hw3

January 31, 2025

1 Problem Set 3

[67]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import scipy as sp
from sklearn.linear_model import LinearRegression, Lasso
```

1.1 1. Growth regressions: Lasso and CV

1.1.1 1.1

Here is the code for the pre-processing of the data set.

[68]:
```
data = pd.read_excel("millions.xls", "BARROSHO", na_values=".")
labels = pd.read_excel("millions.XLS", "Variable code", index_col="#")
data
```

[68]:

	#	code	country	gamma	X1	X2	X3	X4	X5	\
0	1	DZA	Algeria	0.013690	7.438972	47.299999	0.46	0	0	
1	2	AGO	Angola	0.000569	6.786717	NaN	0.21	1	0	
2	3	BEN	Benin	-0.006586	7.019297	38.900002	0.27	1	0	
3	4	BWA	Botswana	0.056195	6.284134	45.700001	0.42	1	0	
4	5	HVO	Burkina Faso	0.004206	6.152733	36.299999	0.08	1	0	
..	…	…	…	…	…	…	…	..	..	
129	130	YUG	Yugoslavia	0.026471	7.577122	63.299999	1.00	0	0	
130	131	AUS	Australia	0.018897	8.972083	70.699997	1.00	0	0	
131	132	FJI	Fiji	0.018968	7.627058	59.200001	0.85	0	0	
132	133	NZL	New Zealand	0.011319	8.979038	71.000000	1.00	0	0	
133	134	PNG	Papua New Guinea	0.011277	7.002156	41.000000	0.32	0	0	

	X6	…	X53	X54	X55	X56	X57	X58	X59	X60	\
0	0.131	…	0.0	0.00	0.005	0.99	0.005	2855.520020	0.196	0.0	
1	0.281	…	0.0	0.00	0.000	0.00	0.150	2319.385498	0.268	0.0	
2	0.050	…	0.0	0.00	0.000	0.15	0.080	1372.623291	0.009	0.0	
3	0.072	…	0.0	0.00	0.000	0.00	0.250	210.918488	0.533	5.0	
4	0.050	…	0.0	0.00	0.000	0.25	0.000	NaN	0.001	1.0	
..	…	…	…	…	…	…	…	…	…	…	

```
129  1.916  …  0.0  0.00  0.000  0.18  0.010  8358.188477  0.025  1.0
130  0.000  …  0.0  0.00  0.000  0.00  0.500  4185.827148  0.038  5.0
131    NaN  …  0.0  0.38  0.000  0.08  0.430   108.980400  0.039  5.0
132  0.000  …  0.0  0.00  0.000  0.00  0.520   884.044434  0.011  5.0
133    NaN  …  0.0  0.00  0.000  0.00  0.440  1036.608032  0.192  5.0

       X61    X62
0    0.836  0.000
1    0.000  0.000
2    0.000  0.000
3    0.000  0.000
4    0.000  0.000
..     …    …
129  0.000  0.000
130  0.000  0.950
131  0.000  0.008
132  0.000  0.900
133  0.000  0.015

[134 rows x 65 columns]
```

[69]:
```
data.dropna(subset=["X1"], inplace=True)
data
```

[69]:
```
       # code           country     gamma        X1         X2    X3  X4  X5  \
0      1  DZA           Algeria  0.013690  7.438972  47.299999  0.46   0   0
1      2  AGO            Angola  0.000569  6.786717        NaN  0.21   1   0
2      3  BEN             Benin -0.006586  7.019297  38.900002  0.27   1   0
3      4  BWA          Botswana  0.056195  6.284134  45.700001  0.42   1   0
4      5  HVO      Burkina Faso  0.004206  6.152733  36.299999  0.08   1   0
..   …  …               …       …       …         …    …  ..  ..
129  130  YUG        Yugoslavia  0.026471  7.577122  63.299999  1.00   0   0
130  131  AUS         Australia  0.018897  8.972083  70.699997  1.00   0   0
131  132  FJI              Fiji  0.018968  7.627058  59.200001  0.85   0   0
132  133  NZL       New Zealand  0.011319  8.979038  71.000000  1.00   0   0
133  134  PNG  Papua New Guinea  0.011277  7.002156  41.000000  0.32   0   0

