jupyter lab5_additional (unsaved changes)

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Not Trusted | Python 3 (ipykernel)

Run Code

In [1]:
```
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
import seaborn as sns
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import PolynomialFeatures
```

In [2]:
```
df = pd.read_csv('Data4.csv', delimiter=';', index_col=0, encoding='cp1251')
df
```

Out[2]:

	ISO	UA	Cql	Ie	Iec	Is
Albania	ALB	Албанія	0,97392353	0,605347614	0,538672856	0,510112666
Algeria	DZA	Алжир	0,782134498	0,58721932	0,348159396	0,497985576
Angola	AGO	Ангола	0,372343539	0,27439361	0,332117384	0,346906645
Argentina	ARG	Аргентина	0,883830062	0,699685109	0,28199471	0,518820368
Armenia	ARM	Вірменія	1,016498793	0,718326882	0,535647909	0,486498047
...	...	...	...	...	...	...
Uruguay	URY	Уругвай	1,198779297	0,612819394	0,568066795	0,648818585
Venezuela, Bolivarian Republic of	VEN	Венесуела, Боліварська Республіка	0,703459931	0,670452164	0,249923267	0,367243869
Viet Nam	VNM	В'єтнам	0,553255653	0,371843431	0,39385414	0,423359346
Yemen	YEM	Ємен	0,364579432	0,244049144	0,357659851	0,330743343
Zambia	ZMB	Замбія	0,689322125	0,495702141	0,442525331	0,424261463

132 rows × 6 columns

In [3]:
```
df.Cql = df.Cql.astype(str).str.replace(',', '.').astype(float)
df.Ie = df.Ie.astype(str).str.replace(',', '.').astype(float)
df.Iec = df.Iec.astype(str).str.replace(',', '.').astype(float)
df.Is = df.Is.astype(str).str.replace(',', '.').astype(float)
df
```

Out[3]:

	ISO	UA	Cql	Ie	Iec	Is
Albania	ALB	Албанія	0.973924	0.605348	0.538673	0.510113
Algeria	DZA	Алжир	0.782134	0.587219	0.348159	0.497986
Angola	AGO	Ангола	0.372344	0.274394	0.332117	0.346907
Argentina	ARG	Аргентина	0.883830	0.699685	0.281995	0.518820
Armenia	ARM	Вірменія	1.016499	0.718327	0.535648	0.486498
...	...	...	...	...	...	...
Uruguay	URY	Уругвай	1.198779	0.612819	0.568067	0.648819
Venezuela, Bolivarian Republic of	VEN	Венесуела, Боліварська Республіка	0.703460	0.670452	0.249923	0.367244
Viet Nam	VNM	В'єтнам	0.553256	0.371843	0.393854	0.423359
Yemen	YEM	Ємен	0.364579	0.244049	0.357660	0.330743
Zambia	ZMB	Замбія	0.689322	0.495702	0.442525	0.424261

132 rows × 6 columns

In [4]:
```
df_test = pd.read_csv('Data4t.csv', delimiter=';', index_col=0, encoding='cp1251')
df_test
```

Out[4]:

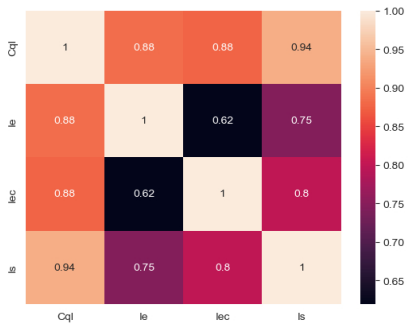
	ISO	UA	Cql	Ie	Iec	Is
Togo	TGO	Того	0,45349807	0,216806252	0,368234721	0,433950896
Tunisia	TUN	Туніс	0,899461952	0,659123985	0,418255976	0,514745939
Turkey	TUR	Туреччина	0,859283802	0,498840185	0,509228185	0,499453094
Uganda	UGA	Уганда	0,571284014	0,362945628	0,448731923	0,375726313
Ukraine	UKR	Україна	0,802203636	0,689164485	0,303554874	0,462744168

