TI3002C_Etapa 5.1_1_Hiram Maximiliano Muñoz Ramirez

April 30, 2024

1 5.1 Código ML (INDIVIDUAL) - Avance Evidencia 2

Equipo 1 Hiram Maximiliano Muñoz Ramirez A01197991

```python
[1]: import pandas as pd
     from tempfile import mkdtemp
     from sklearn import pipeline, preprocessing, feature_selection, compose,
      ↪linear_model, model_selection, svm, ensemble

     coating_df = pd.read_feather('data/pinturas_revestidos_jul20_ago23.feather')
```

```python
[2]: class NullColumnRemover:
         null_threshold = 0.0
         columns_to_keep = None

         def __init__(self, null_threshold):
             self.null_threshold = null_threshold

         def get_params(self, deep):
             return {
                 'null_threshold': self.null_threshold
             }

         def fit(self, X, y=None):
             null_percents = pd.isna(X).sum(axis=0) / X.shape[0]
             self.columns_to_keep = null_percents[null_percents < self.
      ↪null_threshold].index
             return self

         def transform(self, X):
             return X[self.columns_to_keep]

         def get_feature_names_out(self, input_features=None):
             return self.columns_to_keep.values


     cachedir = mkdtemp()
     cleaner = pipeline.Pipeline([
```

```python
    ('null_threshold', NullColumnRemover(0.05)),
    ('scaling_and_one_hot', compose.ColumnTransformer([
        ('one_hot', preprocessing.OneHotEncoder(sparse_output=False,␣
↪handle_unknown='infrequent_if_exist'),
         compose.make_column_selector(dtype_include='category')),
        ('scaler', preprocessing.StandardScaler(), compose.
↪make_column_selector(dtype_include=['float64']))
    ])),
    ('variance_threshold', feature_selection.VarianceThreshold()),
], memory=cachedir)

scoring = [
    'neg_mean_squared_error',
    'neg_root_mean_squared_error',
    'neg_mean_absolute_error',
    'r2',
    'neg_mean_absolute_percentage_error',
]
```

