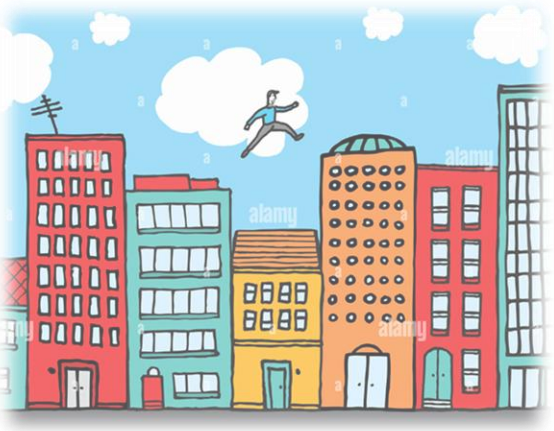
Automated Man Power Allocation By Performance Analysis and Project Categorization For Construction Projects

24-25J-018



Team Members

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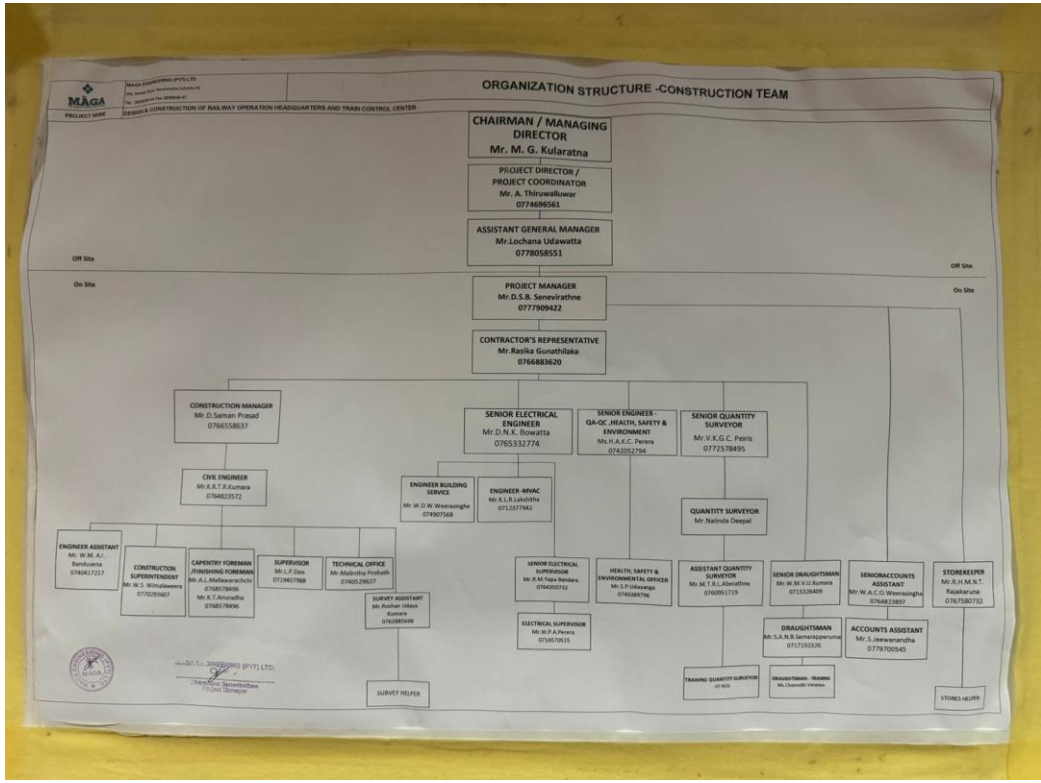
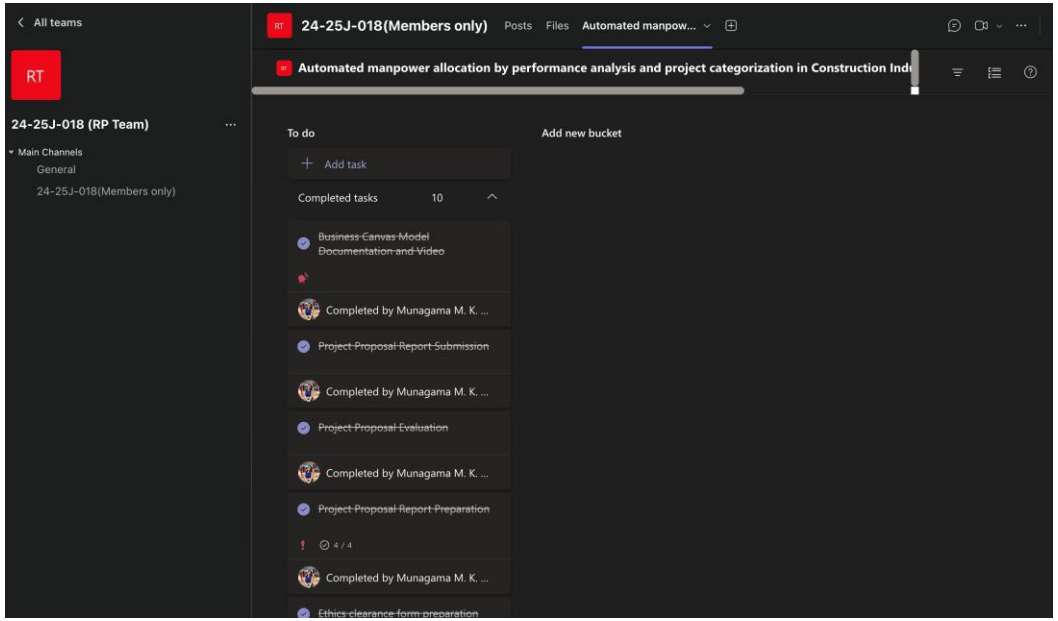
Evidences





SLIIT
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Introduction

- Manpower required in construction projects are in 2 types;

1. Employees in the Company

Ex: Civil Engineers,Technical Officers,Surveyors etc.

2. Laborers work in the site

Ex:Carpentors,Masons,Painters etc.

- Our client : MAGA Engineering PVT LTD
- Types of construction projects in MAGA;

1. **Buildings**
2. Highways & Bridges
3. Water, wastewater
4. Irrigation

MÄGA
the saga of quality construction

Research Problem

"How does improper manpower allocation based on project managers' experience affect efficiency and project outcomes in the construction projects?"

Main Objective

"Develop a system to generate employee KPIs based on experience and performance, categorize projects by complexity and risk, optimally allocate suitable employees, and predict the required number of laborers for future projects."

Sub Objectives

1. Project Categorization.
2. KPI Value generation by performance analysis and CV analysis.
3. Employee allocation and Optimization.
4. Prediction of labor, cost and timeline.