        X6  …  X53   X54    X55   X56    X57          X58    X59  X60  \
0    0.131  …  0.0  0.00  0.005  0.99  0.005  2855.520020  0.196  0.0
1    0.281  …  0.0  0.00  0.000  0.00  0.150  2319.385498  0.268  0.0
2    0.050  …  0.0  0.00  0.000  0.15  0.080  1372.623291  0.009  0.0
3    0.072  …  0.0  0.00  0.000  0.00  0.250   210.918488  0.533  5.0
4    0.050  …  0.0  0.00  0.000  0.25  0.000          NaN  0.001  1.0
..     …  …  …   …     …    …     …          …    …  …
129  1.916  …  0.0  0.00  0.000  0.18  0.010  8358.188477  0.025  1.0
130  0.000  …  0.0  0.00  0.000  0.00  0.500  4185.827148  0.038  5.0
131    NaN  …  0.0  0.38  0.000  0.08  0.430   108.980400  0.039  5.0
```

```
132  0.000  …  0.0  0.00  0.000  0.00  0.520   884.044434  0.011  5.0
133    NaN  …  0.0  0.00  0.000  0.00  0.440  1036.608032  0.192  5.0

       X61    X62
0    0.836  0.000
1    0.000  0.000
2    0.000  0.000
3    0.000  0.000
4    0.000  0.000
..     …    …
129  0.000  0.000
130  0.000  0.950
131  0.000  0.008
132  0.000  0.900
133  0.000  0.015

[117 rows x 65 columns]
```

[70]:
```
data.dropna(axis=1, thresh=data.shape[0] - 10, inplace= True)
data
```

[70]:
```
       # code           country     gamma        X1    X3  X4  X5     X10  \
0      1  DZA           Algeria  0.013690  7.438972  0.46   0   0  8.0650
1      2  AGO            Angola  0.000569  6.786717  0.21   1   0  9.4600
2      3  BEN             Benin -0.006586  7.019297  0.27   1   0  6.3482
3      4  BWA          Botswana  0.056195  6.284134  0.42   1   0  7.8620
4      5  HVO      Burkina Faso  0.004206  6.152733  0.08   1   0  4.9348
..   …  …               …       …       …   …  ..  ..     …
129  130  YUG        Yugoslavia  0.026471  7.577122  1.00   0   0     NaN
130  131  AUS         Australia  0.018897  8.972083  1.00   0   0  7.3570
131  132  FJI              Fiji  0.018968  7.627058  0.85   0   0  7.0730
132  133  NZL       New Zealand  0.011319  8.979038  1.00   0   0  9.3140
133  134  PNG  Papua New Guinea  0.011277  7.002156  0.32   0   0  5.6720

         X11  …  X53   X54    X55   X56    X57          X58    X59  X60  \
0    10.1800  …  0.0  0.00  0.005  0.99  0.005  2855.520020  0.196  0.0
1    10.5300  …  0.0  0.00  0.000  0.00  0.150  2319.385498  0.268  0.0
2     4.8646  …  0.0  0.00  0.000  0.15  0.080  1372.623291  0.009  0.0
3     8.2100  …  0.0  0.00  0.000  0.00  0.250   210.918488  0.533  5.0
4     5.6025  …  0.0  0.00  0.000  0.25  0.000          NaN  0.001  1.0
..       …  …  …   …    …    …     …          …    …  …
129      NaN  …  0.0  0.00  0.000  0.18  0.010  8358.188477  0.025  1.0
130   4.3300  …  0.0  0.00  0.000  0.00  0.500  4185.827148  0.038  5.0
131   7.4100  …  0.0  0.38  0.000  0.08  0.430   108.980400  0.039  5.0
132   5.8500  …  0.0  0.00  0.000  0.00  0.520   884.044434  0.011  5.0
133   5.5040  …  0.0  0.00  0.000  0.00  0.440  1036.608032  0.192  5.0
```

