JUKLAK

PROJECT MANAGEMENT

1.1 Background

Model ini digunakan untuk memperhitungkan prediksi dari suatu laporan proyek pada unit proses waktu dan biaya. Prediksi berdasarkan pada model machine learning yang dibangun dengan Python based Jupyter Notebook.

1.2 Model

Model didasarkan pada rancangan pelaksanaan modeling secara teknis berdasarkan requirement modeling pre-process, automate model dan interpretation. Secara khusus dibagi menjadi 3 fase yakni fase pembacaan directory, automate model dan visualisasi data.
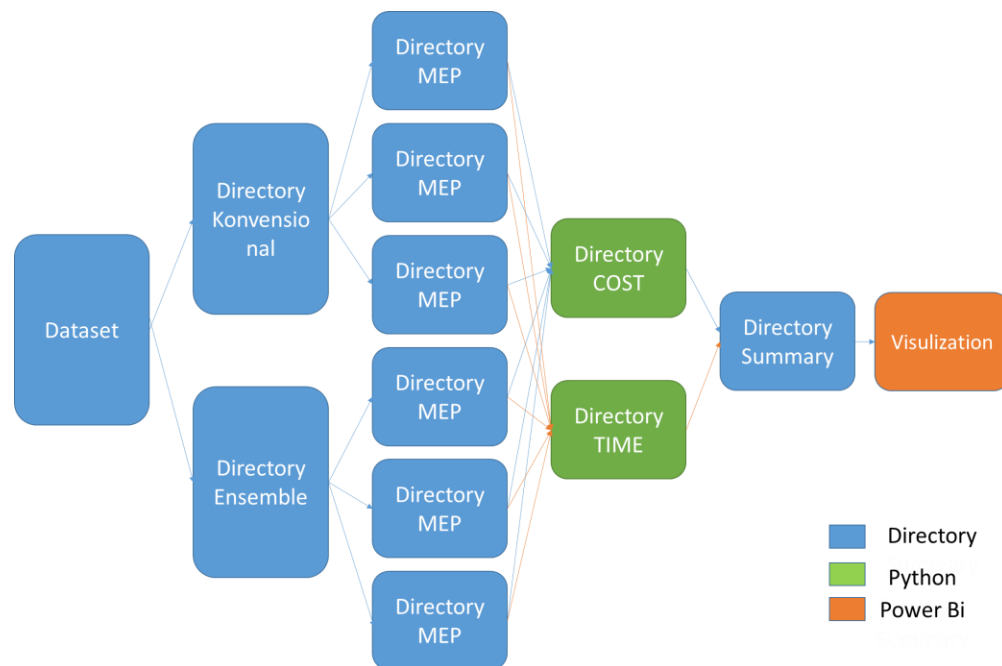
Requirement Environmental : Jupyter Notebook and Power BI.

1.1 Installation Modul

Harap install modul intallasi library yang dibutuhkan, file ini bernama "Installation Modul.ipynb" dan berada diarea luar directory.

1.2 Setting Dataset

Pada directory Dataset terbagi menjadi 3 yakni :

1. MEP = Cost, Time
2. ARSI = Cost, Time
3. KONS = Cost, Time

Masing-masing terdapat data seperti dibawah harap "**tidak merubah letak format, dan bila ada perubahan hanya rubah isi data".** Detail yang bisa dirubah ditunjukan kotak merah dibawah :

	A	B	C
	Minggu	Planned Value	Earned Value
2	1	0,189	0,000
3	2	0,408	0,000
4	3	0,630	0,000
5	4	0,878	0,000
6	5	1,127	0,000
7	6	1,375	0,000
8	7	2,705	0,000
9	8	4,155	0,000
0	9	5,742	0,000
1	10	7,335	0,000
2	11	8,932	0,139
3	12	10,530	0,151
4	13	12,079	0,849
5	14	12,969	1,105
6	15	13,860	1,130
7	16	14,750	1,130
8	17	15,641	0,560
9	18	16,548	1,510
0	19	17,435	1,616
1	20	18,322	1,638
2	21	19,177	1,705

Sheetname sudah disetting sesuai **requirement** tidak bisa dirubah, harap masukan data sesua sheet masing-masing.