Research Gap

Application Reference	Applicable for construction Projects	Web Application	KPI based manpower allocation	Project Categorization	Real time predictive analysis of project	Labor requirement Prediction
Procore	✓	✓	✗	✗	✗	✗
Primavera P6	✓	✗	✗	✗	✗	✗
nPlan	✓	✓	✗	✓	✓	✗
BuildTrend	✓	✓	✗	✗	✗	✗
Project Pulse	✓	✓	✓	✓	✓	✓

KPI Generation by CV detail analysis and Performance analysis

2

Storing CV details in the Database

Employee CV Upload → Initial KPI Generation

Updating the KPI of employees according to the experience

UPDATE

Update KPI

KPI Value as a Percentage

HR Department

Allocated details of the employee

Project Manager

1

Project Categorization

Classifying Projects According to Criteria

Enters Upcoming Project Details → Projects Classification

Project Categorization
- TimeFrame
- Budget Level
- Risk Level
- Complexity
- Geographical Factors
- Environment Impact (Low,Medium,High)

Data Processing and Analysing

Labor,Cost and Timeline Prediction

Labor Prediction on Project Size and Completion days

Recording the Daily Tasks and Labor Attendance

Enters Daily Attendance and Tasks → Predicting Cost and Timeline

Dashboard

4

3

Employee allocation and Optimization

Matching the KPI with Project Complexity

Suggestions of the employees in order to select as per the requirement

Suggestions

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Project Categorization.

Research Question

“How can construction projects be categorized based on key details and factors such as type, scope, objectives, location, budget, duration, risk level, complexity, geographical factors, and time frame?”

Specific & Sub Objectives

"Create a standardized method of categorization projects based on project type, risk level, complexity, location wise/geographical factors, budget level, time frame."

1. Identify the project types.
2. Define specific criteria for categorizing projects.
3. Predict the risks according to project type under the risk category.
4. Gathering Upcoming Project Details

Research Gap

Application Reference	Automatic Classification	Applicable for construction projects	Risk Level Assessment	Complexity Analysis	Location/Environmental Impact Assessment	Budget Analysis	Time Frame Analysis
Procore	✗	✓	✗	✗	✗	✓	✗
Microsoft Project	✗	✓	✗	✓	✗	✓	✓
Smartsheet	✗	✓	✗	✓	✗	✓	✓
nPlan	✗	✓	✗	✗	✗	✗	✓
Trello	✗	✓	✗	✗	✗	✗	✗
Project Pulse	✓	✓	✓	✓	✓	✓	✓

Methodology

- Overview Diagram
- Technologies
- Data Gathering and Data Requirements
- Current Progress
- Project Evidence
- Future Progress

Overview Diagram

Classifying Projects According to Criteria

Enters Upcoming Project Details

- Timeline
- Cost
- Geographical Location
- Project Type (Institute,Company etc.)
- Scope

Projects Classification

Project Categorization

- TimeFrame
- Budget Level
- Risk Level
- Complexity
- Geographical Factors
- Environment Impact (Low,Medium,High)

Technologies

Tools

- Google Colab Notebook
- VS Code

Visual Studio Code

Technologies

- Python V 3.10
- React Js
- Node Js
- MYSQL

Techniques & Algorithms

- Decision Tree Regressor Model

Data Gathering and Data Requirements

Data Source : MAGA Engineering Pvt Ltd.

Required datasets are;

1. **Past Project Details**

   Time,Cost,Scope,Geographical Location, Objectives, Project Type

2. **Risk and Complexity measuring methods**

Current Progress

- Data gathering
- Cleaning & creatin of dataset
- Base model creation for project categorization.

Project Evidence

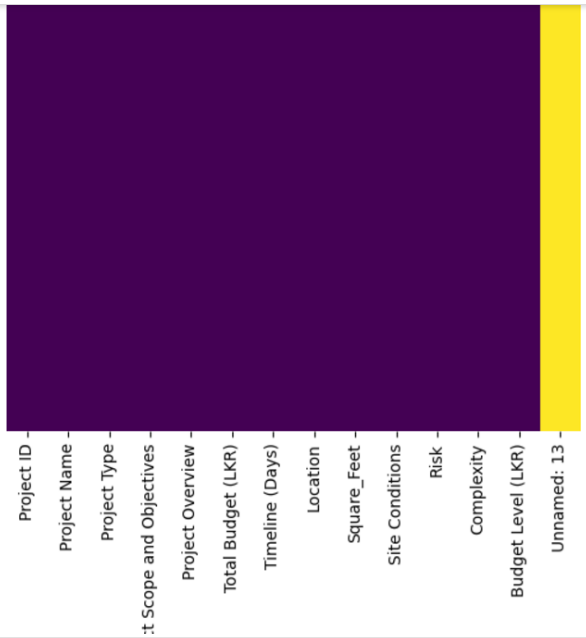
```
[46] import numpy as np
     import pandas as pd
     import matplotlib.pyplot as plt
     import seaborn as sns
     import pickle
     from sklearn.model_selection import train_test_split
     from sklearn.preprocessing import StandardScaler
     from sklearn.tree import DecisionTreeClassifier
     from sklearn.metrics import accuracy_score, classification_report
     from sklearn.model_selection import train_test_split
     from sklearn.preprocessing import StandardScaler, LabelEncoder
     from sklearn.metrics import classification_report
     from sklearn.tree import DecisionTreeClassifier
```

```
[47] data = pd.read_csv('Project Details.csv', encoding='latin-1')
```

```
[48] data
```

	Project ID	Project Name	Project Type	Project Scope and Objectives	Project Overview	Total Budget (LKR)	Timeline (Days)	Location	Square_Feet	Site Conditions	Risk	Complexity	Budg Lev (LK
0	PID - NO -CP - 1	Project 1	Commercial	Develop an eco-friendly resort in the central ...	Construction of 50 villas with solar power and...	Rs. 60,000,000	540	Kandy	15607	Hilly area	Low	High	L

```
[49]
```




```
[51]
```

Complexity	0
Budget Level (LKR)	0

dtype: int64

```
[52] data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100 entries, 0 to 99
Data columns (total 13 columns):
 #   Column                      Non-Null Count  Dtype
---  ------                      --------------  -----
 0   Project ID                  100 non-null    object
 1   Project Name                100 non-null    object
 2   Project Type                100 non-null    object
 3   Project Scope and Objectives 100 non-null   object
 4   Project Overview            100 non-null    object
 5   Total Budget (LKR)          100 non-null    object
 6   Timeline (Days)             100 non-null    int64
 7   Location                    100 non-null    object
 8   Square_Feet                 100 non-null    int64
 9   Site Conditions             100 non-null    object
 10  Risk                        100 non-null    object
 11  Complexity                  100 non-null    object
 12  Budget Level (LKR)          100 non-null    object
dtypes: int64(2), object(11)
memory usage: 10.3+ KB
```