```
       X61    X62
0    0.836  0.000
1    0.000  0.000
2    0.000  0.000
3    0.000  0.000
4    0.000  0.000
..     …    …
129  0.000  0.000
130  0.000  0.950
131  0.000  0.008
132  0.000  0.900
133  0.000  0.015

[117 rows x 41 columns]
```

1.1.2 1.2

[71]:
```
data.iloc[:, 3:] = data.iloc[:, 3:].apply(lambda col: col.fillna(col.median()),␣
 ↪axis = 1)
data
```

```
C:\Users\matth\AppData\Local\Temp\ipykernel_40128\1544970055.py:1:
FutureWarning: Setting an item of incompatible dtype is deprecated and will
raise in a future error of pandas. Value '0      0.0
1      1.0
2      1.0
3      1.0
4      1.0
      …
129    0.0
130    0.0
131    0.0
132    0.0
133    0.0
Name: X4, Length: 117, dtype: float64' has dtype incompatible with int64, please
explicitly cast to a compatible dtype first.
  data.iloc[:, 3:] = data.iloc[:, 3:].apply(lambda col:
col.fillna(col.median()), axis = 1)
C:\Users\matth\AppData\Local\Temp\ipykernel_40128\1544970055.py:1:
FutureWarning: Setting an item of incompatible dtype is deprecated and will
raise in a future error of pandas. Value '0      0.0
1      0.0
2      0.0
3      0.0
4      0.0
      …
129    0.0
130    0.0
```

```
131    0.0
132    0.0
133    0.0
Name: X5, Length: 117, dtype: float64' has dtype incompatible with int64, please
explicitly cast to a compatible dtype first.
  data.iloc[:, 3:] = data.iloc[:, 3:].apply(lambda col:
col.fillna(col.median()), axis = 1)
C:\Users\matth\AppData\Local\Temp\ipykernel_40128\1544970055.py:1:
FutureWarning: Setting an item of incompatible dtype is deprecated and will
raise in a future error of pandas. Value '0      0.0
1      0.0
2      0.0
3      1.0
4      0.0
      …
129    0.0
130    1.0
131    1.0
132    1.0
133    0.0
Name: X48, Length: 117, dtype: float64' has dtype incompatible with int64,
please explicitly cast to a compatible dtype first.
  data.iloc[:, 3:] = data.iloc[:, 3:].apply(lambda col:
col.fillna(col.median()), axis = 1)
C:\Users\matth\AppData\Local\Temp\ipykernel_40128\1544970055.py:1:
FutureWarning: Setting an item of incompatible dtype is deprecated and will
raise in a future error of pandas. Value '0      1.0
1      0.0
2      1.0
3      0.0
4      1.0
      …
129    0.0
130    0.0
131    0.0
132    0.0
133    0.0
Name: X49, Length: 117, dtype: float64' has dtype incompatible with int64,
please explicitly cast to a compatible dtype first.
  data.iloc[:, 3:] = data.iloc[:, 3:].apply(lambda col:
col.fillna(col.median()), axis = 1)
C:\Users\matth\AppData\Local\Temp\ipykernel_40128\1544970055.py:1:
FutureWarning: Setting an item of incompatible dtype is deprecated and will
raise in a future error of pandas. Value '0      0.0
1      0.0
2      0.0
3      0.0
4      0.0
```