[19]:
```python
cleaner.fit(coating_df.drop(columns='total_liters_used'))
for feature in cleaner.get_feature_names_out(input_features=coating_df.
  ↪drop(columns='total_liters_used').columns.values):
    print(feature)
```

```
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
28] No space left on device.
  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
28] No space left on device.
  warnings.warn(
```

```
one_hot__ce_cost_30117207
one_hot__ce_cost_30117208
one_hot__production_line_Pintado 1
one_hot__production_line_Pintado 2
one_hot__paint_id_I0084_AKZO
one_hot__paint_id_I0100_AKZO
one_hot__paint_id_I0100_BECK
one_hot__paint_id_I0100_VALS
one_hot__paint_id_I0177_AKZO
one_hot__paint_id_I0177_VALS
one_hot__paint_id_I0193_AKZO
one_hot__paint_id_I0193_VALS
one_hot__paint_id_I0222_VALS
```

```
one_hot__paint_id_I0276_VALS
one_hot__paint_id_I0402_AKZO
one_hot__paint_id_I0402_BECK
one_hot__paint_id_I0402_VALS
one_hot__paint_id_I0417_AKZO
one_hot__paint_id_I0502_VALS
one_hot__paint_id_I0513_AKZO
one_hot__paint_id_I0515_AKZO
one_hot__paint_id_I0545_VALS
one_hot__paint_id_I0546_AKZO
one_hot__paint_id_I0546_VALS
one_hot__paint_id_I0566_AKZO
one_hot__paint_id_I0567_AKZO
one_hot__paint_id_I0590_VALS
one_hot__paint_id_I0598_AKZO
one_hot__paint_id_I0598_VALS
one_hot__paint_id_I0604_OSEL
one_hot__paint_id_I0604_VALS
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one_hot__paint_id_I0704_BECK
one_hot__paint_id_I0704_VALS
one_hot__paint_id_I0784_AKZO
one_hot__paint_id_I0784_VALS
one_hot__paint_id_I0904_AKZO
one_hot__paint_id_I0912_VALS
one_hot__paint_id_I1001_VALS
one_hot__paint_id_I1008_VALS
one_hot__paint_id_I1019_VALS
one_hot__paint_id_I1026_VALS
one_hot__paint_id_I1037_VALS
one_hot__paint_id_I1055_AKZO
one_hot__paint_id_I1065_VALS
one_hot__paint_id_I1086_AKZO
one_hot__paint_id_I1100_AKZO
one_hot__paint_id_I1100_BECK
one_hot__paint_id_I1100_VALS
one_hot__paint_id_I1101_AKZO
one_hot__paint_id_I1101_VALS
one_hot__paint_id_I1106_AKZO
one_hot__paint_id_I1113_VALS
one_hot__paint_id_I1116_AKZO
one_hot__paint_id_I1116_BECK
one_hot__paint_id_I1116_VALS
one_hot__paint_id_I1119_PPGI
one_hot__paint_id_I1135_VALS
one_hot__paint_id_I1142_BECK
one_hot__paint_id_I1142_VALS
one_hot__paint_id_I1143_AKZO
```

```
one_hot__paint_id_I1144_VALS
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one_hot__paint_id_I1154_AKZO
one_hot__paint_id_I1154_PPGI
one_hot__paint_id_I1154_VALS
one_hot__paint_id_I1180_VALS
one_hot__paint_id_I1182_VALS
one_hot__paint_id_I1193_VALS
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one_hot__paint_id_I1248_VALS
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one_hot__paint_id_I1251_AKZO
one_hot__paint_id_I1253_AKZO
one_hot__paint_id_I1254_VALS
one_hot__paint_id_I1257_AKZO
one_hot__paint_id_I1258_VALS
one_hot__paint_id_I1259_AKZO
one_hot__paint_id_I1261_VALS
one_hot__paint_id_I1262_AKZO
one_hot__paint_id_I1263_AKZO
one_hot__paint_id_I1269_BECK
one_hot__paint_id_I1270_BECK
one_hot__paint_id_I1277_AKZO
one_hot__paint_id_I1510_VALS
one_hot__paint_id_I1511_AKZO
one_hot__paint_id_I1513_VALS
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one_hot__paint_id_I2173_VALS
one_hot__paint_id_I2206_VALS
one_hot__paint_id_I2447_VALS
one_hot__paint_id_I2453_BECK
one_hot__paint_id_I2453_VALS
one_hot__paint_id_I2468_VALS
one_hot__paint_id_I2470_VALS
one_hot__paint_id_I2477_VALS
one_hot__paint_id_I2480_VALS
one_hot__paint_id_I2628_VALS
```

```
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one_hot__paint_id_I2979_AKZO
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one_hot__paint_id_I4076_VALS
one_hot__paint_id_I4077_VALS
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one_hot__paint_id_I4079_VALS
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one_hot__paint_id_I4098_VALS
one_hot__paint_id_I4099_VALS
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one_hot__paint_id_I4476_VALS
one_hot__paint_id_I4479_VALS
one_hot__paint_id_I4480_VALS
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one_hot__paint_id_U0093_AKZO
one_hot__paint_id_U0095_VALS
one_hot__paint_id_U0097_AKZO
one_hot__paint_id_U0099_AKZO
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one_hot__paint_id_U0193_AKZO
one_hot__paint_id_U0195_BECK
one_hot__paint_id_U0195_NCCC
one_hot__paint_id_U0219_AKZO
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one_hot__paint_id_U0223_VALS
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one_hot__paint_id_U0343_AKZO
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one_hot__paint_id_U0346_VALS
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one_hot__paint_id_U0394_BECK
one_hot__paint_id_U0454_AKZO
one_hot__paint_id_U0461_AKZO
one_hot__paint_id_U0485_NCCC
one_hot__paint_id_U0487_AKZO
one_hot__paint_id_U0488_AKZO
one_hot__paint_id_U0498_AKZO
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one_hot__paint_id_U0597_VALS
one_hot__paint_id_U0598_VALS
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one_hot__paint_id_U0788_AKZO
one_hot__paint_id_U0816_VALS
one_hot__paint_id_U0817_VALS
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one_hot__paint_id_U0933_VALS
one_hot__paint_id_U0934_BECK
one_hot__paint_id_U0936_BECK
one_hot__paint_id_U0944_VALS
```

```
one_hot__paint_id_U0945_AKZO
one_hot__paint_id_U0946_AKZO
one_hot__paint_id_U0961_BECK
one_hot__paint_id_U0966_BECK
one_hot__paint_id_U0969_BECK
one_hot__paint_id_U0970_BECK
one_hot__paint_id_U0973_BECK
one_hot__paint_id_U0987_AKZO
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one_hot__paint_id_U0996_BECK
one_hot__paint_id_U0997_BECK
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one_hot__paint_id_U1004_VALS
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one_hot__paint_id_U1028_PPGI
one_hot__paint_id_U1030_VALS
one_hot__paint_id_U1031_BECK
one_hot__paint_id_U1032_VALS
one_hot__paint_id_U1037_NCCC
one_hot__paint_id_U1042_VALS
one_hot__paint_id_U1045_VALS
one_hot__paint_id_U1046_VALS
one_hot__paint_id_U1047_VALS
one_hot__paint_id_U1049_VALS
one_hot__paint_id_U1052_NCCC
one_hot__paint_id_U1055_AKZO
one_hot__paint_id_U1056_NCCC
one_hot__paint_id_U1058_AKZO
one_hot__paint_id_U1059_VALS
one_hot__paint_id_U1065_VALS
one_hot__paint_id_U1070_VALS
one_hot__paint_id_U1073_VALS
one_hot__paint_id_U1074_VALS
one_hot__paint_id_U1077_VALS
one_hot__paint_id_U1078_AKZO
one_hot__paint_id_U1107_VALS
one_hot__paint_id_U1118_VALS
one_hot__paint_id_U1128_VALS
one_hot__paint_id_U1129_VALS
```

```
one_hot__paint_id_U1130_BECK
one_hot__paint_id_U1131_BECK
one_hot__paint_id_U1145_AKZO
one_hot__paint_id_U1152_AKZO
one_hot__paint_id_U1153_AKZO
one_hot__paint_id_U1154_AKZO
one_hot__paint_id_U1161_VALS
one_hot__paint_id_U1164_VALS
one_hot__paint_id_U1168_VALS
one_hot__paint_id_U1174_VALS
one_hot__paint_id_U1181_AKZO
one_hot__paint_id_U1317_AKZO
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one_hot__paint_id_U1328_VALS
one_hot__paint_id_U1340_BECK
one_hot__paint_id_U1418_VALS
one_hot__paint_id_U1426_AKZO
one_hot__paint_id_U1427_AKZO
one_hot__paint_id_U1428_AKZO
one_hot__paint_id_U1430_AKZO
one_hot__paint_id_U1431_BECK
one_hot__paint_id_U1431_VALS
one_hot__paint_id_U1432_AKZO
one_hot__paint_id_U1452_VALS
one_hot__paint_id_U1456_BECK
one_hot__paint_id_U1457_BECK
one_hot__paint_id_U1463_AKZO
one_hot__paint_id_U1470_VALS
one_hot__paint_id_U1474_VALS
one_hot__paint_id_U1475_AKZO
one_hot__paint_id_U1480_VALS
one_hot__paint_id_U1487_VALS
one_hot__paint_id_U1489_VALS
one_hot__paint_id_U1490_VALS
one_hot__paint_id_U1492_AKZO
one_hot__paint_id_U1493_VALS
one_hot__paint_id_U1506_VALS
one_hot__paint_id_U1510_VALS
one_hot__paint_id_U1714_VALS
one_hot__paint_id_U1901_AKZO
one_hot__paint_id_U1922_BECK
one_hot__paint_id_U2102_BECK
one_hot__paint_id_U2111_VALS
one_hot__paint_id_U2113_AKZO
one_hot__paint_id_U2119_AKZO
one_hot__paint_id_U2122_AKZO
one_hot__paint_id_U2146_AKZO
one_hot__paint_id_U2153_AKZO
```