+ Code + Text

RAM Disk

Gemini

```
    total_budget = budget_widget.value
    timeline_days = timeline_widget.value
    square_feet = square_feet_widget.value

    input_data = np.array([[total_budget, timeline_days, location_num, square_feet, site_conditions_num]])

    prediction = model.predict(input_data)

    print("Predicted Risk:", prediction[0][0])
    print("Predicted Complexity:", prediction[0][1])

submit_button = widgets.Button(description="Submit")
submit_button.on_click(submit_input)


display(budget_widget, timeline_widget, location_widget, square_feet_widget, site_conditions_widget, submit_button)
```

Total Budg... 0

Timeline (D... 0

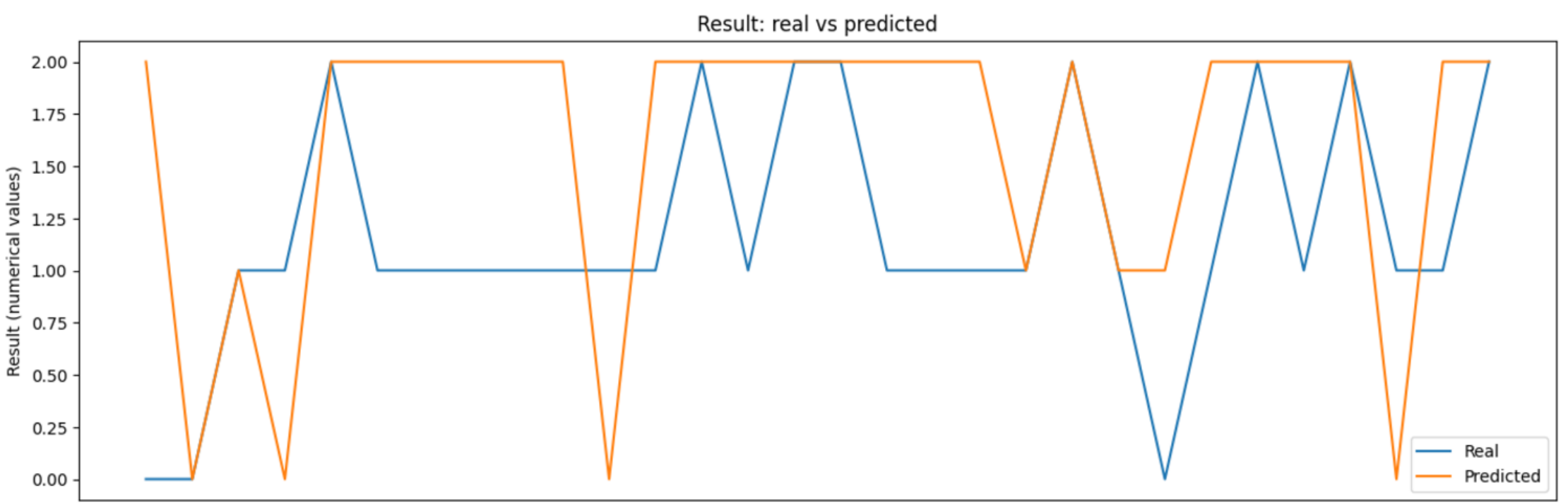
Geographi... Urban

Square Feet: 0

Site Conditi... Flat terrain

Submit

Project Evidence



Future Progress

- Frontend Implementation
- Enhancing the trained model
- Increasing the dataset size

REFERENCES

[1] John Macealois, “Understanding the 7 Construction Project Types”, https://www.workyard.com/construction-management/construction-project-types, May 2024 (accessed July. 2024) pp. 11,14.

[2] M. Safa, A. Sabet, “Classification of Construction Projects”, https://core.ac.uk/download/pdf/144150314.pdf , May 2015 (accessed July. 2024) pp. 11,14.

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KPI Generation by Performance analysis and CV analysis.

Research Question

“How can the challenges of managing physical CVs and using outdated KPIs be addressed to improve decision-making in employee management?”

Specific Objective

" The goal is to generate accurate KPIs based on predefined criteria (Performance, Competencies, Additional Criteria) and provide real-time KPI results for better decision-making. "

Sub Objectives

Developing a upload portal to upload CVs.

Developing a portal to update employees' project work.

Developing to calculate KPI percentage for generated KPI and given project details.

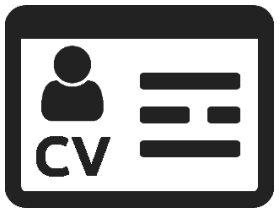
Research Gap

Application Reference	Applicable for construction projects	Performance Update	CV Upload	Real Time Integration with performance	KPI Generation
SAP Success Factor	✓	✗	✓	✗	✓
Workday	✓	✗	✓	✗	✓
BambooHR	✓	✗	✓	✗	✓
Procore	✓	✗	✓	✗	✓
Project Pulse	✓	✓	✓	✓	✓

Methodology

- Overview Diagram
- Technologies
- Data Gathering and Data Requirements
- Current Progress
- Project Evidence
- Future Progress

HR Department



Employee CV

Initial KPI Generation

Storing CV details in the Database

Updating the KPI of employees according to the experience

Update existing KPI

Allocated details of the employee

KPI Value as a Percentage

Technologies

Tools

- Google Colab Notebook
- VS Code

Visual Studio Code

Technologies

- Python V 3.10
- React Js
- Node Js
- MYSQL

Techniques & Algorithms

- Natural Language Processing
- Multi Nominal NB Algorithm

Data Gathering and Data Requirements

Main Data Source : MAGA Pvt Ltd.

Required datasets are;

1. **KPI definning criteria**

   Performance – 60%

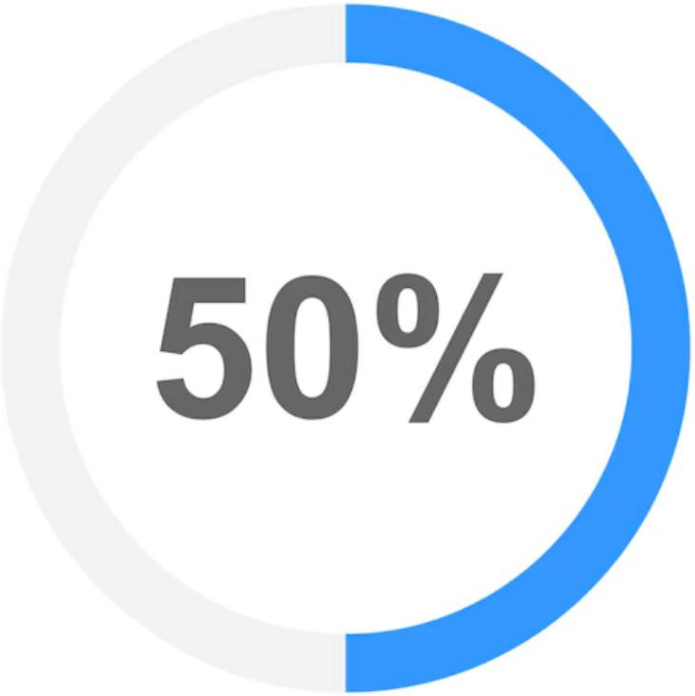
   Competencies (Knowledge,Skills) -20%

   Additional Criteria (Seniority and years of service) - 20%

2. **Employee CV details of each employee category**

Current Progress

- Data gathering to create a datset.
- Cleaning the collected data set.
- Trained a dataset to generate the KPI values according to the performances and experiences.