```
      …
129    0.0
130    0.0
131    0.0
132    0.0
133    0.0
Name: X50, Length: 117, dtype: float64' has dtype incompatible with int64,
please explicitly cast to a compatible dtype first.
  data.iloc[:, 3:] = data.iloc[:, 3:].apply(lambda col:
col.fillna(col.median()), axis = 1)
```

[71]:

	#	code	country	gamma	X1	X3	X4	X5	X10	\
0	1	DZA	Algeria	0.013690	7.438972	0.46	0.0	0.0	8.0650	
1	2	AGO	Angola	0.000569	6.786717	0.21	1.0	0.0	9.4600	
2	3	BEN	Benin	-0.006586	7.019297	0.27	1.0	0.0	6.3482	
3	4	BWA	Botswana	0.056195	6.284134	0.42	1.0	0.0	7.8620	
4	5	HVO	Burkina Faso	0.004206	6.152733	0.08	1.0	0.0	4.9348	
..	…	…	…	…	…	…	…	…	…	
129	130	YUG	Yugoslavia	0.026471	7.577122	1.00	0.0	0.0	0.0100	
130	131	AUS	Australia	0.018897	8.972083	1.00	0.0	0.0	7.3570	
131	132	FJI	Fiji	0.018968	7.627058	0.85	0.0	0.0	7.0730	
132	133	NZL	New Zealand	0.011319	8.979038	1.00	0.0	0.0	9.3140	
133	134	PNG	Papua New Guinea	0.011277	7.002156	0.32	0.0	0.0	5.6720	

	X11	…	X53	X54	X55	X56	X57	X58	X59	X60	\
0	10.1800	…	0.0	0.00	0.005	0.99	0.005	2855.520020	0.196	0.0	
1	10.5300	…	0.0	0.00	0.000	0.00	0.150	2319.385498	0.268	0.0	
2	4.8646	…	0.0	0.00	0.000	0.15	0.080	1372.623291	0.009	0.0	
3	8.2100	…	0.0	0.00	0.000	0.00	0.250	210.918488	0.533	5.0	
4	5.6025	…	0.0	0.00	0.000	0.25	0.000	0.047000	0.001	1.0	
..	…	…	…	…	…	…	…	…	…	…	
129	0.0100	…	0.0	0.00	0.000	0.18	0.010	8358.188477	0.025	1.0	
130	4.3300	…	0.0	0.00	0.000	0.00	0.500	4185.827148	0.038	5.0	
131	7.4100	…	0.0	0.38	0.000	0.08	0.430	108.980400	0.039	5.0	
132	5.8500	…	0.0	0.00	0.000	0.00	0.520	884.044434	0.011	5.0	
133	5.5040	…	0.0	0.00	0.000	0.00	0.440	1036.608032	0.192	5.0	

	X61	X62
0	0.836	0.000
1	0.000	0.000
2	0.000	0.000
3	0.000	0.000
4	0.000	0.000
..	…	…
129	0.000	0.000
130	0.000	0.950
131	0.000	0.008

```
132  0.000  0.900
133  0.000  0.015

[117 rows x 41 columns]
```

1.1.3 1.3

With LASSO, it's important to standardize the covariates your data. LASSO operates based off relative size of the covariates, so it's required to standardize your covariates so that a change of units will not adversely impact your LASSO.

1.1.4 1.4

[141]:
```
X_std = (data.iloc[:, 5:] - data.iloc[:, 5:].mean())/data.iloc[:, 5:].std()
X_raw = data.iloc[:, 5:]
y_std = (data.iloc[:, 4] - data.iloc[:, 4].mean())/data.iloc[:, 4].std()
y_raw = data.iloc[:, 4]
print(X_std)
print(y_std)