1.3 Main Model Python

Model utama terdapat 12 python yang terdapat pada directory :

1. "C:/Users/User/Videos/Project Management and Machine Learning/Ensemble/MEP/Time/ENSEMBLE-MEP-TIME.ipynb"
2. "C:/Users/User/Videos/Project Management and Machine Learning/Ensemble/MEP/Cost/ENSEMBLE-MEP-COST.ipynb"
3. "C:/Users/User/Videos/Project Management and Machine Learning/Ensemble/KONS/Time/ENSEMBLE-KONS-TIME.ipynb"
4. "C:/Users/User/Videos/Project Management and Machine Learning/Ensemble/KONS/Cost/ENSEMBLE-KONS-COST.ipynb"
5. "C:/Users/User/Videos/Project Management and Machine Learning/Ensemble/ARSI/Time/ENSEMBLE-ARSI-TIME.ipynb"
6. "C:/Users/User/Videos/Project Management and Machine Learning/Ensemble/ARSI/Cost/ENSEMBLE-ARSI-COST.ipynb"
7. "C:/Users/User/Videos/Project Management and Machine Learning/Konvesional/MEP/Time/KONVE-MEP-TIME.ipynb"
8. "C:/Users/User/Videos/Project Management and Machine Learning/Konvesional/MEP/Cost/KONVE-MEP-COST.ipynb"
9. "C:/Users/User/Videos/Project Management and Machine Learning/Konvesional/KONS/Time/KONVE-KONS-TIME.ipynb"
10. "C:/Users/User/Videos/Project Management and Machine Learning/Konvesional/KONS/Cost/KONVE-KONS-COST.ipynb"
11. "C:/Users/User/Videos/Project Management and Machine Learning/Konvesional/ARSI/Time/KONVE-ARSI-TIME.ipynb"
12. "C:/Users/User/Videos/Project Management and Machine Learning/Konvesional/ARSI/Cost/KONVE-ARSI-COST.ipynb"

1.3.1 RUNNING MODEL AND CHECK :

1. **Harap Ganti Directory pada setiap model diatas -> harus buka 12 model.** Detail yang diganti pada variable **PATH** dan **CLEAR_PATH.**

2. Input Dataset

```
In [2]: path = "C:/Users/User/Videos/Project Management and Machine Learning/Dataset/COST/MEP"
```

3.Clear Excel Output

```
In [3]: def clear_all_data(file):
            workbook = load_workbook(file)
            sheet_names = workbook.sheetnames

            if not sheet_names:
                # If there are no sheets, create a new sheet and make it visible
                workbook.create_sheet("Sheet1")
            else:
                # Remove all sheets except the first one
                for sheet_name in sheet_names[1:]:
                    workbook.remove(workbook[sheet_name])

            workbook.save(file)
            workbook.close()
```

```
In [4]: clear_path = "C:/Users/User/Videos/Project Management and Machine Learning/Ensemble/MEP/COST"
```

```
In [5]: excel_file1 = clear_path+"/RESULT-ENSEMBLE-MEP-COST.xlsx"
        excel_file2 = clear_path+"/PARAM-ENSEMBLE-MEP-COST.xlsx"

        clear_all_data(excel_file1)
        clear_all_data(excel_file2)
```

Sesuaikan sesuai dengan letak anda menyimpan file.