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one_hot__paint_id_U2153_VALS
one_hot__paint_id_U2154_AKZO
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one_hot__paint_id_U2158_AKZO
one_hot__paint_id_U2172_AKZO
one_hot__paint_id_U2190_AKZO
one_hot__paint_id_U2191_AKZO
one_hot__paint_id_U2199_AKZO
one_hot__paint_id_U2407_AKZO
one_hot__paint_id_U2409_AKZO
one_hot__paint_id_U2413_VALS
one_hot__paint_id_U2432_VALS
one_hot__paint_id_U2437_VALS
one_hot__paint_id_U2452_VALS
one_hot__paint_id_U2453_VALS
one_hot__paint_id_U2460_VALS
one_hot__paint_id_U2469_VALS
one_hot__paint_id_U2470_VALS
one_hot__paint_id_U2474_VALS
one_hot__paint_id_U2485_AKZO
one_hot__paint_id_U3107_AKZO
one_hot__paint_id_U3110_BECK
one_hot__paint_id_U3111_BECK
one_hot__paint_id_U3113_AKZO
one_hot__paint_id_U3139_AKZO
one_hot__paint_id_U4084_AKZO
one_hot__paint_id_U4085_AKZO
one_hot__paint_name_0001-PRIMER 4457
one_hot__paint_name_0003-PRIMARIO 4435
one_hot__paint_name_0008-PRIMARIO 4041
one_hot__paint_name_0013-PRIMER 243
one_hot__paint_name_0018-HIGH BUILT PRIMER
one_hot__paint_name_0021-UNIVERSAL PRIMER
one_hot__paint_name_0023-CLEAR EPOXICO P/ESPUMA
one_hot__paint_name_0024-CLEAR LAUNDRY BACKER
one_hot__paint_name_0025-CLEAR EPOXY (WASH COAT)
one_hot__paint_name_0027-80 GLOSS CLEAR BACKER II
one_hot__paint_name_0028-CLEAR P/ESPUMA
one_hot__paint_name_0029-CLEAR INOXIDABLE
one_hot__paint_name_0034-CLEAR AZUL P/ESPUMA
one_hot__paint_name_0036-BACK PRIMER
one_hot__paint_name_0038-PRIMER 917
one_hot__paint_name_0039-CR FREE POLYURETAN PRIMER
one_hot__paint_name_0043-PRIMARIO NEGRO 4866
one_hot__paint_name_0045-PRIMARIO 4471
one_hot__paint_name_0048-GRAY POLYURETHANE PRIMER
one_hot__paint_name_0051-80 GLOSS CLEAR BACKER.
one_hot__paint_name_0054-CLEAR KRYSTAL KOTE
```