X = X_std
y = y_raw
```

```
           X3        X4        X5       X10       X11       X12       X13  \
0   -0.677530 -0.731343 -0.505825 -0.227478 -0.165188  1.407472  0.981146
1   -1.440327  1.355660 -0.505825 -0.202321 -0.163596 -0.711898  0.297639
2   -1.257256  1.355660 -0.505825 -0.258437 -0.189364 -0.711898 -0.385266
3   -0.799578  1.355660 -0.505825 -0.231138 -0.174148 -0.711898 -0.102830
4   -1.836982  1.355660 -0.505825 -0.283925 -0.186007 -0.711898 -0.288310
..        …         …         …         …         …         …         …
129  0.970111 -0.731343 -0.505825 -0.372736 -0.211443 -0.690704 -0.453309
130  0.970111 -0.731343 -0.505825 -0.240245 -0.191795 -0.711898  4.175864
131  0.512433 -0.731343 -0.505825 -0.245367 -0.177787 -0.711898 -0.442475
132  0.970111 -0.731343 -0.505825 -0.204954 -0.184882 -0.711898 -0.291321
133 -1.104697 -0.731343 -0.505825 -0.270631 -0.186455  1.407472 -0.174492

          X16       X21       X22  …       X53       X54       X55  \
0    0.705526 -0.609347 -0.655056  … -0.183052 -0.270724 -0.051900
1    0.271626 -0.901387 -0.714724  … -0.183052 -0.270724 -0.117194
2    0.258521 -0.901387 -0.714724  … -0.183052 -0.270724 -0.117194
3    1.180759 -0.950060 -0.714724  … -0.183052 -0.270724 -0.117194
4    0.177633 -0.950060  0.220078  … -0.183052 -0.270724 -0.117194
..        …         …         …  …         …         …         …
129 -1.262514  0.656158  0.995765  … -0.183052 -0.270724 -0.117194
130 -0.495798  1.483604  1.890789  … -0.183052 -0.270724 -0.117194
131  0.097670 -0.268634 -0.714724  … -0.183052  2.551407 -0.117194
132 -0.955839  2.554416  1.910678  … -0.183052 -0.270724 -0.117194
133  0.206229 -0.950060 -0.714724  … -0.183052 -0.270724 -0.117194
```

```
          X56       X57       X58       X59       X60       X61       X62
0    2.251828 -0.684605 -0.182998  1.853219 -2.141307  1.442951 -0.320218
1   -0.637766 -0.054590 -0.209918  2.765747 -2.141307 -0.702361 -0.320218
2   -0.199949 -0.358735 -0.257456 -0.516817 -2.141307 -0.702361 -0.320218
3   -0.637766  0.379903 -0.315786  6.124354  1.078911 -0.702361 -0.320218
4    0.091929 -0.706330 -0.326374 -0.618209 -1.497264 -0.702361 -0.320218
..        …         …         …         …         …         …
129 -0.112386 -0.662880  0.093296 -0.314033 -1.497264 -0.702361 -0.320218
130 -0.637766  1.466136 -0.116202 -0.149271  1.078911 -0.702361  3.518877
131 -0.404264  1.161991 -0.320905 -0.136597  1.078911 -0.702361 -0.287889
132 -0.637766  1.553034 -0.281988 -0.491469  1.078911 -0.702361  3.316819
133 -0.637766  1.205440 -0.274328  1.802523  1.078911 -0.702361 -0.259601