- Klik kanan pada file "Project Management and Machine Learning"
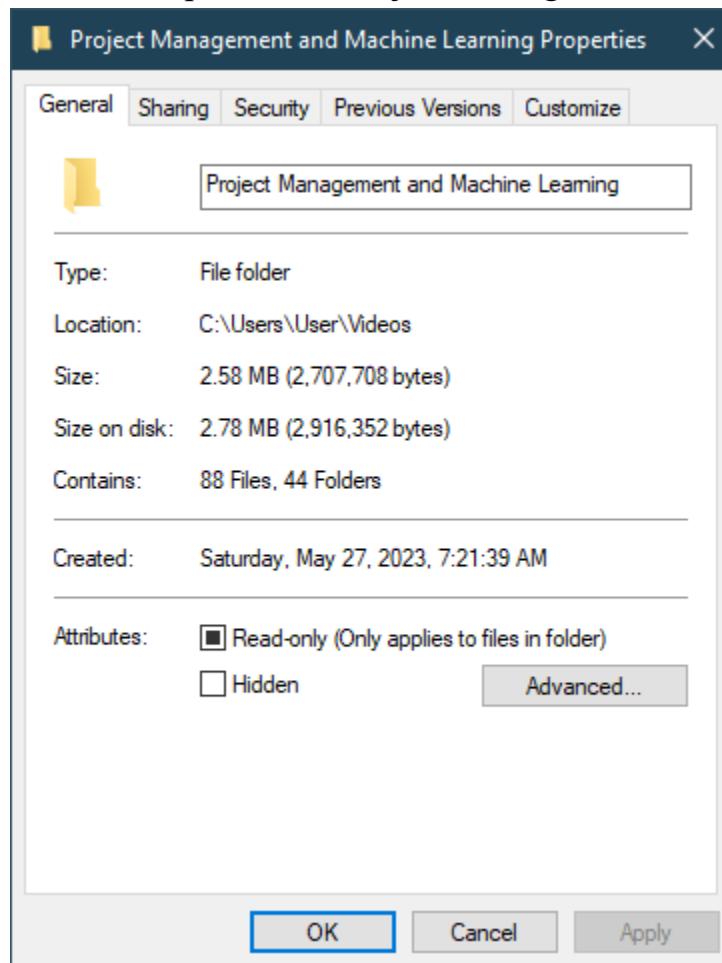
- **RUBAH TANDA (\) MENJADI (/)**

- Tempelkan pada directory dibelakang **project management** sebagai contoh
  C:/Users/User/Videos -> adalah directory disimpan.
  "C:/Users/User/Videos/Project Management and Machine Learning/Dataset/COST/MEP"
  Yang diblok merah saja yang diganti sesuai letak folder Project management.

1.3.2 Tuning Parameter Model :

Terdapat dua karakteristik yang berbeda antara ensemble dan konvesional :

1. Ensemble :
   - Untuk model XGBOOST dan RandomForest terdapat pada section pertama dengan variable **param_grid_xg** dan **param_grid_rf.** SEMUA HARUS TERISI PARAMETER WALAUPUN SATU UNTUK SETIAP PARAMETER

Running MK1

```
In [9]:  data_source_file = path+"/Dataset.xlsx"
         result_file = "RESULT-ENSEMBLE-MEP-COST.xlsx"
         params_file = "PARAM-ENSEMBLE-MEP-COST.xlsx"

         ensemble = EnsembleRegressor(data_source_file, result_file,params_file )


         param_grid_xg = { 'n_estimators': [50, 100, 200],'max_depth': [3, 5, 7],'learning_rate': [0.1, 0.05, 0.01] }
         param_grid_rf = { 'n_estimators': [50, 100, 200],'max_depth': [3, 5, 7],'min_samples_split': [0.1, 0.05, 0.01] }

In [10]: ensemble.train_and_predict('MK1', model_name='XGBoost', param_grid=param_grid_xg)

In [11]: ensemble.train_and_predict('MK1', model_name='RandomForest', param_grid=param_grid_rf)

In [12]: blending_ensemble ('MK1')

Out[12]: (None, None)
```

   - Sedangkan untuk model **Blending** terdapat pada function **blending_ensemble**. KLIK CTRL+F, **CARI blending_ensemble.** Scrooll pada looping iteration. Rubah **DALAM BENTUK RANGE.** SEMUA HARUS TERISI PARAMETER WALAUPUN SATU UNTUK SETIAP PARAMETER

```
def blending_ensemble (x):
    Sheet = x
    Data = pd.read_excel (path+"/Dataset.xlsx",sheet_name = Sheet )
    X = Data.drop (columns = 'ACWP')
    y = Data.drop (columns = X.columns)

    #Splitting Data Training and Testing
    x_train, x_test, y_train, y_test = train_test_split(X, y ,train_size = 0.8,random_state = 58)
    x_train = x_train.sort_index(ascending=True)
    y_train = y_train.sort_index(ascending=True)
    x_test = x_test.sort_index(ascending=True)
    y_test = y_test.sort_index(ascending=True)

    Val =[]
    blg_model = BlendingEnsemble()
    for alpha in np.arange (0.025,0.75,0.25):
        for alpha_r in np.arange(0.25,0.76,0.25) :
            for degree in range (2,5) :
                blg_model.alpha = alpha
                blg_model.alpha_r = alpha_r
                blg_model.degree = degree
                    ##create the model

                blg_model.fit (x_train,y_train)
                    ######Train###############
                y_train_Pred = blg_model.predict (x_train)
                y_train_Pred = pd.DataFrame({'Y_train_Pred':y_train_Pred.ravel()})

                y_train.reset_index(drop=True,inplace=True)
                y_train_Pred.reset_index(drop = True,inplace=True)
```

