



Institute  
and Faculty  
of Actuaries

# Data Visualisation in Insurance

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12 March 2020

# Research Background

## 1. UCL has two major PhD centres:

- CDT in Financial Computing & Analytics
- CDT in Foundational AI

## 2. UCL Actuari project aims to provide the insurance industry with software solutions that enable companies to **exploit advances in machine learning**(e.g. LSTM, GANs, Transfer/Meta Learning)

## 3. UCL is building a **pioneering analytics platform**:

- Template library for Insurance applications (Python)
- Federated Learning algorithms Templates
- Visualisation Templates

## 4. About me:

- PhD Researcher at UCL
- Background: MSc in Mathematics
- Experience : Qualified Actuary, 5 years of industry experience

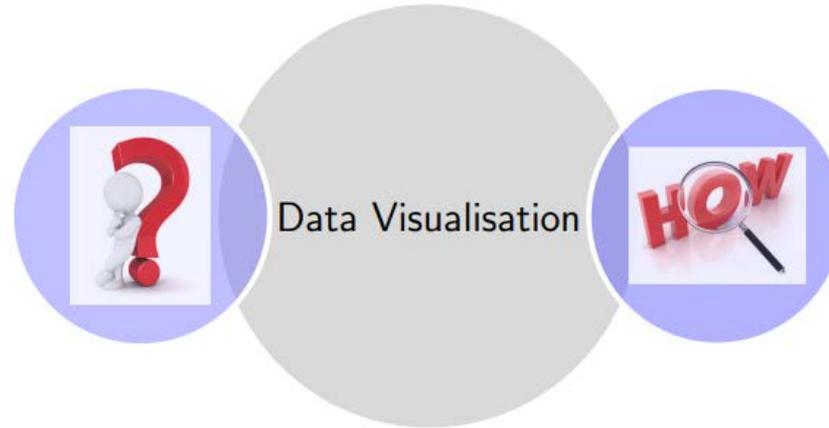


# Agenda

1. Data Visualisation for Insurance
2. Visualisation Libraries in Python
3. Interactive plotting in Python
4. Bokeh basics (open source visualisation Library)
5. Interactive plotting examples
6. Conclusions



# Data Visualisation for Insurance



- What is Data Visualisation ?
- Available Technology
- Is it important ?



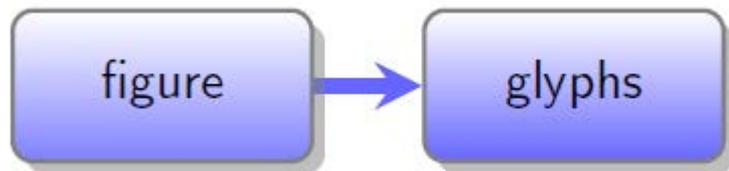
# Visualization Libraries for Python

Static images files	Interactive visualizations
Matplotlib	<b>Bokeh</b>
Seaborn	Plotly
Pandas	Dash





# Bokeh basics



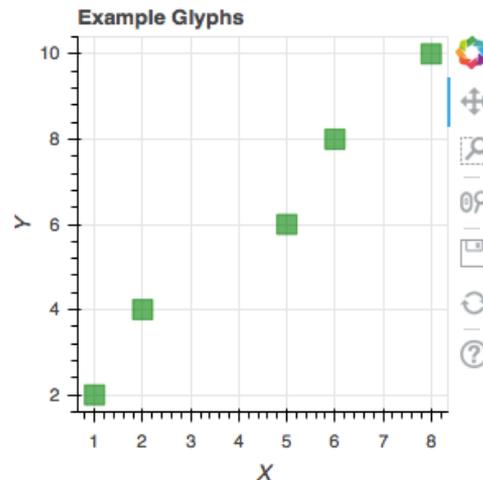
```
# imports
from bokeh.plotting import figure
from bokeh.io import show

# Create a blank figure with labels
p = figure(plot_width = 300, plot_height = 300,
           title = 'Example Glyphs',
           x_axis_label = 'X', y_axis_label = 'Y')

squares_x = [1, 2, 5, 6, 8]
squares_y = [2, 4, 6, 8, 10]

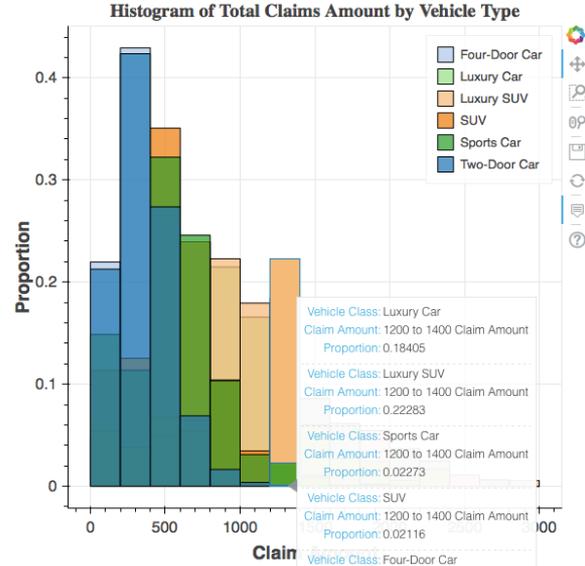
# Squares glyph
p.square(squares_x, squares_y, size = 12, color = 'green', alpha = 0.6)

# Show the plot
show(p)
```



