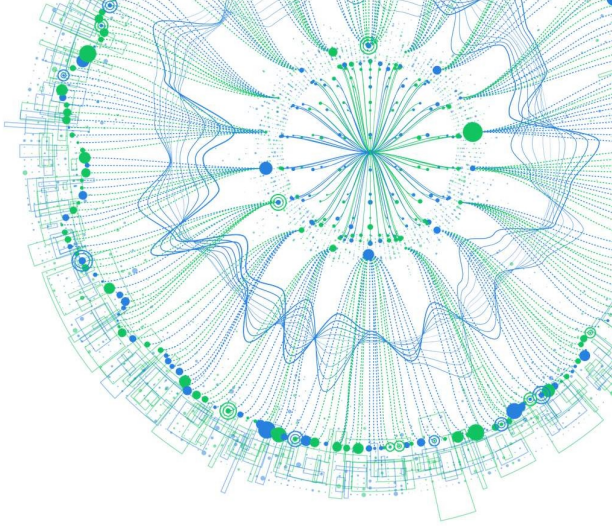


Time Series Analysis

Kubrick's four-day Core Time Series Analysis covers the theoretical principles for applying ML to time series prediction problems, along with practical considerations.

The course includes a range of problems and approaches covered, including analysis of panel data and time-to-event analysis.

Part 1 – Introductory time series analysis

1. Time series analysis: introduction and context

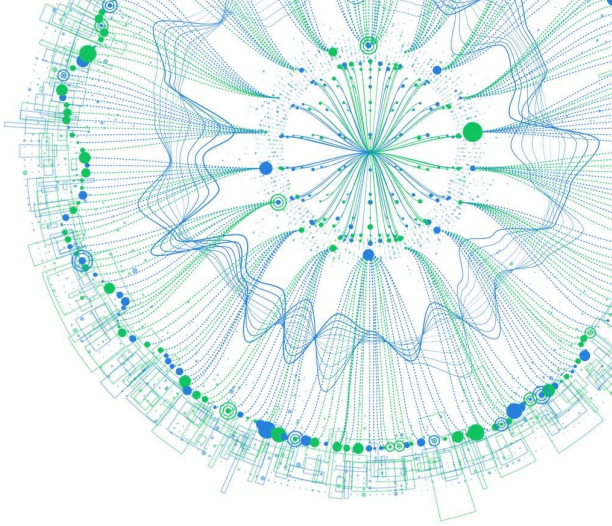
- definition and scope of time series analysis
- purpose of analysis (description, diagnosis, regression, classification, synthesis)
- domains (finance, oil and gas, e-commerce, weather, trends)
- conventional and machine-learned modelling
- success and evaluation criteria, e.g. measuring prediction accuracy

2. Exploration and Validation

- panel format data
- clean and tidy representation
- time indexing: frequencies, super/subsampling, timedate processing
- visualization
- processing: scaling, differencing, averaging, autocorrelating

3. Modelling Trends with Linear Regression

- the linear model and its assumptions
- least squares estimation
- evaluating the regression
- prediction (forecasting)
- analysis of residuals



Part 2 – Further timeseries modelling

1. Decomposition models

- trend, seasonal and cyclic components
- additive and multiplicative decompositions
- analysis of residuals
- modelling heteroscedasticity

2. Seasonal models

- seasonal decomposition
- seasonal adjustment
- forecasting with decomposition

3. General linear models for multivariate time series

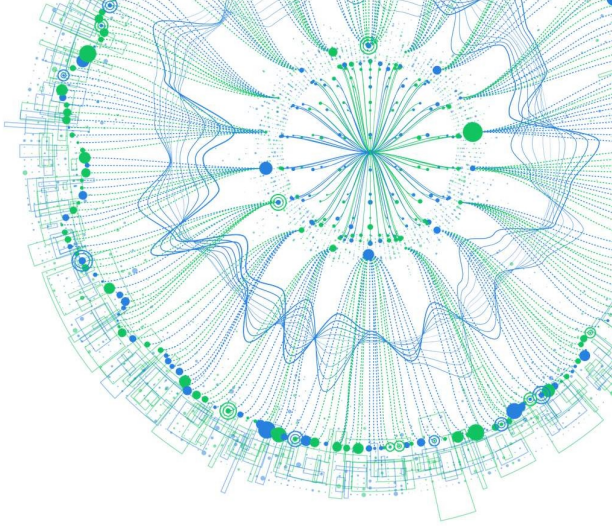
- auto-regressive (AR) models
- moving average (MA) models
- using integrated terms to ensure stationarity
- Vector Auto-regressive (VAR) models

4. Machine-learned time series modelling

- time series prediction as a supervised regression problem
- time series classification
- boosted trees and other popular approaches

5. Deployment pipelines for time series analysis

- patterns for learning and prediction
- pipelines: sklearn, statsmodels, lifelines
- pytorch and skorch
- other open source frameworks, e.g. Facebook Prophet



Part 3 – Duration models, probabilistic predictions

1. Modelling time-to-event processes

- Applications of time-to-event modeling
- Modelling event density
- Survival and hazard functions
- Kaplan Meier plots
- Cumulative hazard and the Nelson Aalen estimator

2. Survival Regression

- Improved forecasting using additional data
- Stratified models
- Cox's model

3. Modelling uncertainty

- Output of the model/analysis: errors and uncertainty
- Probabilistic classification
- Interval estimates for regression
- Quantile estimation and pinball loss functions