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Evidence Logging and Data Analysis for Public Engagement with Research

Introduction

Public Engagement with Research (PER) plays an important role in the University of St Andrews. It provides many opportunities for students and researchers to be engaged in valuable PER activities [1]. At present, the researchers are able to report new activities by using the Pure system. However, Pure templates do not have a simple way to input activity details in which the PER team is interested [2]. Thus the staff of PER team records the activity details in their own ways, mainly using spreadsheets. Moreover, the team needs a data analysis system to evaluate past work.

The aim of this study is exploring the methods to develop a data analysis system for PER activities. This thesis reports on the exploration and development process.

This project utilised two different approaches to solve the problem. One is developing a Web-based system using JavaScript. The other is implementing a data analysis process using Python Jupyter Notebooks.

In this study, these two methods show their different capabilities and demonstrate their powerful features. The research results represent a further step towards developing the information management system. It not only finds out the shortcomings of the current data management but also provides the practical experience of data analysis. These practices provide a robust evidence base for the further development of data analysis software for the Public Engagement with Research team.

Tools

For the Web-based application:

Language: JavaScript

-Vue.js (Front-end)

-Node.js

-Koa.js (Back-end)

-MongoDB (Database)

-adminMongo (Administrator)

-Mongoose (MongoDB Operation)

-ECharts (Visualisation)



For the process based on Jupyter Notebook

Language: Python

Libraries:

-Pandas (Data Processing)

-NumPy (Data Processing)

-Matplotlib (Data Visualisation)

