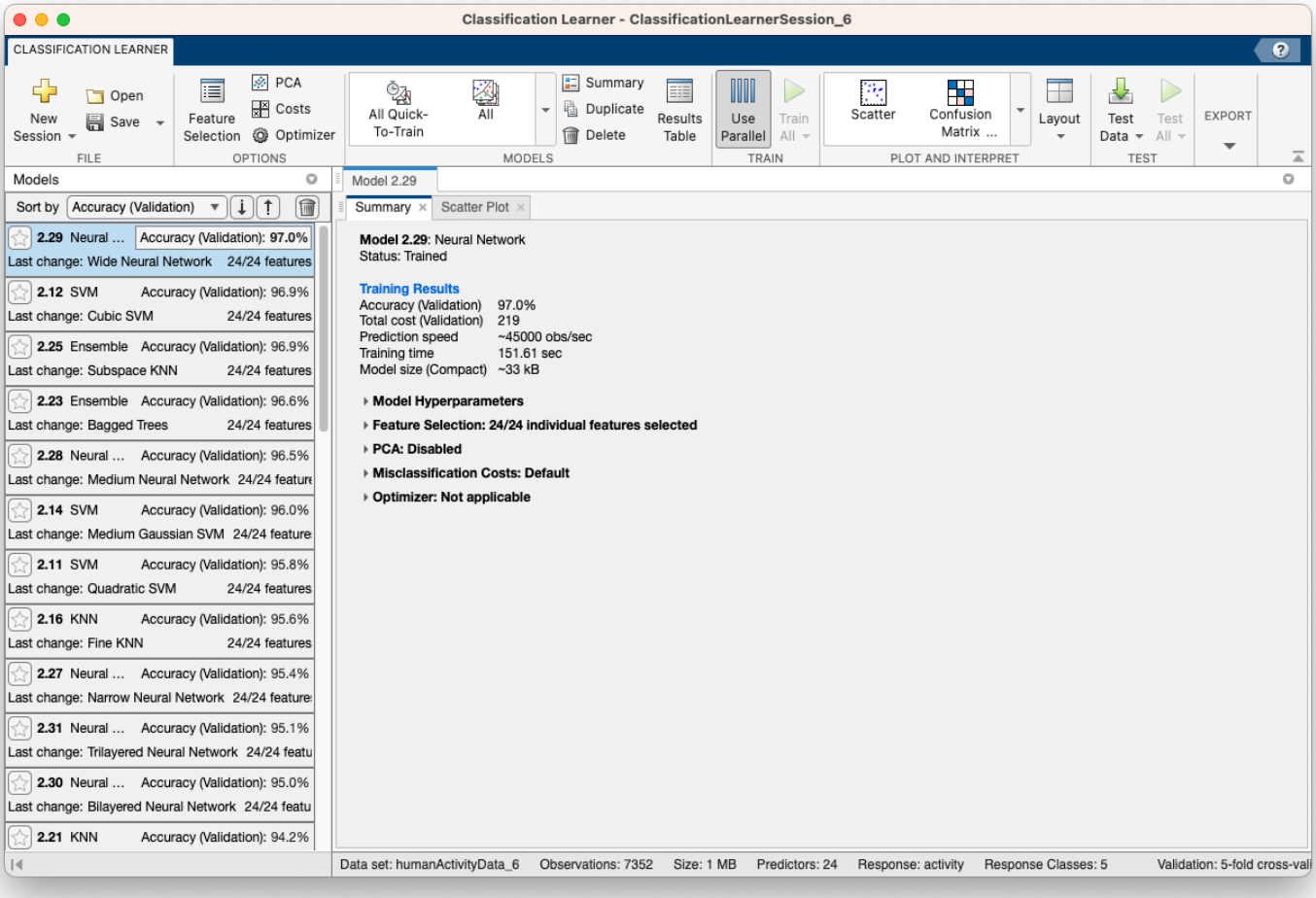
5. Three original features (mean, PCA, Standard deviation) and also Average Absolute Difference, Average Resultant Acceleration, Time Between Peaks and Binned Distribution (i.e. 7 features in total)

Tree: 93.3% Accuracy



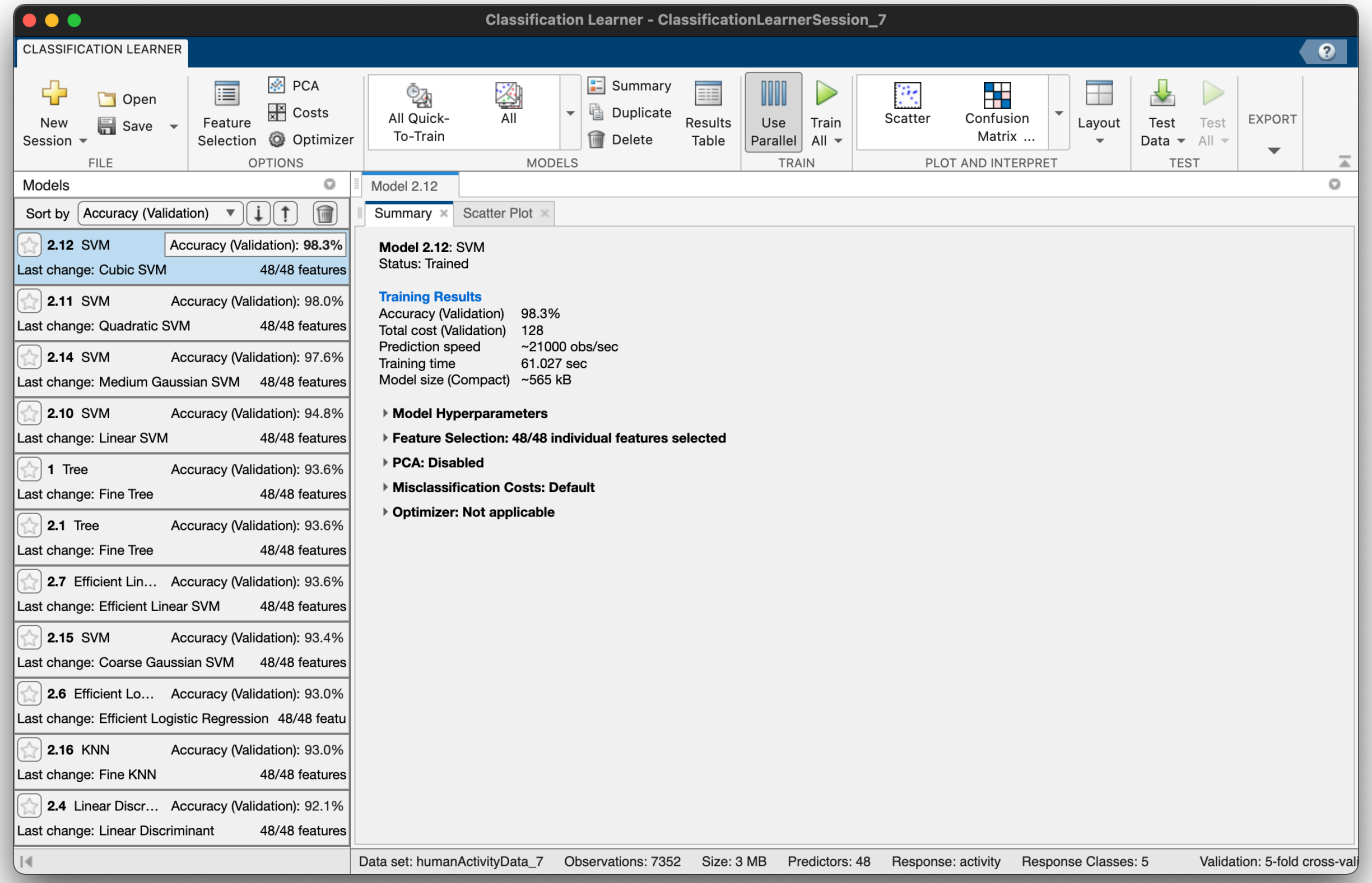
6. Three original features (mean, PCA, Standard deviation) and also Interquartilve Range (IQR) (i.e. 4 features in total)

