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055-assignment.ipynb054-gradient-boosting.ipynbX

Python 3 (pykernel)

5.5. Bankruptcy in Taiwan tw

```
[1]: import wget_grader
wget_grader.init("Project 5 Assessment")

[2]: # Import libraries here
from sklearn.base import ClassifierMixin
from sklearn.pipeline import Pipeline
import gzip
import json
import pickle

import pandas as pd
import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sns
import wget_grader
from imblearn.over_sampling import RandomOverSampler
from imblearn.under_sampling import RandomUnderSampler
from sklearn.metrics import SimpleImputer
from sklearn.metrics import (
    ConfusionMatrixDisplay,
    classification_report,
    confusion_matrix,
)

from sklearn.pipeline import make_pipeline
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import GridSearchCV, cross_val_score, train_test_split
import ipywidgets as widgets
from ipywidgets import interact
from sklearn.ensemble import GradientBoostingClassifier
from teaching_tools.widgets import ConfusionMatrixWidget
```

Prepare Data

Simple05Python 3 (pykernel) | Idle

Mode: CommandLn 1, Col 1English (United States)055-assignment.ipynb

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Search

ENG17-03-202323:36

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Python 3 (pykernel)

Prepare Data

Import

Task 5.5.1: Load the contents of the "data/taiwan-bankruptcy-data.json.gz" and assign it to the variable 'taiwan_data'.
Note that 'taiwan_data' should be a dictionary. You'll create a DataFrame in a later task.

```
[3]: # Load data file
with gzip.open("data/taiwan-bankruptcy-data.json.gz", "r") as f:
    taiwan_data = json.load(f)

print(type(taiwan_data))
<class 'dict'>
```

[4]: wget_grader.grade("Project 5 Assessment", "Task 5.5.1", taiwan_data["metadata"])

✓

That's the right answer. Keep it up!
Score: 1

Task 5.5.2: Extract the key names from 'taiwan_data' and assign them to the variable 'taiwan_data_keys'.

Tip: The data in this assignment might be organized differently than the data from the project, so be sure to inspect it first.

```
[5]: taiwan_data_keys = taiwan_data.keys()
print(taiwan_data_keys)

dict_keys(['schema', 'metadata', 'observations'])
```

Simple05Python 3 (pykernel) | Idle

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- 056-data-di... 2 months ago
- my_predicto... 2 months ago
- my_predicto... 2 months ago

```
[5]: taiwan_data_keys = taiwan_data.keys()
    print(taiwan_data_keys)

dict_keys(['schema', 'metadata', 'observations'])

[7]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.2", list(taiwan_data_keys))

You're making this look easy.
Score: 1

Task 5.5.3: Calculate how many companies are in 'taiwan_data' and assign the result to 'n_companies'.

[8]: len(taiwan_data["observations"])

[8]: 6137

[9]: n_companies = len(taiwan_data["observations"])
    print(n_companies)

6137

[10]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.3", [n_companies])

Very impressive.
Score: 1

Task 5.5.4: Calculate the number of features associated with each company and assign the result to 'n_features'.

[11]: n_features = len(taiwan_data["observations"][0])
    print(n_features)

97
```

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```
Task 5.5.4: Calculate the number of features associated with each company and assign the result to 'n_features'.

[11]: n_features = len(taiwan_data["observations"][0])
    print(n_features)

97

[13]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.4", [n_features])

Yup. You got it.
Score: 1

Task 5.5.5: Create a 'wrangle' function that takes as input the path of a compressed JSON file and returns the file's contents as a DataFrame. Be sure that the index of the DataFrame contains the ID of the companies. When your function is complete, use it to load the data into the DataFrame 'df'.