```
one_hot__paint_name_0061-APPLIANCE 30 GLOSS CLEAR
one_hot__paint_name_0063-CLEAR KYNAR UV
one_hot__paint_name_0066-SUPER HIGH GLOSS CLEAR II
one_hot__paint_name_0068-APPLIANCE 10 GLOSS CLEAR
one_hot__paint_name_0075-CLEAR LAUNDRY BACKER ROHS
one_hot__paint_name_0079-BECKRYPRIM 246
one_hot__paint_name_0084-EDGEGARD PRIMER
one_hot__paint_name_0088-CLEAR TOP PIZZA
one_hot__paint_name_0090-PRIMER 60000
one_hot__paint_name_0092-80 GLOSS CLEAR LAV
one_hot__paint_name_0093-50 GLOSS CLEAR ONE PASS
one_hot__paint_name_0095-INOXIDABLE CLEAR
one_hot__paint_name_0097-CLEAR APPLIANCE BACKER MC
one_hot__paint_name_0099-CLEAR P/ESPUMA ROHS
one_hot__paint_name_0101-BLANCO 15 II MOD.
one_hot__paint_name_0102-BLANCO STD
one_hot__paint_name_0104-BLANCO SUPERMATIC
one_hot__paint_name_0105-RANGE WHITE
one_hot__paint_name_0106-BLANCO CONFAD
one_hot__paint_name_0110-DURAPLUS BLANCO STD
one_hot__paint_name_0111-BLANCO 700 P/EXT
one_hot__paint_name_0114-BLANCO QL
one_hot__paint_name_0121-BLANCO STD KYNAR
one_hot__paint_name_0130-BLANCO MET 9010
one_hot__paint_name_0132-BLANCO MONOCAPA
one_hot__paint_name_0135-BLANCO MET 9010 USDA
one_hot__paint_name_0139-NEW PRIME WHITE
one_hot__paint_name_0144-WHITE POLYESTER ROHS
one_hot__paint_name_0145-BLANCO COOL ROOF 75
one_hot__paint_name_0147-BLANCO 15 II MOD ROHS
one_hot__paint_name_0148-DURAPLUS BCO MET9010 USDA
one_hot__paint_name_0150-BLANCO NIEVE ROLFLEX TER
one_hot__paint_name_0151-BLANCO FRIO
one_hot__paint_name_0153-BLANCO IMPERIAL JUV SILIC
one_hot__paint_name_0159-DURAPLUS BCO COOL ROOF 75
one_hot__paint_name_0162-BLANCO LUMINARIAS
one_hot__paint_name_0163-BLANCO LUMINARIAS FONDO
one_hot__paint_name_0168-BLANCO METECNO9002 USDAII
one_hot__paint_name_0173-BLANCO SM
one_hot__paint_name_0174-BLANCO STD USDA
one_hot__paint_name_0175-SNOW WHITE ROHS
one_hot__paint_name_0177-WHITE 800043 LAUNDRY
one_hot__paint_name_0178-WHITE TEXT KOTE
one_hot__paint_name_0193-WHITE 12H2427 LAV ROHS
one_hot__paint_name_0195-NEAT WHITE LAV ROHS
one_hot__paint_name_0200-AZUL MILITAR
one_hot__paint_name_0202-AZUL REY
one_hot__paint_name_0209-AZUL MILITAR SILIC
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one_hot__paint_name_0219-DEEP BLUE
one_hot__paint_name_0222-AZUL RAL-5003 FC
one_hot__paint_name_0223-AZUL 269 SILIC
one_hot__paint_name_0226-BREATHTAKING BLUE FC
one_hot__paint_name_0245-AZUL RC
one_hot__paint_name_0263-AZUL KB LAV
one_hot__paint_name_0264-GALLERY BLUE RM POLY
one_hot__paint_name_0309-CAFE MOCHA
one_hot__paint_name_0311-BROWN T413 SILIC.
one_hot__paint_name_0318-TOPAZ METALLIC 14H2593
one_hot__paint_name_0342-SAHARA TAN CS XT3Y43425
one_hot__paint_name_0343-BURNISHED SLATE XS3G41339
one_hot__paint_name_0345-LIGHTSONE CS XH3Y43424
one_hot__paint_name_0346-TIMBER TAN WXD0046L
one_hot__paint_name_0347-COCOA BROWN WXB1009L
one_hot__paint_name_0348-COCOA BROWN WXB1008L
one_hot__paint_name_0350-DESERT SAND WXD0055L
one_hot__paint_name_0368-BURNISHED SLATE XN3Y43422
one_hot__paint_name_0371-MARRON RC
one_hot__paint_name_0394-COPPER PENNY RM SP
one_hot__paint_name_0400-GRIS FONDO
one_hot__paint_name_0401-RANGE GRAY
one_hot__paint_name_0403-RAL-9006 VW ALUMINUM
one_hot__paint_name_0404-GRIS FONDO MC
one_hot__paint_name_0405-TAUPE METALLIC
one_hot__paint_name_0406-SILVER POLY
one_hot__paint_name_0407-COOL GRAY ICP
one_hot__paint_name_0409-GRIS HUMO POLY
one_hot__paint_name_0411-AMERICAN STERLING HVAC
one_hot__paint_name_0421-APOLLO GREY REF
one_hot__paint_name_0422-BACKER 0507 CR
one_hot__paint_name_0426-GRIS PIZARRA TERNIUM
one_hot__paint_name_0427-GRIS BACKER TERNIUM
one_hot__paint_name_0433-PLATA 89
one_hot__paint_name_0435-APOLLO GRAY KRYSTAL KOTE
one_hot__paint_name_0439-PRIVATE LABEL GRAY TEXT
one_hot__paint_name_0440-BALTIC GRAY HVAC
one_hot__paint_name_0443-PRIVATE LABEL GRAY
one_hot__paint_name_0446-WARM DARK GRAY SMOOTH
one_hot__paint_name_0447-WARM DARK GRAY TEXT.
one_hot__paint_name_0454-PLATA 104 LAV
one_hot__paint_name_0459-UNIVERSAL SILVER II
one_hot__paint_name_0463-GUN METAL GRAY
one_hot__paint_name_0466-SLATE GRAY HVAC TEXT
one_hot__paint_name_0467-WDG SMOOTH OT
one_hot__paint_name_0473-APOLLO GRAY TEXTURE KOTE
one_hot__paint_name_0475-DUCANE GRAY TEXTURE
one_hot__paint_name_0476-GRAY BACKER
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one_hot__paint_name_0485-URBAN SILVER REF ROHS
one_hot__paint_name_0487-GRIS TERNIUM CR FC
one_hot__paint_name_0488-DIAMOND GRAY LAV
one_hot__paint_name_0498-GRIS FONDO 70 GLOSS
one_hot__paint_name_0501-NEGRO ESTUFAS
one_hot__paint_name_0502-NEGRO AT II
one_hot__paint_name_0503-NEGRO ERNA
one_hot__paint_name_0504-BLACK QL
one_hot__paint_name_0505-NEGRO SUPERMATIC
one_hot__paint_name_0511-AMS BLACK TEXTURE
one_hot__paint_name_0517-BLACK POLYESTER ROHS
one_hot__paint_name_0521-NEGRO MM MITSUI.
one_hot__paint_name_0524-BLACK KRYSTAL KOTE
one_hot__paint_name_0525-NEGRO GRAFITO
one_hot__paint_name_0526-BLACK REF SAB
one_hot__paint_name_0529-BLACK QUANTUM SAB II
one_hot__paint_name_0534-BLACK TEXT KOTE
one_hot__paint_name_0543-BLACK METALLIC
one_hot__paint_name_0545-NEGRO MANDM
one_hot__paint_name_0553-DARK SLATE METALLIC
one_hot__paint_name_0558-BLACK ECOPRINT
one_hot__paint_name_0559-STEALTH BLACK XB3Y43414
one_hot__paint_name_0567-NEGRO RAL 9011 REF
one_hot__paint_name_0571-BLACK XB3Y44733
one_hot__paint_name_0587-MONOBACK BRILLANTE AR
one_hot__paint_name_0590-MED GLOSS BLACK XT30
one_hot__paint_name_0597-BLACK CAVIAR LAV ROHS
one_hot__paint_name_0598-NEGRO RAL 9005 ESTUFAS
one_hot__paint_name_0601-VERDE PRIMSA
one_hot__paint_name_0606-VERDE KOOP SILIC.
one_hot__paint_name_0607-VERDE INGLES
one_hot__paint_name_0614-VERDE MORISCO
one_hot__paint_name_0619 - LEAF GREEN SILIC
one_hot__paint_name_0620-VERDE PINO RAL-6028 POLY
one_hot__paint_name_0623-VERDE WRINKLED CR
one_hot__paint_name_0632-EVERGREEN WXG0020L
one_hot__paint_name_0642-FOREST GREEN XG3Y43427
one_hot__paint_name_0647-VERDE RC
one_hot__paint_name_0657-HUNTER GREEN XG3Y48846
one_hot__paint_name_0664-AQUA KB LAV
one_hot__paint_name_0665-HUNTER GREEN RM POLY
