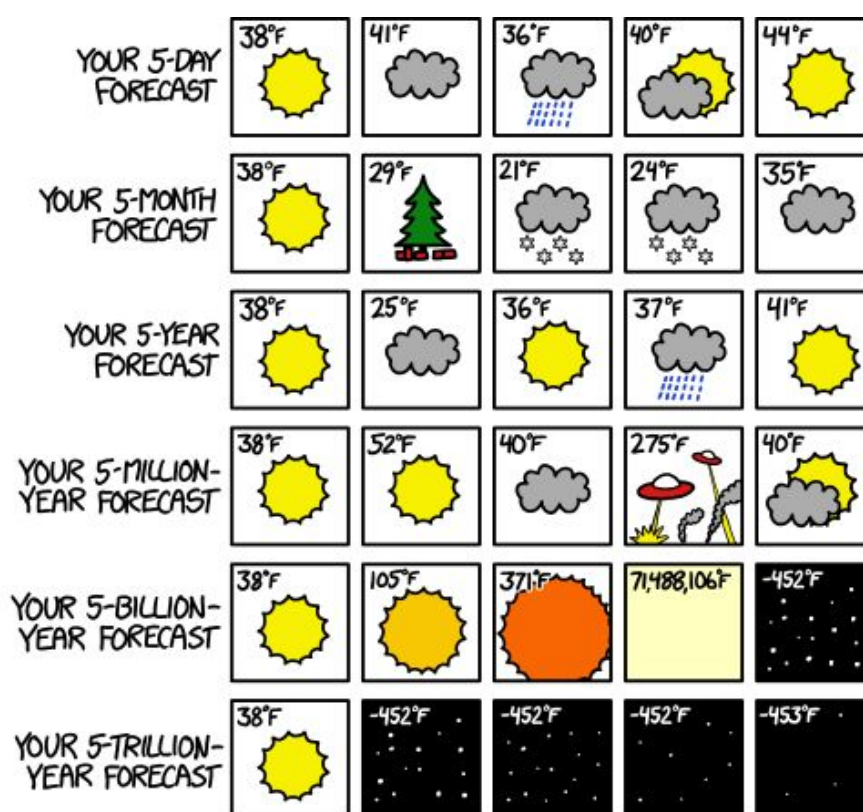




Prévision de séries temporel

...de la demande de passagers, de la chasse au lynx et de la demande d'énergie



Your 5 day forecast

Source: [xkcd](#)

Objectifs du module

A basic introduction to predicting time series

- Understand how the steps to forecast time series are different to other machine learning prediction
- Use classic linear time series models to make univariate forecasts
- Use automated time series forecasting software to make univariate forecasts

Modalités

- Durée du projet : 3 jours
- Travailler en équipes de deux
- Produire vos propres scripts et memos individuels pour terminer le projet

Contexte

The data revolution is coming (actually it's already here)! We are collecting incredible amounts of data with our modern digital world. From our interactions, clicks, purchases online, to our health monitors like 'fitbits', to our gps position from our phones, to our most recent 'selfie' : everything we create in the digital world is time-stamped. The cheaper sensors become and the more sensors and digital systems we incorporate into our lives the more data points we collect to build time series of our lives and society. If some data you have now is NOT a time series, it will be in the future.

Trying to make predictions about the future is known as forecasting. If you can understand accents from the southern hemisphere this useful podcast ['Forecasts are always wrong \(but we need them anyway\)'](#) explains what modern forecasting looks like. In forecasting there can be a lot of terminology and it can take some time to build understanding as to why certain methods are used and might be better than others for different types of data. The aim of this module is to get you to use python to make robust forecasts, and to understand a little of the terminology used in time series forecasting.

Etape 1 (1.5 jour)

ARIMA modelling

Objectifs de l'activité

- Understand how the steps to forecast time series are different to other machine learning prediction

- Use classic linear time series models to make univariate forecasts
- Understand how ARIMA model work

Compétences

- Expliquer une méthodologie typique utilisée lors de la réalisation de prévisions de séries temporel
- Utiliser des modèles classiques de séries temporel statistiques pour faire des prévisions

Consignes

- Complete the tasks in the jupyter notebook 01ARIMA_modelling.ipynb. This notebook will guide you through the process of using ARIMA models on time series data to make forecasts.
- There are many descriptions of ARIMA models and how they work online (and in the book suggested below). Read this to get a basic intuition on what ARIMA models are.

Resources

- Train test splits and cross validation in time series :
<https://stats.stackexchange.com/questions/14099/using-k-fold-cross-validation-for-time-series-model-selection>
<https://robjhyndman.com/hyndsight/tscv/>
- Forecasting: Principles and Practice book (Rob Hyndman) :
<https://otexts.com/fpp2/>
<https://otexts.com/fpp2/non-seasonal-arma.html>
<https://otexts.com/fpp2/transformations.html>
- Pmdarima documentation :
<http://alkaline-ml.com/pmdarima/>
- A more detailed look at the airline passenger problem with more detail :
<https://github.com/TomMonks/code-club-basic-forecasting>

Livrables

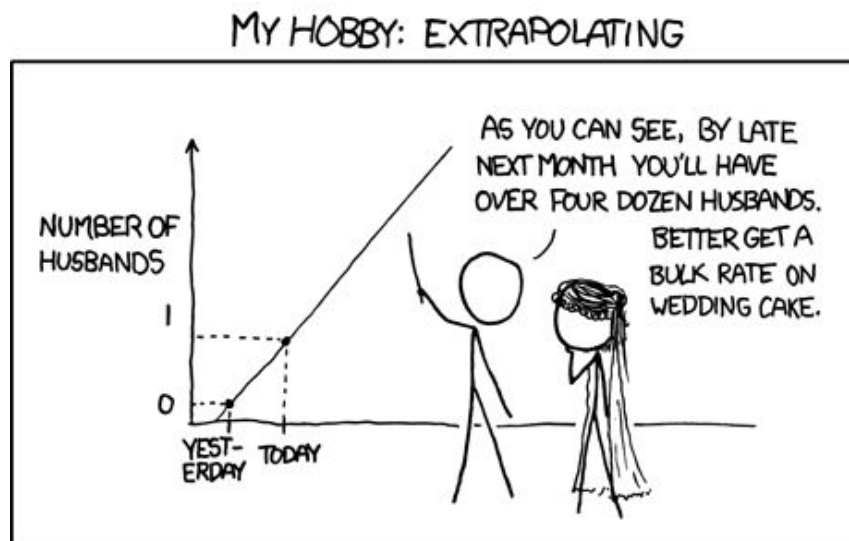
- A memo which explains (in your own words) the following :
 - How Train/Test splitting and Cross Validation of time series data should be performed
 - A brief description of ARIMA time series models
- Python script/notebook (or Memo) that contains :
 - Completed Exercise 1 in 01ARIMA_modelling.ipynb (Lynx skin forecasting)

Pour aller plus loin

- Try building an ARIMA model without using the auto_arima function. See section : 'ACF and PACF plots' here :
<https://otexts.com/fpp2/non-seasonal-arma.html>
- Find a time series data set that interests you and try building a forecast of it

Etape 2 (1.5 jours)

Use prophet to make prophecies...*ahm*...forecasts



Extrapolating is one form of forecasting...

Source : [XKCD](#)

Objectifs de l'activité

- Use automated time series forecasting software to make univariate forecasts
- Make robust evaluations of the accuracy of model forecasts
- Understand what the advantages and disadvantages of using automated forecast software like prophet are
- Complete a forecasting project on a real data set, taking raw data, defining your objective, evaluating you model and making step to improve it

Compétences

- Utilisez Facebook Prophet pour faire des prévisions

Consignes

- Work through the jupyter notebook 02Prophet_forecasting to understand how prophet works
- Read the resources below to understand what prophet is
- Complete Exercise 1 in the notebook

Ressources

- Prophet Documentation
<https://facebook.github.io/prophet/>
- Paper describing prophet
<https://peerj.com/preprints/3190/>
- Why prophet exists - "Time series are not sexy"
<https://www.youtube.com/watch?v=pOYAXv15r3A>
- Blog on tuning hyperparameters in prophet
<https://towardsdatascience.com/implementing-facebook-prophet-efficiently-c241305405a3>
- Prophet applied to energy data forecasting
<https://www.kaggle.com/robikscube/time-series-forecasting-with-prophet>

Livrables

- Python script/notebook (or Memo) that contains :
 - Completed Exercise 1 in 02Prophet_forecasting.ipynb

Pour aller plus loin

- Summary of different types of time series models and how they differ
https://www.youtube.com/watch?v=d4Sn6ny_5LI
- Try adding exogenous variables (such as weather forecasts) to one of your models. Do they improve your model predictions? This is possible in ARIMA models.
https://alkaline-ml.com/pmdarima/modules/generated/pmdarima.arima.auto_arima.html
- Try building an LSTM and compare its predictions to your other models
<https://machinelearningmastery.com/time-series-forecasting-long-short-term-memory-network-python/>
<https://machinelearningmastery.com/multi-step-time-series-forecasting-long-short-term-memory-networks-python/>
<https://medium.com/@cdabakoglu/time-series-forecasting-arima-lstm-prophet-with-python-e73a750a9887>