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**Unit Code: IFN701**

**Project Category: A Development Project**

**Queensland University of Technology**

**Forecasting zestimate error for zillow: a data analysis project Proposal**

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1. **Project Introduction  
   1.1 Background**

Zillow (zillow.com) is one of the popular information sites for real estate in the United States. It plays the role as realestate.com.au and domain.com.au in Australia to offer an online ecosystem for real estate professionals such as agents and mortgage bankers, home buyers, sellers and renters. There are 110 million properties across the nation have been served on Zillow’s platform (Kaggle Inc., n.d.). Zestimate is their price prediction model to forecast the market value of the properties and it is also an online tool to assist their website visitors making rational home-relevant decisions. According to the official data, the current median error rate of Zestimate is 5% (Zillow Inc., n.d.). This percentage seems that there is solely a minor disparity between the forecasting value and the actual sales price. However, it means greatly for the most expensive property people purchases in their lives. For example, a home with actual value of $700,000, its 5% will be $35,000 that approximately equals to an annual minimum income for a full-time employee in California (California Payroll, n.d.). The prediction value with this error rate might cause the potential home buyers to change their purchase decision or to be overconfident in their purchase capability. Furthermore, given the statistical concept, median error means there are a half of the properties’ estimation error rates exceed 5%. Consequently, the less visitor resulting from the worse home value estimate service will lead to the decrease of the revenue of Zillow resulting from the less commercial advertiser on its site. Therefore, it is a critical issue for Zillow to improve the accuracy of Zestimate by finding a more effective home value prediction model. This is also the reason why Zillow posted this issue a challenge with a prize up to $12 million on data science platform Kaggle.com to allow global data scientists for competing. Likewise, this project largely denotes the value of research relevant to value prediction models as the current Zestimate model has relied on more than 7millions of machine learning algorithms and statics data points (Kaggle Inc., n.d.).

**1.2 Scopes**

Given the competition rules of Kaggle, the expectation of Zillow, the table *“MoSCow Prioritised Requirement List”* below will represent the significance of the requirements through the whole project with applying prioritisation tool MoSCoW. “Must”, “Should” and “Could” requirements would be determined in the scope and “Would” items should be out of the scope as the limited time factor for this data analysis task.

**MoSCow Prioritised Requirement List**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***ID*** | ***Requirement List (Kaggle Inc., n.d.)*** | ***Priority*** | ***Points*** | ***Reason*** |
| 1 | As a contest sponsor, Zillow requires the participants to use their supplied data only. Any external data is prohibited. | Must | 2 | This is compulsory requirement. Only the valid data could be fitted for the project. |
| 2 | As a competition organiser, Kaggle requires the participants to predict the error rate and store the value in a CSV file for 6 time points: October, November and December for both 2016 and 2017. R markdown file or Python file is required for indicating the data analysis. | Must | 28 | This is compulsory requirement. Without these outputs, the progress of data analysis and error rate prediction cannot be shown. |
| 3 | Kaggle wants the participants to submit the CSV and data analysis files on October 16, 2017. | Should | 2 | Outcomes should be submitted as per requirement. |
| 4 | As a data supplier, Zillow wants the participants to analyse the value of their collected data. | Should | 23 | Data analysis is aimed to find out the valuable data and their correlations. |
| 5 | As a real estate service provider, Zillow wants the participants to find out the effective prediction model to increase Zestimate’s accuracy. | Could | 25 | The most effective prediction model could improve Zestimate’s performance definitely. However, the level of effectiveness should be evaluated according to the time factor of this project. |
| ***In-Scope Points:*** | | | ***80*** | |
| 6 | As a data science community, Kaggle wants the participants to do contribution on their coding sharing platform and forum. | Would | 2 | This is based on the willing of participants. |
| 7 | Kaggle expects the participants to predict the home values for Zillow. | Would | 18 | Data analysis and error prediction are two current core section. Home value prediction could be done in next round of competition. |
| ***Out-Scope Points:*** | | | ***20*** | |
| ***Project Total Points:*** | | | ***100*** | |

**1.3 Approach Overviews**

The table *Data Analysis Workflow* below indicates the commonly four phases with totally eight steps involved in the workflow for facilitating data analysis project. The four phases are data preparation, data analysis, results reflection and results dissemination. Data preparation is the time-consuming part in the workflow. However, it plays as the fundamental base for the further analysis. Data analysis is the core activity to execute the parameter and analyse the data then obtain the insights from the datasets. The phases of results reflection and dissemination will determine the quality for the final outcomes by continuing adjusting the experiments with collecting the helpful feedbacks from the supervisor or comparing various outputs value.

As to the detail description of the project approach, it can be referred to section two *Project Method*.