[117 rows x 36 columns]
0      0.156891
1     -0.565894
2     -0.308165
3     -1.122823
4     -1.268433
          …
129    0.309980
130    1.855784
131    0.365316
132    1.863491
133   -0.327159
Name: X1, Length: 117, dtype: float64
```

The interpretation of a $\beta_j = 0.5$ is that for an observation of x_j that is a standard deviation above its mean, then the dependent variable changes by a standard deviation of 0.5 above its mean. When y is unstandardized, then an increase of x_i in one standard deviation, then y increases by 0.5 in its units.

1.1.5 1.5

[172]:
```python
# rmse utility
def rmse(y_hat, y):
    """
    @y_hat: predicted values
    @y: true values
    """
    res = np.sqrt(
        np.mean(
            (y_hat - y)**2
        )
    )
    return res
```

[196]:
```
# Rsq utility
def Rsq(y_hat, y):
    """
    returns 1 - Rsquared
    """
    ss_res = np.sum(
        (y - y_hat)**2
    )
    ss_tot = np.sum(
        (y - np.mean(y))**2
    )
    Rsq = ss_res/ss_tot
    return Rsq
```

[228]:
```
def cv_err(X: np.ndarray, y: np.ndarray, model, err=rmse, folds= 5, split=None,␣
 ↪**kwargs):
    """ Returns Cross-Validated Error
    @X: The observation matrix (Num_Samples, Num_Features)
    @y: The outcome vector (Num_Samples,)
    @model: the model you are evaluating. This should have a fit and a predict␣
 ↪method.
    @err: The err you want to evaluate the model with. The default is out of␣
 ↪sample root mean squared error.
    This function should take in y_hat and y as positional args.
    @folds: The number of folds you want to evaluate with.
    @split: An optional argument if you want to pass in a boolean or 0-1 matrix␣
 ↪creating your own split. True elements are used for testing.
    If this is passed, folds will be overwritten to split.shape[0], or 1 if a␣
 ↪1-D array is passed.
    The shape should be (folds, Num_Samples) or (Num_Samples,)
    """
    # init data
    y_hat = np.full_like(y, fill_value=np.nan)
    N = X.shape[0]
    rng = np.random.default_rng()
    reg = model(**kwargs)

    # init idxs
    if split is not None:
        if type(split) is not np.ndarray:
            split = split.to_numpy()
        if split.ndim == 1:
            split = split[np.newaxis, :]
        folds = split.shape[0]
        idxs = np.linspace(1, folds, num=folds) @ split.astype(int) - 1
    else:
        idxs = rng.permutation(N) % folds
```

```
    # train and predict
    for i in range(folds):
        # exclude class i from training
        X_train = X[idxs != i]
        y_train = y[idxs != i]
        reg.fit(X_train, y_train)
        # class i is the test set
        X_test = X[idxs == i]
        y_hat[idxs == i] = reg.predict(X_test)
    return err(y_hat[~np.isnan(y_hat)], y[~np.isnan(y_hat)])
```

[229]:
```
# init params
model = ['X16', 'X46', 'X53']
rich = y > y.quantile(0.8)

# train and evaluate
err = cv_err(X.loc[:, model], y, LinearRegression, folds=1, split=rich)
print(f"The out of sample root mean square error is {err}")
```

```
The out of sample root mean square error is 1.4257850333784832
```

1.1.6 1.6

[230]:
```
def train_model(X, y, model, err=rmse, folds=5, split=None, **kwargs):
    """
    Returns model trained with one optimal hyperparameter.
    @X: The observation matrix (Num_Samples, Num_Features)
    @y: The outcome vector (Num_Samples,)
    @model: the model you are evaluating. This should have a fit and a predict␣
 ↪method.
    @err: The err you want to evaluate the model with. The default is out of␣
 ↪sample root mean squared error.
    This function should take in y_hat and y as positional args.
    @folds: The number of folds you want to evaluate with.
    @split: An optional argument if you want to pass in a boolean or 0-1 matrix␣
 ↪creating your own split. True elements are used for testing
    If this is passed, folds will be overwritten to split.shape[0], or 1 if a␣
 ↪1-D array is passed.
    The shape should be (folds, Num_Samples) or (Num_Samples,)
    """
    # init alphas
    nonzero = [k for k in X.abs().to_numpy().flatten() if k != 0]
    m = np.min(nonzero)
    M = np.max(nonzero)
    alphas = np.geomspace(m/100, M*100, num=1000)
```

