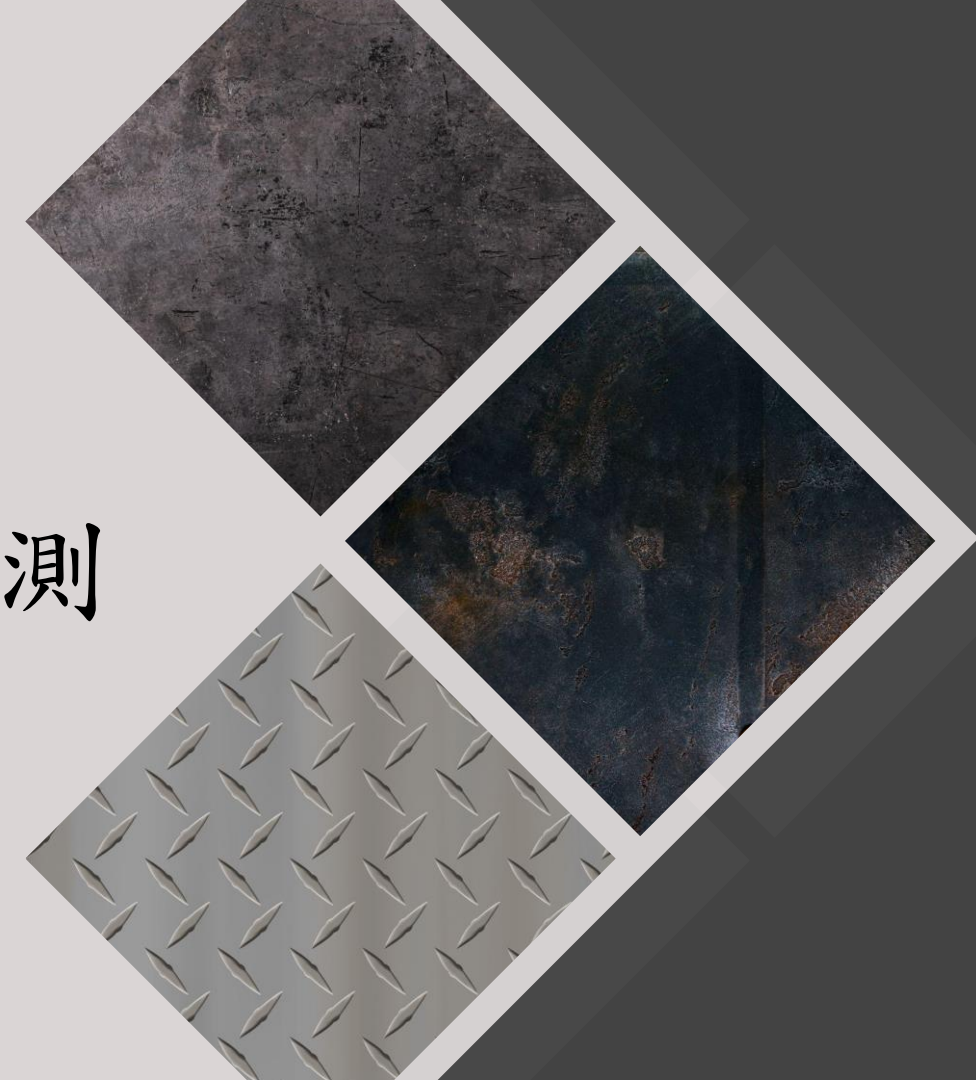
專題報告

# 合金生產品質預測



# 使用資料集

**資料集來源:**

Kaggle：Metal-Furnace

**描述:**

此資料集紀錄了金屬熔爐中冶金製程的28 個匿名因素(編號為f0至f27)與其產品的合金品質。

# 專題目標與流程

01 找出冶金製程中與產品品質高度相關的關鍵因子