Neural Network: 97.0% Accuracy



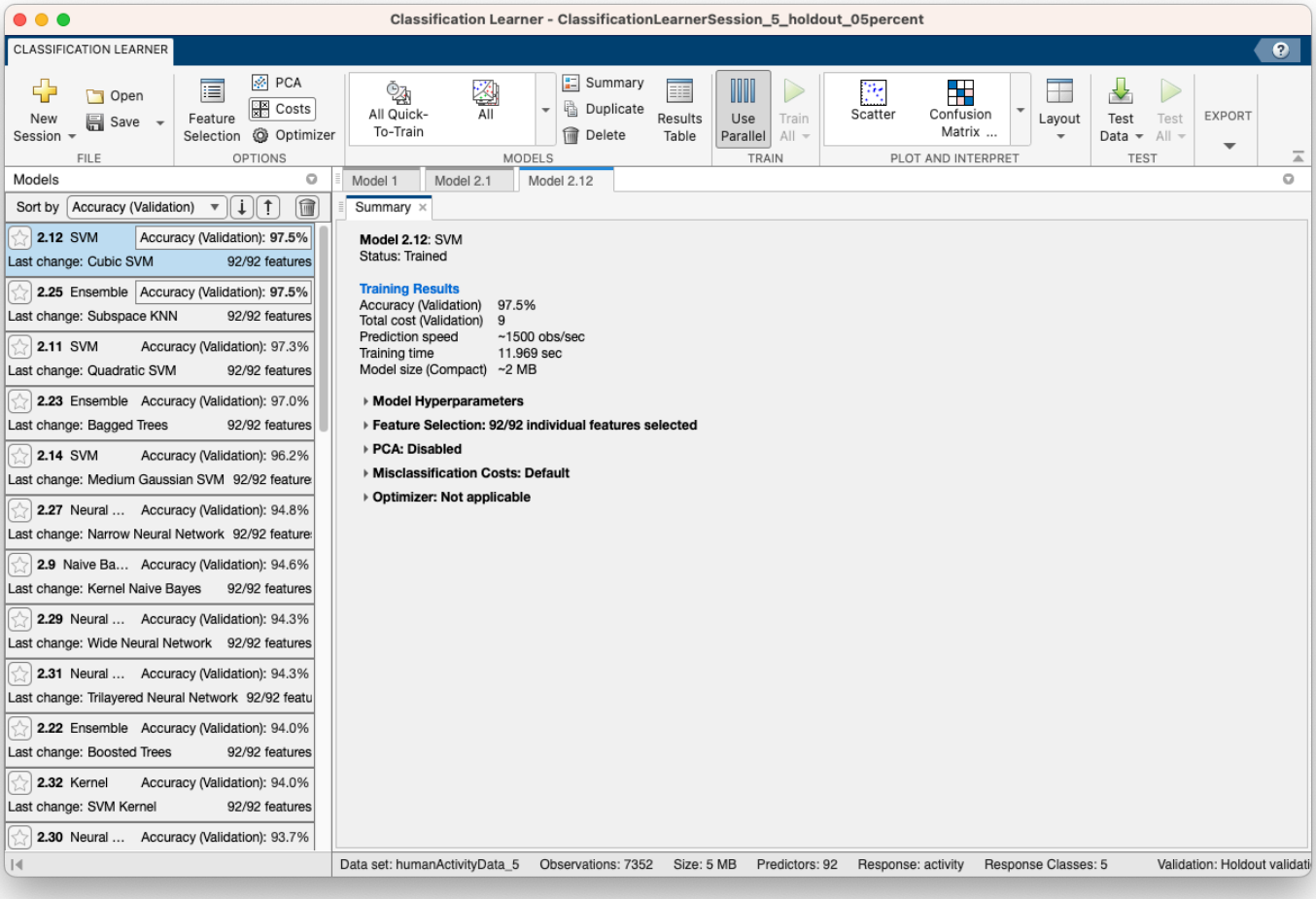
7. Three original features (mean, PCA, Standard deviation) and Interquartile range (IQR), Mean Absolute Deviation (MAD), Correlation between axes, Entropy, and Kurtosis (i.e. 8 features in total)

