AI Augmented Project Management

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# Abstract

*One of the black arts of* ***project management*** *is predicting the future, where we represent this future state as a new project plan.*

*We draw upon our own domain and company experience to determine the steps, resources and time needed to accomplish the goal.*

*Our success rate at predicting the future is* ***not good****.*

*Our predictions are fraught with error due to the limits of our experience and that of the organization.*

This report attempts to look at the difficulties in project management, specifically in the domain of Software Development, and propose for a NLP-based, AI augmented solution to some of the common problems to any general projects being managed at any given point in time and to all of the projects being managed as a collective in a small-medium enterprise (SME) or a Start-Up setting.

The scope of the Capstone Project captured in this document examines at the technicality, feasibility, and accuracy of a NLP model in recognising various project tasks, in a typical project setting, trained to a pre-determined category.

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# **Introduction**

## **What is Project Management?**

**Project management** is the application of processes, methods, skills, knowledge and experience to achieve specific project **objectives** according to the project acceptance criteria within agreed parameters. Project management has **final deliverables** that are constrained to a finite timescale and budget.

A key factor that distinguishes project management from just 'management' is that it has this final deliverable and a **finite timespan**, unlike management which is an ongoing process. Because of this a project professional needs a wide range of skills; often technical skills, and certainly people management skills and good business awareness.

## **What is a project?**

A project is a unique, transient endeavour, undertaken to achieve planned objectives, which could be defined in terms of outputs, outcomes or benefits. A project is usually deemed to be a success if it achieves the objectives according to their acceptance criteria, within an agreed timescale and budget. Time, cost and quality are the building blocks of every project.

**Time:** scheduling is a collection of techniques used to develop and present schedules that show when work will be performed.

**Cost**: how are necessary funds acquired and finances managed?

**Quality**: how will fitness for purpose of the deliverables and management processes be assured

## State of the industry

In the domain of software development, the current state of the industry, observed especially for Small-Medium Enterprises and Start-Ups are:

* Assortments of tools / unstructured information silos
* Haphazard project management “methodologies”
* Low visibility of project performance, resources allocations / availability

According to Standish Group's Annual CHAOS report, 66% of technology **projects** (based on the analysis of 50,000 **projects** globally) end in partial or total **failure**. Despite larger **projects** being more prone to encountering challenges or **failing** altogether, even the smallest of **software projects fail** one in ten times.

# About the Data

## Data Sources

Data could be gathered from sources such as

* Sales proposals and quotations
* Timesheets or time logs
* Project schedule / Project Plan

## Feature Engineering

Raw data were collected from real-life samples of 40+ project plans.

Data were sanitised to remove confidential information.

Graphical user interface, application, table

Description automatically generated

Chart

Description automatically generated

The data are then tagged manually according to a pre-defined dictionary of 10 categories.

The figure above shows the distribution of the labels as well as it’s corresponding representation for the 1395 rows of data.

# Training the model

## Methodology

Spacy is the NLP library first applied to each line of the statement of task.

Followed by TF-IDF vectorizer to be fed into the classifiers.

The classifiers chosen in this case were:

* Logistics Regression Classifer
* Multi-Nomial Naïve Bayes Classifier
* Random Forest Classifier
* Gradient Boosting Classifier

And finally, all the above classifiers were stacked as an ensemble to produce the results for this model.

### Logistics Regression Classifier

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### Multi-Nomial Naïve Bayes Classifer

Graphical user interface, text

Description automatically generated

### Random Forest Classifier

Graphical user interface, text, application, email

Description automatically generated

### Gradient Boosting Classifer

Graphical user interface, text

Description automatically generated

We observed that all the classifiers mentioned performed satisfactorily individually at >70% accuracy rates.

### Stacking

Graphical user interface, text, application, email

Description automatically generated

## Accuracy of the model

Table

Description automatically generated

We performed about 20 rounds of training and recorded the Stacking Model results. Accuracies generally ranged between 74% to 86%.

# Conclusion

Results from the preliminary study of how the NLP performs in identifying and classifying the tasks descriptions without any optimisation were encouraging.

Future enhancements to data

* Include data from sources such as sales proposals and timesheets
* Finer granularity of tagging to train tasks groupings
* SMOTE sampling to balance the labelling of data

Future enhancements to data model

* Fine tuning of hyper-parameters of classifiers
* Increase or replace more classifiers for stacking
* Utilising BERT and neural network models

Based on the above, further enhancements to the data collection and data modelling, subsequent deployment of an analytics dashboard would yield satisfactory visibilities as to how projects are performing, be it on an individual basis, or as a collective.

Utilising such a solution would significantly improve the success rates of project executions.

# Appendix A: References

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# Appendix B: Commonly Used Terms & Acronyms in Professional Project Management

PMO: Project Management Office  
a management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques

PV: Planned Value  
Planned Value (PV) is the authorized budget assigned to work to be accomplished for an activity or WBS component.

EV: Earned Value  
Earned Value (EV) is the value of work performed expressed in terms of the approved budget assigned to that work for an activity or WBS component.

AC: Actual Cost  
Actual Cost (AC) is the total cost actually incurred in accomplishing work performed for an activity or WBS component.

BAC: Budget at Completion  
The sum of all budgets established for the work to be performed.

WBS: Work Breakdown Structure  
a deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables