MONASH University

MONASH BUSINESS SCHOOL

Feature-based Time Series Forecasting

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Joint work with

Introduction

Big picture of the problem

Time series features

- Transform a given time series $y = \{y_1, y_2, \cdots, y_n\}$ to a feature vector $F = (f_1(y), f_2(y), \cdots, f_p(y))'\}$.

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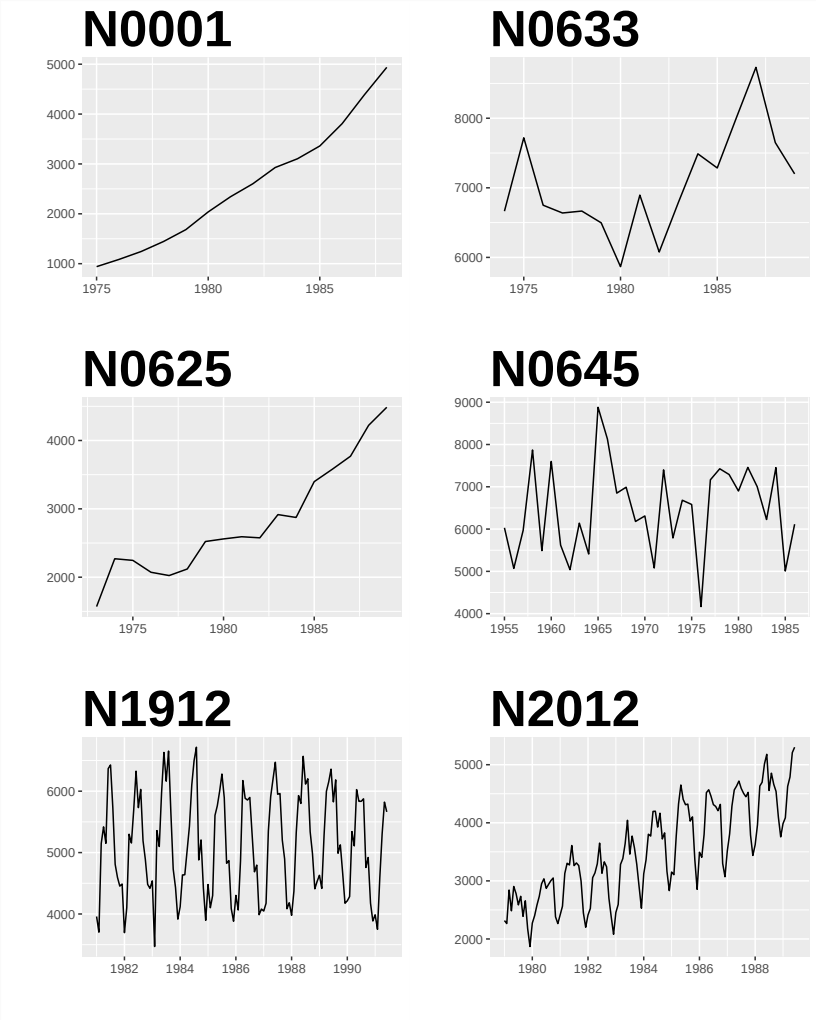