SVM: 98.1% Accuracy



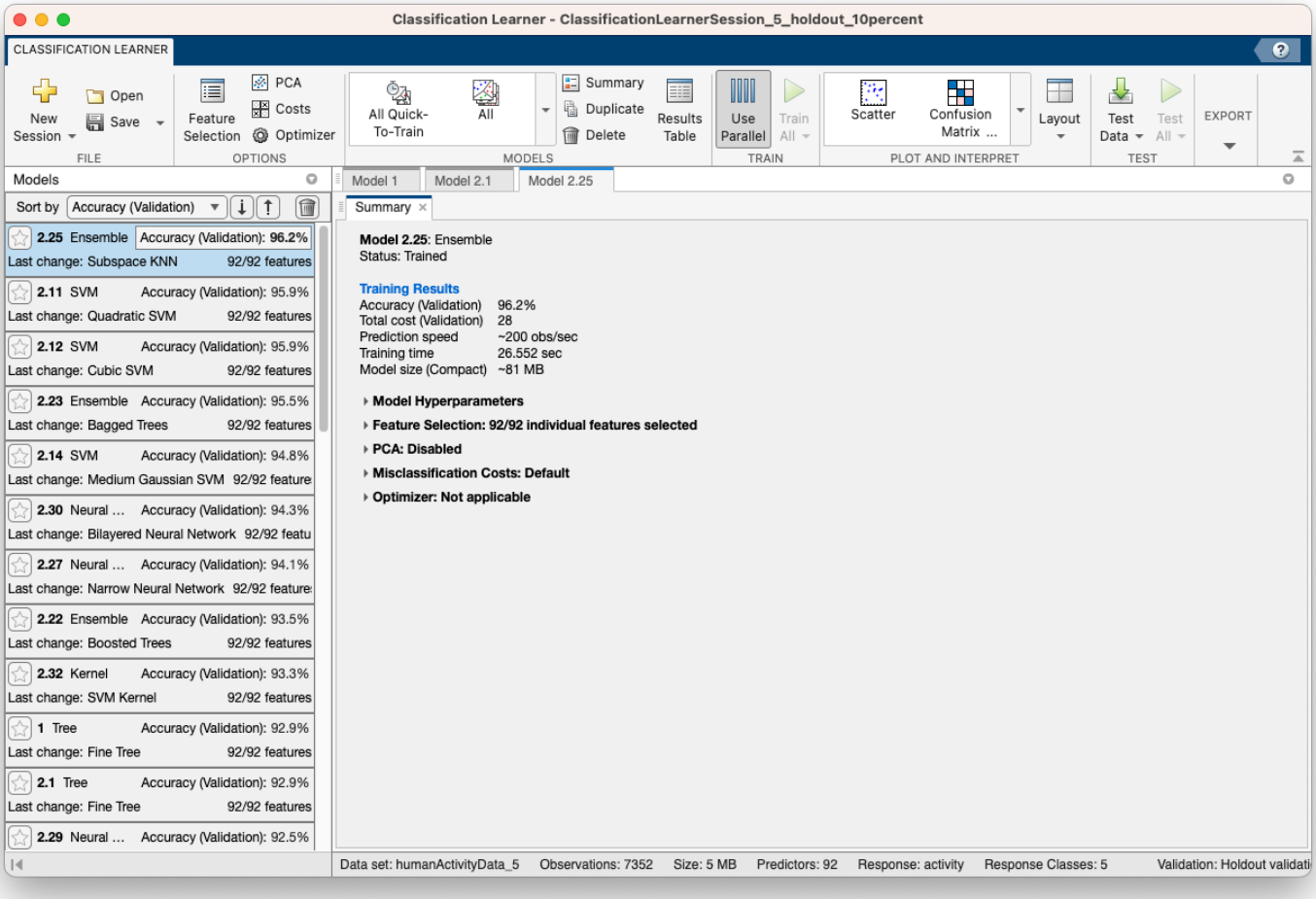
Session 5 with 5% Holdout

SVM: 97.5% Accuracy



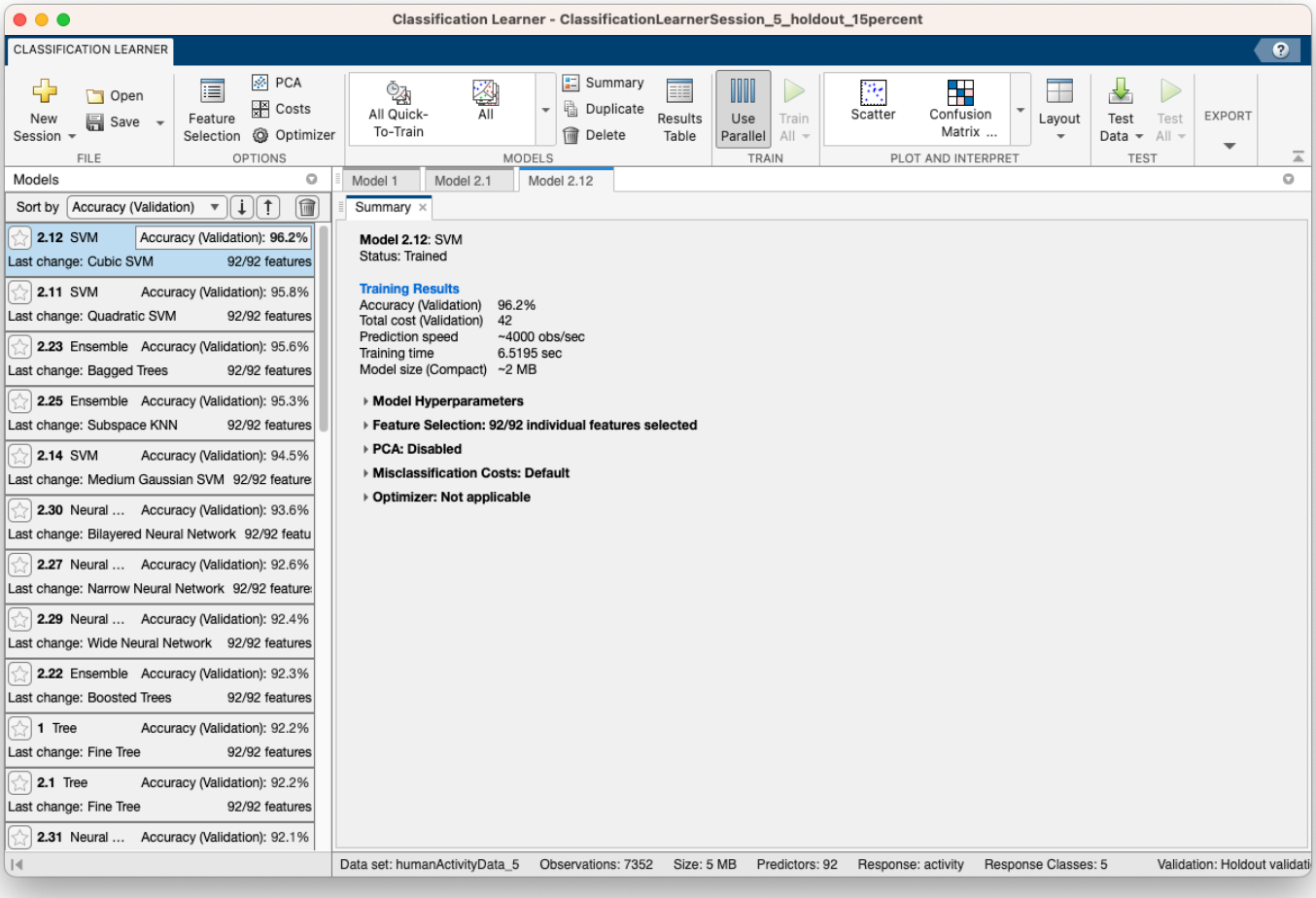
Session 5 with 10% Holdout

Ensemble: 96.2% Accuracy



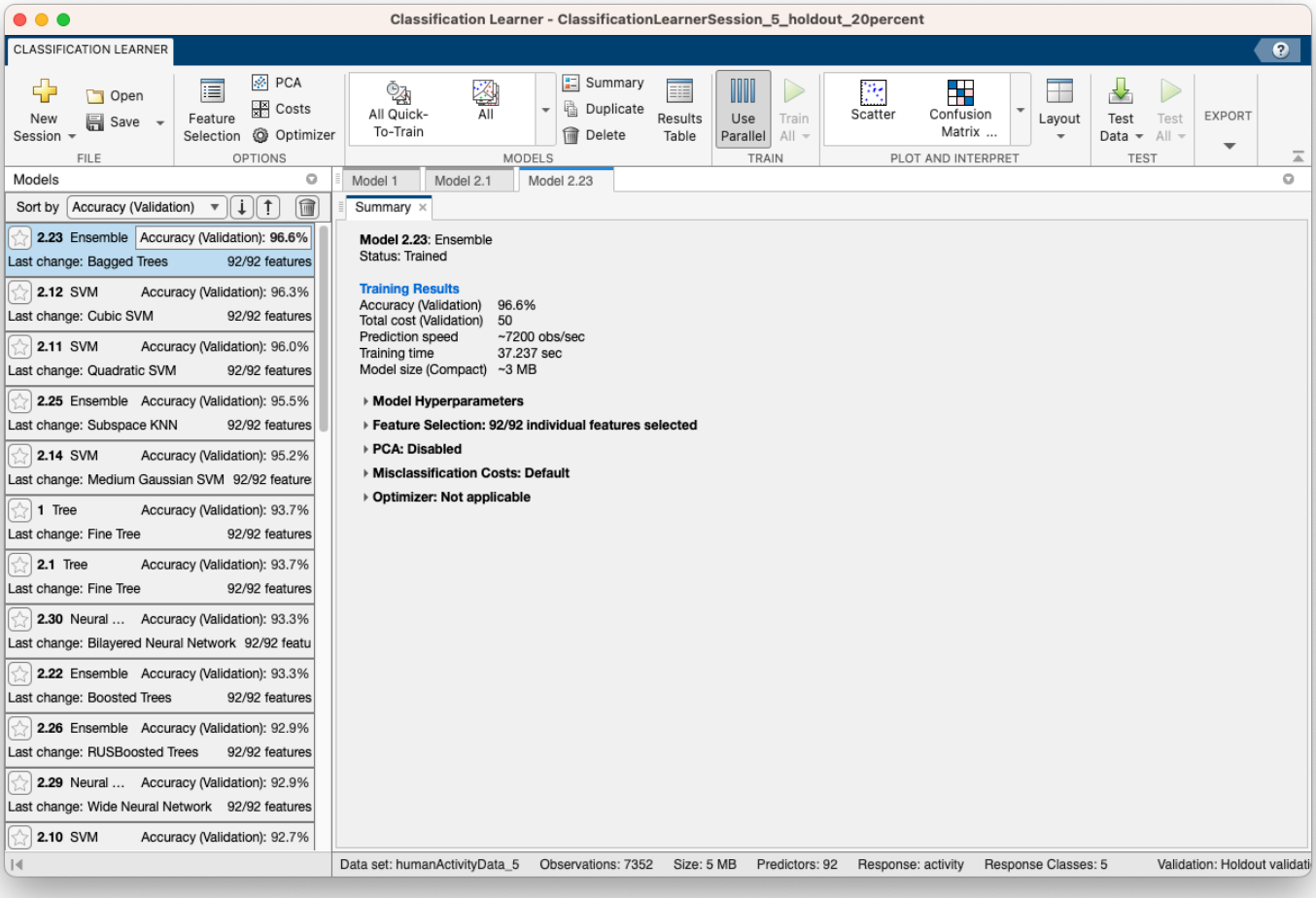