2. Konvensional :

Semua tuning parameter terdapat pada section running untuk kelompok pertama kali. Dengan param_gridd ANN ->ANN, param_grid_svm -> SVM dan param_grid_poly - >Polynomial Regression. <mark>SEMUA HARUS TERISI PARAMETER WALAUPUN SATU UNTUK SETIAP PARAMETER</mark>

Running MK1

```
In [7]: data_source_file = path+"/Dataset.xlsx"
        result_file = "RESULT-KONVE-MEP-TIME.xlsx"
        params_file = "PARAM-KONVE-MEP-TIME.xlsx"

        ensemble = KonveRegressor(data_source_file, result_file,params_file )

        param_grid_ann = { 'hidden_layer_sizes': [10,50, 100],'activation': ['logistic', 'tanh', 'relu'],'learning_rate_init': [0.01, 0.
        param_grid_svm = { 'kernel': [ 'poly','linear','rbf'] ,'C':[1,2,4],'epsilon':[0.1,0.2,0.3]}
        param_grid_poly = {
            'polynomialfeatures__degree': [2, 3, 4],
            'linearregression__normalize': [True, False],
            'polynomialfeatures__include_bias' : [True, False]
        }
```

1.3.3 Output Model

Terdiri dari 2 output yakni "**PARAM-.....**" untuk tuning parameter dan "**RESULT-...**" untuk hasil prediksi. Ouput adalah excel file.

- Contoh "PARAM-...."

PARAM-ENSEMBLE-ARSI-COST - Excel

n_estimators	max_depth	learning_rate	R2	RMSE	Model	Method	Subwork	Work	Process
50	3	0,1	0,999809	0,014023	XGBoost	ensemble	INT1	ARSI	Cost
50	3	0,05	0,9742	0,162986	XGBoost	ensemble	INT1	ARSI	Cost
50	3	0,01	-0,23125	1,125929	XGBoost	ensemble	INT1	ARSI	Cost
50	5	0,1	0,99981	0,014001	XGBoost	ensemble	INT1	ARSI	Cost
50	5	0,05	0,974236	0,162872	XGBoost	ensemble	INT1	ARSI	Cost
50	5	0,01	-0,23117	1,125893	XGBoost	ensemble	INT1	ARSI	Cost
50	7	0,1	0,99981	0,014001	XGBoost	ensemble	INT1	ARSI	Cost
50	7	0,05	0,974236	0,162872	XGBoost	ensemble	INT1	ARSI	Cost
50	7	0,01	-0,23117	1,125893	XGBoost	ensemble	INT1	ARSI	Cost
100	3	0,1	0,999997	0,001852	XGBoost	ensemble	INT1	ARSI	Cost
100	3	0,05	0,999771	0,015345	XGBoost	ensemble	INT1	ARSI	Cost
100	3	0,01	0,521138	0,702172	XGBoost	ensemble	INT1	ARSI	Cost
100	5	0,1	0,999999	0,001138	XGBoost	ensemble	INT1	ARSI	Cost
100	5	0,05	0,999772	0,015329	XGBoost	ensemble	INT1	ARSI	Cost
100	5	0,01	0,521221	0,702112	XGBoost	ensemble	INT1	ARSI	Cost
100	7	0,1	0,999999	0,000853	XGBoost	ensemble	INT1	ARSI	Cost
100	7	0,05	0,999772	0,015329	XGBoost	ensemble	INT1	ARSI	Cost
100	7	0,01	0,521221	0,702112	XGBoost	ensemble	INT1	ARSI	Cost
200	3	0,1	1	0,000553	XGBoost	ensemble	INT1	ARSI	Cost
200	3	0,05	1	0,000523	XGBoost	ensemble	INT1	ARSI	Cost
200	3	0,01	0,927447	0,273317	XGBoost	ensemble	INT1	ARSI	Cost
200	5	0,1	1	0,000106	XGBoost	ensemble	INT1	ARSI	Cost

Sheets: INT1, INT2, EKS1, EKS2, GKB1, GKB2, KUM

- Contoh "RESULT-..."