Project Evidence

```
[2]  import json
     import os

     import pandas as  pd
     import spacy

     import seaborn as sns
     import string

     from tqdm import tqdm
     from textblob import TextBlob

     from nltk.corpus import stopwords
     import nltk
     from nltk.stem import WordNetLemmatizer
     from nltk import word_tokenize
     import re

     from sklearn.model_selection import train_test_split
     from sklearn.preprocessing import LabelEncoder
     from sklearn.feature_extraction.text import CountVectorizer
     from sklearn.feature_extraction.text import TfidfTransformer
     from sklearn.naive_bayes import MultinomialNB
     from sklearn.pipeline import Pipeline


     from sklearn.preprocessing import FunctionTransformer
     from sklearn.base import BaseEstimator, TransformerMixin
     from sklearn.pipeline import FeatureUnion
```

```
[3]  data = pd.read_csv('resume.csv')
```

```
[4]  data.head()
```

	Resume Summary	KPI Value
0	Name: Jane Smith, Job Title: Construction Fore...	32
1	Name: Daniel Johnson, Job Title: Site Supervis...	39
2	Name: Emily Johnson, Job Title: Civil Engineer...	24
3	Name: Michael Miller, Job Title: Project Manag...	29
4	Name: Jane Garcia, Job Title: Architect, Years...	25

Next steps: Generate code with data | View recommended plots | New interactive sheet

```
[5]  data.shape
```

```
(1000, 2)
```

```
[6]  data['KPI Value'].value_counts()
```

```
            count
```

```
[7]  data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 2 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Resume Summary  1000 non-null   object
 1   KPI Value       1000 non-null   int64
dtypes: int64(1), object(1)
memory usage: 15.8+ KB
```

```
[8]  data['Resume Summary'] = data['Resume Summary'].astype(str)
```

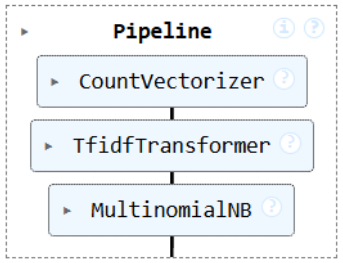
```
[9]  import re
     def cleanResume(txt):
         cleanText = re.sub('http\S+\s', ' ', txt)
         cleanText = re.sub('RT|cc', ' ', cleanText)
         cleanText = re.sub('#\S+\s', ' ', cleanText)
         cleanText = re.sub('@\S+', '  ', cleanText)
         cleanText = re.sub('[%s]' % re.escape("""!"#$%&'()*+,-./:;<=>?@[\]^_`{|}~"""), ' ', cleanText)
         cleanText = re.sub(r'[^\x00-\x7f]', ' ', cleanText)
         cleanText = re.sub('\s+', ' ', cleanText)
         return cleanText
```

```
[10] cleanResume("my #### $ #  # hello @ world access it @gmain.com")
```

Project Evidence

```
...     ('tfidf', TfidfTransformer(use_idf=True)),
...     ('clf', MultinomialNB(alpha=.01)),
... ])
```

```
[16] text_clf.fit(X_train['Resume Summary'], list(y_train))
```




```
[17] y_pred = text_clf.predict(X_test['Resume Summary'].to_list())
```

```
[18] import pickle
     pickle.dump(text_clf, open("nlp_model.dat", "wb"))
```

```
[19] with open('nlp_model.dat' , 'rb') as f:
```

```
[10] cleanResume("my #### $ #  # hello @ world access it @gmain.com")
```

```
'my hello world a ess it '
```

```
[11] data['Resume Summary'] = data['Resume Summary'].apply(lambda x: cleanResume(x))
```

```
[12] X = data.drop('KPI Value', axis=1)
     y = data['KPI Value']
```

```
[13] from sklearn.model_selection import train_test_split

     X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.25)
```

```
[14] from sklearn.feature_extraction.text import TfidfVectorizer
     tf = TfidfVectorizer()
```

```
[15] text_clf = Pipeline([
...     ('vect', CountVectorizer(analyzer="word", stop_words="english")),
...     ('tfidf', TfidfTransformer(use_idf=True)),
...     ('clf', MultinomialNB(alpha=.01)),
... ])
```

```
[16] text_clf.fit(X_train['Resume Summary'], list(y_train))
```

+ Code + Text RAM Disk Gemini

```
submit_button = widgets.Button(description="Submit")
submit_button.on_click(collect_data)

display(name_input, job_title_input, experience_input, skills_input, education_input, certifications_input, email_input, phone_number_input, loc
```

Name: Enter your name

Job Title: Project Manager

Years of Exp: Enter your years of experience (e.g., 3 years)

Skills: Enter skills (e.g., Python, Machine Learning)

Education: Enter your education details

Certifications: Enter certifications (if any)