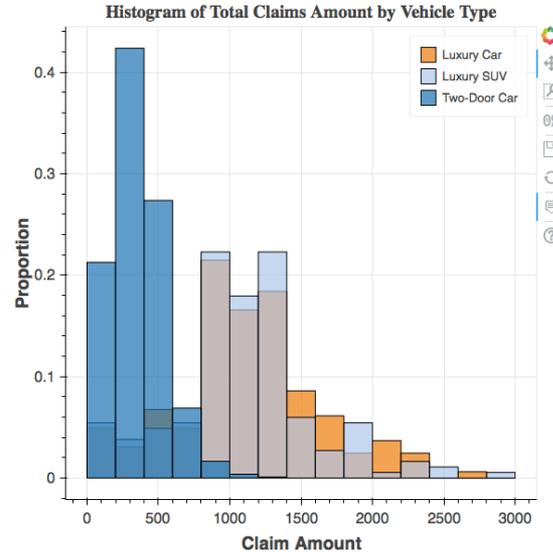
# Interactive Histogram: Hover Tool

```
def make_plot(src):  
    # Blank plot with correct labels  
    p = figure(plot_width = 600, plot_height = 600,  
              title = 'Histogram of Total Claims Amount by Vehicle Type',  
              x_axis_label = 'Claim Amount', y_axis_label = 'Proportion')  
  
    # Quad glyphs to create a histogram  
    p.quad(source = src, bottom = 0, top = 'proportion', left = 'left', right = 'right',  
          color = 'color', fill_alpha = 0.7, hover_fill_color = 'color', legend = 'name',  
          hover_fill_alpha = 1.0, line_color = 'black')  
  
    # Hover tool with vline mode  
    hover = HoverTool(tooltips=[('Vehicle Class', '@name'),  
                                ('Claim Amount', '@f_interval'),  
                                ('Proportion', '@f_proportion')],  
                    mode='vline')  
  
    p.add_tools(hover)  
  
    # Styling  
    p = style(p)  
  
    return p
```



# Interactive Histogram: Checkbox Tool

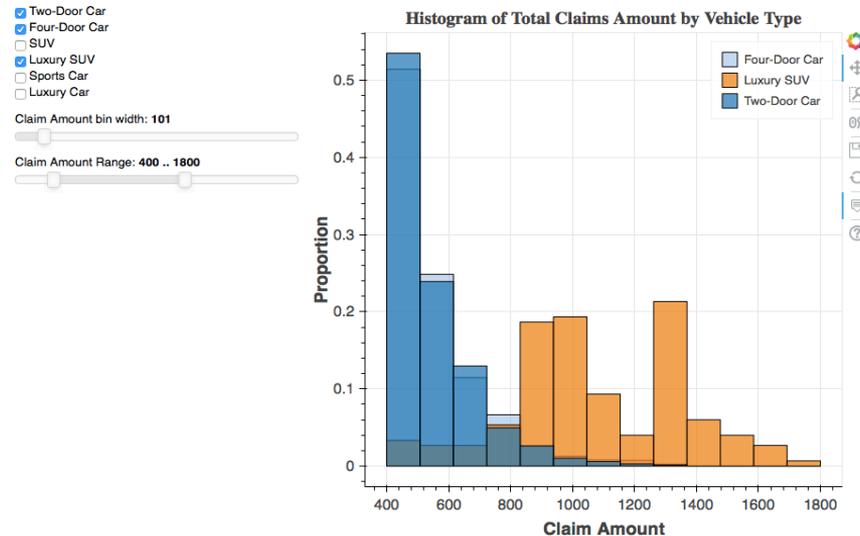
- Two-Door Car
- Four-Door Car
- SUV
- Luxury SUV
- Sports Car
- Luxury Car



```
vehicle_selection = CheckboxGroup(labels=available_vehicleClass, active = [0, 1])  
  
vehicle_selection.on_change('active', update)  
  
controls = WidgetBox(vehicle_selection)
```