RESULT-ENSEMBLE-ARSI-COST - Excel

AT	BCWP	ACWP	ACWP_Pre	Model	Method	Subwork	Work	Process
7	0	2512632	2516370	XGBoost	ensemble	INT1	ARSI	Cost
8	1818151	2512632	2516370	XGBoost	ensemble	INT1	ARSI	Cost
11	14545207	11680453	66005728	XGBoost	ensemble	INT1	ARSI	Cost
16	1,18E+08	1,92E+08	1,6E+08	XGBoost	ensemble	INT1	ARSI	Cost
17	2,01E+08	2,55E+08	2,81E+08	XGBoost	ensemble	INT1	ARSI	Cost
18	2,41E+08	2,68E+08	2,81E+08	XGBoost	ensemble	INT1	ARSI	Cost
21	4,01E+08	3,54E+08	4,43E+08	XGBoost	ensemble	INT1	ARSI	Cost
29	7,69E+08	7,96E+08	8,47E+08	XGBoost	ensemble	INT1	ARSI	Cost
32	8,3E+08	1,06E+09	1,1E+09	XGBoost	ensemble	INT1	ARSI	Cost
37	9,72E+08	1,23E+09	1,27E+09	XGBoost	ensemble	INT1	ARSI	Cost
42	1,2E+09	1,47E+09	1,49E+09	XGBoost	ensemble	INT1	ARSI	Cost
55	1,97E+09	2,4E+09	2,34E+09	XGBoost	ensemble	INT1	ARSI	Cost
56	2,04E+09	2,43E+09	2,56E+09	XGBoost	ensemble	INT1	ARSI	Cost
57	2,08E+09	2,54E+09	2,56E+09	XGBoost	ensemble	INT1	ARSI	Cost
59	2,2E+09	2,56E+09	2,6E+09	XGBoost	ensemble	INT1	ARSI	Cost
76	2,65E+09	2,65E+09	2,65E+09	XGBoost	ensemble	INT1	ARSI	Cost
AT	BCWP	ACWP	ACWP_Pre	Model	Method	Subwork	Work	Process
7	0	2512632	2512632	RandomF	ensemble	INT1	ARSI	Cost
8	1818151	2512632	3147552	RandomF	ensemble	INT1	ARSI	Cost
11	14545207	11680453	19869458	RandomF	ensemble	INT1	ARSI	Cost
16	1,18E+08	1,92E+08	1,43E+08	RandomF	ensemble	INT1	ARSI	Cost
17	2,01E+08	2,55E+08	2,13E+08	RandomF	ensemble	INT1	ARSI	Cost