Email: Enter your email

Phone: Enter your phone number

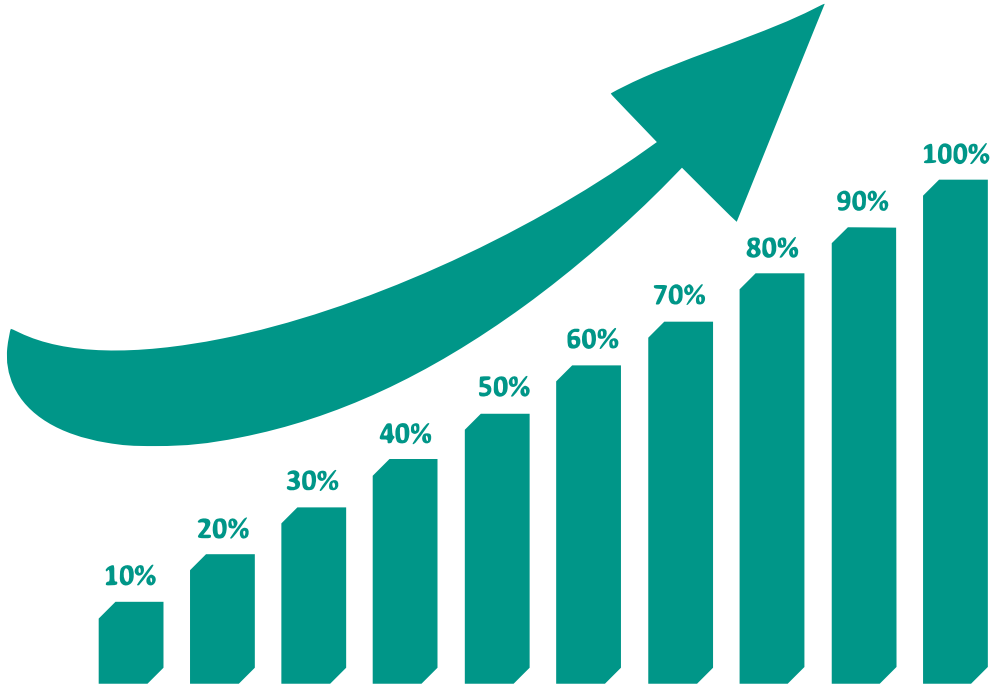
Location: Enter your location

Submit

```
[260] Start coding or generate with AI.
```

Future Progress

- Frontend Implementation.
- Increase data records to improve accuracy.



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[1] A. Anand, "Ijiraset," [Online]. Available: https://www.ijraset.com/research-paper/cv-analysis-using-machine-learning. [Accessed 25 07 2024].

[2] V. Jagwani, "Arvix," [Online]. Available: https://arxiv.org/pdf/2307.15752. [Accessed 25 07 2024].

[3] H. A. Purba, "Research Gate," [Online]. Available: https://www.researchgate.net/publication/344493860_KEY_PERFORMANCE_INDICATORS_A_SYSTEMATIC_LITERATURE_REVIEW. [Accessed 26 07 2024].

[4] L. Pinilla, "MDPI," [Online]. Available: https://www.mdpi.com/2071-1050/12/15/5977. [Accessed 27 07 2024].

[5] MAGA, "MAGA," [Online]. Available: https://www.maga.lk/. [Accessed 24 07 2024].

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Employee Allocation and Optimization.

Research Question

“How can employee allocation by project managers, which is often based on experience, be improved to reduce inefficiencies and address employee management issues? "

Specific Objective

"Develop a systematic approach for allocating employees to categorized construction projects using Key Performance Indicators (KPIs) to improve project efficiency and outcomes."

Gather outcomes of component 1 and 2 such as project categorization result and generated KPI.

Develop a model for matching employees to projects using the identified KPIs.

Optimize the outcome of this component

Validate the model with historical data and real-world scenarios.

Research Gap

Application Reference	Web Application	Applicable for construction projects	KPI-based manpower allocation	Employee requirement prediction	Employee allocation and optimization
Procore	✓	✓	✗	✗	✗
Primavera P6	✗	✓	✗	✗	✗
BuildTrend	✓	✓	✗	✗	✗
ALICE Technologies	✓	✓	✓	✓	✗
PlanGrid	✓	✓	✓	✓	✗
Project Pulse	✓	✓	✓	✓	✓

Methodology

- Overview Diagram
- Technologies
- Data Gathering and Data Requirements
- Current Progress
- Project Evidence
- Future Progress

Overview Diagram

Project Categorization

- TimeFrame
- Budget Level
- Risk Level
- Complexity
- Geographical Factors
- Environment Impact (Low,Medium,High)

KPI Value as a Percentage

Project Manager

Matching the KPI with Project Categorization Results

Suggestions of the employee IDs in order to select as per the requirement

Technologies

Tools

- Google Colab Notebook
- VS Code

Visual Studio Code

Technologies

- Python V 3.10
- React Js
- Node Js
- MYSQL

Techniques & Algorithms

- Decision Tree Regressor Model

Data Gathering and Data Requirements

Main Data Source : MAGA Pvt Ltd.

Required datasets are;

1. **Number of employees worked in certain projects.**
2. **Employee categories required for different projects.**

Current Progress

Data gathering to create a datset.

Cleaning the collected data set.

Trained a dataset to generate the KPI values according to the performances and experiences.

Project Evidence

+ Code + Text

```
def submit_input(change):
    risk_num = risk_widget.value
    complexity_num = complexity_widget.value
    job_title_num = job_title_widget.value

    budget_level = budget_widget.value

    input_data = np.array([[risk_num, complexity_num, budget_level, job_title_num]])

    prediction = new_model.predict(input_data)

    print("Predicted KPI:", prediction[0])

# Submit button and its event handler
submit_button = widgets.Button(description="Submit")
submit_button.on_click(submit_input)

# Display widgets
display(risk_widget, complexity_widget, budget_widget, job_title_widget, submit_button)
```

+ Code + Text

dtype: int64

+ Code + Text

```
[79] data['Budget Level (LKR)'].value_counts()
```

Budget Level (LKR)	count
High	192
Low	80
Medium	40

dtype: int64

```
[80] data['Risk']=data['Risk'].str.replace('Low','1')
     data['Risk']=data['Risk'].str.replace('Medium','2')
     data['Risk']=data['Risk'].str.replace('High','3')
```

```
[81] data['Complexity']=data['Complexity'].str.replace('Low','1')
     data['Complexity']=data['Complexity'].str.replace('Medium','2')
     data['Complexity']=data['Complexity'].str.replace('High','3')
```

```
[82] data['Budget Level (LKR)']=data['Budget Level (LKR)'].str.replace('Low','1')
     data['Budget Level (LKR)']=data['Budget Level (LKR)'].str.replace('Medium','2')
     data['Budget Level (LKR)']=data['Budget Level (LKR)'].str.replace('High','3')
```

```
[83] data
```