[14]: def wrangle(filePath):
    # Open compressed file, load to dict
    with gzip.open(filePath, "r") as f:
        data = json.load(f)

    # Dictionary -> DataFrame, set index
    df = pd.DataFrame().from_dict(data["observations"]).set_index("id")

    return df

[15]: df = wrangle('data/taiwan-bankruptcy-data.json.gz')
    print("df shape:", df.shape)
    df.head()

df shape: (6137, 96)

[15]: bankrupt feat_1 feat_2 feat_3 feat_4 feat_5 feat_6 feat_7 feat_8 feat_9 ... feat_86 feat_87 feat_88 feat_89 feat_90 feat_91 feat_92 feat_93 feat_94 feat_95
id
1 True 0.370594 0.424389 0.405750 0.601457 0.601457 0.998969 0.796687 0.808809 0.302646 ... 0.716845 0.009219 0.622879 0.601453 0.827890 0.290202 0.026601 0.564050 1 0.016469
2 True 0.464291 0.538214 0.516730 0.610235 0.610235 0.998946 0.787380 0.809301 0.303556 ... 0.795297 0.008323 0.623652 0.610237 0.839969 0.283846 0.264577 0.570175 1 0.020794
```

Simple Python 3 (pykernel) | Idle Mode: Command Ln 1, Col 1 English (United States) 055-assignment.ipynb

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Python 3 (pykernel)

```
[15]: df = wrangle("data/taiwan-bankruptcy-data.json.gz")
      print("df shape:", df.shape)
      df.head()
```

df shape: (6137, 96)

```
[15]: bankrupt feat_1 feat_2 feat_3 feat_4 feat_5 feat_6 feat_7 feat_8 feat_9 ... feat_86 feat_87 feat_88 feat_89 feat_90 feat_91 feat_92 feat_93 feat_94 feat_95
```

id	bankrupt	feat_1	feat_2	feat_3	feat_4	feat_5	feat_6	feat_7	feat_8	feat_9	...	feat_86	feat_87	feat_88	feat_89	feat_90	feat_91	feat_92	feat_93	feat_94	feat_95
1	True	0.370594	0.424389	0.405750	0.601457	0.601457	0.998969	0.796887	0.808809	0.302646	...	0.716845	0.009219	0.622879	0.601453	0.827890	0.290202	0.026601	0.564050	1	0.016469
2	True	0.464291	0.538214	0.516730	0.610235	0.610235	0.998946	0.797380	0.808901	0.303556	...	0.795297	0.008323	0.623652	0.610237	0.839969	0.263846	0.264577	0.570175	1	0.020794
3	True	0.426071	0.499019	0.472295	0.601450	0.601364	0.998857	0.796403	0.808388	0.302035	...	0.774670	0.040003	0.623841	0.601449	0.836774	0.290189	0.026555	0.563706	1	0.016474
4	True	0.399844	0.451265	0.457733	0.583541	0.583541	0.998700	0.796967	0.808966	0.303350	...	0.739555	0.003252	0.622929	0.583538	0.834697	0.281721	0.026697	0.564663	1	0.023982
5	True	0.465022	0.538432	0.522298	0.598783	0.598783	0.998973	0.797366	0.808904	0.303475	...	0.795016	0.003878	0.623521	0.598782	0.839973	0.278514	0.024752	0.575617	1	0.035490

5 rows x 96 columns

```
[16]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.5", df)
```

Party time! 🎉 🎉 🎉
Score: 1

Explore

Task 5.5.6: Is there any missing data in the dataset? Create a Series where the index contains the name of the columns in `df` and the values are the number of `NaN`'s in each column. Assign the result to `nans_by_col`. Neither the Series itself nor its index require a name.

```
[17]: nans_by_col = pd.Series(df.isnull().sum(), index=df.columns)
      print("nans_by_col shape:", nans_by_col.shape)
      nans_by_col.head()
```

nans_by_col shape: (96,)

Simple Python 3 (pykernel) | Idle Mode: Command Ln 1, Col 1 English (United States) 055-assignment.ipynb

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Python 3 (pykernel)

Explore

Task 5.5.6: Is there any missing data in the dataset? Create a Series where the index contains the name of the columns in `df` and the values are the number of `NaN`'s in each column. Assign the result to `nans_by_col`. Neither the Series itself nor its index require a name.

```
[17]: nans_by_col = pd.Series(df.isnull().sum(), index=df.columns)
      print("nans_by_col shape:", nans_by_col.shape)
      nans_by_col.head()
```

nans_by_col shape: (96,)

```
[17]: bankrupt 0
      feat_1 0
      feat_2 0
      feat_3 0
      feat_4 0
      dtype: int64
```

```
[19]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.6", nans_by_col)
```

Good work!
Score: 1

Task 5.5.7: Is the data imbalanced? Create a bar chart that shows the normalized value counts for the column `df["bankrupt"]`. Be sure to label your x-axis "Bankrupt", your y-axis "Frequency", and use the title "Class Balance".

```
[20]: # Plot class balance
      df["bankrupt"].value_counts(normalize=True).plot(
          kind = "bar",
          xlabel = "Bankrupt",
          ylabel = "Frequency",
          title = "Class Balance"
      );
      # Don't delete the code below
      plt.savefig("images/5-5-7.png", dpi=150)
```

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Python 3 (pykernel)

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my_predicto...	2 months ago

```

[20]: # Plot class balance
df["bankrupt"].value_counts(normalize=True).plot(
    kind = "bar",
    xlabel = "Bankrupt",
    ylabel = "Frequency",
    title = "Class Balance"
);
# Don't delete the code below
plt.savefig("Images/5-5-7.png", dpi=150)

[22]: with open("Images/5-5-7.png", "rb") as file:
      wqet_grader.grade("Project 5 Assessment", "Task 5.5.7", file)

```

Very impressive.
Score: 1

Simple

0 5 Python 3 (pykernel) | Idle

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work/ds-curricu (2) - JupyterLab

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Python 3 (pykernel)

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Split

Task 5.5.8: Create your feature matrix X and target vector y . Your target is "bankrupt".

```

[23]: target = "bankrupt"
X = df.drop(columns="bankrupt")
y = df[target]

print("X shape:", X.shape)
print("y shape:", y.shape)

X shape: (6137, 95)
y shape: (6137,)

[24]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.8a", X)

[27]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.8b", y)

```

Correct.
Score: 1

Good work!
Score: 1

Task 5.5.9: Divide your dataset into training and test sets using a randomized split. Your test set should be 20% of your data. Be sure to set `random_state` to 42.

```

[28]: X_train, X_test, y_train, y_test = train_test_split(
      X, y, test_size=0.2, random_state=42
)

```

Simple

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Build Model

Iterate

Task 5.5.11: Create a classifier `c1f` that can be trained on `(X_train_over, y_train_over)`. You can use any of the predictors you've learned about in the Data Science Lab.

```
[34]: c1f = GradientBoostingClassifier(random_state=42)
[34]: c1f
[35]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.11", c1f)
```

Score: 1

Task 5.5.12: Perform cross-validation with your classifier using the over-sampled training data, and assign your results to `cv_scores`. Be sure to set the `cv` argument to 5.

Tip: Use your CV scores to evaluate different classifiers. Choose the one that gives you the best scores.

```
[36]: cv_scores = cross_val_score(c1f, X_train_over, y_train_over, cv=5, n_jobs=-1)
[36]: print(cv_scores)
[0.96952181 0.97162375 0.97003155 0.97160883 0.96845426]
[37]: cv_scores
[37]: array([0.96952181, 0.97162375, 0.97003155, 0.97160883, 0.96845426])
```

Simple 0 5 Python 3 (pykernel) | Idle

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Task 5.5.12: Perform cross-validation with your classifier using the over-sampled training data, and assign your results to `cv_scores`. Be sure to set the `cv` argument to 5.

Tip: Use your CV scores to evaluate different classifiers. Choose the one that gives you the best scores.

```
[36]: cv_scores = cross_val_score(c1f, X_train_over, y_train_over, cv=5, n_jobs=-1)
[36]: print(cv_scores)
[0.96952181 0.97162375 0.97003155 0.97160883 0.96845426]
[37]: cv_scores
[37]: array([0.96952181, 0.97162375, 0.97003155, 0.97160883, 0.96845426])
[38]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.12", list(cv_scores))
```

Yes! Great problem solving.
Score: 1

Ungraded Task: Create a dictionary `params` with the range of hyperparameters that you want to evaluate for your classifier. If you're not sure which hyperparameters to tune, check the [scikit-learn](#) documentation for your predictor for ideas.

Tip: If the classifier you built is a predictor only (not a pipeline with multiple steps), you don't need to include the step name in the keys of your `params` dictionary. For example, if your classifier was only a random forest (not a pipeline containing a random forest), you would access the number of estimators using `"n_estimators"`, not `"randomforestclassifier__n_estimators"`.