Session 5 with 15% Holdout

SVM: 96.2% Accuracy



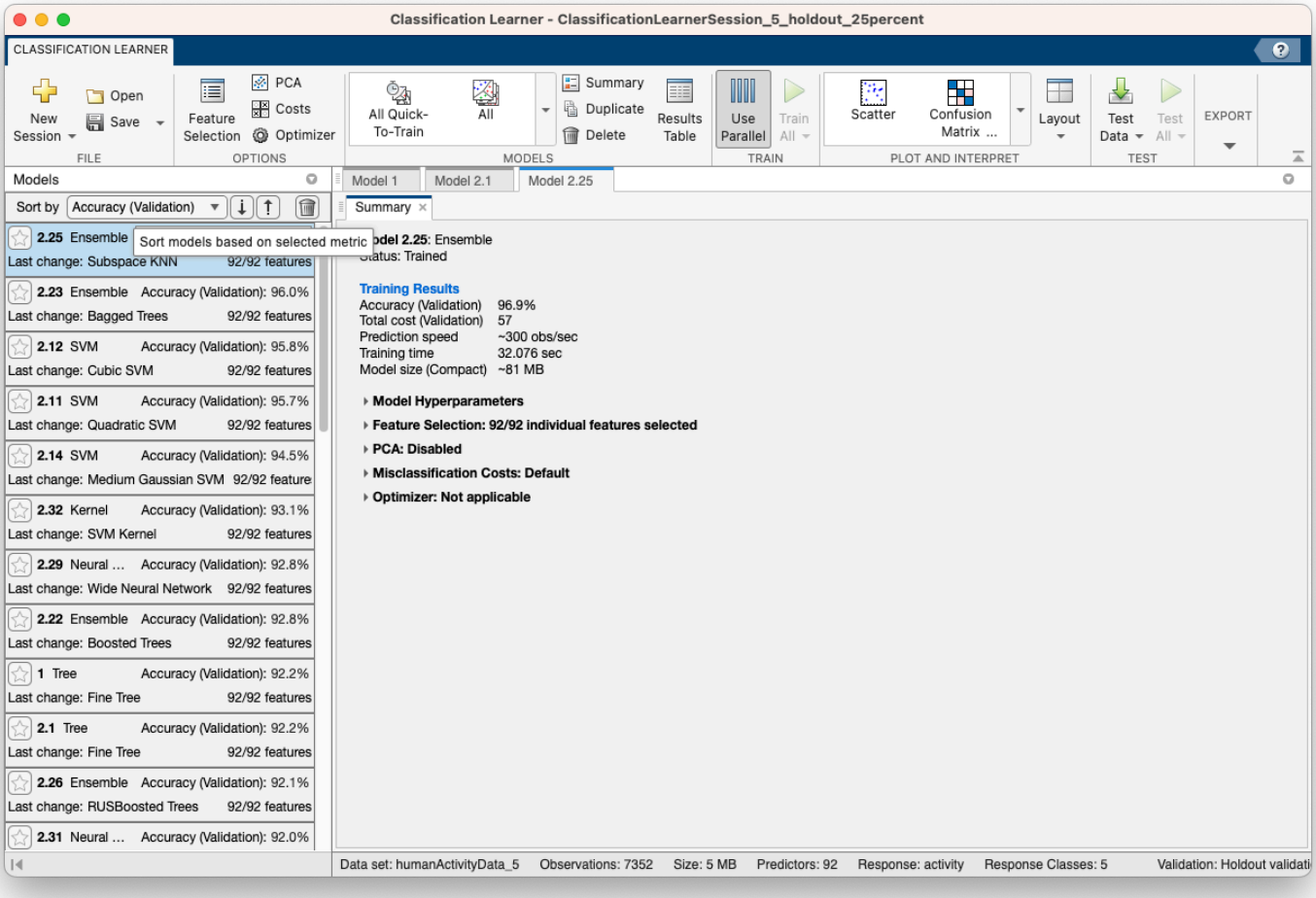
Session 5 with 20% Holdout

Ensemble: 96.6% Accuracy



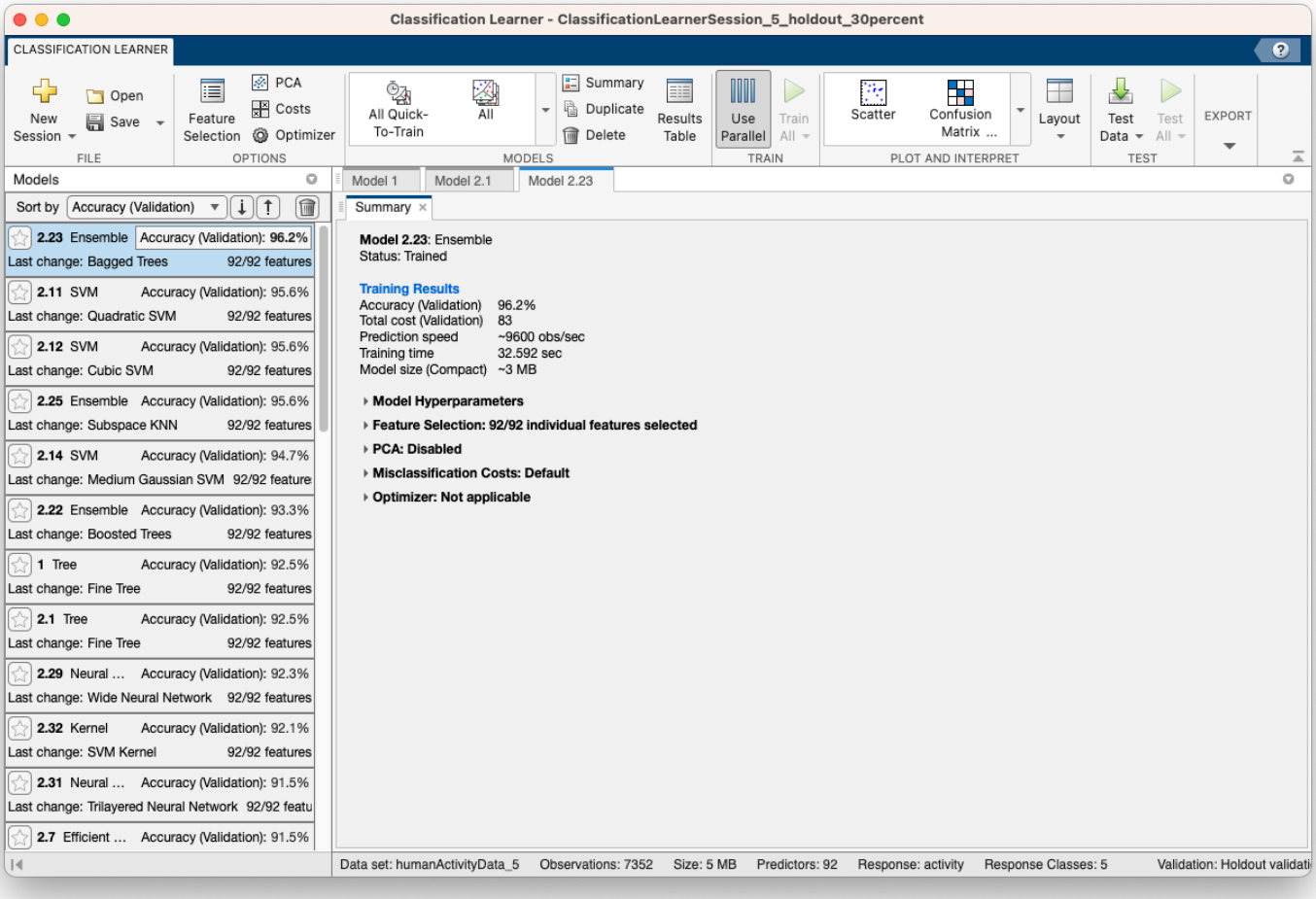
Session 5 with 25% Holdout

Ensemble: 96.9% Accuracy



Session 5 with 30% Holdout

Ensemble: 96.2% Accuracy



Accuracies Ranked

Rank	Feature Set	Classifier	Accuracy
1	7	SVM	98.1%
2	6	Neural Network	97.0%
3	2	SVM	96.5%
4	1	Neural Network	96.4%
5	4	Ensemble	95.5%
6	5	Tree	93.3%
7	3	Tree	92.8%