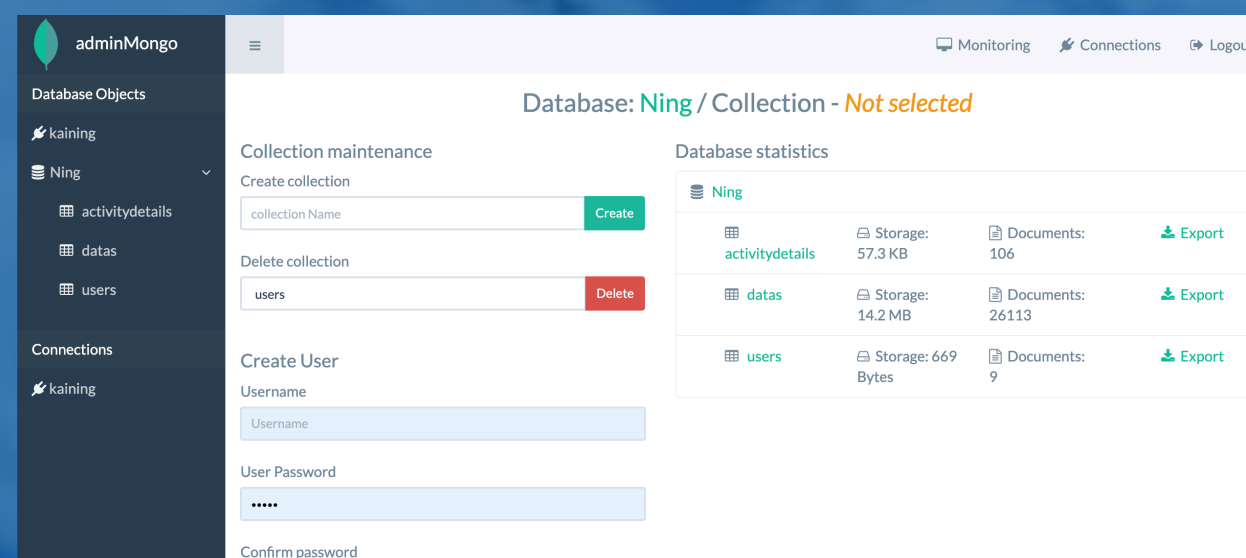


pandas

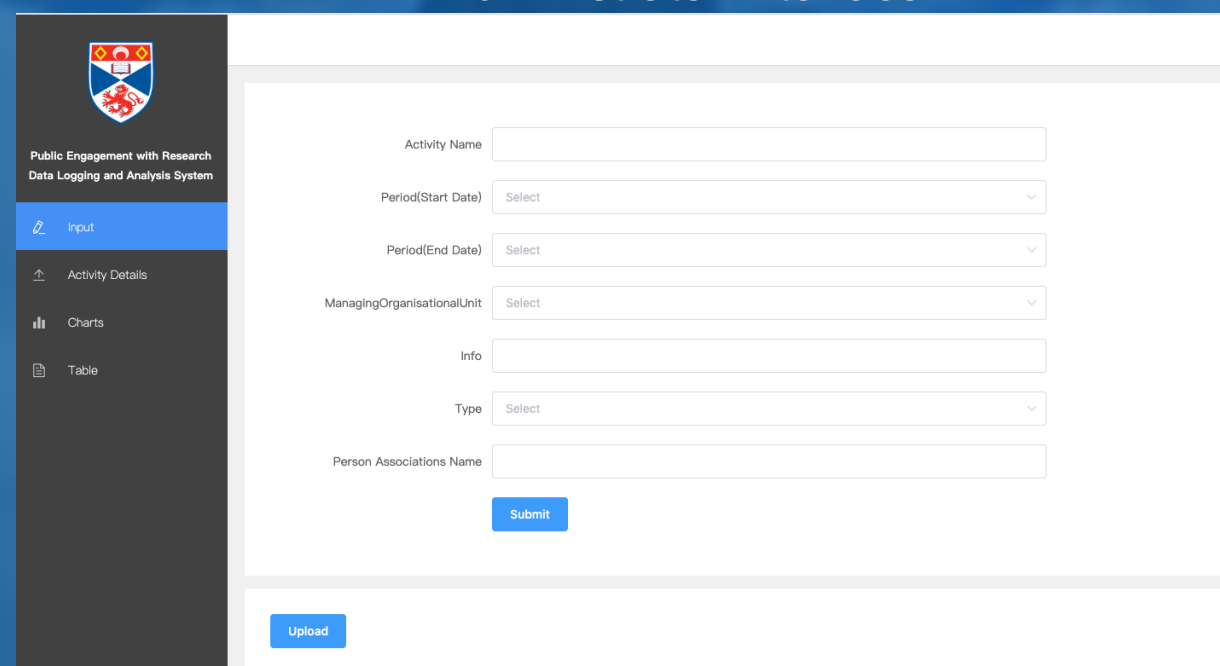


$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