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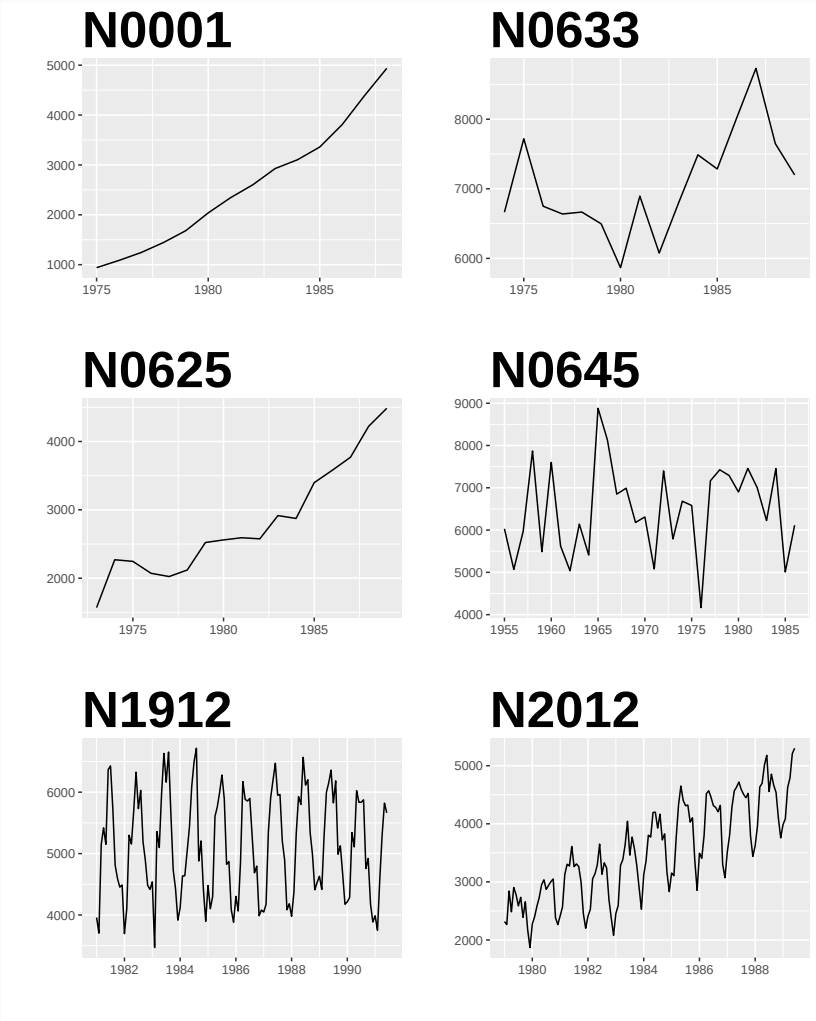
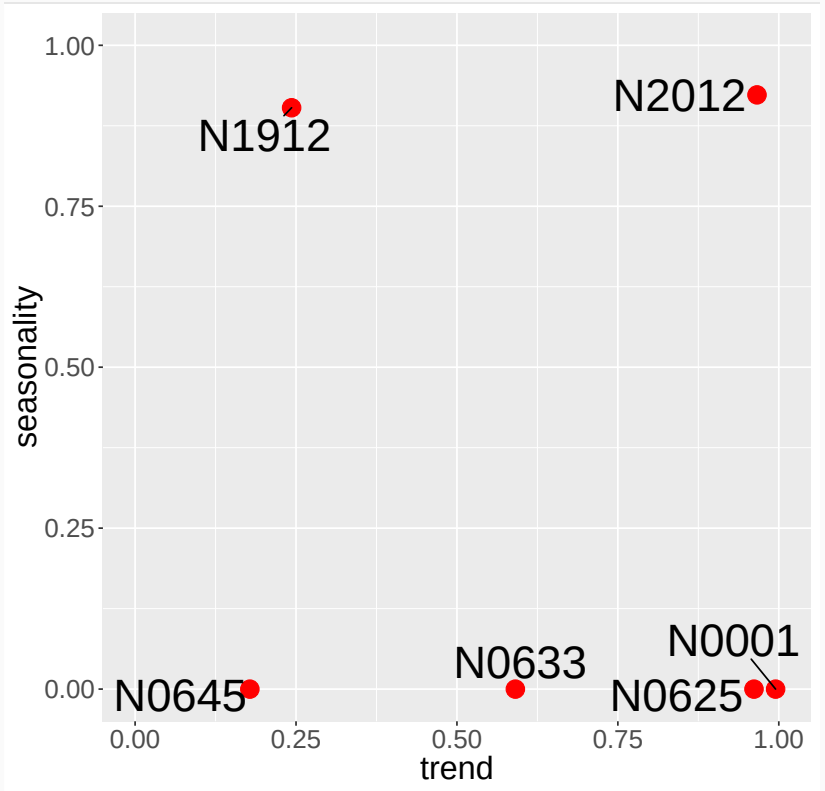
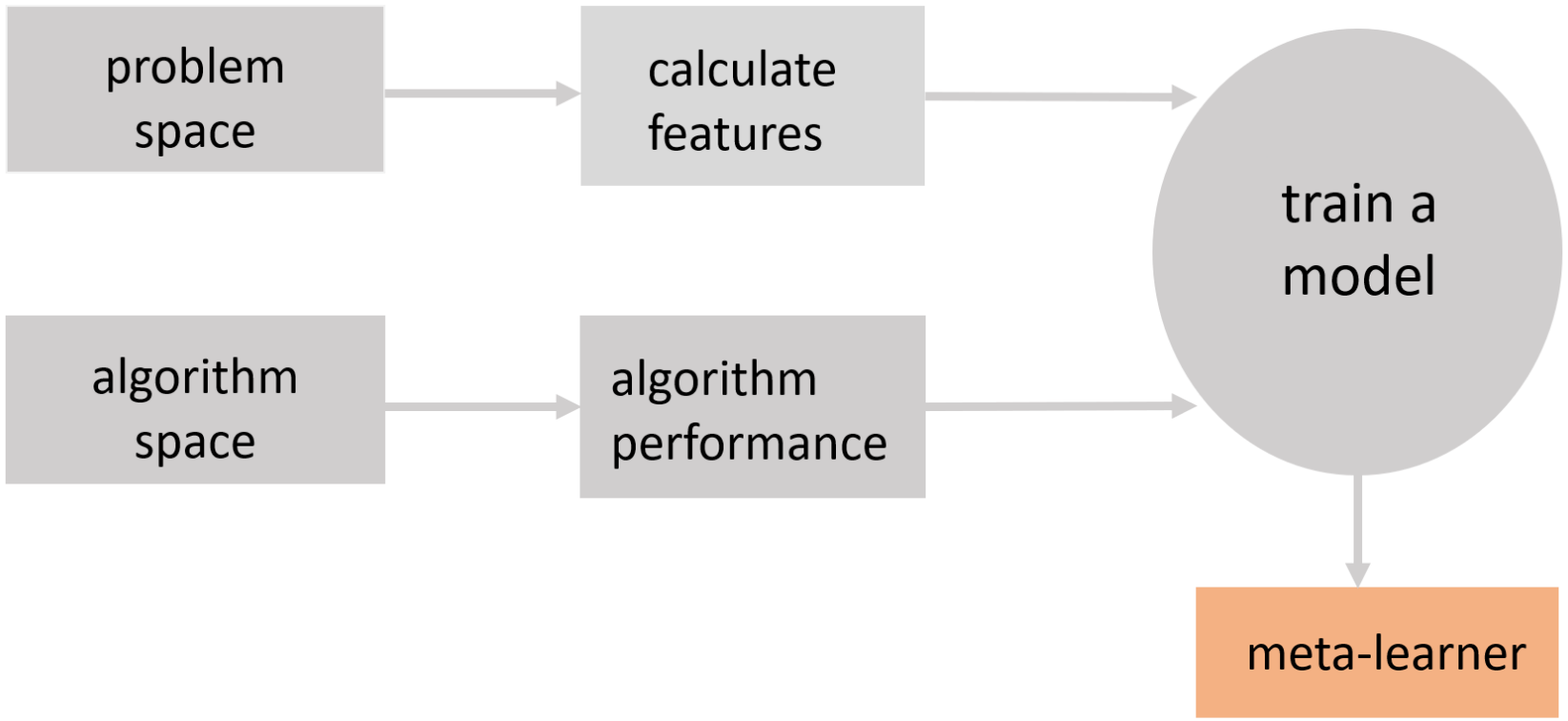




Features used to select a forecasting model

- length
- strength of seasonality
- strength of trend
- linearity
- curvature
- spikiness
- stability
- lumpiness
- parameter estimates of Holt's linear trend method
- spectral entropy
- Hurst exponent
- nonlinearity
- parameter estimates of Holt-Winters' additive method
- unit root test statistics
- crossing points, flat spots
- peaks, troughs
- ACF and PACF based features - calculated on raw, differenced, and remainder series.
- ARCH/GARCH statistics and ACF of squared series and residuals.