```
    best_err = np.inf
    best_alpha = 0
    for alpha in alphas:
        cur_err = cv_err(X, y, model, err=err, folds=folds, split=split,␣
↪alpha=alpha, **kwargs)
        if cur_err < best_err:
            best_err = cur_err
            best_alpha = alpha
    return model(alpha = best_alpha, **kwargs)
```

[231]:
```
reg = train_model(X, y, Lasso, folds=1, split=rich, warm_start=True)
```

[232]:
```
# train best lasso
# both metrics were equivalent
reg.fit(X[~rich], y[~rich])
err = rmse(reg.predict(X[rich]), y[rich])
res_rich = pd.Series(reg.coef_, index=reg.feature_names_in_)[reg.coef_ != 0]
print(res_rich.head())
print(f"The number of covariates is {len(res_rich)}")
print(f"The out of sample rmse is {err}")
```

```
X3     0.113336
X4     0.009195
X5    -0.036428
X11   -0.037452
X12    0.009518
dtype: float64
The number of covariates is 32
The out of sample rmse is 0.5221064767860897
```

1.1.7 1.7

If we have a random fold, we most likely will have the model perform better than in the previous split, since the random split will likely include some of the rich countries, and therefore be closer to the true distribution of the rich countries. The previous fold was very biased away from the wealthy countries, and so including any of the rich countries will get closer. However, we will alpha based on performance in the out of sample random fold instead of performance in the rich fold. This may bias our choice of alpha away from the alpha minimizing the out of sample error in the rich fold.

1.1.8 1.8

[219]:
```
rng = np.random.default_rng()
split_80 = (rng.binomial(1, 0.8, X.shape[0]) == 1)
reg = train_model(X, y, Lasso, folds=1, split=split_80, warm_start = True)
```

```
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 2.269e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.314e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.360e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.407e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.455e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.503e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.619e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.664e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 2.721e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.778e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.834e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.892e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.950e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.010e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.070e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.131e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 3.193e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.257e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.321e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.387e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.453e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.521e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.590e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.660e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 3.732e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.805e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.879e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.954e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.031e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.109e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.189e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.270e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 4.352e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.436e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.521e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.608e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.696e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.786e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.878e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.970e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 5.065e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 5.161e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 5.259e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 5.359e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 5.460e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 5.563e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 5.667e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 5.773e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 6.202e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 6.325e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 6.452e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 6.580e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 6.707e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 6.835e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 6.964e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 7.094e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 7.225e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 7.359e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 7.494e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 7.631e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 7.770e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 7.912e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 8.055e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 8.201e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

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check the scale of the features or consider increasing regularisation. Duality
gap: 8.349e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 8.499e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 8.651e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 8.805e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 8.962e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 9.121e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 9.282e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 9.445e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

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check the scale of the features or consider increasing regularisation. Duality
gap: 9.610e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 9.778e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 9.947e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.012e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.029e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.047e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.065e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.083e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.101e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.120e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.138e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.157e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.176e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.195e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.215e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.235e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.254e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.274e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.294e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.315e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.351e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.390e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.412e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.446e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.473e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.498e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.521e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.544e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.567e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.589e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.611e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.633e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.655e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.677e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.691e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.727e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.748e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.802e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.831e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.856e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.844e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.809e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.854e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.871e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.912e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.950e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.986e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.019e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 2.051e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.082e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.112e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.108e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.125e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.156e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.186e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.228e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 2.218e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.233e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.004e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.002e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.031e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.056e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.082e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.107e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 2.132e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.223e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.157e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.835e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.657e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.528e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.471e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.454e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.455e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.464e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.479e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.497e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.518e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.540e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.563e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.587e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.612e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.637e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.663e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.689e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.715e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.741e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.435e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.369e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.324e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.280e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.238e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.231e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.277e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.308e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.331e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.351e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.370e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.389e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.408e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.279e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.292e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.352e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.392e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.424e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

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check the scale of the features or consider increasing regularisation. Duality
gap: 1.455e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.484e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.512e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.540e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.568e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.475e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.451e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.478e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.512e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.548e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.583e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.288e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.301e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.289e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.279e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.274e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
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check the scale of the features or consider increasing regularisation. Duality
gap: 1.272e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.272e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.308e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.343e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.368e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.391e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.414e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.391e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 1.322e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.300e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.298e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.307e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.322e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.338e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.352e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.356e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 1.384e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.412e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.440e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.468e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.497e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.526e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.555e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.584e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 1.613e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.382e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 1.181e-02, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 8.758e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 6.194e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.664e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.842e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.246e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 2.822e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.673e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 2.874e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.292e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.605e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 3.843e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.029e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.180e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
```