$

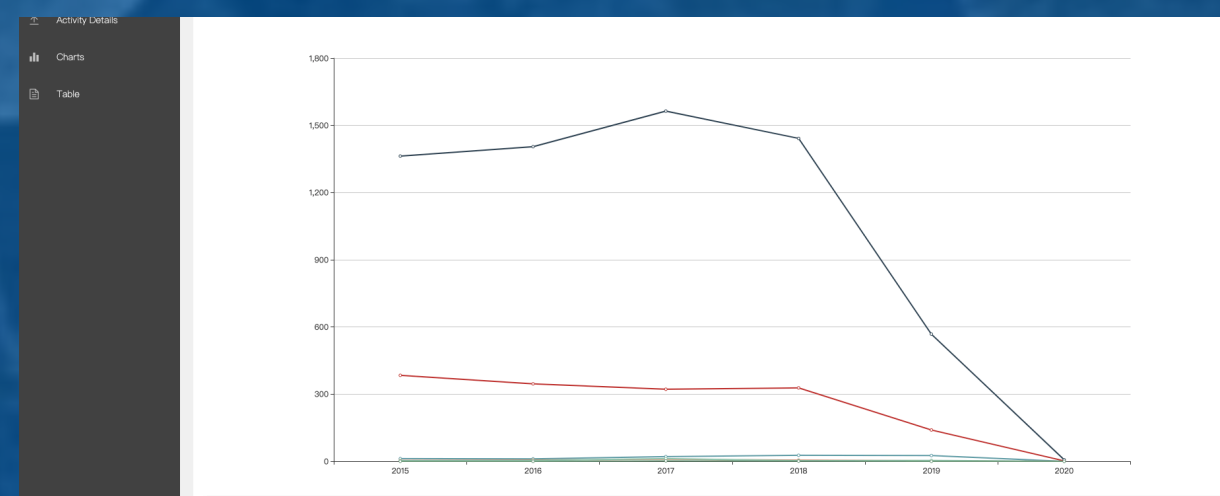
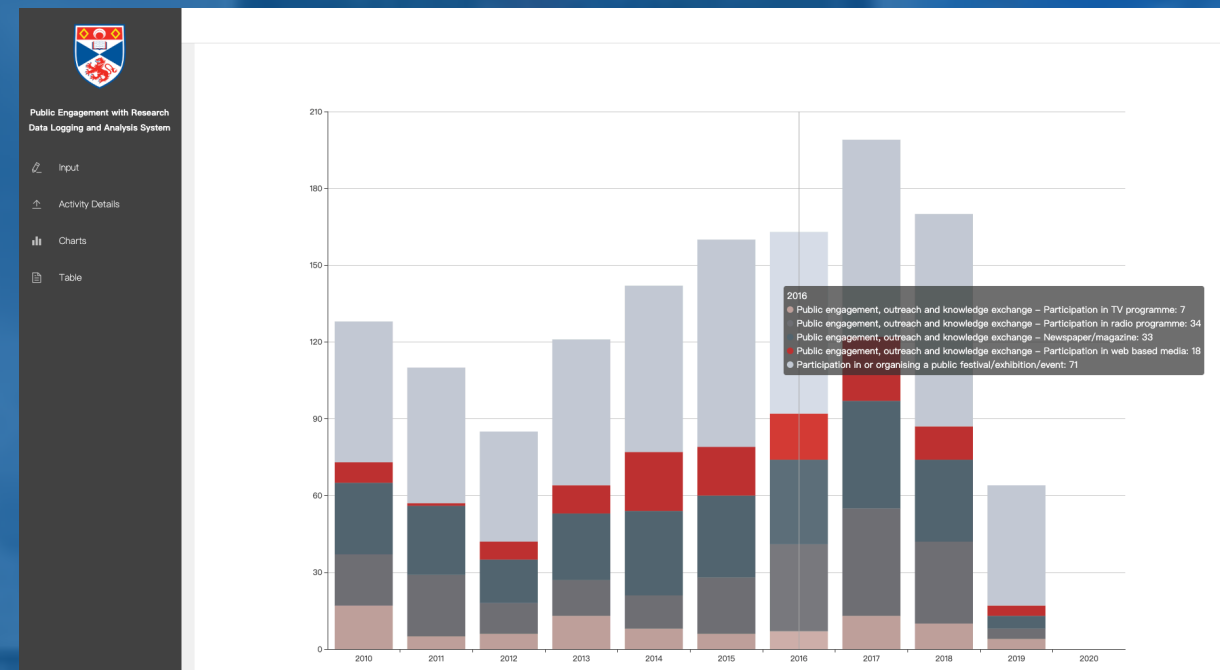
Web-based System