Meta-learning



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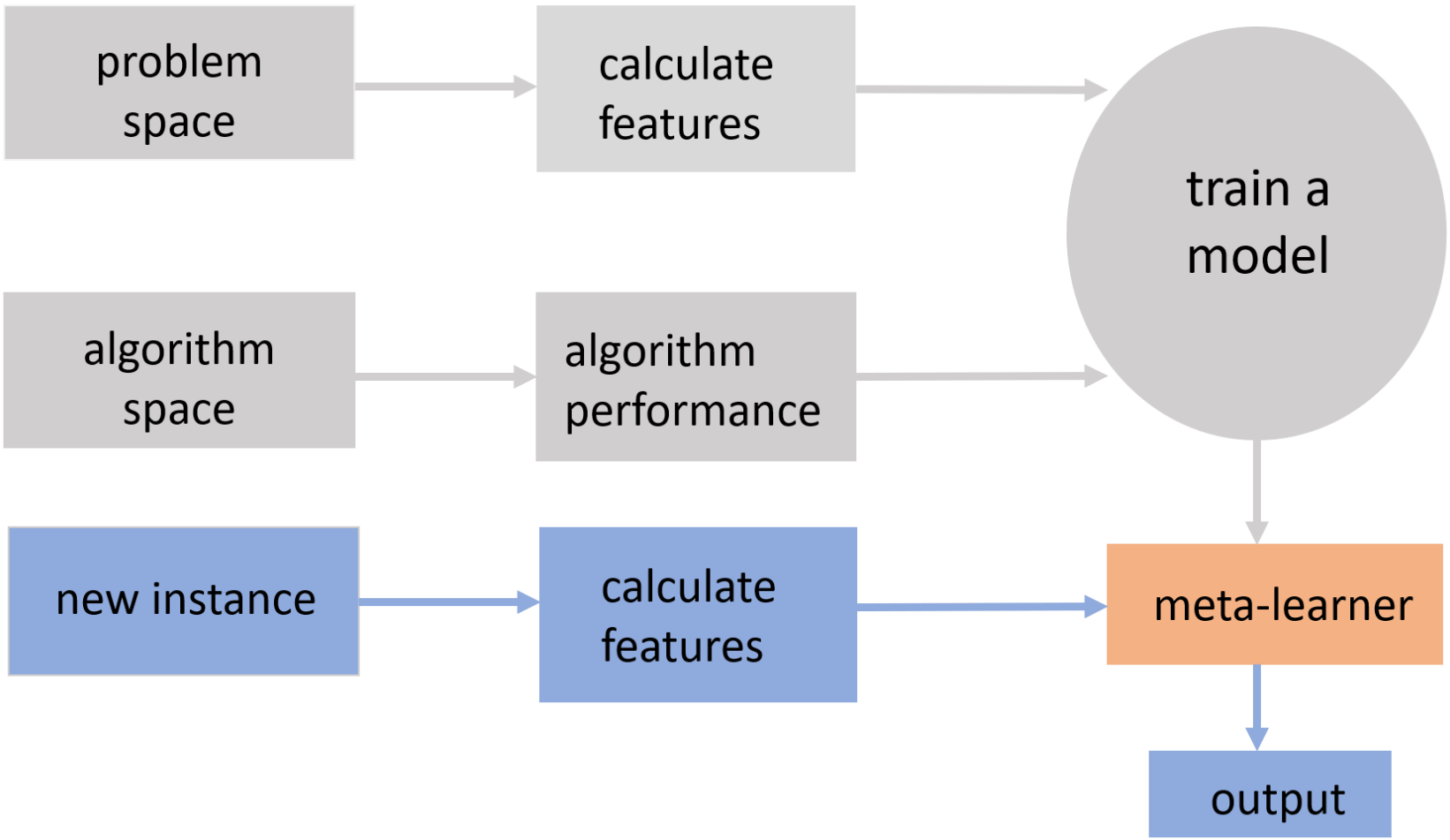
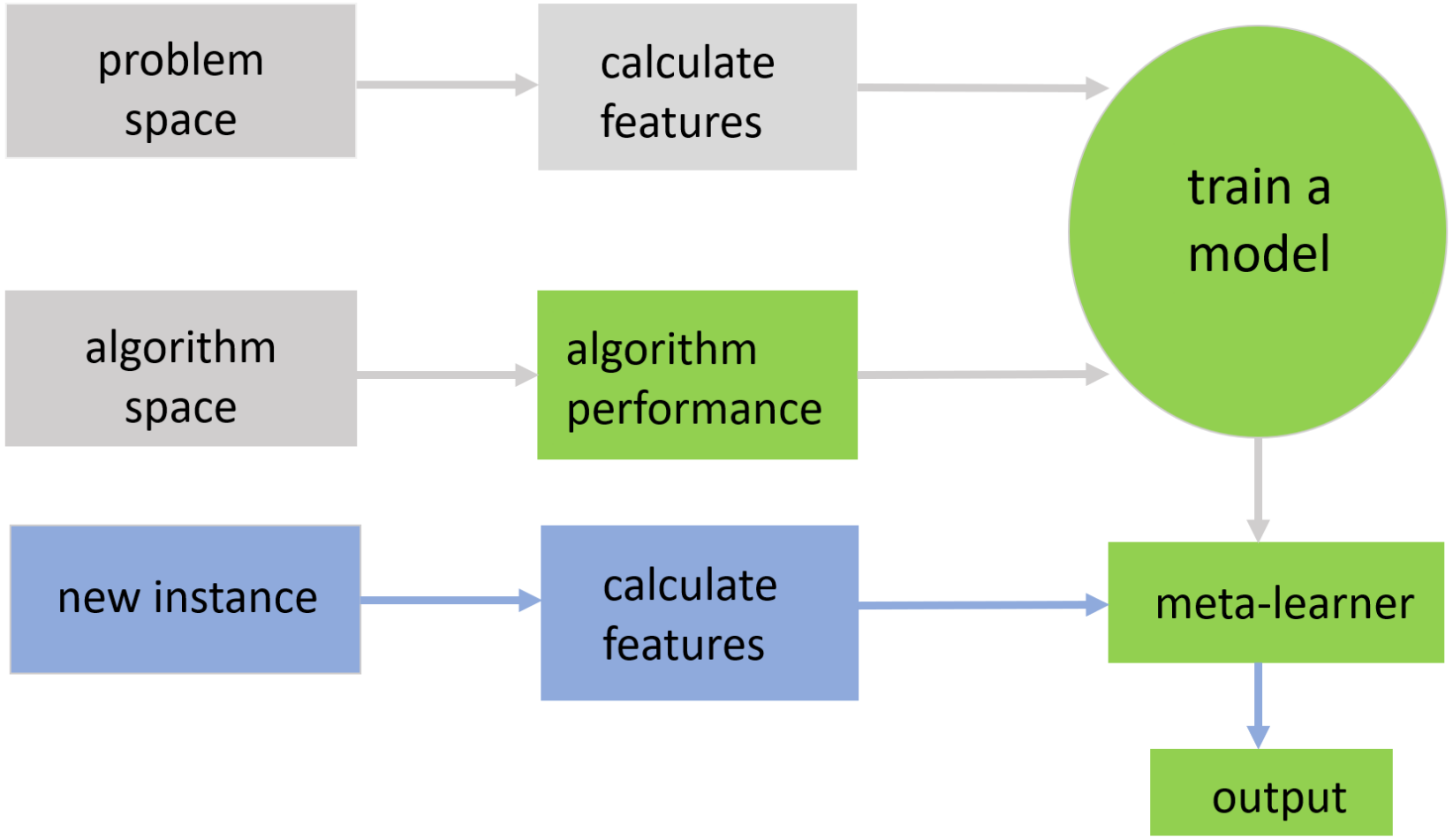


