UNIVERSITY OF COPENHAGEN

Faculty of Science

User Behavior Analysis Using Decision Trees

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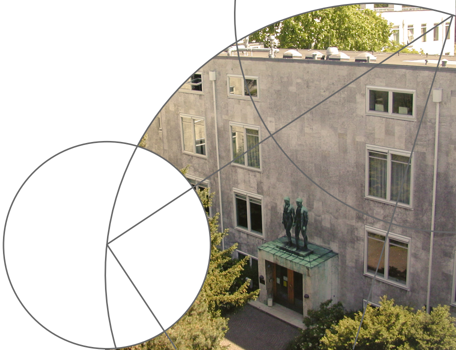

Friday 12th February, 2016

Company Project

Martin Nicklas Jørgensen

Disposition

Introduction

Problem Analysis

Results

Conclusion and Future Work

Question

Disposition

- Introduction
- Problem Analysis
- Results & Conclusion
- Questions

Simplesite ApS

Introduction

- Hosts and sells a website CMS.
- Founded in 2001 as *Elk Consulting ApS*, later *123hjemmeside ApS* and now *Simplesite ApS*.
- 20-49 employees globally.
- 400.000 new websites every month.
- 80.000 paying subscribers.

Problem Description

Introduction

- After the change to freemium, a huge increase in new free users was observed.
- The number of paying users did not increase comparetively.
- Many users stop being active after a few days.
- Using Data Science, is it possible to find a pattern in how users who stay are using the site?

CRSIP-DM

Problem Analysis

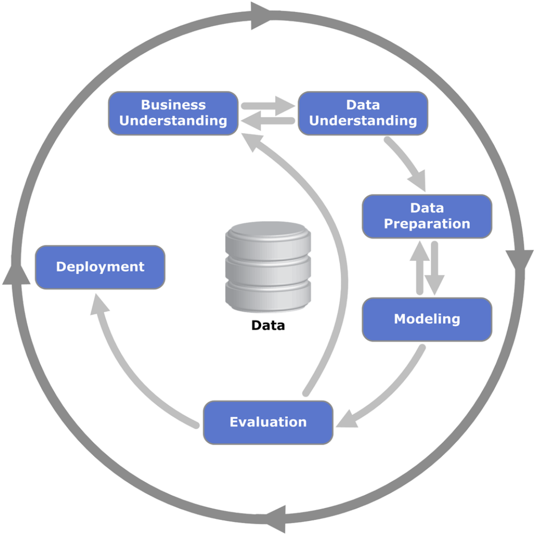

Figure : Diagram of the CRISP-DM method. Image source: Wikimedia Foundation.

Business Understanding

Problem Analysis

- Some users do not stay active for very long, even on the free product.
- Can we figure out what makes users stay?

Data Understanding & Preparation

Problem Analysis

- `EngagementData` datasets.
- `CustomerJourney` datasets.
- Features are removed from the datasets if they are derivative or not relevant.
- Datasets are merged into a single dataset.
- Data from Sep. 2015 are used for training. (463716 observations)
- Data from Oct. 2015 are used for test. (495390 observations)
- Final dataset have 15 features one of which is the target variable *iscjretained*.

Modelling - Tree Type

Problem Analysis

Max Depth	rpart Accuracy	ctree Accuracy
4	94.2799 %	94.27990 %
8	94.2799 %	94.31958 %
12	94.2799 %	94.36638 %

Table : The mean accuracy for the different 5-fold cross validation runs.

Modelling - Formula & Depth

Problem Analysis

Formula	Max Depth	Mean Accuracy
`iscjretained ~ .`	4	94.27990 %
	6	94.29672 %
	8	94.31958 %
`iscjretained ~ edits14`	4	93.50055 %
	6	93.50227 %
	8	93.50119 %
`iscjretained ~ logins14`	4	94.27990 %
	6	94.27990 %
	8	94.27990 %
`iscjretained ~ edits14 + logins14`	4	94.27990 %
	6	94.28465 %
	8	94.29414 %

Table : Mean accuracy of different formulas and tree depths using 5-fold cross

Evaluation - Dataset Bias

Problem Analysis

Dataset	TRUE	FALSE
Training	30358	433358
Test	40731	454659
Equal	30358	30358

Table : The distribution of the *iscjretained* target variable classes in the different datasets.

Deployment

Problem Analysis

- Deployment was not done during this project.
- Mail 2.0
- Possible design mentioned Future Work.

Results

Maximum Depth	Accuracy
4	92.84039 %
6	92.84846 %
8	92.75823 %

Table : The results of the final datarun when training on the full training set and trying to predict the entire test set.

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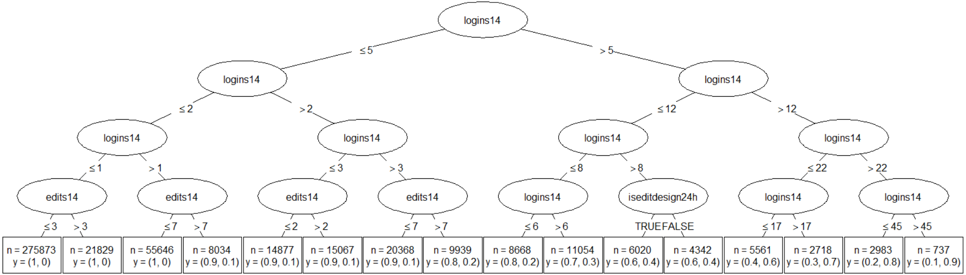

Figure : The comditional inference tree produced by the code when using a maximum depth of 4.

Results

Maximum Depth	**Accuracy**
4	91.79051 %
6	91.74852 %
8	91.74388 %

Table : The results of the final data run when training on the full training set excluding the *logins14 variable* and trying to predict the entire test set.

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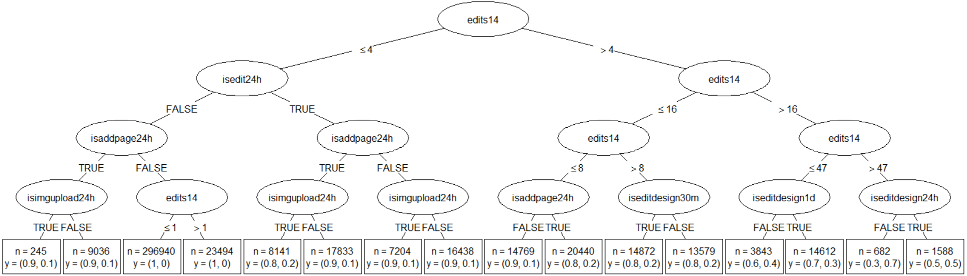

Figure : The conditional inference tree produced by the code when using a maximum depth of 4 and exluding the *logins14* attribute.

Conclusions and Future Work

- Getting the user to engange with the product is key for this classification target.
- New knowledge may be acquired by having more “counter” features.
- The produced code can be incorporated into a system that allows for automatic training and action.

Questions

- Questions.