02 選擇不同的機器學習模型訓練並評估結果

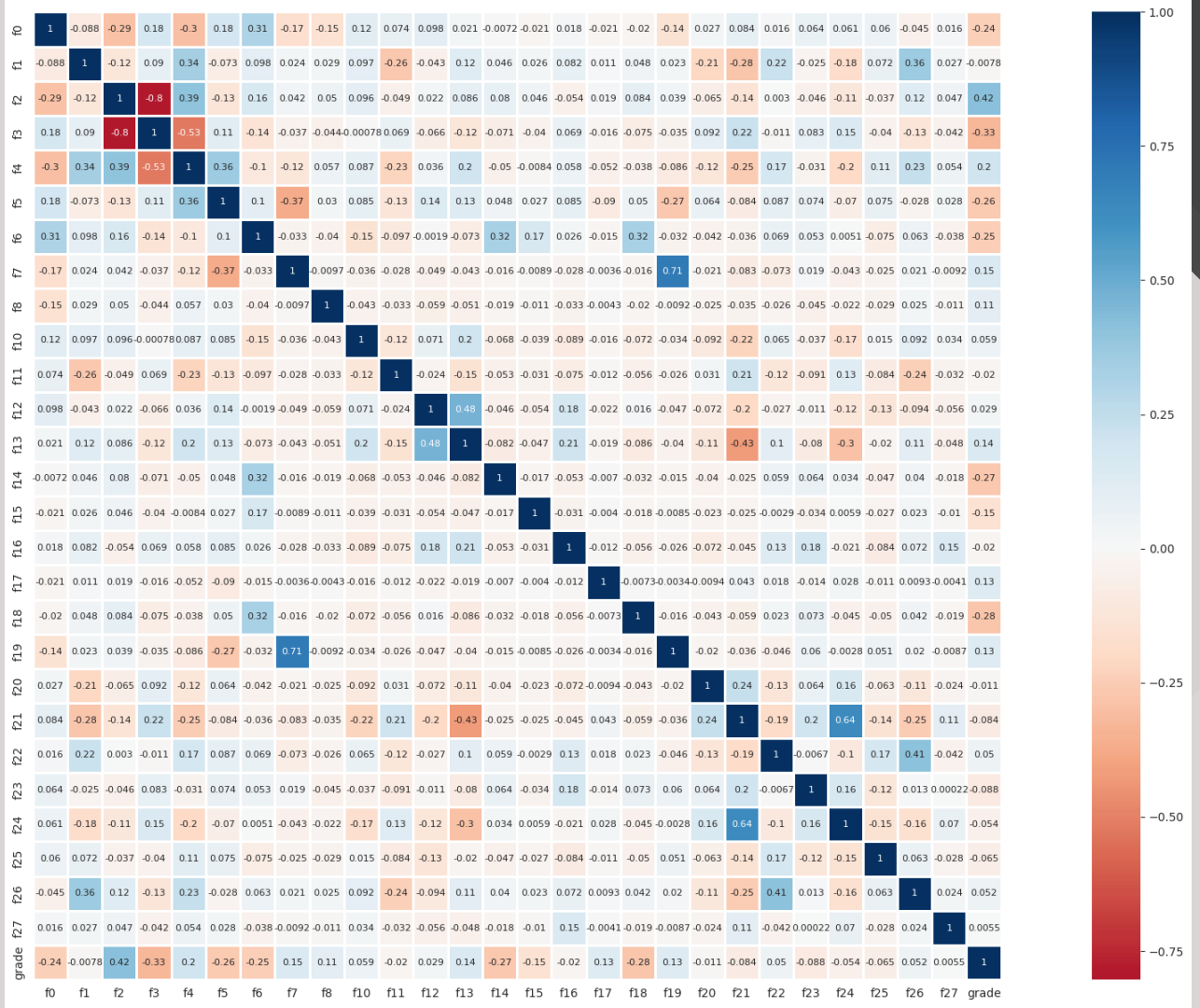
03 使用精準度較高的模型對新資料集進行預測

# 資料清洗

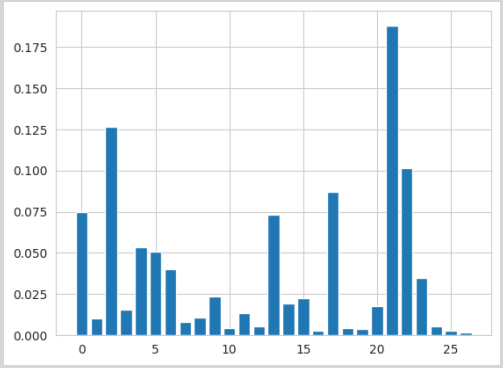
f9的欄位0值太多，選擇drop不放入模型訓練

```
[ ]   1 data  =  data.drop(['f9'],axis=1)
```

