

Predictive Models for Time Series Analysis

A Hands-On Course

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Teachers

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Classes

- Introduction & Preprocessing - 30/04/2026 - 14-18
- Distances, Approximation & Global Features - 05/05/2026 - 09-13
- Classification & Regression Part 1 - 07/05/2026 - 14-18
- Classification & Regression Part 2 - 12/05/2026 - 09-13
- Forecasting - 14/05/2026 - 09-13
- In-class Project - 19/05/2026 - 09-13

Syllabus

- **Time Series Preprocessing**

- Time Series, Datasets and Problems
- Missing Values and Anomalies
- Normalizations
- Time Series Components
- Stationarity

- **Distances, Approximations & Global Features**

- Euclidean Distance
- Dynamic Time Warping
- Piecewise Aggregate Approximation
- Symbolic Aggregate approXimation
- Discrete Fourier Transformation
- Symbolic Fourier Approximation
- Singular Value Decomposition
- Principal Component Analysis
- Global Structural Features

- **Classification & Regression**

- Instance-based Models
- Linear Models
- Tree-based Models
- Shapelet-based Models
- Dictionary-based Models
- Deep Learning-based Models
- Kernel-based Models
- Ensemble-based Models

- **Forecasting**

- Simple Forecasting Methods
- Exponential Smoothing
- Autoregressive Methods
- Forecasting via Reduced Regression
- Deep Learning-based Models
- Probabilistic Forecasting

Exam - TSA Project

- The project starts the last lecture.
- Objective: accomplish a TSA task in the best possible way showing different approaches the problem and justifying every choices.
- A PDF report with images and tables of maximum 10 pages (min font 11pt) summarizing the analytical workflow designed and followed.
- The code/notebooks to realize the project.
- The project must be submitted within 7 days from the last lecture.
- **Deadline 26/05/2026**

Laboratory



tslearn

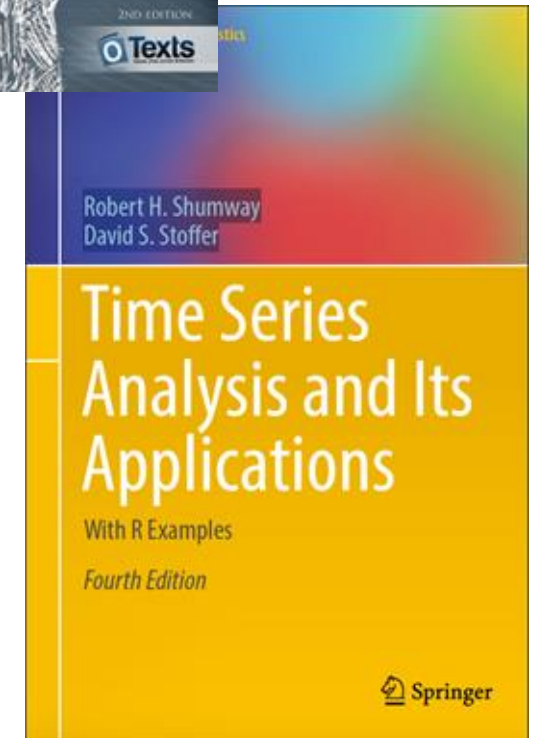
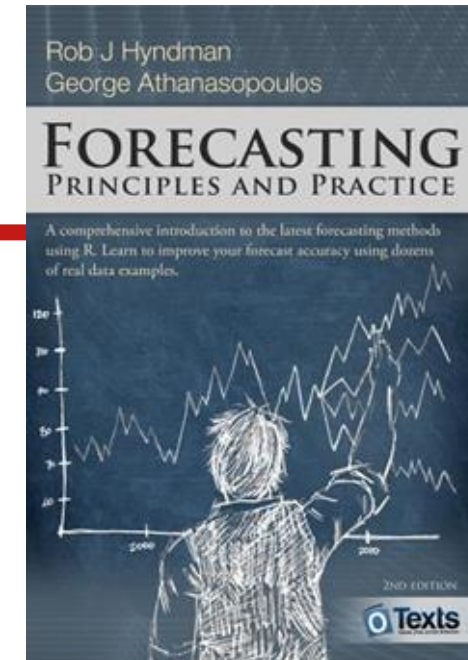


matplotlib



Material & Resources

- Forecasting: Principles and Practice. Rob J Hyndman and George Athanasaopoulos. (<https://otexts.com/fpp2/>)
- Time Series Analysis and Its Applications. Robert H. Shumway and David S. Stoffer. 4th edition. (<http://www.stat.ucla.edu/~frederic/415/S23/tsa4.pdf>)
- Time Series Analysis in R (<https://s-ai-f.github.io/Time-Series/>)
- Introductory Time Series with R. Michaela A. Kratofil (https://michaela-kratofil.com/files/2009_Book_IntroductoryTimeSeriesWithR.pdf)
- Mining Time Series Data. Chotirat Ann Ratanamahatana et al. 2010. (https://www.researchgate.net/publication/227001229_Mining_Time_Series_Data)
- Dynamic Programming Algorithm Optimization for Spoken Word Recognition. Hiroaki Sakode et al. 1978.
- Experiencing SAX: a Novel Symbolic Representation of Time Series. Jessica Line et al. 2009
- catch22: CANonical Time-series CHaracteristics selected through highly comparative time-series analysis Carl H Lubba et al. 2019.



Questions?

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Let's start!