```
check the scale of the features or consider increasing regularisation. Duality
gap: 4.304e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
c:\Users\matth\anaconda3\envs\ml\Lib\site-
packages\sklearn\linear_model\_coordinate_descent.py:697: ConvergenceWarning:
Objective did not converge. You might want to increase the number of iterations,
check the scale of the features or consider increasing regularisation. Duality
gap: 4.410e-03, tolerance: 2.231e-03
  model = cd_fast.enet_coordinate_descent(
```

[220]:
```
reg.fit(X[split_80], y[split_80])
err = rmse(reg.predict(X[rich]), y[rich])
print(f"The rmse of the model, with alpha = {reg.alpha}, tested on the wealthy,␣
  ↪is {err}")
```

```
The rmse of the model, with alpha = 0.07845026660891585, tested on the wealthy,
is 0.5465170394676734
```

This model performs shockingly close to the previous one. It seems that although our data was heavily biased away from the test set, we still managed to select accurate covariates.

[236]:
```
res_rand = pd.Series(reg.coef_, index=reg.feature_names_in_)
print(f"The covariates chosen by the random split, but not the rich split are␣
  ↪{set(res_rand.index) - set(res_rich.index)}. \nThe covariates chosen by the␣
  ↪rich split, but not the random split are {set(res_rich.index) - set(res_rand.
  ↪index)}")
```

```
The covariates chosen by the random split, but not the rich split are {'X10',
'X50', 'X55', 'X46'}.
The covariates chosen by the rich split, but not the random split are set()
```

However, the random split selects a few more covariates that seem to be helpful for the rich countries, that aren't selected in the previous model.

1.1.9 1.9

[238]:
```
# Train LASSO with 5 folds
reg = train_model(X, y, Lasso, warm_start=True)
```

[239]:
```
reg.fit(X, y)
res = pd.Series(reg.coef_, index=reg.feature_names_in_)
print(res[res != 0].head())
print(f"The number of features chosen, with alpha = {reg.alpha} is {np.sum(res !
  ↪= 0)}")
print(f"The average rmse on the rich countries sample is {rmse(reg.
  ↪predict(X[rich]), y[rich])}")
```

```
X3     0.096691
X13    0.006619
X21    0.200394
```

```
X32   -0.083191
X33   -0.105724
dtype: float64
The number of features chosen, with alpha = 0.03397779668288602 is 16
The average rmse on the rich countries sample is 0.4452173215322848
```

As shown above, 20 features were selected, and the out of sample rmse is 0.41.

1.1.10 1.10

Prediction error was highest on the OLS model with the covariates X16, X46, and X53. The next two best models were very close to each other: the single 80-20 fold and the rich-poor fold. The best model was the 5-fold cross-validated model. This makes sense, since the LASSO models choose covariates that are more relevant than the 3 covariates that were selected for the OLS model. Additionally, I ran the single fold model a few times, and the error had very high variance, sometimes it had the best error, and sometimes it had far worse error. This makes sense, since the behavior of the estimator is very dependent on if the random split includes rich countries or not. If it does, it not only selects covariates that are correlated with the growth of rich countries, but the sample is closer to the distribution, so our linear estimator has lower generalization error. The 5-fold cross-validated estimator performs the best, almost all the time, except for when the 1-fold estimator selects many rich countries. The same logic follows as for the 1-fold estimator, except that the sample is distributed according to uniformly chosen country, not necessarily a wealthy country and since, if X is the random variable of countries, $X|X$ is wealthy $\neq X$, our estimator will always be biased.