one_hot__paint_name_0667-VERDE MILITAR FC
one_hot__paint_name_0672-VERDE MORISCO BB
one_hot__paint_name_0691-JUNIPER GREEN METALLIC ROHS
one_hot__paint_name_0700-ARENA STD
one_hot__paint_name_0702-ARENA STD SILIC.
one_hot__paint_name_0704-DURAPLUS ARENA STD
one_hot__paint_name_0706-ARENA KYNER STD
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one_hot__paint_name_0709-BISQUET SUPERMATIC
one_hot__paint_name_0712-HVAC RAL-9001
one_hot__paint_name_0716-HVAC RAL-9001 II
one_hot__paint_name_0718-SANDPIPER BEIGE
one_hot__paint_name_0728-SAND TEXTURED
one_hot__paint_name_0730-ARENA STD USDA
one_hot__paint_name_0733-BISQUE TEXT KOTE
one_hot__paint_name_0744-AMARILLO TERNIUM CR FC
one_hot__paint_name_0777-AMARILLO RC
one_hot__paint_name_0786-CAOBA MADERA EXT SILIC
one_hot__paint_name_0788-CLAY XH3Y48843
one_hot__paint_name_0816-WOOD TRAD. SYSTEM SILIC
one_hot__paint_name_0817-NARANJA TERNIUM CR FC
one_hot__paint_name_0900-ROJO STD SILIC.
one_hot__paint_name_0901-ROJO STD
one_hot__paint_name_0903-HVAC RAL-3005
one_hot__paint_name_0905-ROJO MET TEJA
one_hot__paint_name_0906-ROJO MET TEJA BACKER
one_hot__paint_name_0907-ROJO MONOCAPA
one_hot__paint_name_0917-ROJO CERAMICO
one_hot__paint_name_0919-ROJO TERNIUM CR
one_hot__paint_name_0928-BURGUNDY PIZZA
one_hot__paint_name_0931-ROJO PERFILES
one_hot__paint_name_0933-ROJO RAL-8004 POLY
one_hot__paint_name_0934-ROJO RAL-8004 BACKER
one_hot__paint_name_0936-ROJO WRINKLED CR
one_hot__paint_name_0944-LIBERTY RED PANT 2035C
one_hot__paint_name_0945-RUSTIC RED CS XR3Y43419
one_hot__paint_name_0946-BURGUNDY CS XR3Y43420
one_hot__paint_name_0961-CARPORT RED
one_hot__paint_name_0966-ROJO RAL 8004 BC
one_hot__paint_name_0969-ROJO OSCURO RC
one_hot__paint_name_0970-ROJO CLARO RC
one_hot__paint_name_0973-ROJO COLONIAL SP
one_hot__paint_name_0987-DEEP RED TRINAR
one_hot__paint_name_0995-ROSA KB LAV
one_hot__paint_name_0995-ROSA KV LAV
one_hot__paint_name_0996-BURGUNDY RM POLY
one_hot__paint_name_0997-VINO RM POLY
one_hot__paint_name_1002-CLEAR PRIMER
one_hot__paint_name_1004-CLEAR EPOXY INOXIDABLE
one_hot__paint_name_1005-COIL PRIMER ROHS
one_hot__paint_name_1007-BECKRYPRIM 235
one_hot__paint_name_1009-APPLIANCE 30 GLOSS CLR OP
one_hot__paint_name_1013-DYNAPRIME 2821
one_hot__paint_name_1014-WHITE PRIMER
one_hot__paint_name_1015-CR FREE WHITE PRIMER
one_hot__paint_name_1022-EPOXY CHROMATE BACKER
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one_hot__paint_name_1025 - 60 GLOSS CLEAR BACKER
one_hot__paint_name_1026-CLEAR PRINT INOX
one_hot__paint_name_1027-BLACK INK PRINT
one_hot__paint_name_1028-CLEAR BLUE EPOXY
one_hot__paint_name_1030-PRIMER 4494
one_hot__paint_name_1031-BECKRYPRIM 235 NEGRO
one_hot__paint_name_1032-TINTA SILVER ECOPRINT
one_hot__paint_name_1037-APPLIANCE 5 GLOSS CLEAR
one_hot__paint_name_1042-BLACK STAINLESS LIKE CLR
one_hot__paint_name_1045-CLEAR COAT WOOD SILIC
one_hot__paint_name_1046-CLEAR PRINT INOX HG
one_hot__paint_name_1047-TINTA NEGRA SILIC
one_hot__paint_name_1049-TINTA WOOD TRAD. SILIC
one_hot__paint_name_1052-PRIMER NCC CR FREE
one_hot__paint_name_1055-CLEAR TOP LAVADORAS
one_hot__paint_name_1056-PRIMER LAUNDRY NCC ROHS
one_hot__paint_name_1058-WHITE SLATE CLEARCOAT
one_hot__paint_name_1059-CLEAR BLACK INOX
one_hot__paint_name_1065-BLACK CAVIAR CLEAR TOP
one_hot__paint_name_1070-CLEAR P/ESPUMA GRIS
one_hot__paint_name_1073-CLEAR P/BASECOAT CAOBA FC
one_hot__paint_name_1074-TINTA NEGRA FC
one_hot__paint_name_1077-CLEAR PRINT INOX MATE
one_hot__paint_name_1078-CLEAR TOP 20 GLOSS
one_hot__paint_name_1101-WHITE HVAC 101385
one_hot__paint_name_1104-WHITE BACKER 28555
one_hot__paint_name_1107-DURAPLUS BLANCO STD USDA
one_hot__paint_name_1118-BLANCO MET 9010 USDA SILIC
one_hot__paint_name_1128-BLANCO PURO G9010 ROHS
one_hot__paint_name_1129-BLANCO GRIS G9073 ROHS
one_hot__paint_name_1130-BLANCO RAL 9003 POLY
one_hot__paint_name_1131-BLANCO RAL 9003 BACKER
one_hot__paint_name_1145-BLANCO TERNIUM CR
one_hot__paint_name_1152-BLANCO TERNIUM CR TOP
one_hot__paint_name_1153-WHITE BASECOAT FC
one_hot__paint_name_1154-BLANCO CONFAD II
one_hot__paint_name_1161-NM WHITE BASECOAT
one_hot__paint_name_1164-BLANCO RAL 9010
one_hot__paint_name_1168-BLANCO RAL 9010 USDA
one_hot__paint_name_1174-WHITE 800043 RF
one_hot__paint_name_1317-BURNISHED SLATE XS3S66324
one_hot__paint_name_1327-TAN SELECT XT3S66326
one_hot__paint_name_1328-CAFÉ PERFILES & RACKS
one_hot__paint_name_1340-DARK BROWN RAL 8022 SILIC
one_hot__paint_name_1418-PRINTING SILVER INOX
one_hot__paint_name_1427-CHARCOAL XA3Y44946
one_hot__paint_name_1430-OLD TOWN GRAY XA3Y44382
one_hot__paint_name_1431-GRIS 356 TEXT.
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one_hot__paint_name_1432-DIAMOND GRAY LAV ROHS
one_hot__paint_name_1452-ASH GRAY WXA0092L
one_hot__paint_name_1456-GRIS CLARO RC
one_hot__paint_name_1457-GRIS OSCURO RC
one_hot__paint_name_1463-ALUMINIO RAL 9006 CR FC
one_hot__paint_name_1470-CHARCOAL 48842
one_hot__paint_name_1474-PRINTING DARK SILVER INOX
one_hot__paint_name_1475-CHACOAL GRAY CKA3Y49403
one_hot__paint_name_1480-GRIS ANTRACITA G7016 POLY
one_hot__paint_name_1487-AMERICAN STERLING III
one_hot__paint_name_1489-IRON ORE GRAY
one_hot__paint_name_1490-IRON ORE GRAY TXT
one_hot__paint_name_1492-GRIS KB LAV
one_hot__paint_name_1493-GRAY 2001
one_hot__paint_name_1506-NEGRO MM MITSUI. II
one_hot__paint_name_1510-BLACK ECOPRINT MATE
one_hot__paint_name_16 - 24 SEGS;3113-WHITE 12H2427 LAV ROHS
one_hot__paint_name_1714-CAOBA MADERA EXT FC
one_hot__paint_name_1901-BARN RED XR3G42462
one_hot__paint_name_1922-ROJO JANITZIO MONOCAPA;BECKERS PESM
one_hot__paint_name_2102-BLANCO RAL 9003 BC
one_hot__paint_name_2111-COMMODITY WHITE PMW3226
one_hot__paint_name_2113-WHITE XW3Y48850
one_hot__paint_name_2119-WHITE PW3R09872
one_hot__paint_name_2122-WHITE BACKER 28555F
one_hot__paint_name_2146-WHITE SLATE METALLIC
one_hot__paint_name_2153-BLANCO PURO USDA ROHS AST
one_hot__paint_name_2154-PURE WHITE XW3G42478
one_hot__paint_name_2157-BLANCO STD SILIC