Sheets: INT1, INT2, EKS1, EKS2, GKB1, GKB2, KUM

1.4 Running Automation

    1. Hapus Semua **File Excel Kecuali :**

- **Parameter.xlsx**
- **Result.xlsx**

    2. **Restart dan Run All** pada **FILE "Automate-Process"**

    3. **Succes akan muncul semua file excel**

Name	Date modified	Type	Size
.ipynb_checkpoints	6/10/2023 7:35 PM	File folder	
Automate-Process.ipynb	6/11/2023 10:00 AM	IPYNB File	10 KB
PARAM-ENSEMBLE-ARSI-COST	6/11/2023 9:56 AM	Microsoft Excel W...	41 KB
PARAM-ENSEMBLE-ARSI-TIME	6/11/2023 9:55 AM	Microsoft Excel W...	40 KB
PARAM-ENSEMBLE-KONS-COST	6/11/2023 9:53 AM	Microsoft Excel W...	40 KB
PARAM-ENSEMBLE-KONS-TIME	6/11/2023 9:52 AM	Microsoft Excel W...	41 KB
PARAM-ENSEMBLE-MEP-COST	6/11/2023 9:51 AM	Microsoft Excel W...	52 KB
PARAM-ENSEMBLE-MEP-TIME	6/11/2023 9:49 AM	Microsoft Excel W...	51 KB
Parameter	6/11/2023 9:59 AM	Microsoft Excel W...	361 KB
PARAM-KONVE-ARSI-COST	6/11/2023 9:59 AM	Microsoft Excel W...	28 KB
PARAM-KONVE-ARSI-TIME	6/11/2023 9:59 AM	Microsoft Excel W...	36 KB
PARAM-KONVE-KONS-COST	6/11/2023 9:58 AM	Microsoft Excel W...	28 KB
PARAM-KONVE-KONS-TIME	6/11/2023 9:58 AM	Microsoft Excel W...	36 KB
PARAM-KONVE-MEP-COST	6/11/2023 9:57 AM	Microsoft Excel W...	34 KB
PARAM-KONVE-MEP-TIME	6/11/2023 9:57 AM	Microsoft Excel W...	45 KB
Result	6/11/2023 9:59 AM	Microsoft Excel W...	197 KB
RESULT-ENSEMBLE-ARSI-COST	6/11/2023 9:56 AM	Microsoft Excel W...	26 KB
RESULT-ENSEMBLE-ARSI-TIME	6/11/2023 9:55 AM	Microsoft Excel W...	26 KB
RESULT-ENSEMBLE-KONS-COST	6/11/2023 9:53 AM	Microsoft Excel W...	18 KB
RESULT-ENSEMBLE-KONS-TIME	6/11/2023 9:52 AM	Microsoft Excel W...	18 KB
RESULT-ENSEMBLE-MEP-COST	6/11/2023 9:51 AM	Microsoft Excel W...	29 KB
RESULT-ENSEMBLE-MEP-TIME	6/11/2023 9:49 AM	Microsoft Excel W...	35 KB
RESULT-KONVE-ARSI-COST	6/11/2023 9:59 AM	Microsoft Excel W...	26 KB
RESULT-KONVE-ARSI-TIME	6/11/2023 9:59 AM	Microsoft Excel W...	27 KB
RESULT-KONVE-KONS-COST	6/11/2023 9:58 AM	Microsoft Excel W...	18 KB
RESULT-KONVE-KONS-TIME	6/11/2023 9:58 AM	Microsoft Excel W...	18 KB
RESULT-KONVE-MEP-COST	6/11/2023 9:57 AM	Microsoft Excel W...	30 KB
RESULT-KONVE-MEP-TIME	6/11/2023 9:57 AM	Microsoft Excel W...	36 KB