```
[39]: params = params = {
[39]: "n_estimators": range(20, 31, 5),
[39]: "max_depth": range(2, 5)
[39]: }
[39]: params
[39]: {'n_estimators': range(20, 31, 5), 'max_depth': range(2, 5)}
```

Task 5.5.13: Create a `GridSearchCV` named `model` that includes your classifier and hyperparameter grid. Be sure to set `cv` to 5, `n_jobs` to -1, and `verbose` to 1.

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- my_predicto... 2 months ago

Task 5.5.13: Create a `GridSearchCV` named `model` that includes your classifier and hyperparameter grid. Be sure to set `cv` to 5, `n_jobs` to -1, and `verbose` to 1.

```
[40]: model = GridSearchCV(
      clf,
      param_grid=params,
      cv=5,
      n_jobs=-1,
      verbose=1
    )
```

```
[41]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.13", model)
```

Booni! You got it.
Score: 1

Ungraded Task: Fit your model to the over-sampled training data.

```
[46]: model.fit(X_train_over, y_train_over)
```

Fitting 5 folds for each of 9 candidates, totalling 45 fits

```
[46]: *
      GridSearchCV
      estimator: GradientBoostingClassifier
      param_grid:
      - GradientBoostingClassifier
```

Task 5.5.14: Extract the cross-validation results from your model and load them into a DataFrame named `cv_results`. Looking at the results, which set of hyperparameters led to the best performance?

```
[48]: cv_results = pd.DataFrame(model.cv_results_)
      cv_results.head(5)
```

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Task 5.5.14: Extract the cross-validation results from your model and load them into a DataFrame named `cv_results`. Looking at the results, which set of hyperparameters led to the best performance?

```
[48]: cv_results = pd.DataFrame(model.cv_results_)
      cv_results.head(5)
```

	mean_fit_time	std_fit_time	mean_score_time	std_score_time	param_max_depth	param_n_estimators	params	split0_test_score	split1_test_score	split2_test_score	split3_test_score	split4_test_score	mean_test_score
0	4.274908	0.119663	0.004303	0.000142	2	20	{'max_depth': 2, 'n_estimators': 20}	0.909616	0.897530	0.903260	0.905363	0.906414	0.904457
1	5.252297	0.130287	0.028929	0.029672	2	25	{'max_depth': 2, 'n_estimators': 25}	0.912769	0.913820	0.917455	0.913775	0.912198	0.913820
2	6.512919	0.120718	0.005092	0.001144	2	30	{'max_depth': 2, 'n_estimators': 30}	0.923279	0.917499	0.916930	0.923239	0.919558	0.919558
3	6.279949	0.180477	0.017523	0.024972	3	20	{'max_depth': 3, 'n_estimators': 20}	0.929585	0.930636	0.932177	0.934805	0.931651	0.931651
4	7.655999	0.134539	0.004829	0.000464	3	25	{'max_depth': 3, 'n_estimators': 25}	0.935365	0.931687	0.939537	0.937434	0.935331	0.935331

```
[49]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.14", cv_results)
```

Yes! Great problem solving.
Score: 1

My Path Module | WorldQuant U

work/ds-curricu - JupyterLab

Data-Science-Lab/conf_matrix.py

vm.wqu.edu/lab/tree/work/ds-curriculum/050-bankruptcy-in-poland/055-assignment.ipynb

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055-assignment.ipynb

054-gradient-boosting.ipynb

Python 3 (pykernel)

Python 3 (pykernel)

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055-assign...	2 minutes ago
056-data-di...	2 months ago
my_predicto...	2 months ago
my_predicto...	2 months ago

Task 5.5.15: Extract the best hyperparameters from your model and assign them to `best_params`.

```
[51]: best_params = model.best_params_
      print(best_params)
      {'max_depth': 4, 'n_estimators': 30}

[52]: wqet_grader.grade(
      "Project 5 Assessment", "Task 5.5.15", [isinstance(best_params, dict)])
      ]
```

✓

You are coding

Score: 1

Evaluate

Ungraded Task: Test the quality of your model by calculating accuracy scores for the training and test data.