Administrator Interface



Data Logging and Upload

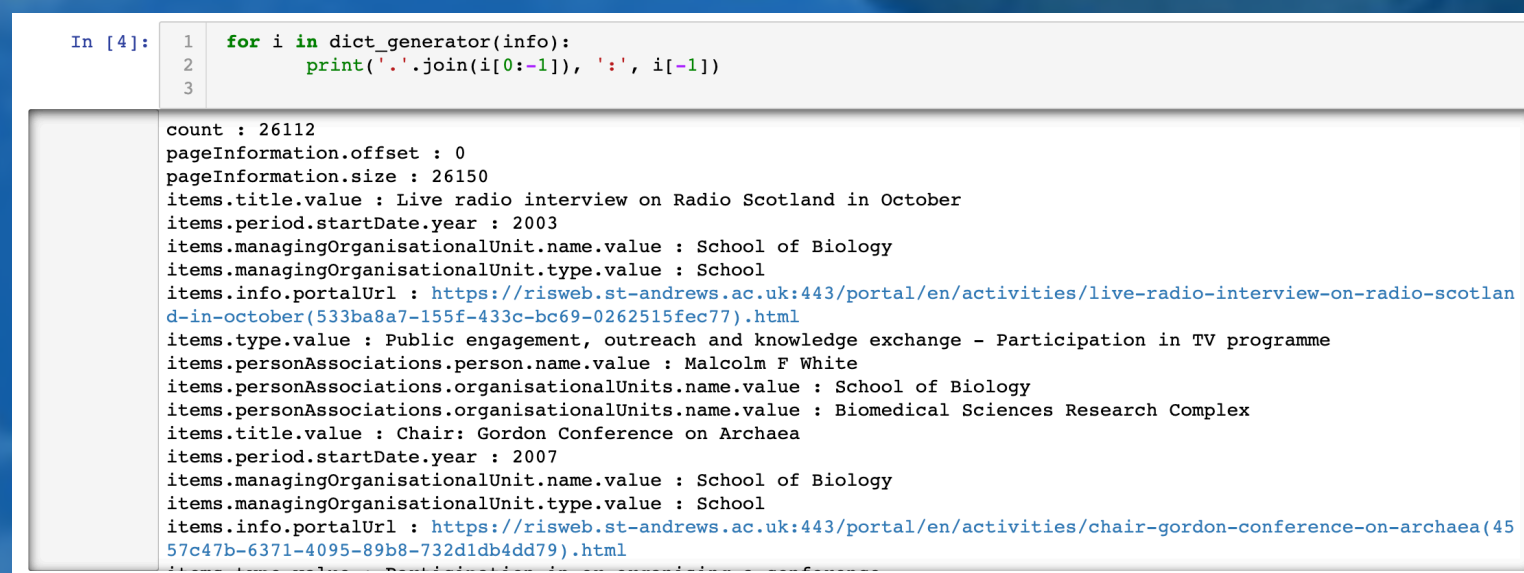


Data Visualisations Examples

Activity Name	PeriodStart Date	PeriodEnd Date	ManagingOrganisationalUnit	Info	Type	Person Associations Name
Public Engagement with Research	2019	2019	School of Computer Science	https://www.st-and.ac.uk/research/support/public-engagement/	Public Engagement	None
Public Engagement with Research	2019	2019	School of Computer Science	https://www.st-and.ac.uk/research/support/public-engagement/	Public Engagement	None
Public Engagement with Research	2019	2019	School of Computer Science	https://www.st-and.ac.uk/research/support/public-engagement/	Public Engagement	None
Public Engagement with Research	2019	2019	School of Computer Science	https://www.st-and.ac.uk/research/support/public-engagement/	Public Engagement	None
Public Engagement with Research	2019	2019	School of Computer Science	https://www.st-and.ac.uk/research/support/public-engagement/	Public Engagement	None
Public Engagement with Research	2019	2019	School of Computer Science	https://www.st-and.ac.uk/research/support/public-engagement/	Public Engagement	None
Public Engagement with Research	2019	2019	School of Computer Science	https://www.st-and.ac.uk/research/support/public-engagement/	Public Engagement	None
Public Engagement with Research	2019	2019	School of Computer Science	https://www.st-and.ac.uk/research/support/public-engagement/	Public Engagement	None
Public Engagement with Research	2019	2019	School of Computer Science	https://www.st-and.ac.uk/research/support/public-engagement/	Public Engagement	None