Project Evidence

```
(312, 6)
```

```
data.isnull().sum()
```

	0
Project ID	0
Risk	0
Complexity	0
Budget Level (LKR)	0
Job Title	0
KPI	0

dtype: int64

```
[75] data=data.drop('Project ID', axis=1)
```

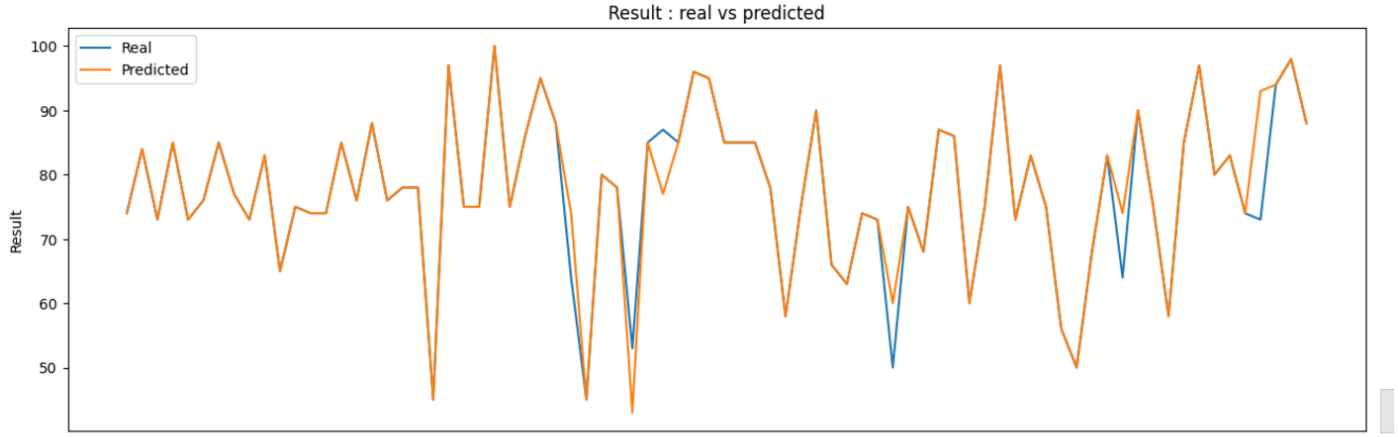
```
[76] data['Job Title'].value_counts()
```

Job Title	count
Project Manager	39
Civil Engineer	39

+ Code + Text

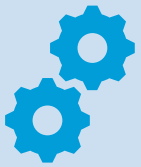
```
plt.legend()
plt.title("Result : real vs predicted")
plt.ylabel("Result")
plt.xticks(())
plt.show()
```

```
<class 'numpy.ndarray'>
<class 'pandas.core.series.Series'>
```



Future Progress

Frontend Implementation



Component Integration

Increasing dataset size to improve the accuracy

REFERENCES

[1] TaskTag, "MEDIUM," [Online]. Available: https://tasktagapp.medium.com/resource-allocation-in-construction-strategies-for-optimal-performance-e05bf5270b00. [Accessed 31 07 2024].

[2] K.-L. Lin, "researchgate," [Online]. Available: https://www.researchgate.net/publication/245298399_Human_Resource_Allocation_for_Remote_Construction_Projects. [Accessed 31 07 2024].

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IT21270956|MUNAGAMA M.K.H

BSc(Hons)in Information Technology specialized in
Information Systems Engineering

Labor, cost and timeline prediction.

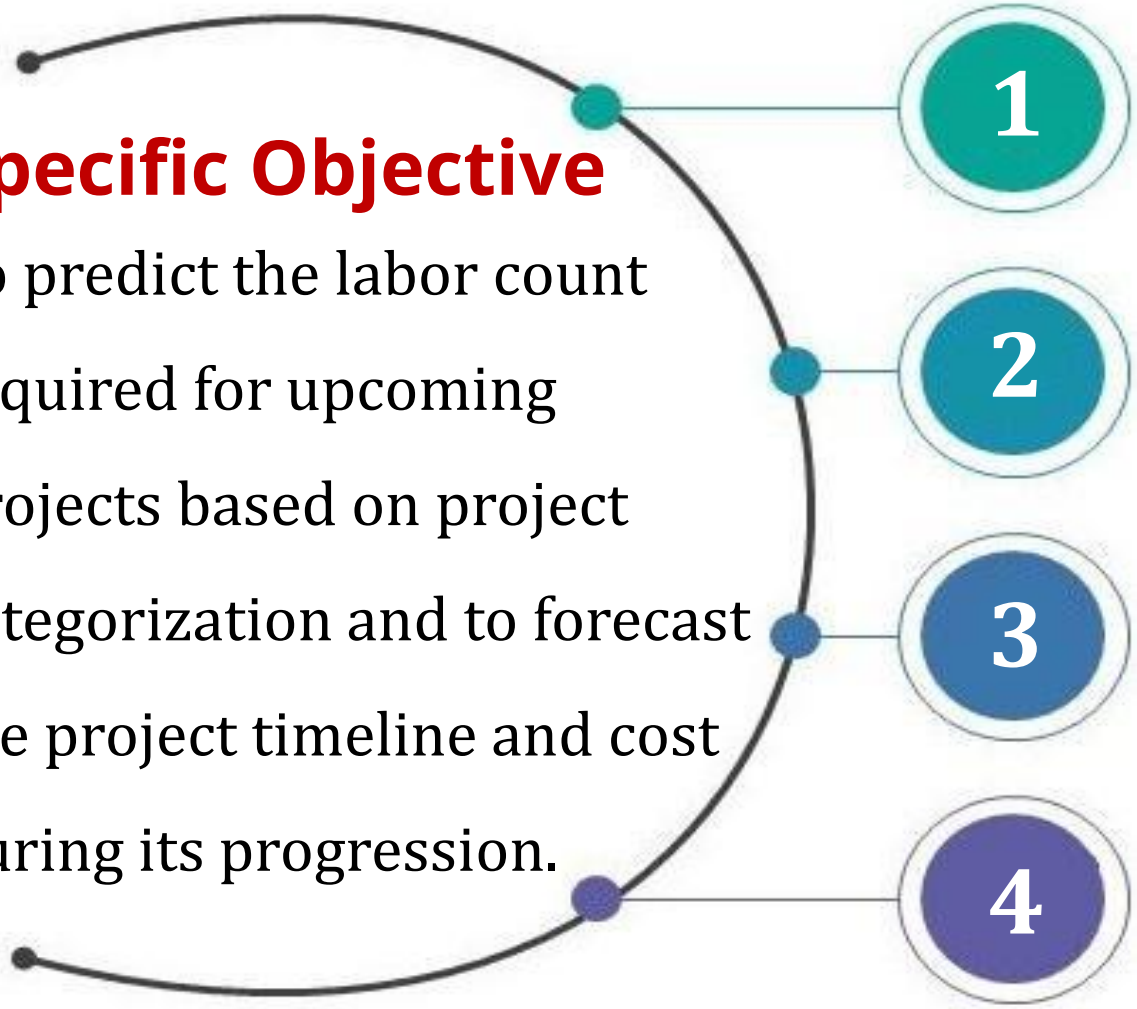
Research Question

“How can the inefficiencies in labor allocation, irregular attendance affects the cost and timeline in construction projects?”

Sub Objectives

Specific Objective

To predict the labor count required for upcoming projects based on project categorization and to forecast the project timeline and cost during its progression.



Analyzing past project details.

Training the system according to the past project details.

Creating a platform to update the daily labor count and completed tasks.

Predicting the realtime status of the projects.