Feature-based forecasting algorithms



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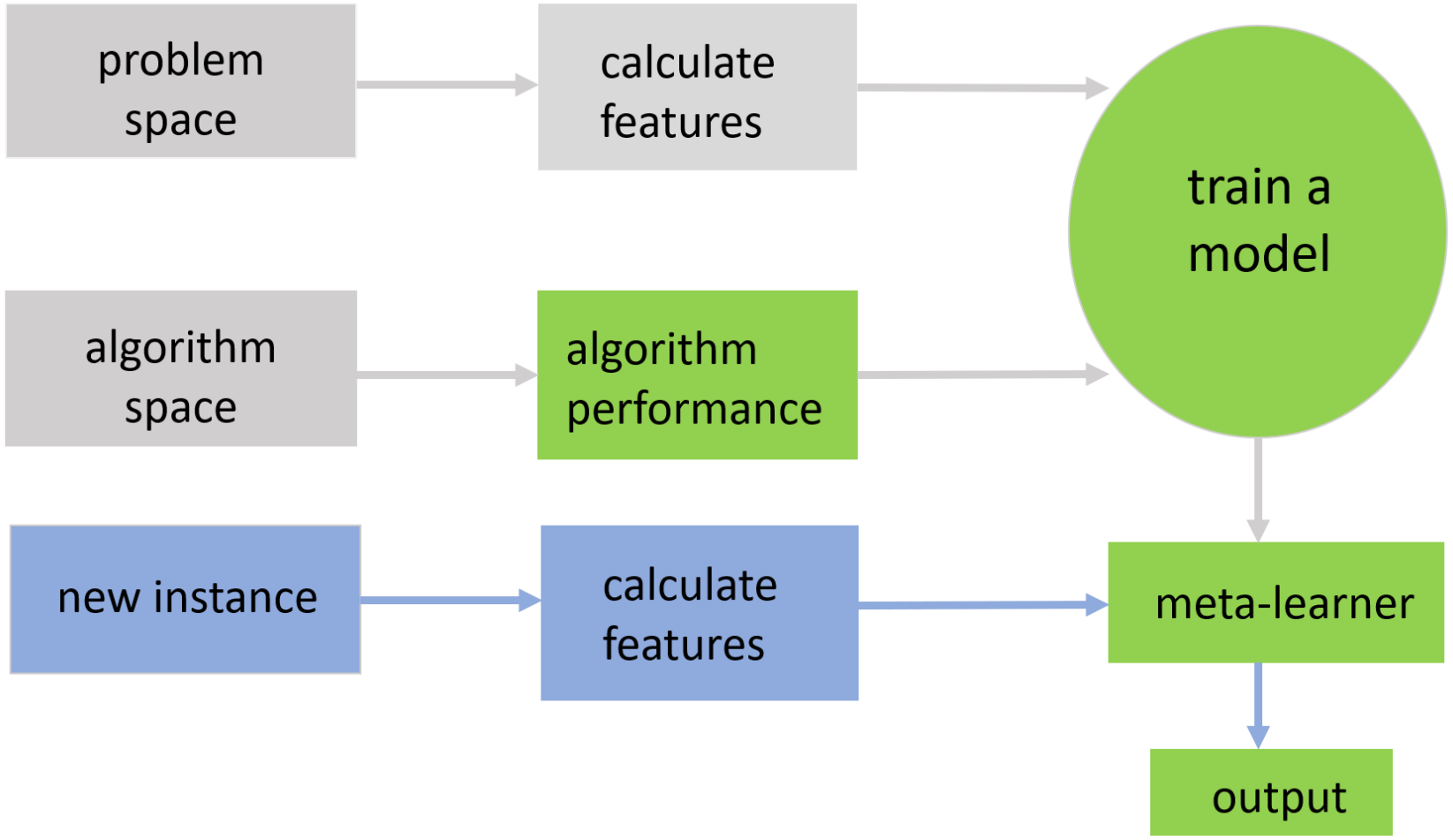
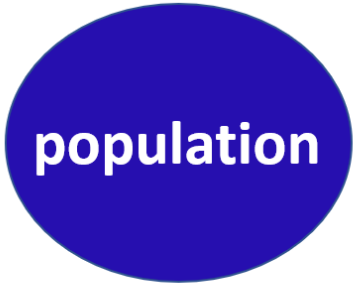
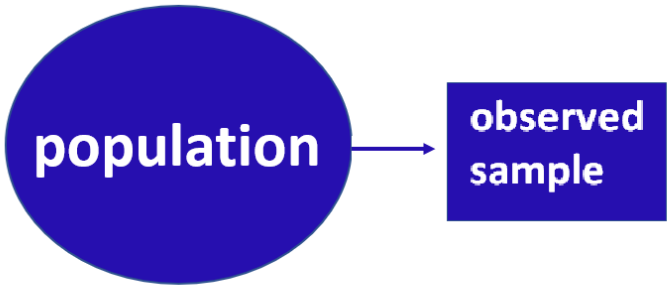


- three algorithms: FFORMS, FFORMA, FFORMPP

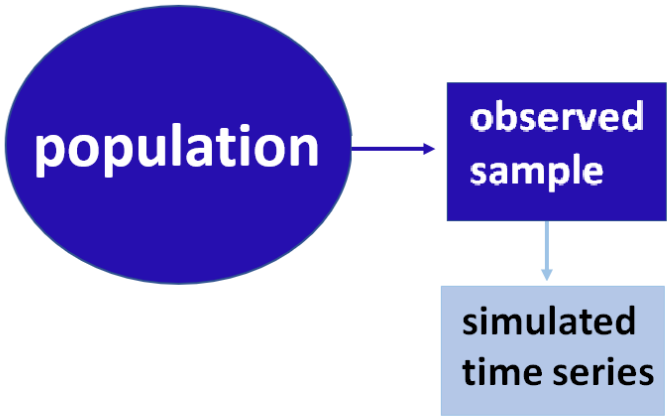
FFORMS: Feature-based FORecast Model Selection



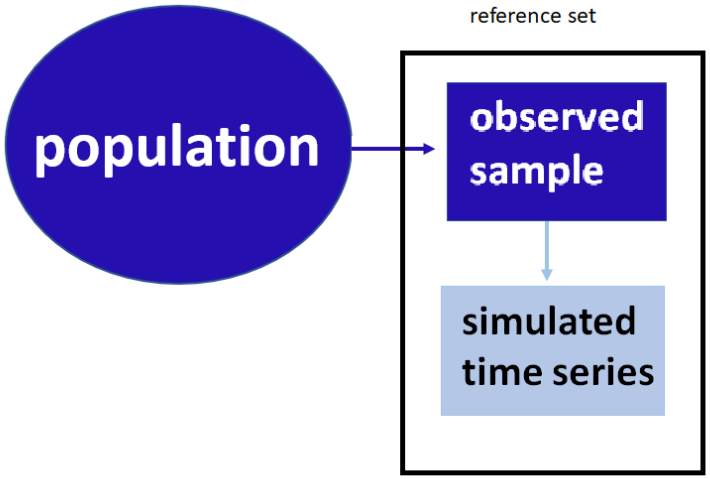
FFORMS: observed sample



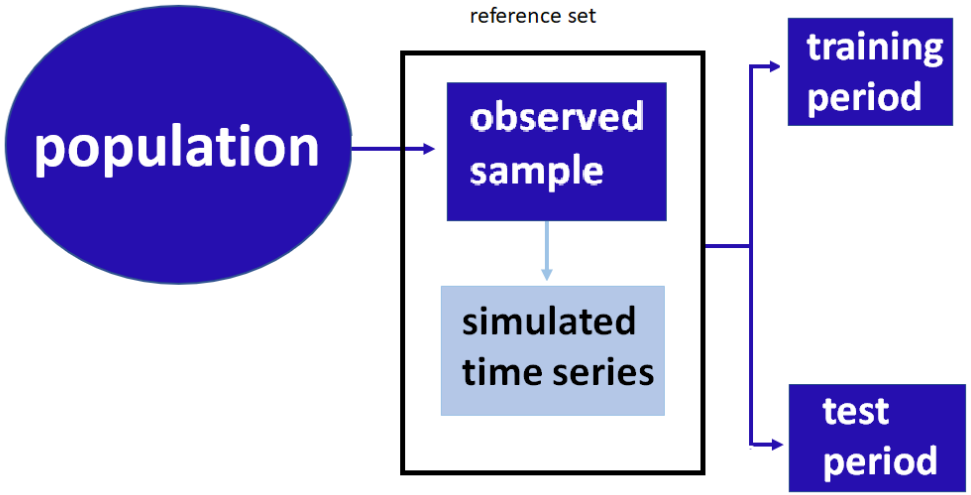
FFORMS: simulated time series



FFORMS: reference set



FFORMS: Meta-data



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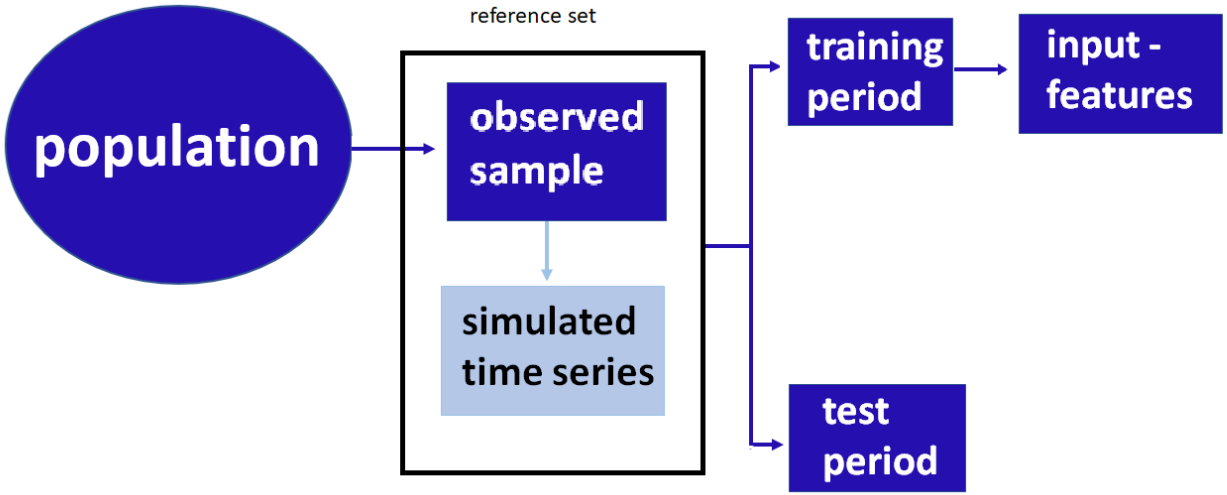

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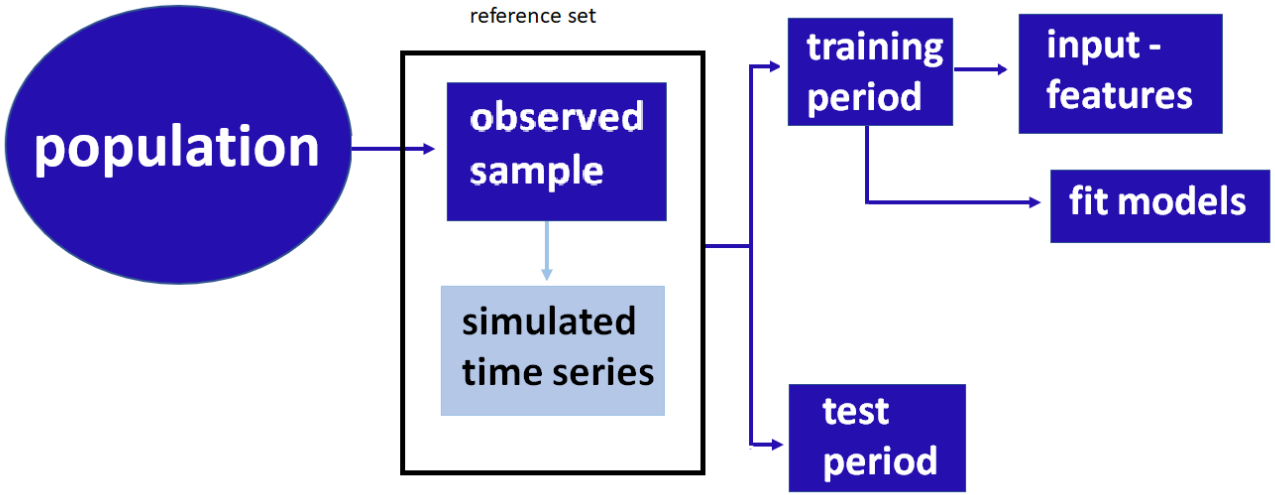

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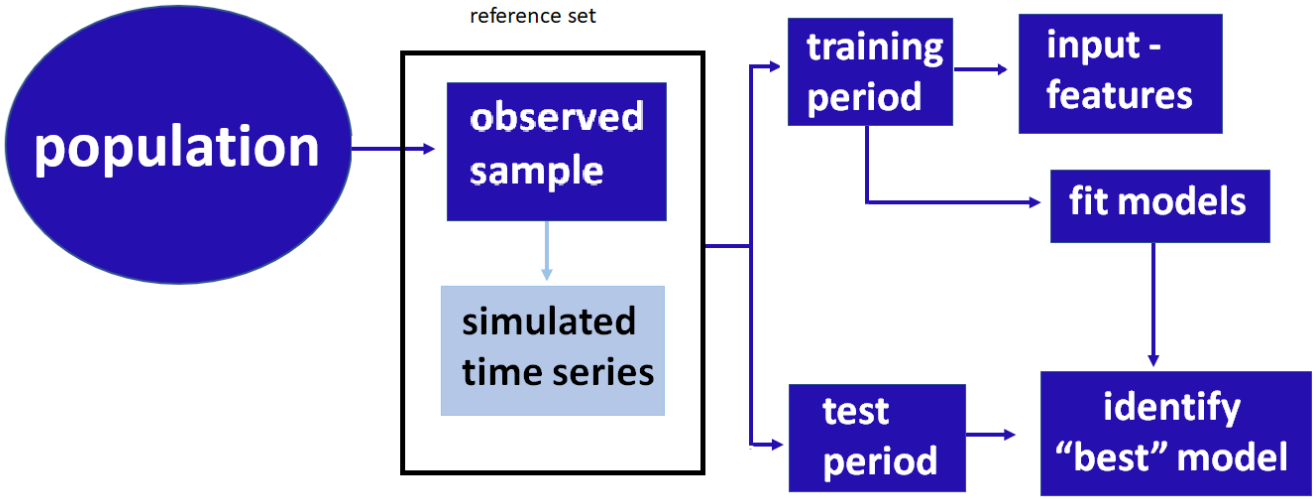