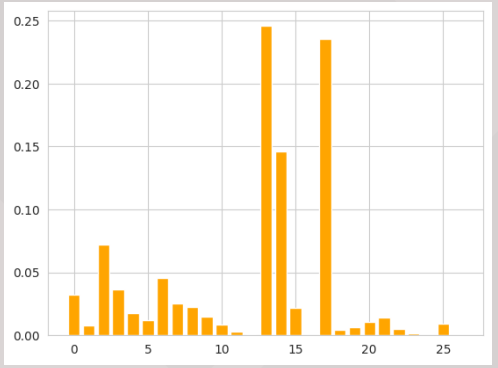
# Correlation Matrix



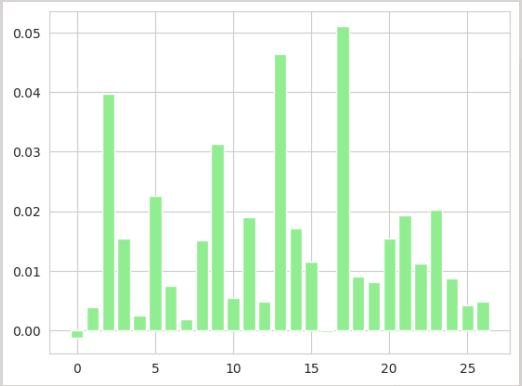
# Feature Importance




**RandomForestClassifier**




**XGBClassifier**




**KNeighborsClassifier**

# 與產品品質高度相關的因子

| | |
|---|---|
| Correlation Matrix | f9 |
| Feature Importance | f12 f13 f16 |

# 切割資料集與載入模型

```
[ ]
1 from sklearn.model_selection import train_test_split
2 from sklearn.tree import DecisionTreeClassifier
3 from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
4 X = data.iloc[:,:-1]
5 y = data.iloc[:,-1]
6 train_X,test_X,train_y,test_y=train_test_split(X,y,test_size=0.2,random_state=17,shuffle=True,stratify=y)
```