```
[53]: acc_train = model.score(X_train, y_train)
      acc_test = model.score(X_test, y_test)

      print("Model Training Accuracy:", round(acc_train, 4))
      print("Model Test Accuracy:", round(acc_test, 4))

      Model Training Accuracy: 0.9466
      Model Test Accuracy: 0.9389

Task 5.5.16: Plot a confusion matrix that shows how your model performed on your test set.

[59]: ConfusionMatrixDisplay.from_estimator(model, X_test, y_test);
      # Don't delete the code below
      plt.savefig("images/5-5-16.png", dpi=150)
```

Simple

0 5 Python 3 (pykernel) | Idle

Mode: Command Ln 1, Col 1 English (United States) 055-assignment.ipynb

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Python 3 (pykernel)

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Task 5.5.16: Plot a confusion matrix that shows how your model performed on your test set.

```
[59]: ConfusionMatrixDisplay.from_estimator(model, X_test, y_test);
      # Don't delete the code below
      plt.savefig("images/5-5-16.png", dpi=150)
```

	False	True
True	1123	30
False	68	7

Way to go!

Score: 1

Task 5.5.17: Generate a classification report for your model's performance on the test data and assign it to `class_report`.

```
[ ]: class_report = classification_report(y_test, model.predict(X_test))
      print(class_report)

[ ]: wqet_grader.grade("Project 5 Assessment", "Task 5.5.17", class_report)
```

Simple

0 5 Python 3 (pykernel) | Idle

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work/ds-curricu (2) - JupyterLab

Data-Science-Lab/conf_matrix.py

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051-workin...

images

data

ipynb_chec...

with open("images/5-5-16.png", "rb") as file:

wqet_grader.grade("Project 5 Assessment", "Task 5.5.16", file)

Way to go!

Score: 1

Task 5.5.17: Generate a classification report for your model's performance on the test data and assign it to `class_report`.

class_report = classification_report(y_test, model.predict(X_test))

print(class_report)

precision recall f1-score support

False 0.99 0.94 0.97 1191

True 0.31 0.81 0.44 37

accuracy 0.94 1228

macro avg 0.65 0.88 0.71 1228

weighted avg 0.97 0.94 0.95 1228

wqet_grader.grade("Project 5 Assessment", "Task 5.5.17", class_report)

You = coding

Score: 1

Communicate

Task 5.5.18: Create a horizontal bar chart with the 10 most important features for your model. Be sure to label the x-axis "Gini Importance", the y-axis "Feature", and use the title "Feature Importance".

features = X_train_over.columns

Extract importances from model

importances = model.best_estimator_.feature_importances_

Create a series with feature names and importances

feat_imp = pd.Series(importances, index=features).sort_values()

Plot 10 most important features

feat_imp.tail(10).plot(kind="barh")

plt.xlabel("Gini Importance")

plt.ylabel("Feature")

plt.title("Feature Importance")

Don't delete the code below

plt.savefig("images/5-5-17.png", dpi=150)

Feature Importance

Feat_86

Feat_19

Feat_36

Feat_40

Feat_9

Feat_46

Feat_69

Feat_16

Feat_3

Feat_34

Gini Importance

Simple 0 5 Python 3 (pykernel) | Idle

Mode: Command Ln 1, Col 1 English (United States) 055-assignment.ipynb

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My Path Module | WorldQuant U

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Communicate

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Feature Importance

Feat_86

Feat_19

Feat_36

Feat_40

Feat_9

Feat_46

Feat_69

Feat_16

Feat_3

Feat_34

Gini Importance

Simple 0 5 Python 3 (pykernel) | Idle

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images	4 minutes ago
051-workin...	4 days ago
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055-assign...	a minute ago
056-data-di...	2 months ago
model-5-5.pkl	seconds ago
my_predicto...	2 months ago
my_predicto...	2 months ago

055-assignment.ipynb

Yes! Your hard work is paying off.
Score: 1

Task 5.5.19: Save your best-performing model to a file named "model-5-5.pkl".