Data Exploration

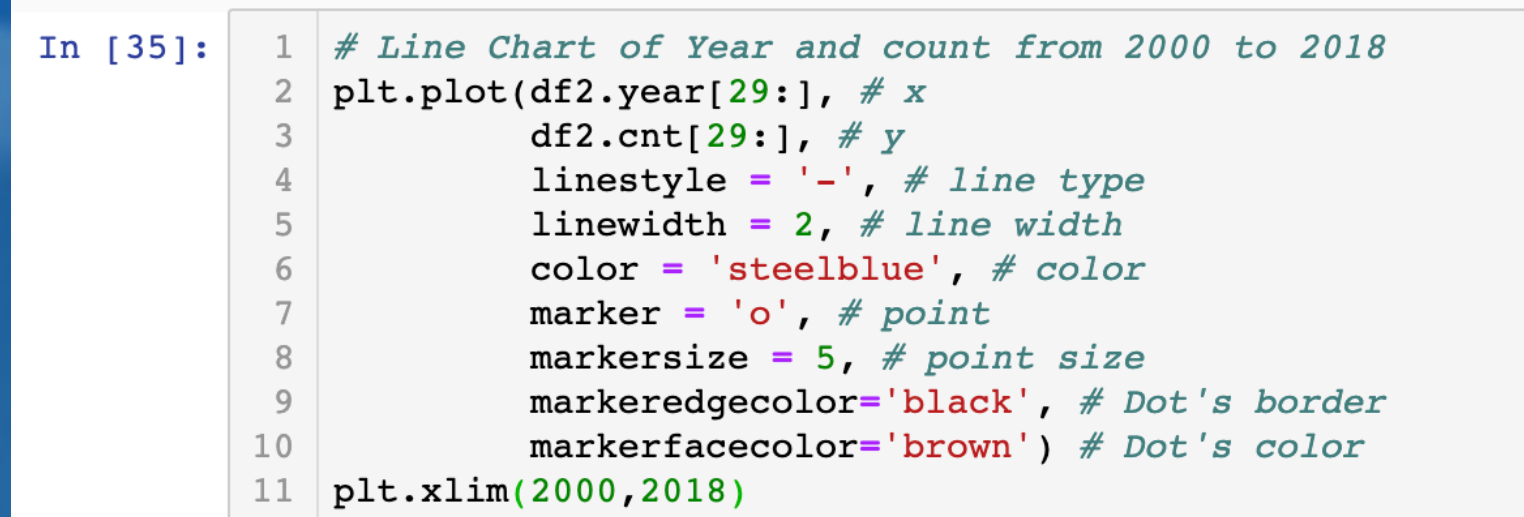
Jupyter Notebook Process



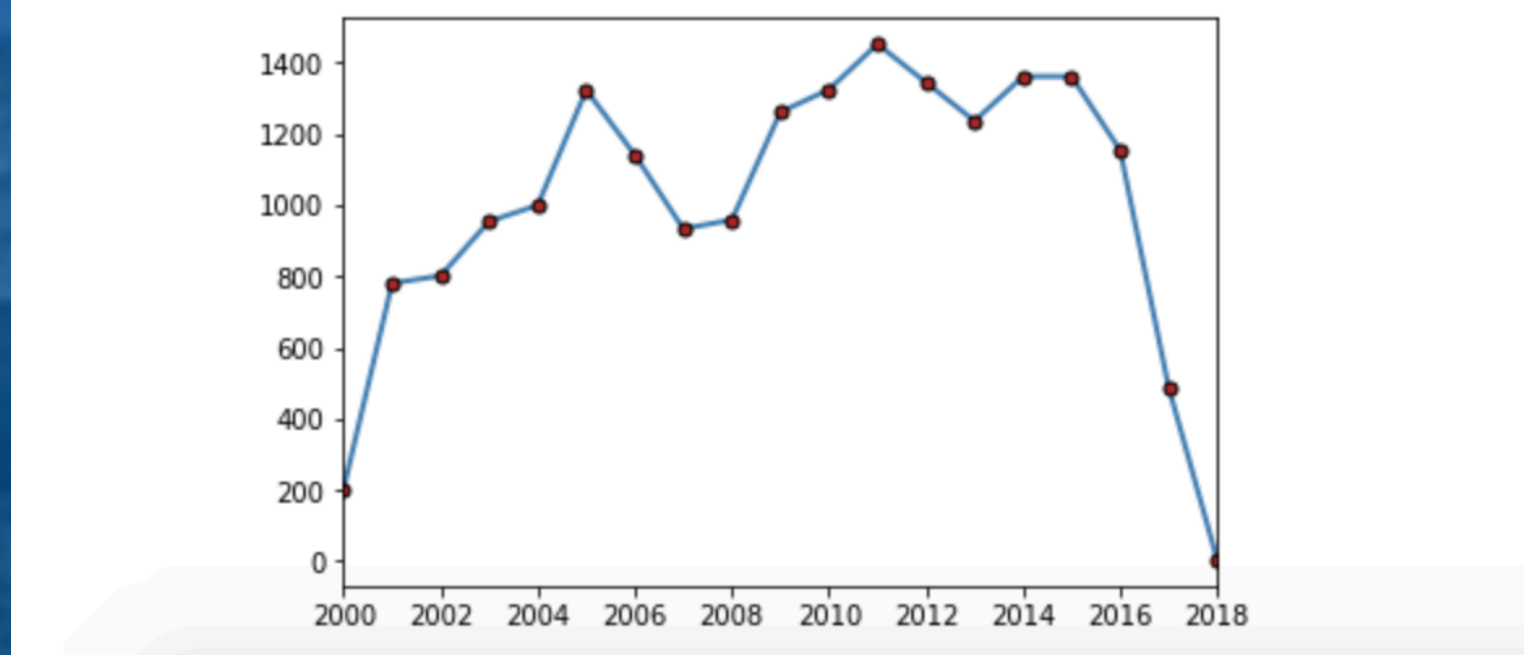
Data Processing

In [16]: 1 df							
Out[16]:							
	year	title	organisation	unitType	type	people	peopleUnitist
0	2003	Live radio interview on Radio Scotland in October	School of Biology	School	Public engagement, outreach and knowledge exchange	Malcolm F White	School of Biology
1	2007	Chair: Gordon Conference on Archaea	School of Biology	School	Participation in or organising a conference	Malcolm F White	School of Biology
2	2005	Service on Research Council review panels (Ext...	School of Biology	School	Membership of peer review panel or committee	Christopher David Todd	School of Biology
3	2005	Press release on the major publication arising...	School of Biology	School	Public engagement, outreach and knowledge exchange	Christopher David Todd	School of Biology
4	2005	Member external Relations Committee and a major...	School of Biology	School	Participation in or organising a conference	Christopher David Todd	School of Biology
5	2001	Regional co-ordinator for BBSRC schools liaison...	School of Biology	School	Membership of peer review panel or committee	Alyson Kim Tobin	School of Biology
6	2002	Plant and Microbial Sciences Research Committee...	School of Biology	School	Participation in or organising a conference	Alyson Kim Tobin	School of Biology

DataFrame



Out[35]: (2000, 2018)



Data Visualisation

References

[1] Public engagement with research, August 2019. [online] <https://www.st-andrews.ac.uk/research/support/public-engagement/>

[2] Pure - Research Information System, August 2019. [online] <https://www.st-andrews.ac.uk/staff/research/pure/>

A vital feature of this project is using two different methods to solve the problem. For the web system, many of the most popular frameworks and tools are used, including Vue.js, Koa.js, Node.js, MongoDB, Echarts and adminMongo. For the analysis process in the Jupyter Notebook, the cell-based interface allows users to understand the whole data analysis process better. Also, the process has a higher degree of customization and scalability than the web system.

Notwithstanding the relatively limited sample, this work offers valuable insights into the data analysis software. Considerably more work will need to be done to improve the systems. For example, because it contains some private data, user registration should have an administrator review process. A second broad recommendation is that the visualisation should be optimised to improve the loading speed. What is more, after collecting enough numeric data from the activity details, more data analysis can be added. In Jupyter Notebook, future studies should include more visualisations and focus on usability and improving the user experience.