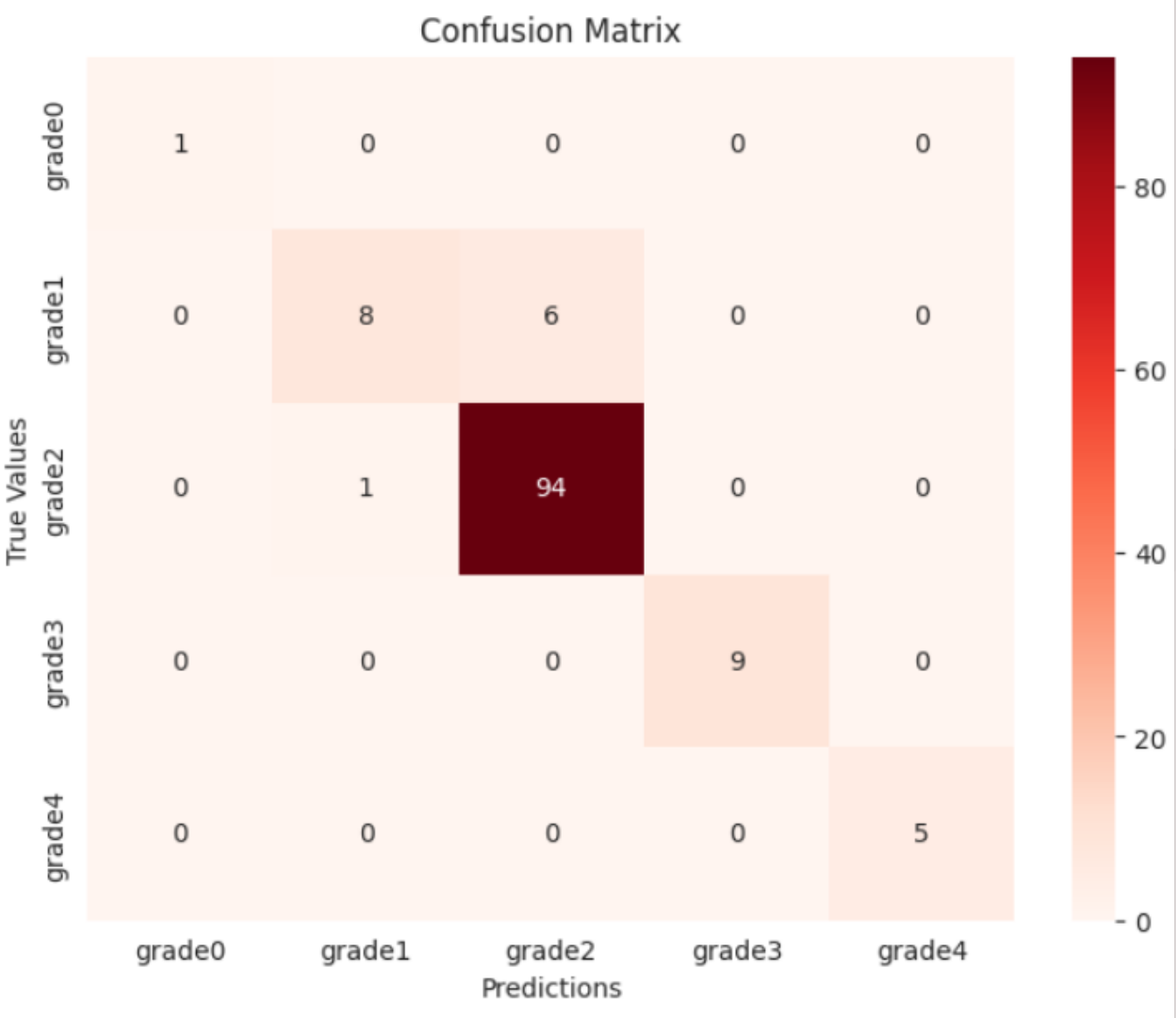
# 模型選擇

RandomForestClassifier

GradientBoostingClassifier

XGBoostClassifier

# Confusion Matrix



# 預測新資料集

## 載入驗證集進行預測

＋ 程式碼　＋ 文字

```
1 pre_data = pd.read_csv("/content/gdrive/My  Drive/Test1.csv")
2 pre_data
```

| | f0 | f1 | f2 | f3 | f4 | f5 | f6 | f7 | f8 | f9 | ... | f18 | f19 | f20 | f21 | f22 | f23 | f24 | f25 | f26 | f27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | -0.837812 | -0.273636 | 1.276580 | 0.463262 | -0.585142 | -0.24287 | 0.349804 | 0.12356 | 0.166795 | 0.06143 | ... | 0.197642 | 0.06143 | 0.27735 | 0.886135 | -0.568935 | 1.100428 | -0.244589 | 0.229718 | -0.217109 | 0.087039 |
| **1** | 2.078087 | -0.273636 | -0.496119 | 0.463262 | -2.438092 | -0.24287 | 0.349804 | 0.12356 | 0.166795 | 0.06143 | ... | -5.059644 | 0.06143 | 0.27735 | 0.886135 | 0.504299 | -0.434268 | -0.244040 | 0.229718 | -0.217109 | 0.087039 |
| **2** | -0.837812 | -0.273636 | 1.276580 | 0.463262 | -0.585142 | -0.24287 | 0.349804 | 0.12356 | 0.166795 | 0.06143 | ... | 0.197642 | 0.06143 | 0.27735 | -1.128496 | -0.568935 | -0.434268 | -0.662763 | 0.229718 | -0.217109 | 0.087039 |
| **3** | -0.837812 | -0.273636 | -0.496119 | 0.463262 | 1.267808 | -0.24287 | -2.858743 | 0.12356 | 0.166795 | 0.06143 | ... | -5.059644 | 0.06143 | 0.27735 | -1.128496 | -0.449819 | -1.918647 | -0.662763 | 0.229718 | -0.217109 | 0.087039 |
| **4** | -0.837812 | -0.273636 | -0.496119 | 0.463262 | -0.585142 | -0.24287 | -2.858743 | 0.12356 | 0.166795 | 0.06143 | ... | 0.197642 | 0.06143 | 0.27735 | -1.128496 | -0.568935 | -0.434268 | -0.662763 | 0.229718 | -0.217109 | 0.087039 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **261** | 0.411859 | -0.273636 | -0.496119 | 0.463262 | -0.585142 | -0.24287 | 0.349804 | 0.12356 | 0.166795 | 0.06143 | ... | 0.197642 | 0.06143 | 0.27735 | 0.886135 | -0.567744 | -1.025755 | -0.244040 | 0.229718 | -0.217109 | 0.087039 |
| **262** | -0.837812 | -0.273636 | -0.496119 | 0.463262 | -0.585142 | -0.24287 | 0.349804 | 0.12356 | 0.166795 | 0.06143 | ... | 0.197642 | 0.06143 | 0.27735 | -1.128496 | 2.410154 | -0.434520 | -0.662763 | 0.229718 | -0.217109 | 0.087039 |
| **263** | 0.411859 | -0.273636 | -0.496119 | 0.463262 | -0.585142 | -0.24287 | 0.349804 | 0.12356 | 0.166795 | 0.06143 | ... | 0.197642 | 0.06143 | 0.27735 | 0.886135 | -0.448628 | -0.434268 | -0.662213 | 0.229718 | -0.217109 | 0.087039 |
| **264** | 0.828416 | 4.569609 | -0.496119 | 0.463262 | 1.267808 | -0.24287 | 0.349804 | 0.12356 | 0.166795 | 0.06143 | ... | 0.197642 | 0.06143 | 0.27735 | 0.886135 | 0.504299 | 1.352018 | -0.244040 | 0.229718 | -0.217109 | 0.087039 |
| **265** | -0.837812 | -0.273636 | -0.496119 | 0.463262 | -0.585142 | -0.24287 | 0.349804 | 0.12356 | 0.166795 | 0.06143 | ... | 0.197642 | 0.06143 | 0.27735 | -1.128496 | 2.410154 | 1.352018 | -0.662763 | 0.229718 | -0.217109 | 0.087039 |