one_hot__paint_name_2158-BLANCO POLAR RF AR
one_hot__paint_name_2172-WHITE 12H2427 LAV ROHS II
one_hot__paint_name_2190-BONE WHITE XW3Y44515
one_hot__paint_name_2199-POLAR WHITE XW3S66332
one_hot__paint_name_2407-GRIS BACKER TER MC
one_hot__paint_name_2409-PLATA 113 REF
one_hot__paint_name_2413-GRIS FDO P ACABADO MADERA
one_hot__paint_name_2432-GRIS ESPADA POLY
one_hot__paint_name_2437-DUCANE GRAY TEXTURE II
one_hot__paint_name_2452-QUARTZ GRAY TXT EDGE
one_hot__paint_name_2453-GRAY BACKER EDGE
one_hot__paint_name_2460-GRIS 356 REF
one_hot__paint_name_2469-EDGEGARD QUARTZ GRAY TXT
one_hot__paint_name_2470-HG GRAY POLYESTER BACKER
one_hot__paint_name_2474-EDGE PLATINUM GRAY TEXT
one_hot__paint_name_2485-CAST IRON GRAY MET ROHS
one_hot__paint_name_3107-WHITE HVAC 102167 GALVAPR
one_hot__paint_name_3110-BLANCO GLACIAR AR LAV
one_hot__paint_name_3111-BLANCO TRACTOCAMIONES
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one_hot__paint_name_3139-CHARACTER WHITE ROHS
one_hot__paint_name_50 GLOSS APPLIANCE CLEAR
one_hot__paint_name_50' BLACK EPOXY BACKER
one_hot__paint_name_APPLIANCE 10 GLOSS CLEAR
one_hot__paint_name_ARENA STD SILIC.
one_hot__paint_name_ARENA STD USDA
one_hot__paint_name_ASH GRAY - CS
one_hot__paint_name_BECKRYPRIM 243
one_hot__paint_name_BISQUE KRYSTAL KOTE
one_hot__paint_name_BISQUE QUANTUM SAB
one_hot__paint_name_BLACK PRIMER ROHS
one_hot__paint_name_BLACK TEXT KOTE
one_hot__paint_name_BLANCO 15 II MOD.
one_hot__paint_name_BLANCO COOL ROOF 75
one_hot__paint_name_BLANCO IMPERIAL JUV SILIC
one_hot__paint_name_BLANCO MET 9002
one_hot__paint_name_BLANCO METECNO 9002 USDA II
one_hot__paint_name_BLANCO QUANTUM SAB
one_hot__paint_name_BLANCO QUANTUM SAB ROHS
one_hot__paint_name_BLANCO RAL 9003 BACKER
one_hot__paint_name_BLANCO RAL 9003 POLY
one_hot__paint_name_BLANCO STD KYNAR
one_hot__paint_name_BROWN T413 SILIC.
one_hot__paint_name_BURGUNDY - CS
one_hot__paint_name_CHARCOAL - CS
one_hot__paint_name_CHROME FREE POLYURETANE PRIMER
one_hot__paint_name_CLEAR INOXIDABLE
one_hot__paint_name_CLEAR KRYSTAL KOTE
one_hot__paint_name_CLEAR LAUNDRY BACKER
one_hot__paint_name_CLEAR POLIESTER BACKER
one_hot__paint_name_DIAMOND GRAY LAV
one_hot__paint_name_DURAPLUS ARENA STD
one_hot__paint_name_DURAPLUS AZUL MILITAR
one_hot__paint_name_DURAPLUS BLANCO COOL ROOF 75
one_hot__paint_name_DURAPLUS CAFE LA CARIDAD
one_hot__paint_name_GRIS BACKER TERNIUM
one_hot__paint_name_HIGH BUILT PRIMER
one_hot__paint_name_LIGHTSTONE - CS
one_hot__paint_name_LIGHTSTONE - S
one_hot__paint_name_PINTURA 2191-BRIGHT WHITE XW5Y44516
one_hot__paint_name_PLATA 104 LAV
one_hot__paint_name_PRIMARIO  4041
one_hot__paint_name_PRIMARIO 4435
one_hot__paint_name_PRIMARIO 4464
one_hot__paint_name_PRIMER 4457
one_hot__paint_name_PRIMER GRIS 4857
one_hot__paint_name_RAL9006 VW ALUMINUM
one_hot__paint_name_ROJO JANITZIO BB
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one_hot__paint_name_ROJO MONOCAPA
one_hot__paint_name_ROJO PERFILES
one_hot__paint_name_ROJO RAL-8004 BACKER
one_hot__paint_name_ROJO RAL-8004 POLY
one_hot__paint_name_ROJO STD SILIC.
one_hot__paint_name_SAND TEXTURED
one_hot__paint_name_STEALTH BLACK - CS
one_hot__paint_name_SUPER HIGH GLOSS CLEAR
one_hot__paint_name_TEXTURED GRAY ROHS PRIMER
one_hot__paint_name_UNIVERSAL SILVER CLEAR TOP
one_hot__paint_name_UNIVERSAL SILVER CLEAR TOP II
one_hot__paint_name_UNIVERSAL SILVER ROHS
one_hot__paint_name_UNIVERSAL STEEL LIGHT
one_hot__paint_name_VERDE STD SILIC
one_hot__paint_name_WARM DARK GRAY SMOOTH
one_hot__paint_name_WHITE AKZO NOBEL XW3Y56897
one_hot__paint_name_WHITE BACKER 28555
one_hot__paint_name_WHITE KRYSTAL KOTE
one_hot__paint_name_WHITE TEXT KOTE
one_hot__user_ALEINSUMOS
one_hot__user_ALEMASTER
one_hot__user_ALOPEZB
one_hot__user_ANHERNANDEZT
one_hot__user_AORTEGAD
one_hot__user_CONVHANA_MM5
one_hot__user_GILRODRIGUEZ
one_hot__user_GSOTOR
one_hot__user_GURODRIGUEZR
one_hot__user_RHOLTEN
one_hot__user_SCORONAR
one_hot__period_1
one_hot__period_2
one_hot__period_3
one_hot__period_4
one_hot__period_5
one_hot__period_6
one_hot__period_7
one_hot__period_8
one_hot__period_9
one_hot__period_10
one_hot__period_11
one_hot__period_12
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one_hot__assignment_20200705
one_hot__assignment_20200706
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one_hot__assignment_20200707
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one_hot__assignment_20200721
one_hot__assignment_20200722
one_hot__assignment_20200723
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one_hot__assignment_20200725
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one_hot__assignment_20200804
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one_hot__assignment_20200807
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one_hot__assignment_20200810
one_hot__assignment_20200811
one_hot__assignment_20200812
one_hot__assignment_20200813
one_hot__assignment_20200814
one_hot__assignment_20200815
one_hot__assignment_20200816
one_hot__assignment_20200817
one_hot__assignment_20200818
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one_hot__assignment_20200824
one_hot__assignment_20200825
one_hot__assignment_20200826
one_hot__assignment_20200827
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one_hot__assignment_20200828
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one_hot__assignment_20230828
one_hot__assignment_20230829
one_hot__assignment_20230830
one_hot__assignment_20230831
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one_hot__supplier_BECK
one_hot__supplier_NCCC
one_hot__supplier_OSEL
one_hot__supplier_PPGI
one_hot__supplier_VALS
one_hot__line_Pintado 1 UNI
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one_hot__line_Pintado 2 UNI
one_hot__line_Pintado 2 Uni
one_hot__exercice_Ej.'20/21
one_hot__exercice_Ej.'21/22
one_hot__exercice_Ej.'22/23
one_hot__exercice_Ej.'23/24
scaler__transaction_monetary_value
scaler__object_monetary_value
scaler__monetary_value_usd
scaler__price_per_liter
```