Research Gap

Application Reference	Applicable for construction projects	User Focused Dashboards	Labor requirement prediction	Predict timeline and budget variations	Tracking daily logs and attendance
Procore	✓	✓	✗	✗	✓
ALICE Technologies	✓	✓	✓	✗	✗
nPlan	✓	✓	✗	✓	✗
LaborChart	✓	✓	✗	✗	✗
PlanGrid	✓	✓	✗	✗	✓
Project Pulse	✓	✓	✓	✓	✓

Methodology

- Overview Diagram
- Technologies
- Data Gathering and Data Requirements
- Current Progress
- Project Evidence
- Future Progress

Overview Diagram

Project Manager

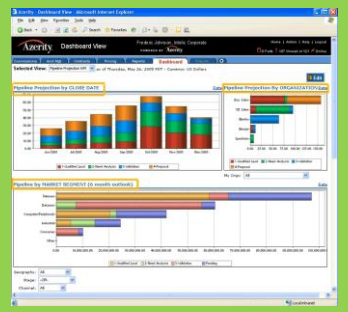
Recording the Daily Tasks and Labor Attendance

Enters Daily Attendance and Tasks

Predicting Cost and Timeline

Dashboard

Labor Prediction on Project Categorization



Project Categorization
- TimeFrame
- Project Size

Technologies

Tools

- Google Colab Notebook
- VS Code

Visual Studio Code

Technologies

- Python V 3.10
- React Js
- Node Js
- MYSQL
- Power Bi

Techniques & Algorithms

- Decision Tree Regressor Model

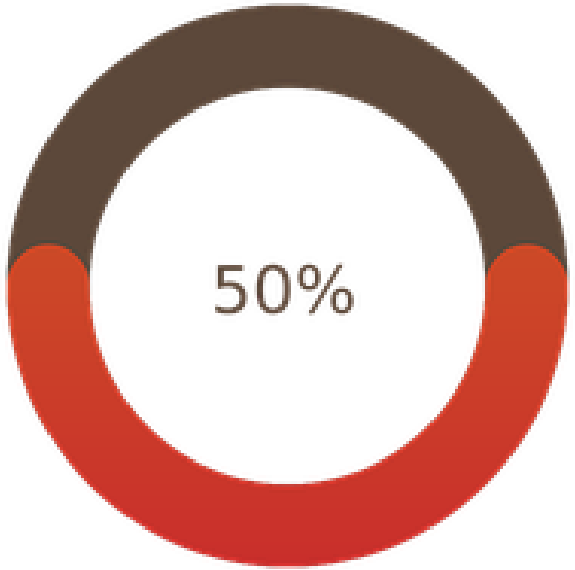
Data Gathering and Data Requirements

Main Data Source : MAGA Pvt Ltd.

Required datasets are;

1. Budget ,Timeline and Number of labours worked at the past project.
2. Labor categories required for the projects.
3. Labor histogram details of each project.

Current Progress



- Data Gathering
- Cleaning and Creation of dataset.
- Trained a basemodel to predict the required labor count categorywise based on the building size and completed number of days.

Project Evidence

```
[1] import numpy as np
    import pandas as pd
    import matplotlib.pyplot as plt
    import seaborn as sns
```

```
[2] data = pd.read_csv('Project details with labor count.csv', encoding='latin-1')
```

```
[3] data
```

	Project_ID	Square_Feet	Duration_Days	Carpenters	Barbenders	Masons	Painters	Plumbers	Tillers	Electricians	Mechanics	Welders	Machi Operato
0	1	15607	181	17	11	14	20	7	15	19	10	11	
1	2	19381	173	18	2	15	20	14	18	10	4	8	
2	3	14056	302	11	6	10	20	13	13	17	5	10	
3	4	5932	110	8	3	3	19	14	11	15	9	13	
4	5	5397	341	19	5	19	13	6	1	12	4	3	
...	...	...	...	...	...	...	...	...	...	...	...	...	
95	96	19826	249	13	2	16	12	18	5	14	20	5	
96	97	9655	107	6	7	11	14	18	14	4	15	11	
97	98	10366	320	7	14	10	15	9	7	8	19	12	

✓ 0s completed at 04:08

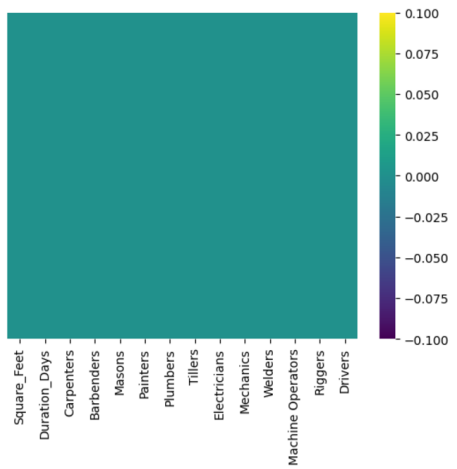
```
[4] data = data.drop(columns=['Project_ID'])
```

```
[5] data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100 entries, 0 to 99
Data columns (total 14 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Square_Feet        100 non-null    int64
 1   Duration_Days      100 non-null    int64
 2   Carpenters         100 non-null    int64
 3   Barbenders         100 non-null    int64
 4   Masons             100 non-null    int64
 5   Painters           100 non-null    int64
 6   Plumbers           100 non-null    int64
 7   Tillers            100 non-null    int64
 8   Electricians       100 non-null    int64
 9   Mechanics          100 non-null    int64
 10  Welders            100 non-null    int64
 11  Machine Operators  100 non-null    int64
 12  Riggers            100 non-null    int64
 13  Drivers            100 non-null    int64
dtypes: int64(14)
memory usage: 11.1 KB
```

```
[6] sns.heatmap(data.isnull(),yticklabels=False, cmap="viridis")
```

```
[6] <Axes: >
```




```
[7] y = data.drop(['Square_Feet','Duration_Days'], axis=1)
    X = data[['Square_Feet', 'Duration_Days']]
```

```
[8] from sklearn.svm import SVR
    from sklearn.model_selection import train_test_split
    from sklearn.preprocessing import StandardScaler
    from sklearn.metrics import mean_squared_error

    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=30)
```

