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Getting Started with AutoML Using MATLAB®

Why AutoML?

Automated machine learning (AutoML) lets you automate difficult and iterative steps in the model building workflow without requiring machine learning expertise.

What limits adoption of machine learning:

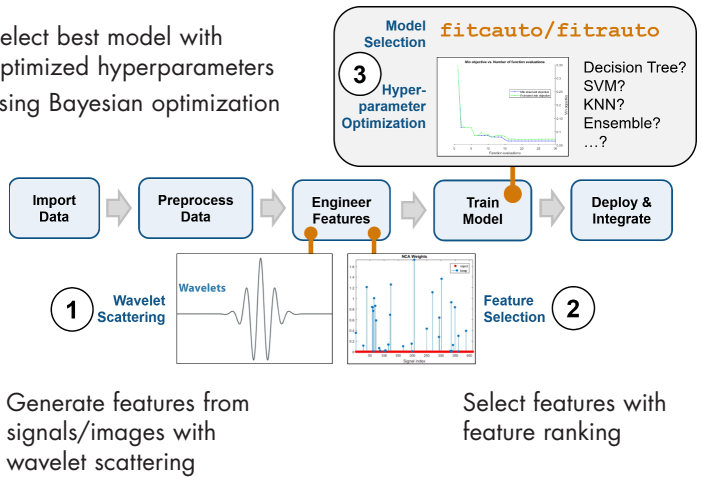
- High cost of required expertise
- Incremental iterative workflow
- Manual optimization not feasible for lots of models

Benefits of AutoML

- Engineers and domain experts with little to no expertise can build good models.
- Machine learning experts save time.
- Applications that require lots of optimized models can be realized.

Approaches to Automating Model Building

Select best model with optimized hyperparameters using Bayesian optimization

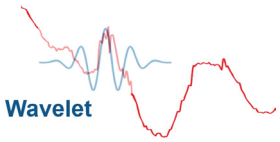


Generate features from signals/images with wavelet scattering

Select features with feature ranking

1. Feature Extraction

Wavelets decompose complex signals.



Wavelet Scattering


```
sf = waveletScattering (SignalLength);
Loop over signal
   waveletFeature = featureMatrix(sf,signal)
   Append waveletFeature to feature table
   Add labels
end
```

Note:

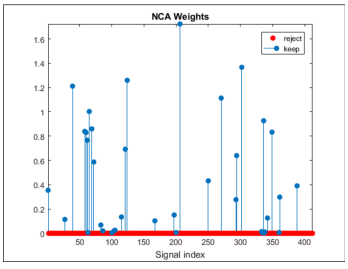
Works well for signal and image data

2. Feature Selection

Neighborhood Component Analysis

Identify small subset of features with high predictive power.

```
fscnca(data, labels, 'Lambda');
find(mdl.FeatureWeights > 0.2)
```



Also available:

- Max Relevance Min Redundancy
- ReliefF
- Stepwise selection

3. Model Selection

Identify best model in one step:

For classification: `fitcauto(data, labels, 'Options', ...)`

For regression: `fitrauto`

Options

- Limit optimization iterations: `MaxObjectiveEvaluations`
- Activate parallel execution: `UseParallel`
- Save model after each iteration: `SaveIntermediateResults`
- Limit which models and hyperparameters to consider: `Learners` / `OptimizeHyperparameters`
- Display errors: `ShowPlots`

Notes:

- Not guaranteed to find best model
- Good results after 50–150 iterations

Learn more: *mathworks.com/discovery/automl.html*

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