```
[ ]: lasso_pipeline = pipeline.Pipeline([
         ('cleaner', cleaner),
         ('lasso', linear_model.Lasso())
     ], memory=cachedir)
```

```
[10]: lasso_pipeline
```

```
[10]: Pipeline(memory='/tmp/tmpna0xoc4h',
               steps=[('cleaner',
                       Pipeline(memory='/tmp/tmpna0xoc4h',
                               steps=[('null_threshold',
                                       <__main__.NullColumnRemover object at
      0x7356b4334500>),
                                      ('scaling_and_one_hot',
                                       ColumnTransformer(transformers=[('one_hot',
      OneHotEncoder(handle_unknown='infrequent_if_exist',
       sparse_output=False),
      <sklearn.compose._column_transformer.make_column_selector object at
      0x7356c82b6c60>),
                                                                       ('scaler',
      StandardScaler(),
      <sklearn.compose._column_transformer.make_column_selector object at
      0x7356c82da360>)])),
                                      ('variance_threshold', VarianceThreshold())])),
                      ('lasso', Lasso())])
```

```
[3]: lasso_grid = model_selection.GridSearchCV(lasso_pipeline, param_grid={
         'lasso__alpha': [0.1, 0.5, 1, 2],
     }, scoring='neg_mean_squared_error', refit=True)

     lasso_scores = model_selection.cross_validate(lasso_grid, coating_df.
      ↪drop(columns='total_liters_used'),
                                                   coating_df['total_liters_used'],␣
      ↪scoring=scoring)
```

/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/sklearn/linear_model/_coordinate_descent.py:678: 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: 1.473e+04, tolerance: 1.361e+04
  model = cd_fast.enet_coordinate_descent(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/sklearn/linear_model/_coordinate_descent.py:678: 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: 1.339e+04, tolerance: 1.335e+04
  model = cd_fast.enet_coordinate_descent(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
28] No space left on device.
  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
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/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
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/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
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  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
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28] No space left on device.
  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
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/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
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  warnings.warn(
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Possibly a race condition in the creation of the directory. Exception: [Errno
28] No space left on device.
  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
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packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
28] No space left on device.
  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
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/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
28] No space left on device.
  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
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  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
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  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
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/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
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/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
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/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
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28] No space left on device.
  warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
28] No space left on device.
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    warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
28] No space left on device.
    warnings.warn(
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
packages/joblib/_store_backends.py:215: CacheWarning: Unable to cache to disk.
Possibly a race condition in the creation of the directory. Exception: [Errno
28] No space left on device.
    warnings.warn(
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```

```
[ ]: svm_pipeline = pipeline.Pipeline([
         ('cleaner', cleaner),
         ('svr', svm.LinearSVR())
     ], memory=cachedir)
```