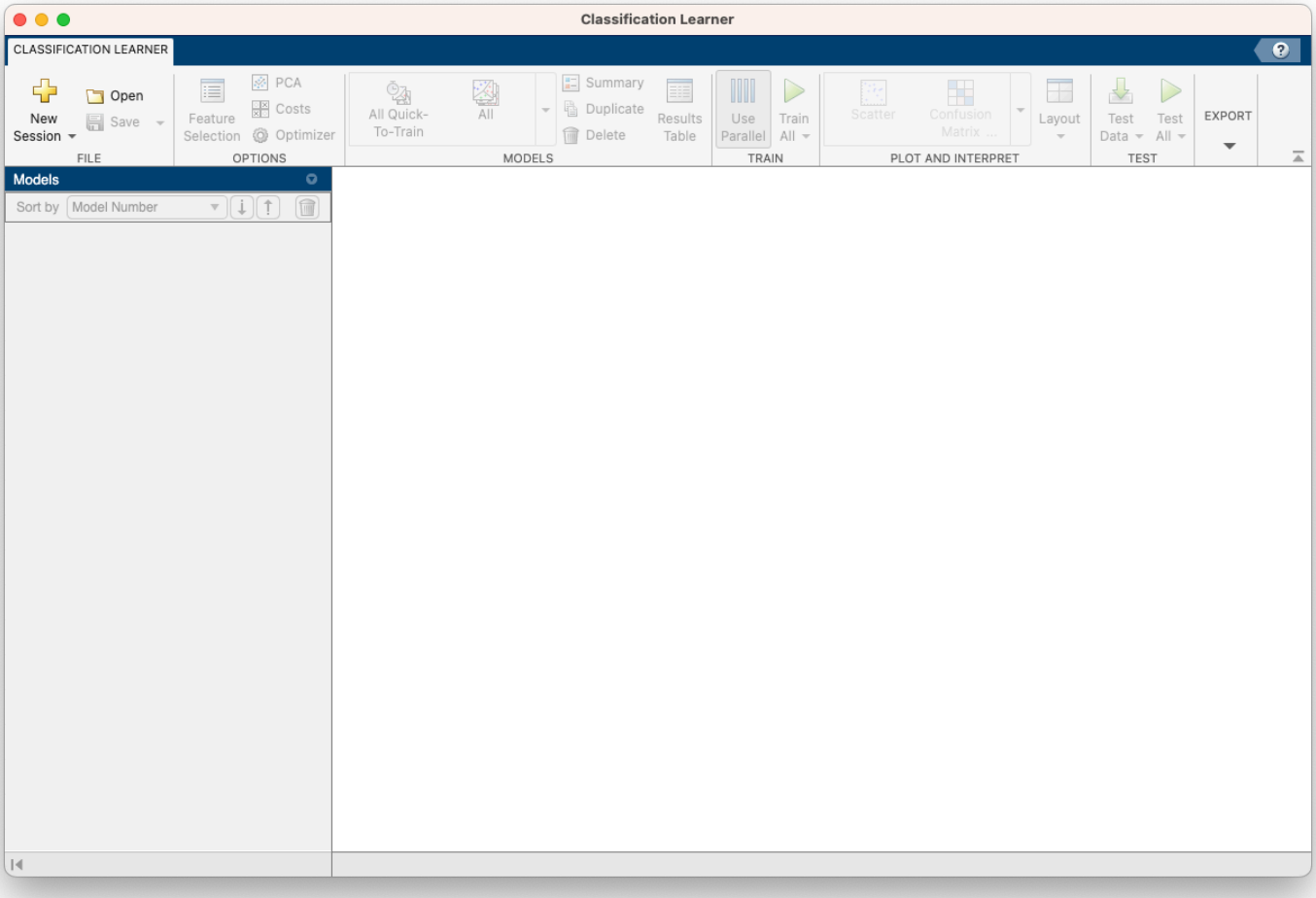
Feature set 7, containing eight features including the originals, mean, PCA, and standard deviation, along with Interquartile range (IQR), Mean Absolute Deviation (MAD), Correlation between axes, Entropy, and Kurtosis performed the best with SVM and an accuracy of 98.1%.

Running Mathworks version 2023a

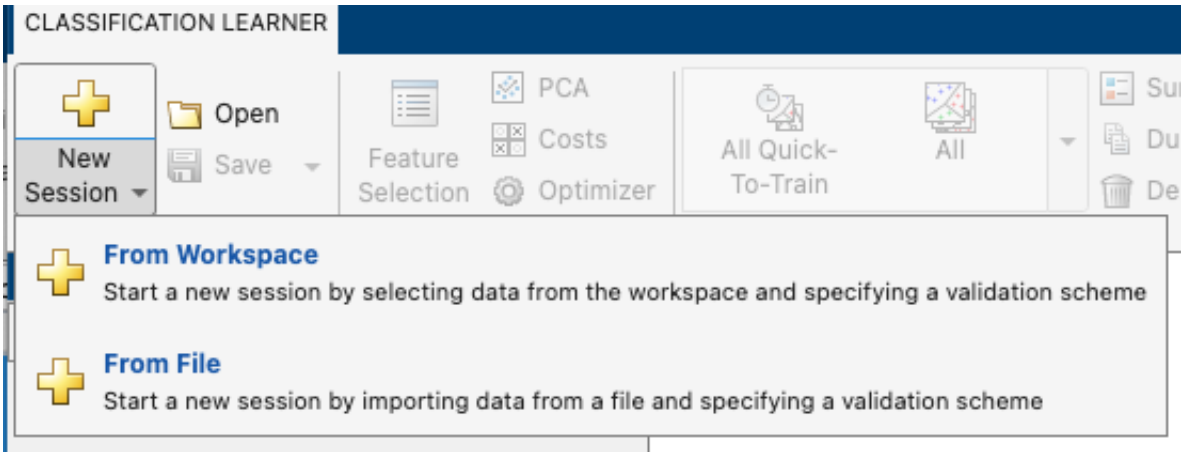
The GUI has been updated since the tutorial was created in 2015. We thought we should include instructions for using the most current release (2023a).

To begin, open *classisificationLearner*

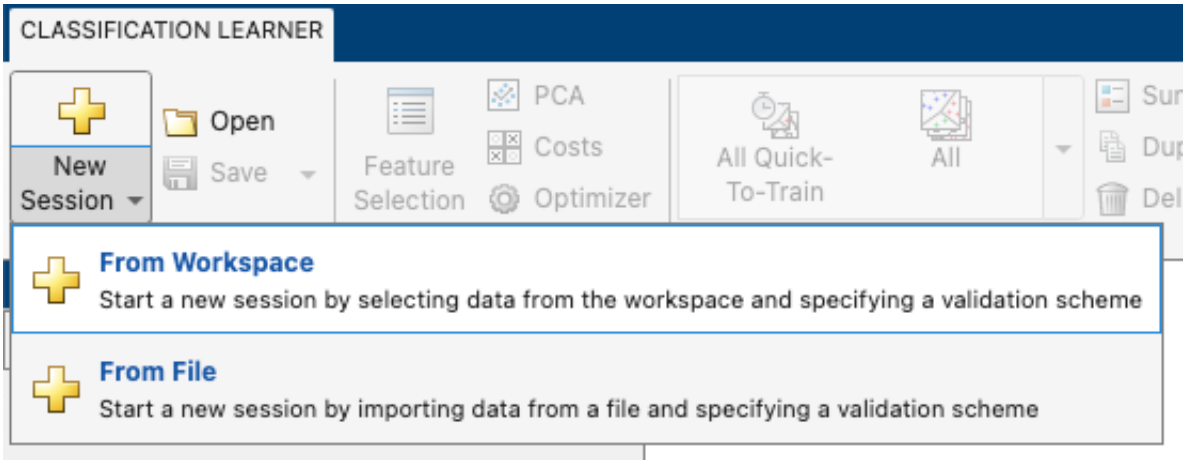
Step 1:



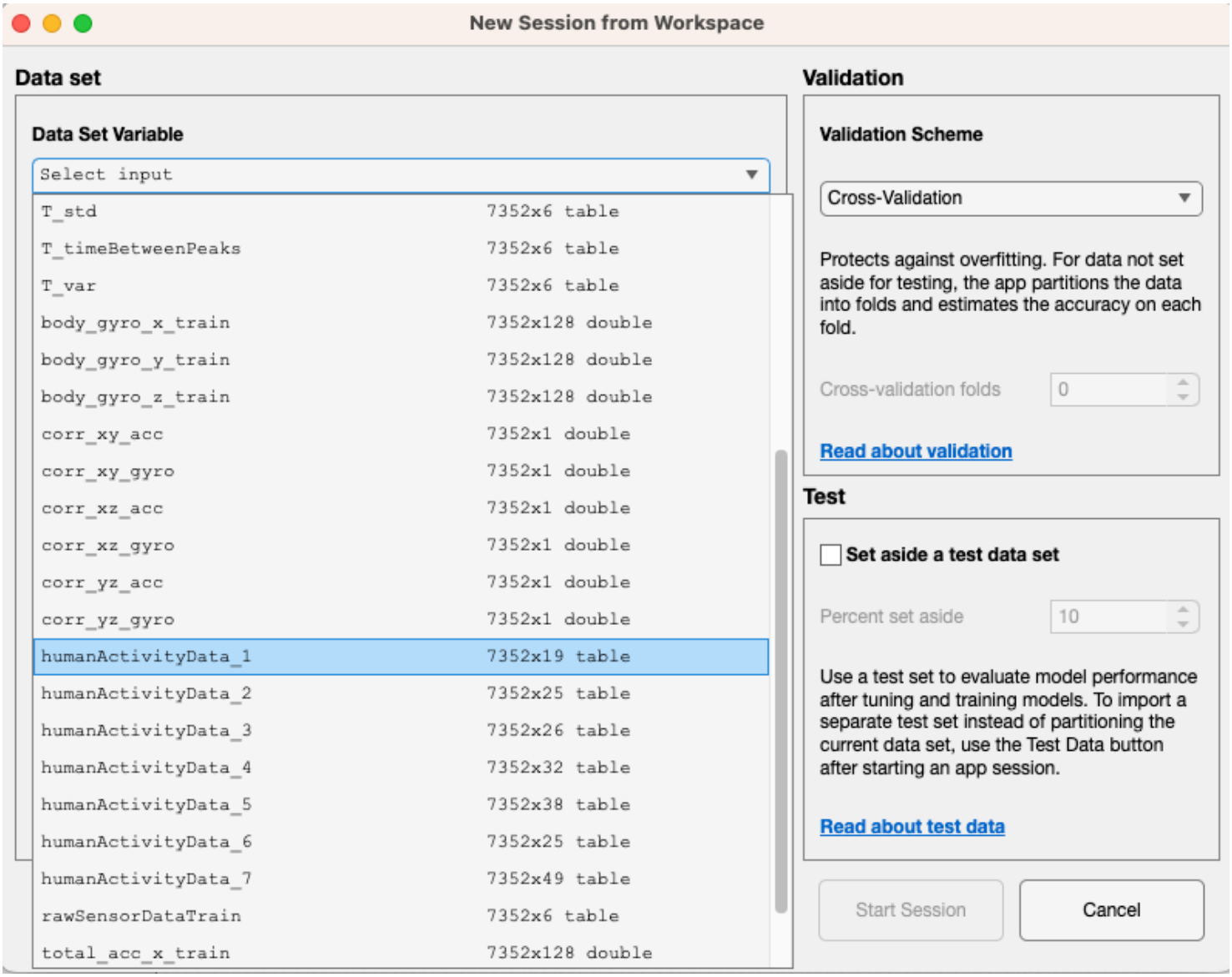
Step 2:


CLASSIFICATION LEARNER
New Session
Open
Save
Feature Selection
PCA
Costs
Optimizer
All Quick-To-Train
All
From Workspace
Start a new session by selecting data from the workspace and specifying a validation scheme
From File
Start a new session by importing data from a file and specifying a validation scheme

Step 3:

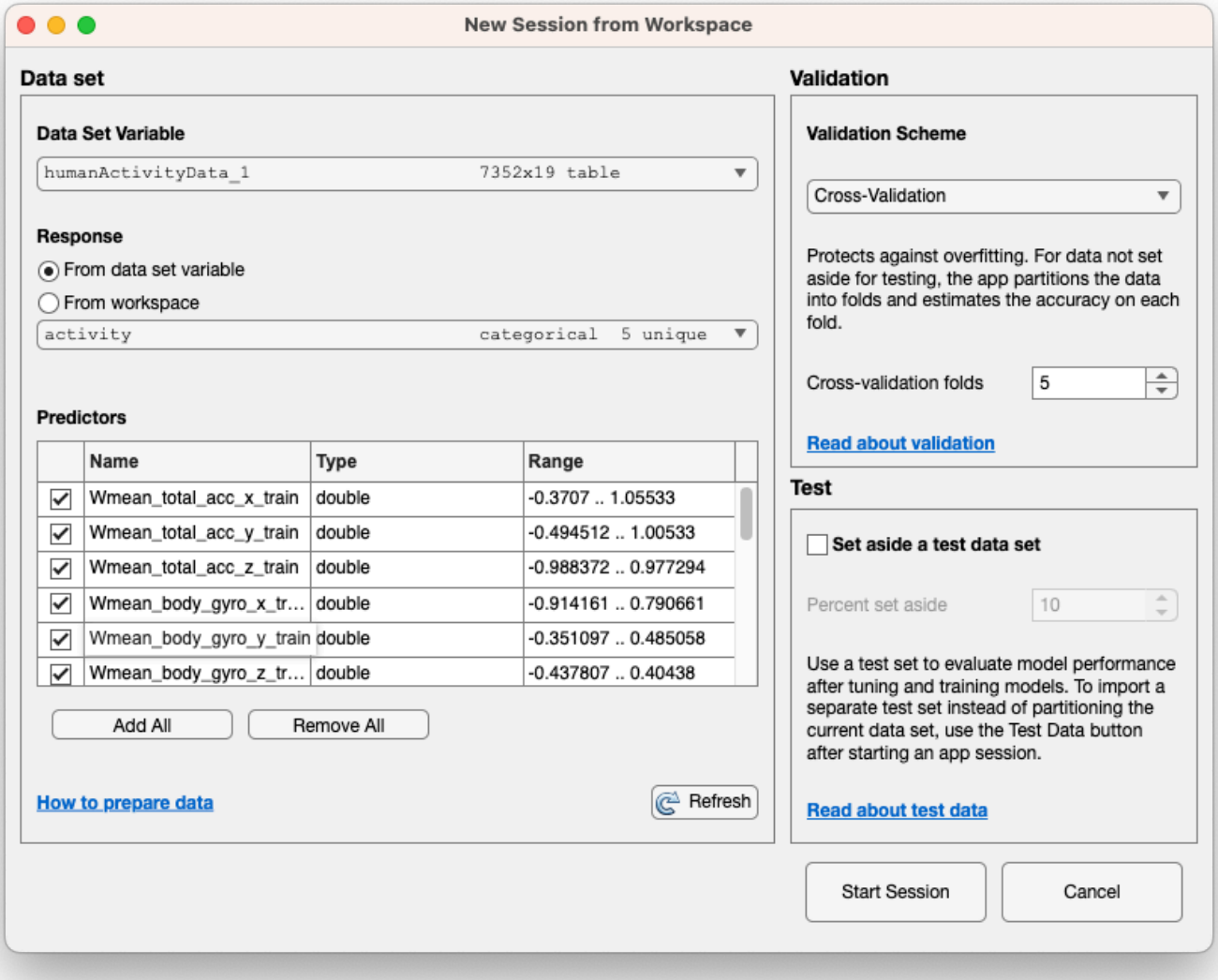

CLASSIFICATION LEARNER
New Session
Open
Save
Feature Selection
PCA
Costs
Optimizer
All Quick-To-Train
All
From Workspace
Start a new session by selecting data from the workspace and specifying a validation scheme
From File
Start a new session by importing data from a file and specifying a validation scheme

Step 4:



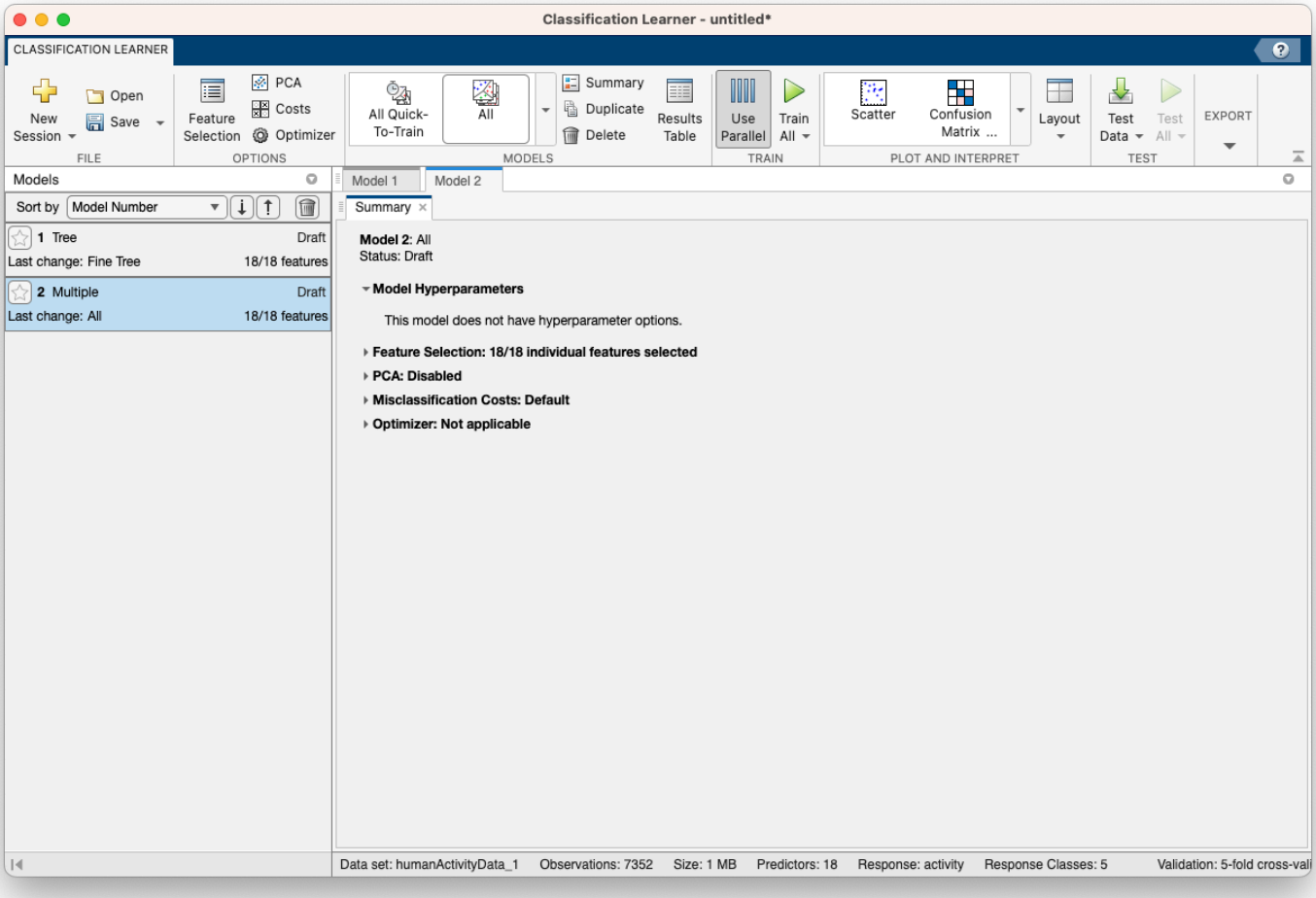
Step 5:

(Use the defaults.)



Step 6:

Select "All" in the models panel then "Train All"


Classification Learner - untitled*
CLASSIFICATION LEARNER
New Session
Open
Save
FILE
Feature Selection
PCA
Costs
Optimizer
OPTIONS
All Quick-To-Train
All
Summary
Duplicate
Delete
Results Table
MODELS
Use Parallel
Train All
TRAIN
Scatter
Confusion Matrix ...
Layout
PLOT AND INTERPRET
Test Data
Test All
TEST
EXPORT
Models
Sort by Model Number
1 Tree
Draft
Last change: Fine Tree
18/18 features
2 Multiple
Draft
Last change: All
18/18 features
Model 1
Model 2
Summary
Model 2: All
Status: Draft
Model Hyperparameters
This model does not have hyperparameter options.
Feature Selection: 18/18 individual features selected
PCA: Disabled
Misclassification Costs: Default
Optimizer: Not applicable
Data set: humanActivityData_1
Observations: 7352
Size: 1 MB
Predictors: 18
Response: activity
Response Classes: 5
Validation: 5-fold cross-vali