Interactive User Interfaces using Dash

LDATA2010

This exercise session will help you create an interactive tool to explore a dataset. This is especially useful when you need specific views that would not be easily creatable with off-the-shelf software.

You will create this tool using Dash, which is an easy-to-use framework for building interactive data visualization.

Install Dash, pandas and numpy :

```
pip install dash pandas numpy
```

1 Importing and Analyzing the data

Before starting to create an interface, you should first be comfortable with the data that is provided. During this exercise session, we will use the Abalone dataset. The abalone is a type of snail. The dataset contains columns which are measurements which could be used to predict the snail's age :

> "The age of abalone is determined by cutting the shell through the cone, staining it, and counting the number of rings through a microscope – a boring and time-consuming task. Other measurements, which are easier to obtain, are used to predict the age. Further information, such as weather patterns and location (hence food availability) may be required to solve the problem."

Exercise 1

Import the data from the Abalone dataset (in the `abalone.csv` file) in a pandas DataFrame, and show the first ten lines of the dataframe. Display some statistics concerning the data.
Which columns are categorical and which are continuous ? What are the ranges of possible values for each column ? Are there some weird or missing values ?

2 Building a basic layout

Follow the tutorial at : `https://dash.plotly.com/layout`. Don't simply copy-paste the samples, but try to understand each part of the code. Once you're done with the tutorial, apply it to the abalone dataset :

Exercise 2

Create a layout where you display :

- A plot of the distribution of the Length for each Sex.
- A scatter-plot of the Length and the Diameter.
- A table of the first ten lines of the dataframe.

How would you lay these three elements out on the screen ?

3 Callbacks

Once you have something on the screen, it's time to interact with the different parts, and make the information come alive.

Follow the tutorial at `https://dash.plotly.com/basic-callbacks`.

Exercise 3

Using the layout you created in the previous exercise as base, add two dropdowns to choose the columns you want to compare in the scatter plot, and make the scatter-plot respond to those changes.

Exercise 4

Filter the Length distribution plot by number of Rings using a slider. What do you observe ?

4 Crossfiltering

The best way to enable interactivity is often to enable selections in a certain plot to generate changes to other plots.

The tutorial at `https://dash.plotly.com/interactive-graphing`, explains how to achieve this.

Exercise 5

Allow the user to select elements from the scatterplot, and only display the distribution for these elements. The table should also be updated to take the first ten lines of the selected data points instead of from the complete dataset.

5 Building a visualization dashboard

Building an interface that is easy to use yet powerful requires forethought and attention.

Exercise 6 (optional)

Choose 4 plot types that you think are relevant to the abalone dataset. Create an interface with cross-filtering and other UI elements to let the user explore the full dataset. First design it on paper, before creating the layout in Dash, and adding interactivity.