```
[11]: svm_pipeline
```

```
[11]: Pipeline(memory='/tmp/tmpna0xoc4h',
               steps=[('cleaner',
                       Pipeline(memory='/tmp/tmpna0xoc4h',
                                steps=[('null_threshold',
```

```
                                        <__main__.NullColumnRemover object at
   0x7356b4334500>),
                                        ('scaling_and_one_hot',
                                         ColumnTransformer(transformers=[('one_hot',
   OneHotEncoder(handle_unknown='infrequent_if_exist',
    sparse_output=False),
   <sklearn.compose._column_transformer.make_column_selector object at
   0x7356c82b6c60>),
                                                                  ('scaler',
   StandardScaler(),
   <sklearn.compose._column_transformer.make_column_selector object at
   0x7356c82da360>)])),
                                        ('variance_threshold', VarianceThreshold())])),
                  ('svr', LinearSVR())])
```

[4]:
```python
svm_grid = model_selection.GridSearchCV(svm_pipeline, param_grid={
    'svr__C': [2.5, 5, 10, 20],
}, scoring='neg_mean_squared_error', refit=True)

svm_scores = model_selection.cross_validate(svm_grid, coating_df.
 ↪drop(columns='total_liters_used'),
                                    coating_df['total_liters_used'],↲
 ↪scoring=scoring)
```

```
/home/hiram/Projects/Pandalytics/.venv/lib/python3.12/site-
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```python
[ ]: gradient_booster_pipeline = pipeline.Pipeline([
         ('cleaner', cleaner),
         ('gradient_booster', ensemble.HistGradientBoostingRegressor(max_iter=100))
     ])
```

```python
[14]: gradient_booster_pipeline
```

```
[14]: Pipeline(steps=[('cleaner',
                      Pipeline(memory='/tmp/tmpna0xoc4h',
                               steps=[('null_threshold',
                                       <__main__.NullColumnRemover object at
      0x7356b4334500>),
                                      ('scaling_and_one_hot',
                                       ColumnTransformer(transformers=[('one_hot',
      OneHotEncoder(handle_unknown='infrequent_if_exist',
       sparse_output=False),
      <sklearn.compose._column_transformer.make_column_selector object at
      0x7356c82b6c60>),
                                                                       ('scaler',
      StandardScaler(),
      <sklearn.compose._column_transformer.make_column_selector object at
      0x7356c82da360>)])),
                                      ('variance_threshold', VarianceThreshold())])),
                     ('gradient_booster', HistGradientBoostingRegressor())])
```

```python
[5]: gradient_booster_grid = model_selection.GridSearchCV(gradient_booster_pipeline,
     ↪param_grid={
         'gradient_booster__learning_rate': [0.05, 0.1, 0.25, 0.5],
     }, scoring='neg_mean_squared_error', refit=True)

     gradient_booster_scores = model_selection.cross_validate(gradient_booster_grid,
                                                              coating_df.
     ↪drop(columns='total_liters_used'),

     ↪coating_df['total_liters_used'],
                                                              scoring=scoring)
```

```
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```

```
[6]: lasso_scores_df = pd.DataFrame(lasso_scores)
     lasso_scores_df
```

```
[6]:       fit_time   score_time   test_neg_mean_squared_error  \
     0  228.128459     0.184940                     -602.824268
     1  202.900915     0.186494                     -745.645169
     2  119.097236     0.181031                     -662.108127
     3  143.395928     0.176220                     -784.279168
     4  182.060987     0.202333                    -1022.169021

        test_neg_root_mean_squared_error   test_neg_mean_absolute_error   test_r2  \
     0                        -24.552480                     -18.710299  0.831843
     1                        -27.306504                     -21.092090  0.804201
     2                        -25.731462                     -18.030634  0.835505
     3                        -28.004985                     -16.759499  0.775816
     4                        -31.971378                     -18.439709  0.701821

        test_neg_mean_absolute_percentage_error
     0                                -0.400855
     1                                -0.367211
     2                                -0.526224
     3                                -0.204177
     4                                -0.728414
```

```
[7]: svm_scores_df = pd.DataFrame(svm_scores)
     svm_scores_df
```

```
[7]:      fit_time   score_time   test_neg_mean_squared_error  \
     0  23.602458     0.189831                     -487.773304
     1  23.149499     0.126296                     -644.203465
     2  28.398958     0.128217                     -669.260013
     3  35.322811     0.120276                    -1071.508849
     4  33.824475     0.137142                    -1604.742668

        test_neg_root_mean_squared_error   test_neg_mean_absolute_error   test_r2  \
     0                        -22.085590                     -15.033741  0.863936
     1                        -25.381164                     -15.701325  0.830839
     2                        -25.870060                     -14.650231  0.833729
     3                        -32.733910                     -15.834358  0.693712
     4                        -40.059239                     -20.280636  0.531877
```

```
    test_neg_mean_absolute_percentage_error
0                                  -0.279954
1                                  -0.294677
2                                  -0.439236
3                                  -0.215286
4                                  -1.231506
```

[8]: ```python
gradient_booster_scores_df = pd.DataFrame(gradient_booster_scores)
gradient_booster_scores_df
```

[8]:
```
        fit_time   score_time test_neg_mean_squared_error \
0   133.260628   0.149414   -17.111492
1   128.387022   0.142599   -13.742734
2   139.320506   0.137235   -153.649097
3   132.232818   0.139474   -22.944900
4   138.233630   0.136832   -47.269224

    test_neg_root_mean_squared_error test_neg_mean_absolute_error   test_r2 \
0   -4.136604   -1.735741 0.995227
1   -3.707119   -1.857155 0.996391
2   -12.395527   -2.463464 0.961827
3   -4.790084   -2.060299 0.993441
4   -6.875262   -2.979760 0.986211

    test_neg_mean_absolute_percentage_error
0   -0.221345
1   -0.046993
2   -0.447934
3   -0.022579
4   -2.008066
```

El mejor modelo es claramente el de **Gradient Boost**. Este modelo presenta el menor error en todas las pruebas, por lo cual claramente resulta la mejora elección para la predicción del consumo de pintura. Los otros dos modelos comparten la característica de ser modelos lineales, por lo que no son ideales para realizar esta regresión.