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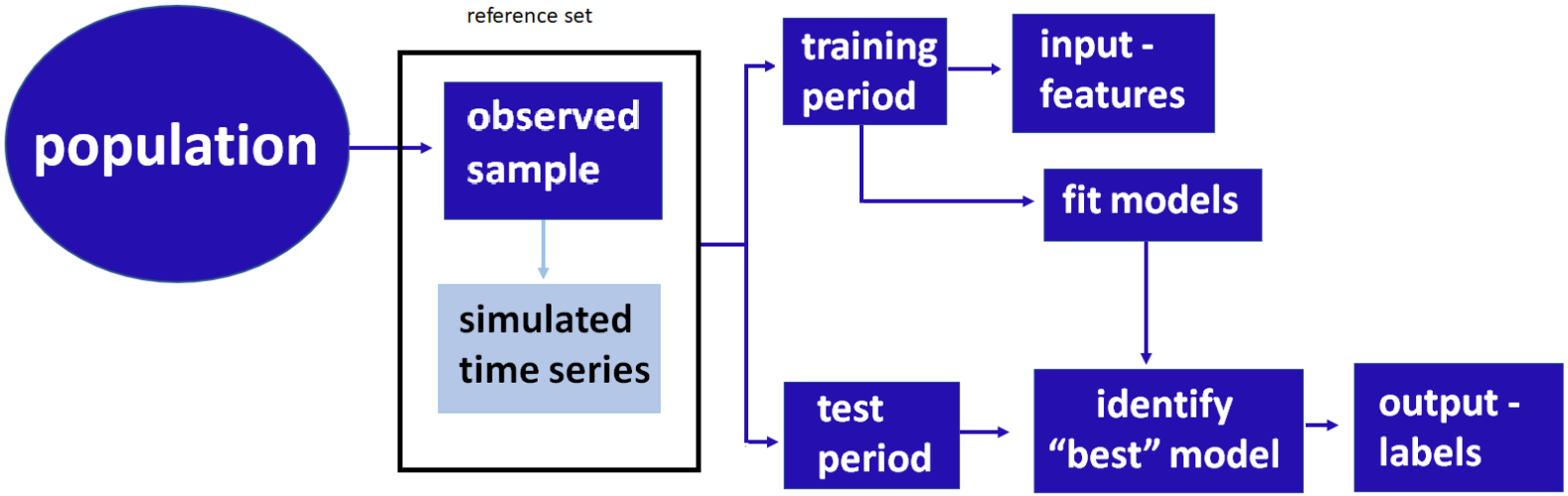

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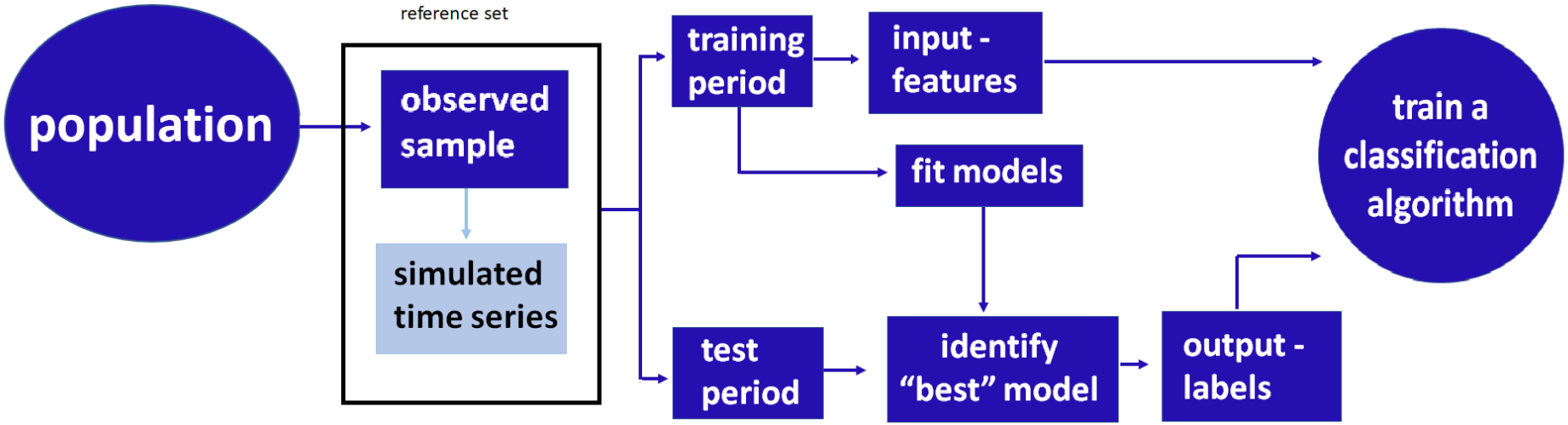
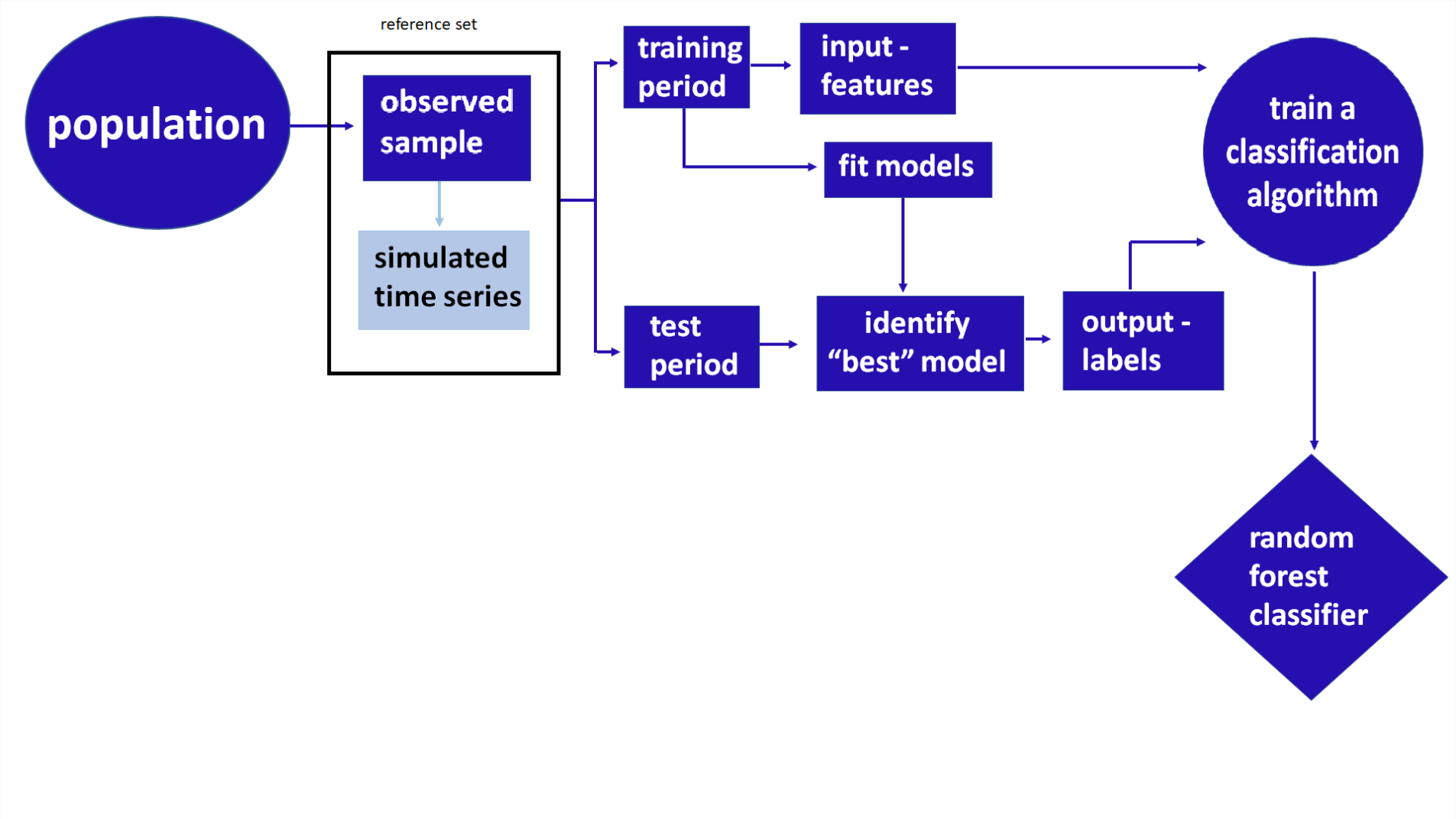
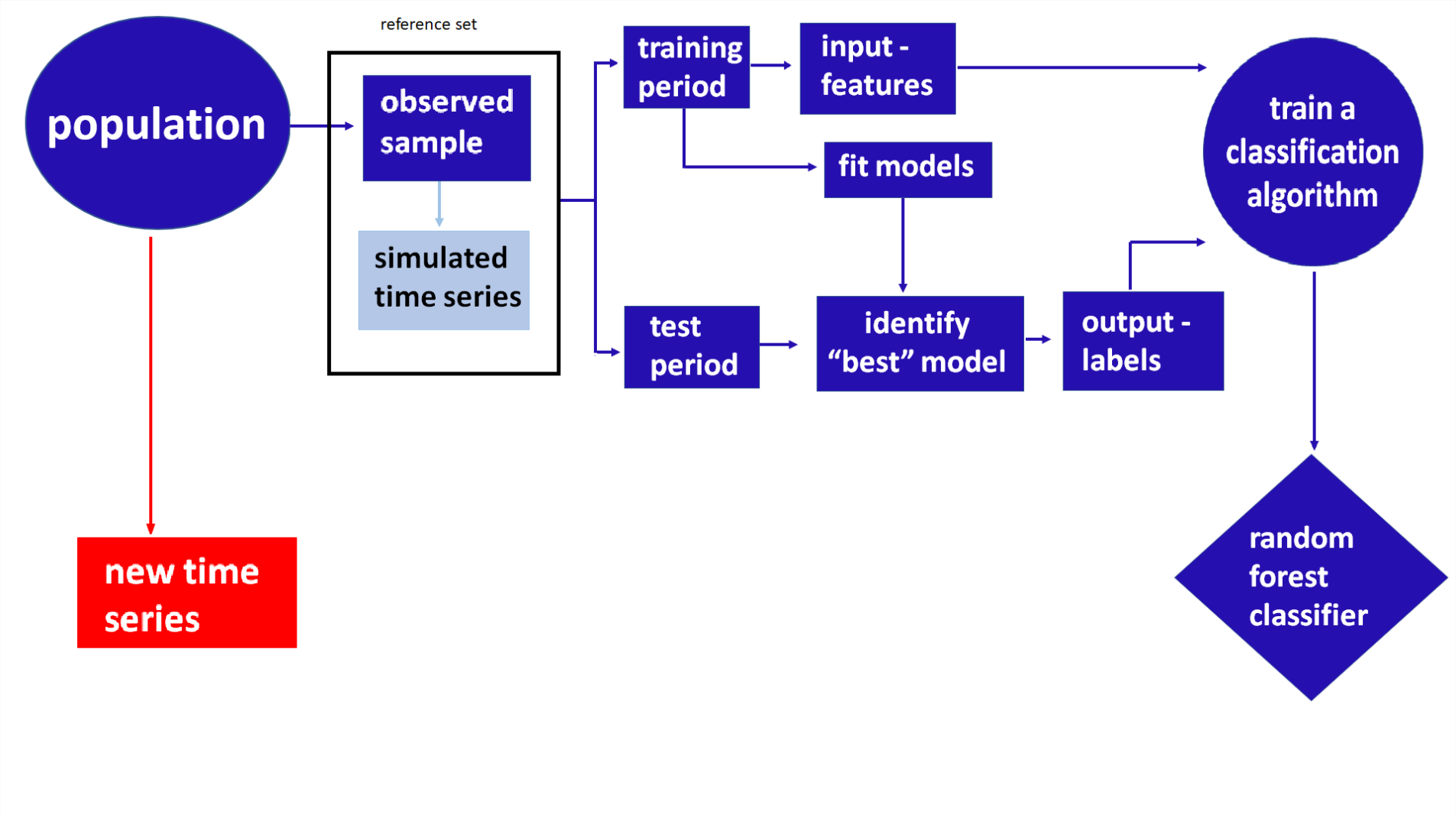


