

For an airline company it is important to forecast the number of air passengers so they can better price their tickets and schedule flights to meet the demand for a given month. The goal is to develop a model for an airline to predict the number of monthly passengers for one year. The data was recorded from January 1949 to December 1960.

1. Start by loading the dataset "air-passengers.csv".
2. Visualize the time series.
3. Use **time series decomposition** to extract the trend and seasonal components.
4. Based on your exploration, determine the most suitable model.
5. Model the series with the usual steps:
 - a. Apply transformations to make it stationary
 - b. Set the values of **d** and **D**. Set the value of **m**.
 - c. Find the optimal **(p,d,q)(P,D,Q)m** parameters.
 - d. Fit the model with the optimal parameters on the training set
 - e. Perform the residual analysis to validate if the model can be used to forecast.
6. Predict a full year of monthly number of air passengers using the **last 12 months** of data as **test set**.
7. Compare the performance of the SARIMA model with a **baseline model** and with an **ARIMA(p, d, q)** model.
8. Visualize all the forecasts in a single plot.
9. Compare the performance of all three models using the **mae** and **mape** metrics.
10. Which model is best? Should it be used or not.