```
[69]: # Save model
with open("model-5-5.pkl", "wb") as f:
    pickle.dump(model, f)

# Load model from "Destination"
with open("model-5-5.pkl", "rb") as f:
    loaded_model = pickle.load(f)
print(loaded_model)

GridSearchCV(cv=5, estimator=GradientBoostingClassifier(random_state=42),
              n_jobs=-1,
              param_grid={'max_depth': range(2, 5),
                           'n_estimators': range(20, 31, 5)},
              verbose=1)

[70]: with open("model-5-5.pkl", "rb") as f:
      wqet_grader.grade("Project 5 Assessment", "Task 5.5.19", pickle.load(f))

Yes! Keep on rockin'. That's right.  
Score: 1

Task 5.5.20: Open the file my_predictor_assignment.py. Add your wrangle function, and then create a make_predictions function that takes two arguments: data_filepath and model_filepath. Use the cell below to test your module. When you're satisfied with the result, submit it to the grader.



```
[72]: # Import your module
```



Simple 0 5 Python 3 (pykernel) | Idle Mode: Command Ln 1, Col 1 English (United States) 055-assignment.ipynb



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055-assignment.ipynb my_predictor_assignment.py x 054-gradient-boosting.ipynb x



Task 5.5.20: Open the file my_predictor_assignment.py. Add your wrangle function, and then create a make_predictions function that takes two arguments: data_filepath and model_filepath. Use the cell below to test your module. When you're satisfied with the result, submit it to the grader.



```
[62]: %bash
cat my_predictor_assignment.py

Import libraries
import gzip
import json
import pickle
import pandas as pd

Add wrangle function from lesson 5.4
def wrangle(filePath):
 # Open compressed file, load to dict
 with gzip.open(filePath, "r") as f:
 data = json.load(f)

 # Dictionary --> DataFrame, set index
 df = pd.DataFrame().from_dict(data["observations"]).set_index("id")

 return df
df = wrangle('data/taiwan-bankruptcy-data-test-features.json.gz')
print("df shape:", df.shape)
df.head()

Add make_predictions function from lesson 5.3
def make_predictions(data_filepath, model_filepath):
 X_test = wrangle(data_filepath)
 with open(model_filepath, "rb") as f:
 model = pickle.load(f)
 y_test_pred = model.predict(X_test)
 y_test_pred = pd.Series(y_test_pred, index=X_test.index, name="bankrupt")
 return y_test_pred

[60]: from my_predictor_assignment import make_predictions
```



Simple 0 6 Python 3 (pykernel) | Idle Mode: Command Ln 1, Col 1 English (United States) 055-assignment.ipynb



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Haze



VARIABLES  
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```

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055-assignment.ipynbE: my_predictor_assignment.pyX054-gradient-boosting.ipynbXPython 3 (ipykernel)

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poland-ban...	2 months ago
poland-ban...	2 months ago
taiwan-bank...	2 months ago
taiwan-bank...	2 months ago

```
[60]: from my_predictor_assignment import make_predictions

y_test_pred = make_predictions(
    data_filepath="data/taiwan-bankruptcy-data-test-features.json.gz",
    model_filepath="model-5-5.pkl",
)

print("predictions shape:", y_test_pred.shape)
y_test_pred.head()

df shape: (682, 95)
predictions shape: (682,)

[60]: id
18      False
20      False
24       True
32       True
38      False
Name: bankrupt, dtype: bool

Tip: If you get an ImportError when you try to import make_predictions from my_predictor_assignment, try restarting your kernel. Go to the Kernel menu and click on Restart Kernel and Clear All Outputs. Then rerun just the cell above.

[61]: wqet_grader.grade(
    "Project 5 Assessment",
    "Task 5.5.20",
    make_predictions(
        data_filepath="data/taiwan-bankruptcy-data-test-features.json.gz",
        model_filepath="model-5-5.pkl",
    ),
),

Your model's accuracy score is 0.9179. Party time! 🎉
Score: 1
```

VARIABLESCALLSTACKBREAKPOINTS

SOURCE

Single06Python 3 (ipykernel) | IdleMode: CommandLn 1, Col 1English (United States)055-assignment.ipynb

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