In [5]:
```
df_test.Cql = df_test.Cql.astype(str).str.replace(',', '.').astype(float)
df_test.Ie = df_test.Ie.astype(str).str.replace(',', '.').astype(float)
df_test.Iec = df_test.Iec.astype(str).str.replace(',', '.').astype(float)
df_test.Is = df_test.Is.astype(str).str.replace(',', '.').astype(float)
df_test
```

Out[5]:

	ISO	UA	Cql	Ie	Iec	Is
Togo	TGO	Того	0.453498	0.216806	0.368235	0.433951
Tunisia	TUN	Туніс	0.899462	0.659124	0.418256	0.514746
Turkey	TUR	Туреччина	0.859284	0.498840	0.509228	0.499453
Uganda	UGA	Уганда	0.571284	0.362946	0.448732	0.375726
Ukraine	UKR	Україна	0.802204	0.689164	0.303555	0.462744

In [6]:
```
sns.heatmap(df.corr(numeric_only=True), annot=True);
```



In [7]:
```
numeric = df.select_dtypes(include=np.number)
numeric
```

Out[7]:

	Cql	Ie	Iec	Is
Albania	0.973924	0.605348	0.538673	0.510113
Algeria	0.782134	0.587219	0.348159	0.497986
Angola	0.372344	0.274394	0.332117	0.346907
Argentina	0.883830	0.699685	0.281995	0.518820
Armenia	1.016499	0.718327	0.535648	0.486498
...	...	...	...	...
Uruguay	1.198779	0.612819	0.568067	0.648819
Venezuela, Bolivarian Republic of	0.703460	0.670452	0.249923	0.367244
Viet Nam	0.553256	0.371843	0.393854	0.423359
Yemen	0.364579	0.244049	0.357660	0.330743
Zambia	0.689322	0.495702	0.442525	0.424261

132 rows × 4 columns

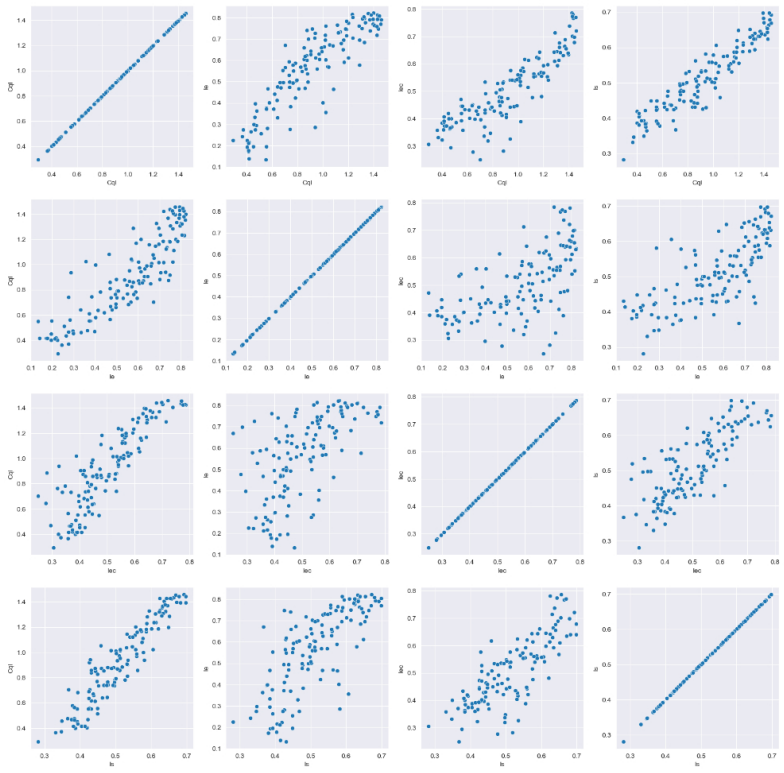
In [8]:
```
numeric.merge(numeric)
```

Out[8]:

	Cgl	Ie	Iec	Is
0	0.973924	0.605348	0.538673	0.510113
1	0.782134	0.587219	0.348159	0.497986
2	0.372344	0.274394	0.332117	0.346907
3	0.883830	0.699685	0.281995	0.518820
4	1.016499	0.718327	0.535648	0.486498
...	...	...	...	...
127	1.198779	0.612819	0.568067	0.648819
128	0.703460	0.670452	0.249923	0.367244
129	0.553256	0.371843	0.393854	0.423359
130	0.364579	0.244049	0.357660	0.330743
131	0.689322	0.495702	0.442525	0.424261

132 rows × 4 columns

In [9]:
```
fig, axes = plt.subplots(numeric.shape[1], numeric.shape[1], figsize=(20, 20))

for row, col1 in enumerate(numeric.columns):
    for column, col2 in enumerate(numeric.columns):
        sns.scatterplot(x=numeric[col1], y=numeric[col2], ax=axes[row, column])
```



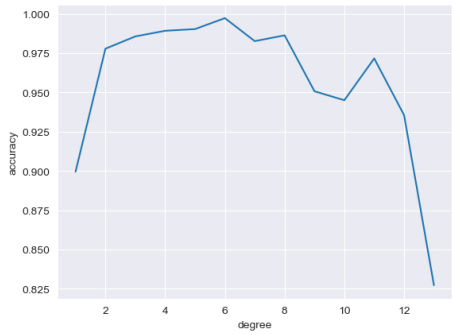
In [10]:
```
X_train = df.drop(['ISO', 'UA', 'Is'], axis=1)
y_train = df.Is
X_test = df_test.drop(['ISO', 'UA', 'Is'], axis=1)
y_test = df_test.Is
```

In [11]:
```
degrees = []
accuracies = []
predictions = []

for degree in range(1, 14):
    polynomial_feautures = PolynomialFeatures(degree=degree)

    X_train_polynomial = polynomial_feautures.fit_transform(X_train)
    X_test_polynomial = polynomial_feautures.transform(X_test)

    polynomial_model = LinearRegression()
    polynomial_model.fit(X_train_polynomial, y_train)

    y_pred = polynomial_model.predict(X_test_polynomial)

    degrees.append(degree)
    accuracies.append(polynomial_model.score(X_test_polynomial, y_test))
    predictions.append(y_pred)

poly_df = pd.DataFrame.from_dict({
    'degree': degrees,
    'accuracy': accuracies,
    'predictions': predictions
})

poly_df.set_index('degree', inplace=True)
poly_df
```

Out[11]:

degree	accuracy	predictions
1	0.899632	[0.4126135233717582, 0.5020957600309623, 0.495...
2	0.977882	[0.4255055673359544, 0.5018778754329953, 0.50...
3	0.985692	[0.43448862372313724, 0.5144497675528928, 0.50...
4	0.989287	[0.43231201171875, 0.51611328125, 0.5000915527...
5	0.990365	[0.4353742599487304 7, 0.5150671005249023, 0.49...
6	0.997347	[0.4335060119628906, 0.5144805908203125, 0.499...
7	0.982694	[0.44332313537597656, 0.5128030776977539, 0.49...
8	0.986385	[0.431468560435988, 0.5137725385376513, 0.4992...
9	0.950782	[0.43638026765439974, 0.5143344215031362, 0.49...
10	0.945087	[0.43844275077800887, 0.5139127772059879, 0.49...
11	0.971694	[0.43950841301712273, 0.5135539799042732, 0.49...
12	0.935619	[0.4392895153211569, 0.5130148232876266, 0.499...
13	0.827304	[0.4389730368292035, 0.5123697018725 65, 0.4999...

In [12]:
```
sns.lineplot(x=poly_df.index, y=poly_df.accuracy);
```



In [13]:
```
sns.regplot(x=y_test, y=poly_df.loc[poly_df.accuracy.idxmax()].predictions).set(xlabel='Actual Is', ylabel='Predicted Is');
```