FFORMS: Random-forest classifier



FFORMS: “online” part of the algorithm



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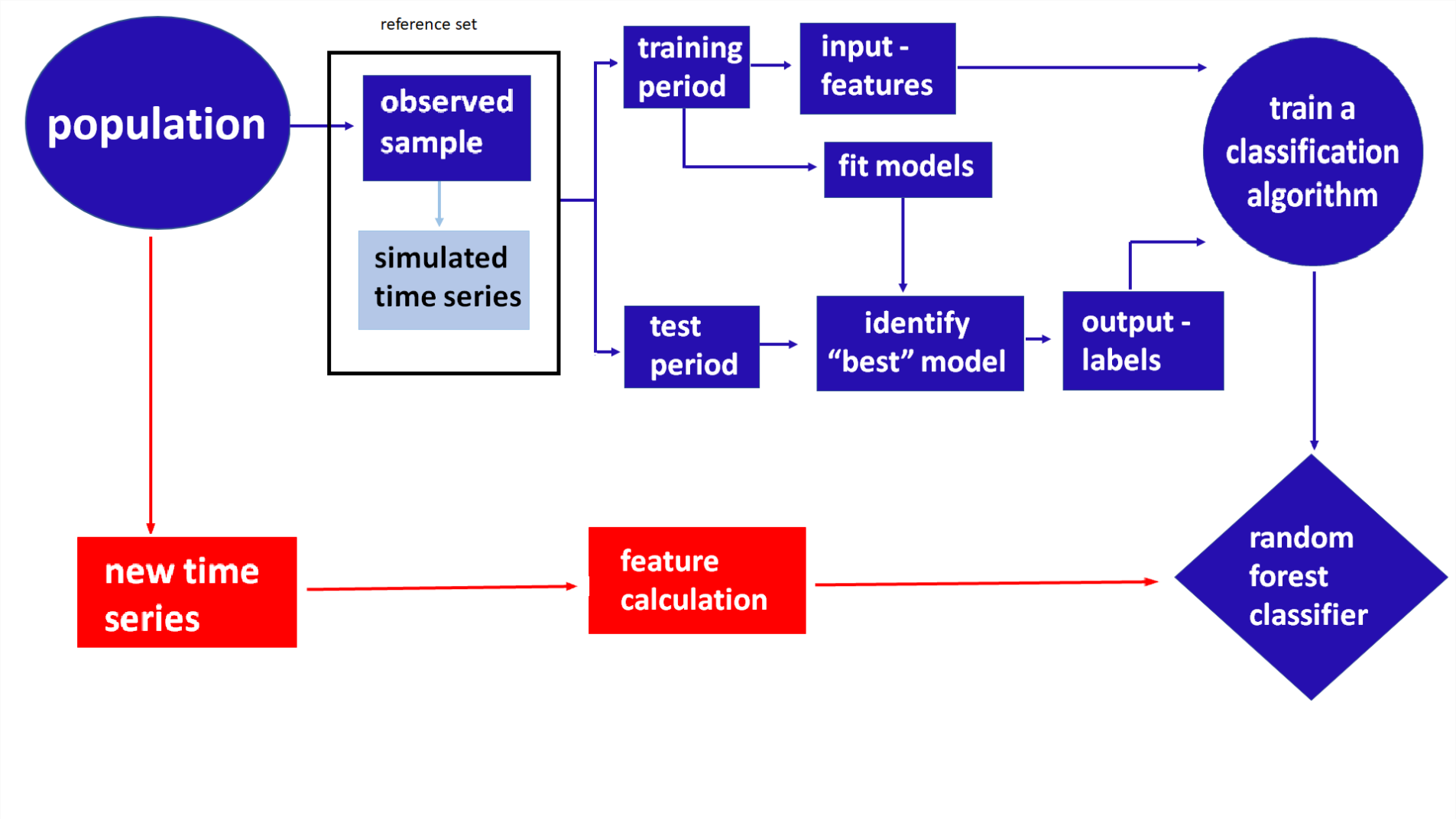

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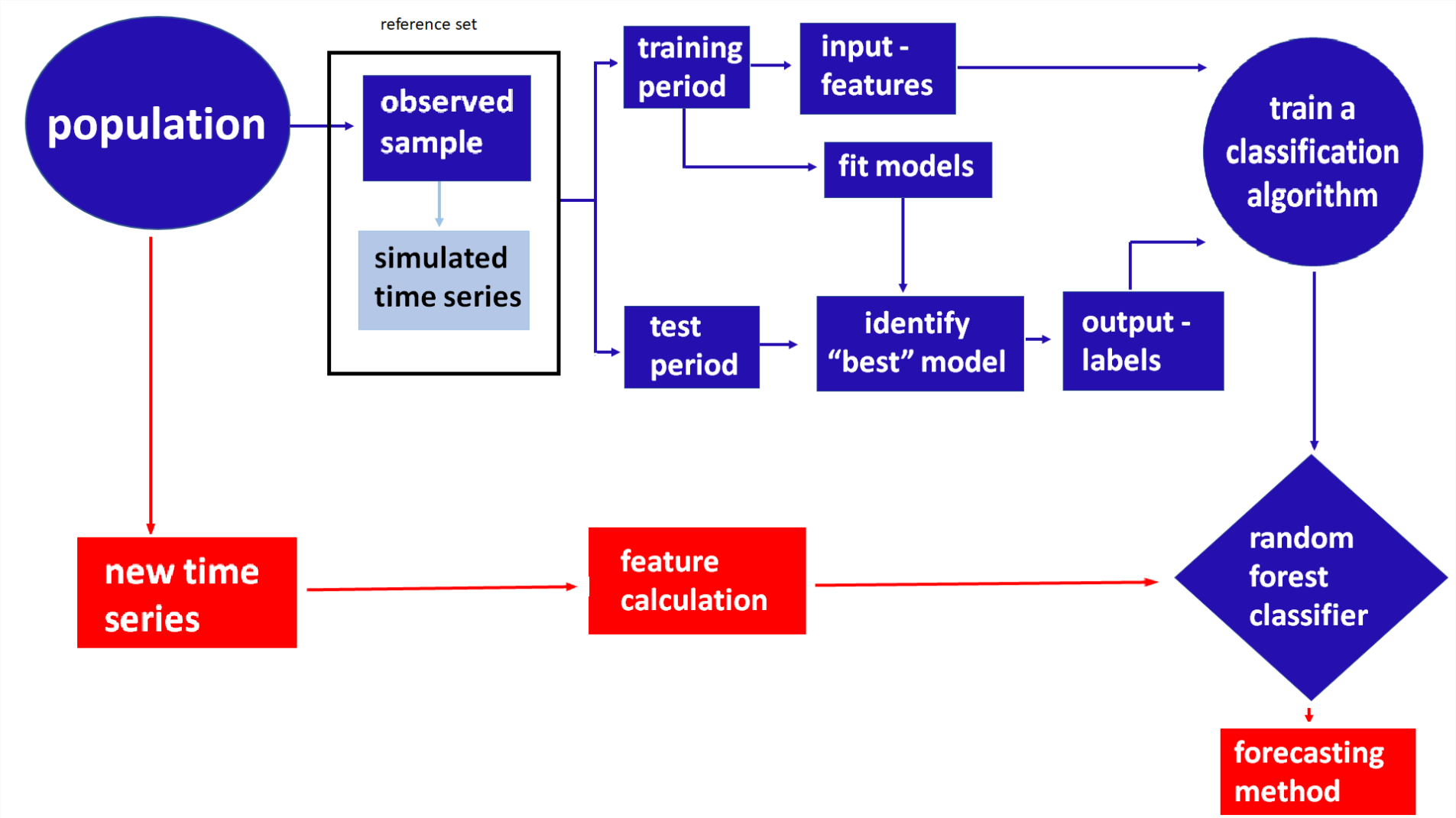

Peeking inside FFORMS

Feature-based FORecast Model Averaging

Feature-based FORecast Model Performance Prediction

R packages

References