1.5 Buka File Power BI

1. Refresh Power BI
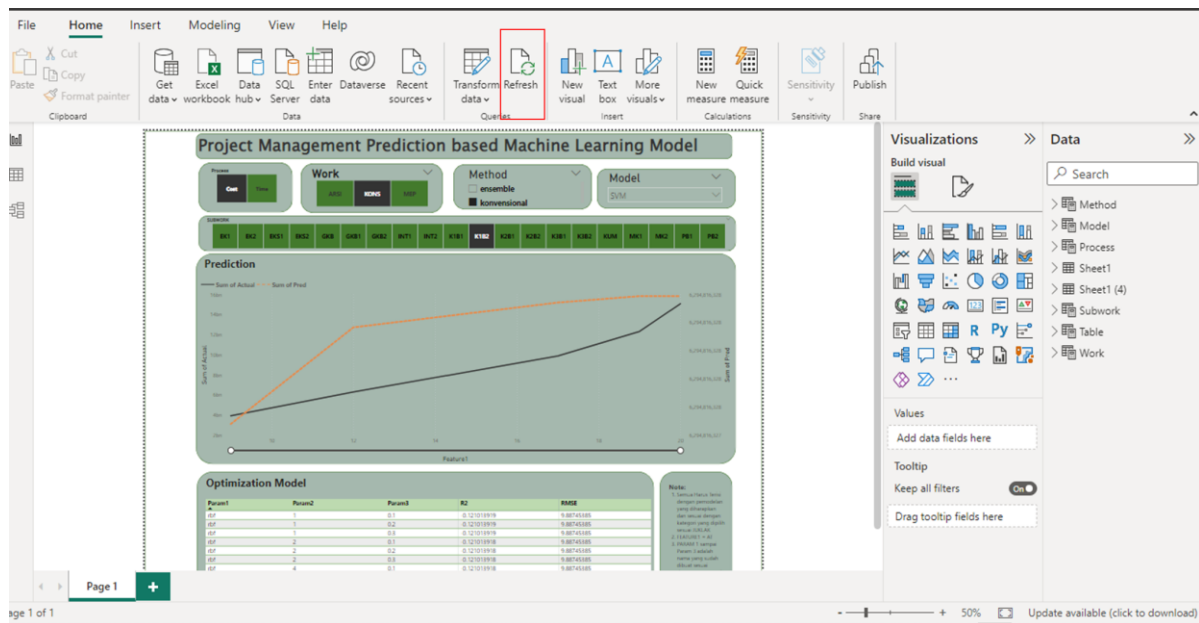
2 . Succes maka akan muncul tampilan
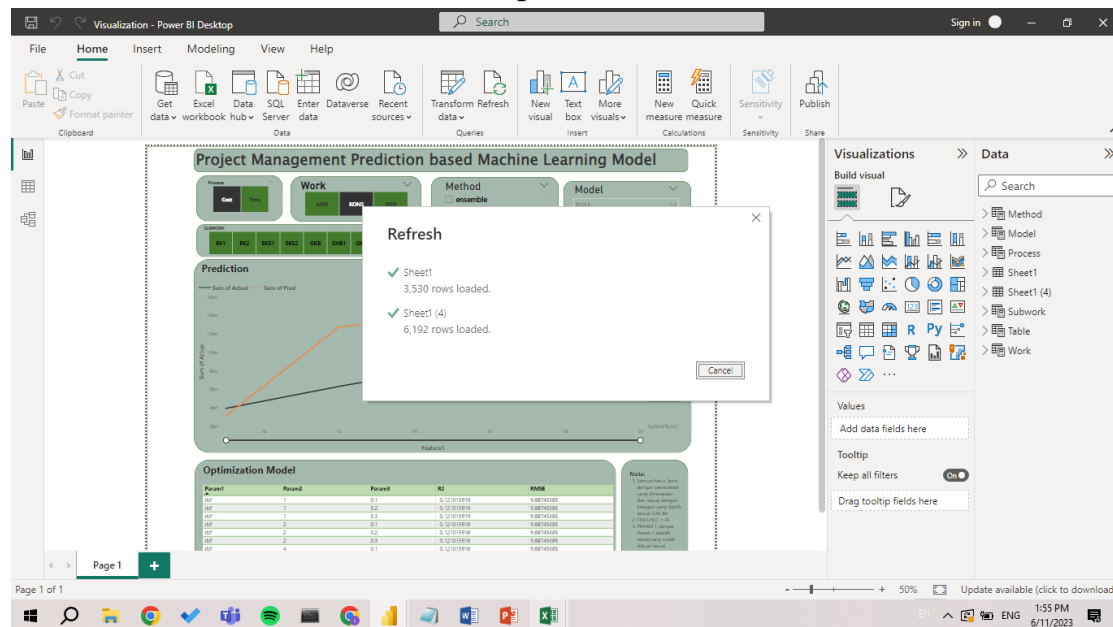
3. Filter Tampilan

Filter Harus diisi semua sesuai dengan tampilan yang diharapkan. Dengan
mandatory = Process, Method, Work, Model.

Pengisian Subwork harus berdasarkan pada Work yang dipilih sesuai table
dibawah :

Work	Subwork
MEP	MK1
	MK2
	EK1
	EK2
	PB1
	PB2
	GKB1
	GKB2
	GKB
ARSI	INT1
	INT2
	EKS1
	EKS2
	GKB1
	GKB2
	KUM
KONS	K1B1
	K1B2
	K2B1
	K2B2
	K3B1
	K3B2

4. Interpretasi

   Terdapat Interpretasi pada 2 kolom tampilan :

   1. Prediction

      Ketika **Process -> Cost**, Actual = ACWP dan Prediksi ACWP

            Process -> Time, Actual = EV dan Prediksi EV

          AT -> Real Time

   2. Optimization Model

      Terdapat penjelasan pemilihan param1, param2 dan param3 berdasarkan pemilihan **Model.**

Model	Param1	Param2	Param3
XGBoost	n_estimators	max_depth	learning_rate
Random Forest	n_estimators	max_depth	min_samples_split

Blending	alpha	alpha_r	degree
ANN	hidden_layer_sizes	activation	learning_rate_init
SVM	kernel	C	epsilon
POLY	polynomialfeatures__degree	linearregression__normalize	polynomialfeatures__include_bias