266 rows × 28 columns

```
[ ] 1 pre_data = pre_data.drop(['f9'],axis=1)
```

# 輸出預測結果

使用預測準確率最高的模型(RandomForestClassifier)進行預測

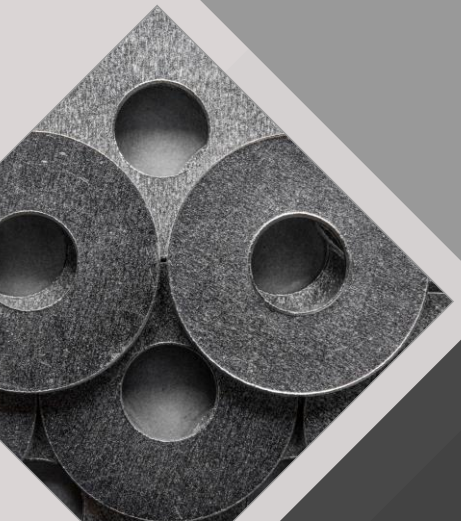
```
1 TestPredictions = rfcgrid.predict(pre_data)
2 PredictResult = {'grade':TestPredictions}
3 Result = pd.DataFrame(PredictResult)
4 Result
```

| | grade |
|---|---|
| 0 | 2 |
| 1 | 3 |
| 2 | 2 |
| 3 | 3 |
| 4 | 2 |
| ... | ... |
| 261 | 2 |
| 262 | 2 |
| 263 | 1 |
| 264 | 2 |
| 265 | 2 |

266 rows × 1 columns

```
1 Result.to_csv("/content/gdrive/My  Drive/predict_result.csv")
```

| | | grade |
|---|---|---|
| 2 | 0 | 2 |
| 3 | 1 | 3 |
| 4 | 2 | 2 |
| 5 | 3 | 3 |
| 6 | 4 | 2 |
| 7 | 5 | 2 |
| 8 | 6 | 2 |
| 9 | 7 | 2 |
| 10 | 8 | 2 |
| 11 | 9 | 2 |
| 12 | 10 | 1 |
| 13 | 11 | 2 |
| 14 | 12 | 2 |
| 15 | 13 | 2 |
| 16 | 14 | 3 |
| 17 | 15 | 2 |
| 18 | 16 | 1 |
| 19 | 17 | 2 |
| 20 | 18 | 2 |
| 21 | 19 | 2 |
| 22 | 20 | 2 |
| 23 | 21 | 2 |
| 24 | 22 | 2 |
| 25 | 23 | 2 |
| 26 | 24 | 2 |
| 27 | 25 | 2 |
| 28 | 26 | 2 |
| 29 | 27 | 2 |
| 30 | 28 | 2 |



# Thank You For Watching!