**Data Analysis Workflow**

|  |  |  |  |
| --- | --- | --- | --- |
| ***Phase One***  ***Data Preparation*** | ***Phase Two***  ***Data Analysis*** | ***Phase Three***  ***Results Reflection*** | ***Phase Four***  ***Results Dissemination*** |
| Step 1: Defining problem  Step 2: Identifying ideal datasets to answer analysis problems  Step 3: Acquiring data  Step 4: Cleaning data | Step 5: Exploring data  Step 6: Statistical prediction and modelling data | Step 7: Interpreting results | Step8: Communicating and distributing results |

**1.4 Outcome**

Two main tangible outcomes will be returned in the end of this competition task. One of them is a data analysis report that represents the depth insight of the Zillow datasets building on a considerable large amount of house data across three counties in California of the United States. It is going to demonstrate the relationship patterns between the estimated price of each property and their respective over-fifty physical variables. The other one is a rational prediction model that generates the estimated error value relating to 3millions of properties during the last quarter of both 2016 and 2017, depending on the training data and test data supplied from Zillow.

1. **Project Method**

The data analysis methodology below builds on the knowledge obtaining from unit IFN509 – Data Manipulation in Queensland University of Technology (Guido, Z., February, 2017).

**Phase one: Preparation**

**Step 1: Defining the problem**

Before proceeding, it needs to figure out the categories of data analysis questions that are to be solved. According to the supplied property data, there are around 3millions of properties needing predicted on their error rate, then there are 57 variables such as the room number, square footage and location for each house. The goal to understand this large scale of data set is to define the relationships among these variables and confirm whether physical factors of each property correlates with their estimated price. Meanwhile, the training dataset of 2016 and the test data set of 2017 are used to predict the error rate between the estimated home value and the actual sales price for each individual property. Thus, this project is going to solve a hybrid analysis problem - an inferential and predictive analysis.

**Step 2: Identifying the ideal dataset to answer the analysis problem**

Although there are 3millions of properties listed, certain of them are provided high level of detail information for their physical elements from the home owner, and parts of them are with little data. Similarly, 90thousands of the training data with different error rates, some larger than 5%, others smaller than that. It is essential to identify the ideal dataset to implement the data searching.

**Step 3: Acquiring the data**

Data will be acquired from the Kaggle competition site as this is the only official and approved channel to obtain the valid data. Then, the data will be stored in working computer hard disk and other stable backup working station. A couple of risks related to data storage will be explained in detail in section five Risk Management Plan. Finally, import the data into the experimental environments such as RStudio for further proceeding.

**Step 4: Cleaning the data**

Raw datasets downloaded from Kaggle are all CSV files that might contain certain value formats like inconsistence that cannot be executed and computed while a specific analysis needs running. Meanwhile, different datasets might need to integrate into one file for analysis convenience. Therefore, after importing into experimental platform, the data should be cleaned. The executing tool for data munging can be R packages such as plyr and dplyr.

**Phase two: Analysis**

**Step 5: Exploring the data**

Starting from this step, it is getting to understand the data with developing hypotheses for the relationships between the variables that to be correlated beforehand. Secondly, identify the hypotheses with check if there are positive or negative relationships between the targeted variables then explore the relevant pattern so as to find out the most valuable data. The tool can be R with its packages, like ggplot to plot or cluster the datasets.

**Step 6: Statistical prediction and modelling the data**

Implement the research to find out which prediction model, for example, the logistic regression model and machine learning models, are appropriate to apply for this project. Deploy the models into the experiment and monitor their performance. Repeat the cycle of model building, model deploying and model monitor until finding the most effective one within the timebox.

**Phase three: Reflection**

**Step 7: Interpreting the results**

Analysis and reflection phases should be frequently alternative, especially when making comparisons among the various outputs. Adjust the code and parameters to rerun the processes with testing data. Also, discuss the outputs with the supervisor to get their helpful feedbacks.

**Phase four: Dissemination**

**Step8: Communicating and distributing the results**

The final step is to disseminate the results. The required forms of result representation from Kaggle are one CSV file that will contain the predicted error value of 3millions of properties for 6 timepoints. The other representation is one programming file such as R markdown file to include the execution code and written report that will allow Kaggle examiners and other data analysists to reproduce the experiment. Those two communicating channels are going to display the depth insights of the Zillow property data and the power of prediction model to improve the performance of Zestimate.

**Reference**

Kaggle Inc. (n.d.). Zillow Prize: Zillow’s Home Value Prediction (Zestimate). Retrieved from https://www.kaggle.com/c/zillow-prize-1#Competition Overview

Zillow Inc. (n.d.). Zestimate. Retrieved from https://www.zillow.com/zestimate/

Guido, Z (Feburary, 2017). IFN509: Data Manipulation – Week 1 Lecture. Retrieved from https://blackboard.qut.edu.au/bbcswebdav/pid-6726760-dt-content-rid-7967236\_1/courses/IFN509\_17se1/lecture\_w1.pdf

California Payroll (n.d.). 2017 California Minimum Wage Table. Retrieved from https://californiapayroll.com/minimum-wage-changes-effective-july-1-2016/

**Appendix: Project Proposal Statement – Supervisor Sign-Off**

I, Dr. Guido Zuccon *<name of supervisor>,* confirm that I have gone through the project plan made by Linni Qin *<student name>* holding student ID number: n9632981 on the project titled: “IT MASTER (DS): Perform a Data Science Analysis of a Dataset/Task – Dr Guido Zuccon” for IFN701 <unit code>.

I confirm that I have been consulted in deriving this project proposal and that I approve of the suggested scope and tasks described in this project plan and that I am satisfied with the identified risk mitigation and communication plans articulated here.

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Supervisor signature Date