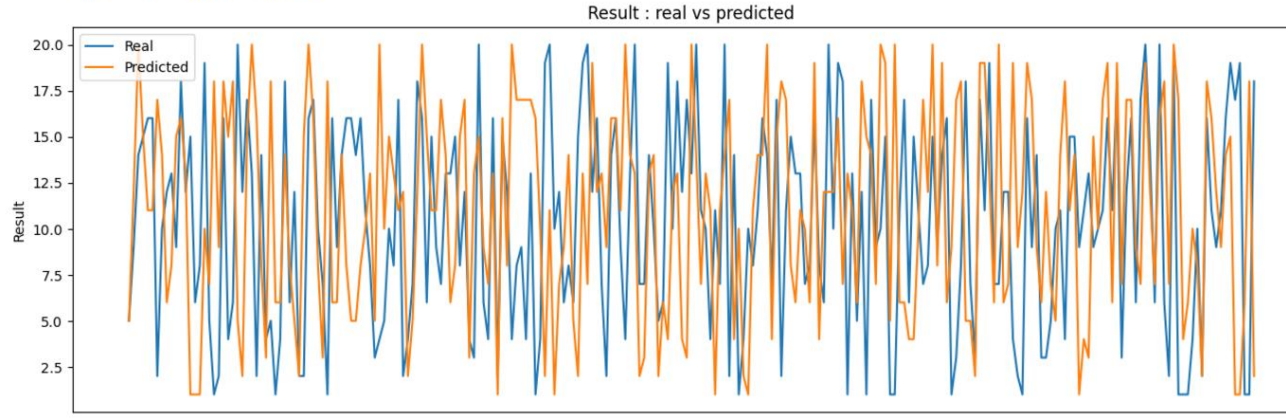
```
[9] def model_score(model):
        model.fit(X_train, y_train)
        acc = model.score(X_test, y_test)
        print(str(model)+ ' | ' +str(acc))
```

```
[10] from sklearn.linear_model import LinearRegression
     lr = LinearRegression()
     model_score(lr)

     from sklearn.ensemble import RandomForestRegressor
     rf = RandomForestRegressor()
     model_score(rf)

     from sklearn.tree import DecisionTreeRegressor
     dt = DecisionTreeRegressor()
```

Project Evidence

```
[16] def predict_workers():

        square_feet = float(input("Enter the Square Feet of the construction area: "))
        duration_days = int(input("Enter the Duration of the construction in days: "))

        sample_input = [[square_feet, duration_days]]

        predicted_workers = model.predict(sample_input)

        worker_columns = ['Carpenters', 'Barbenders', 'Masons', 'Painters', 'Plumbers', 'Tillers',
                          'Electricians', 'Mechanics', 'Welders', 'Machine Operators', 'Riggers', 'Drivers']

        predicted_workers = predicted_workers.round(0).astype(int)

        print("\nPredicted number of workers required:")
        for worker, count in zip(worker_columns, predicted_workers[0]):
            print(f"{worker}: {count}")
```

```
<class 'numpy.ndarray'>
<class 'pandas.core.frame.DataFrame'>
```

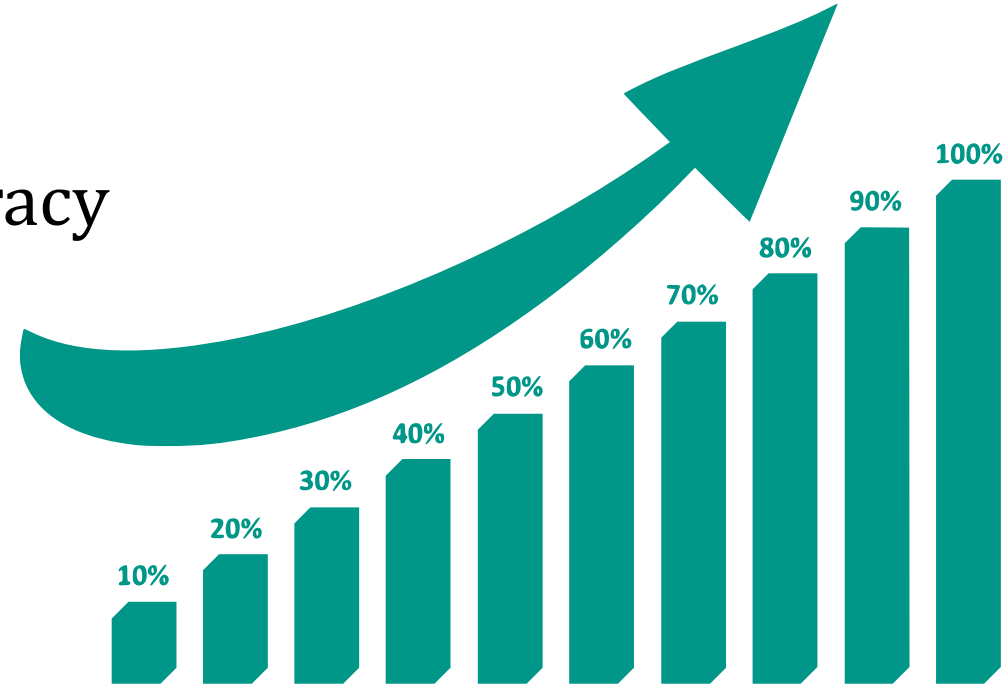



```
predict_workers()
```

```
Enter the Square Feet of the construction area: 2345
Enter the Duration of the construction in days: 1080

Predicted number of workers required:
Carpenters: 5
Barbenders: 3
Masons: 17
Painters: 4
Plumbers: 9
Tillers: 15
Electricians: 12
Mechanics: 2
Welders: 6
Machine Operators: 3
Riggers: 14
Drivers: 20
/usr/local/lib/python3.10/dist-packages/sklearn/base.py:493: UserWarning: X does not have valid feature name
```

Future Progress

- Frontend Implementation
- Component Integration
- Increasing dataset size to improve the accuracy



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PROTOTYPE DEMONSTRATION

https://www.figma.com/proto/SfiSFAodV2IIuEbiVFLANP/Project-Pulse?node-id=46-107&node-type=frame&t=yPgBIa6Bhc5c2cqt-0&scaling=min-zoom&content-scaling=fixed&page-id=0%3A1&starting-point-node-id=28%3A40

Commercialization Information

Common Version

- Initial KPI generation by CV Upload.
- Updating the performance of employees.
- Project categorization on Time Frame and Geographical factors.

Premium Version

- Updated KPI Values.
- Project Categorization on risk and complexity.
- Most appropriate employee suggestions.
- Labour,Cost and timeline predictions.

Market Place

- No need of advanced knowledge in technology.
- No age limit for users.

Target Audience

- Construction companies and contractors.
- Project Managers.

Subscription Fee (Monthly/Anually)

Business Canvas Model for MAGA Engineering's Systematic Manpower Allocation System

Link to Video:
[Commercialization Video]

Best Practices

- Break down the project into smaller tasks and create a project plan.
- Design a user-friendly and intuitive interface for a seamless user experience.
- Consider usability testing and gather feedback during the design phase.
- Use meaningful and consistent naming conventions for variables, functions, and classes.
- Implement proper code documentation to enhance readability and facilitate collaboration.

Risk Mitigation

- Discussions with the supervisor on progress.
- Use project management tools. E.g: Teams - Planner
- Regular Project Monitoring and Review.

Demonstration


Q&A

Thank You