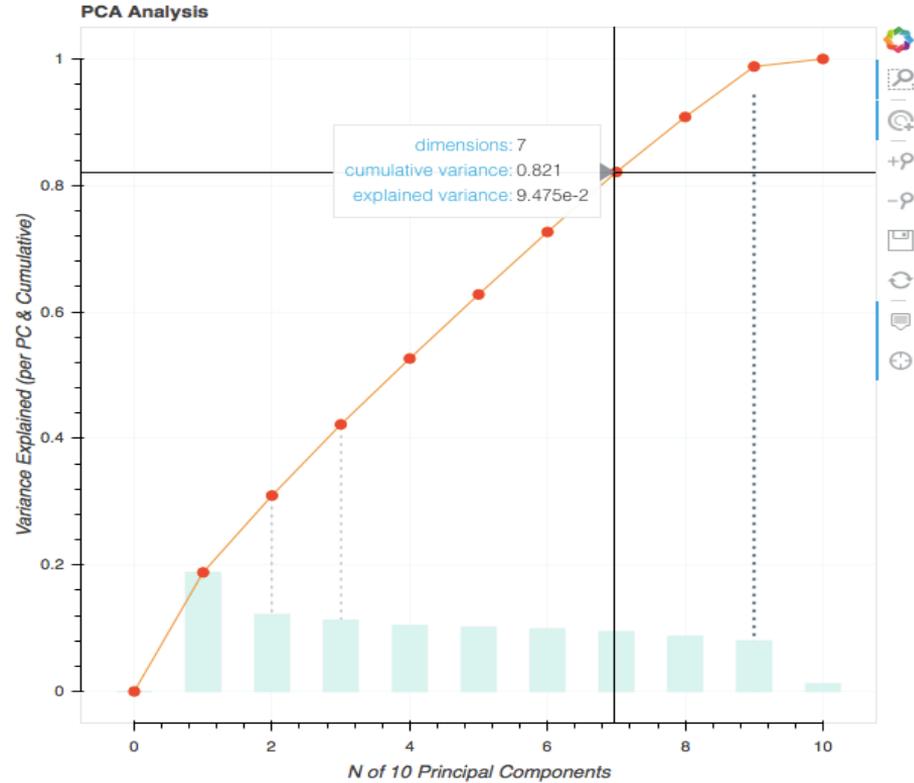
# Interactive Histogram: Slider and Range Slider



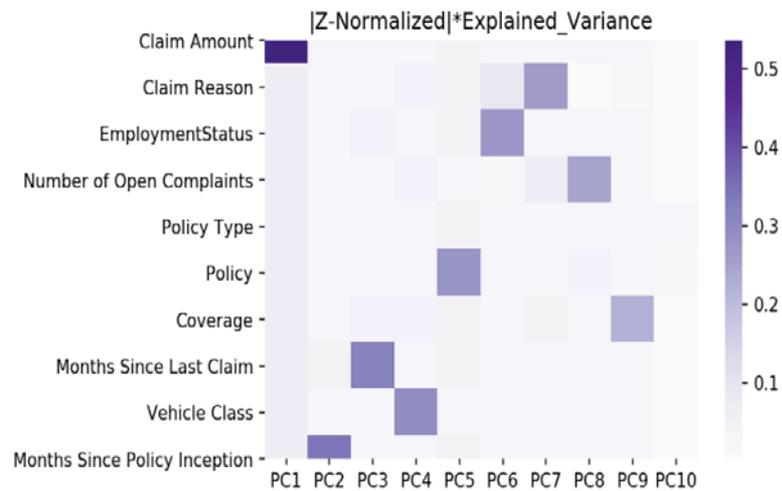
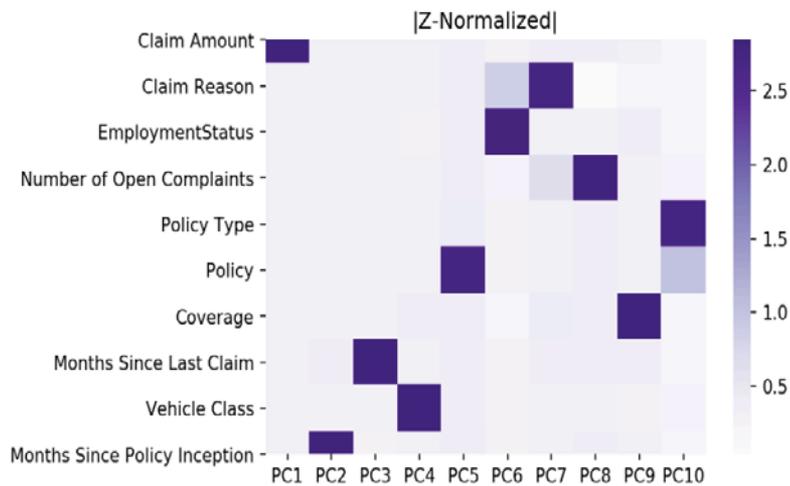
```
binwidth_select = Slider(start = 1, end = 1000,  
                          step = 100, value = 200,  
                          title = 'Claim Amount bin width')  
binwidth_select.on_change('value', update)  
  
range_select = RangeSlider(start = 0, end = 3000, value = (0, 3000),  
                            step = 100, title = 'Claim Amount Range')  
range_select.on_change('value', update)
```



# Interactive PCA



# Interactive PCA



# Conclusions

## UCL Actuari project:

1. The importance of Data Visualisation
2. **UCL InsurTech Analytics platform:**
  - Template Library for Insurance applications
  - Visualisation Templates
3. If you are interested in **collaborating** please contact:

**Malgorzata Smietanka:** [malgorzata.wasiewicz.17@ucl.ac.uk](mailto:malgorzata.wasiewicz.17@ucl.ac.uk)

**Prof. Philip Treleaven:** [p.treleaven@ucl.ac.uk](mailto:p.treleaven@ucl.ac.uk)



# Questions

# Comments

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