NJRealtors_ML_Project

March 4, 2024

#Looking at the Big Picture ##### The first task is to use the New Jersey Realtor's state data to build a model that can predict median housing prices in each municipality using metrics sunch as New Listings, Closed Sales, Days on Market, Percent of Listing Price Received, Inventory of Homes , Months of Supply.

1 Framing the Problem

Objective: This model's output will be used to feed two other machine learning systems. One will use the predicted median sales price to determine the ARV of a renovated home. The other will determine if it's worth investing in the particular area/municipality

Current Solutions: The current solutions are to rely on industry experts (real estate agents and brokers) to manually create Comparable Market Analysis (CMA) which compares the target house to recently solds homes within a 0.5-1 mile radius which have similar property attributes. This method is highly unreliable because there currently isnt an industry standard as how to how to conduct a CMA. Agents are tasked to learn how to conduct this analysis either from other agents or learn by themselves; it is possible that no two agents will produce a similar CMA for the same property because their methodology will be different. In addition to the unreliability of the analysis, it is a very time consuming task and would benefit from being automated by a model.

Another solution available is the Zillow Zestimate price. Agents and or consumers will usually use the Zestimate as a trusted source in gauging the value of a target property. However, the model used to create the Zestimate is unknown and we arent certain on how that value is reached, although we are certain that machine learning/deep learning is involved.

2 Designing the System

My initial bias is to using a multiple regression model because it seems intuitive to use, however, I will approach this project with a true scientists mind. Coming in with zero assumptions and learning as I analyze different models, I will be exploring: #####1) If the data shows any significant correlation to warrant a machine learning project #####2) The use of various supervised and unsupervised models which tasks are used to solved reggression problems if there is significant correlation found.

#####This model will learn through batch learning

[62]:
```
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import FunctionTransformer
from sklearn.compose import TransformedTargetRegressor
from sklearn.compose import ColumnTransformer
from sklearn.pipeline import make_pipeline
from sklearn.metrics import mean_squared_error
from sklearn.metrics import r2_score
import math
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from google.colab import drive
import os
import seaborn as sns
```

[63]:
```
# /content is the default directory of Google Colab. Googel Drive needs to be␣
 ↪mounted in order to access the My Drive directory
current_wd = os.getcwd()
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
```

[64]:
```
os.chdir('/content/drive/MyDrive/Colab Notebooks')
```

[65]:
```
data = pd.read_excel('NJ 10k Real Estate Data 2024-01-25.xlsx', sheet_name='All␣
 ↪Months', index_col='City')
data.head()
```

[65]:

City	Dates	County	Quarter	Month	Year	\
Aberdeen Twp	2019-12-01	Monmouth County	Q4	December	2019	
Aberdeen Twp	2019-11-01	Monmouth County	Q4	November	2019	
Aberdeen Twp	2019-10-01	Monmouth County	Q4	October	2019	
Aberdeen Twp	2019-09-01	Monmouth County	Q3	September	2019	
Absecon City	2019-12-01	Atlantic County	Q4	December	2019	

City	New Listings	New Listing % Change (YoY)	Closed Sales	\
Aberdeen Twp	6	-0.625	9	
Aberdeen Twp	12	-0.250	21	
Aberdeen Twp	13	-0.235	11	
Aberdeen Twp	19	-0.136	15	

```
Absecon City           11                      0.100            18

             Closed Sale % Change (YoY)  Days on Markets  \
City
Aberdeen Twp                     -0.250              40
Aberdeen Twp                      0.313              48
Aberdeen Twp                     -0.450              84
Aberdeen Twp                     -0.318              56
Absecon City                      0.636              83

             Days on Market % Change (YoY)  Median Sales Prices  \
City
Aberdeen Twp                        -0.130               342500
Aberdeen Twp                        -0.515               355000
Aberdeen Twp                         0.556               380000
Aberdeen Twp                         0.302               376000
Absecon City                         0.297               190000

             Median Sales Price % Change (YoY)  \
City
Aberdeen Twp                             0.000
Aberdeen Twp                             0.043
Aberdeen Twp                             0.027
Aberdeen Twp                             0.153
Absecon City                            -0.050

             Percent of Listing Price Received  \
City
Aberdeen Twp                             0.992
Aberdeen Twp                             0.973
Aberdeen Twp                             0.973
Aberdeen Twp                             0.974
Absecon City                             0.962

             Percent of Listing Price Receive % Change (YoY)  \
City
Aberdeen Twp                                          -0.001
Aberdeen Twp                                           0.003
Aberdeen Twp                                          -0.028
Aberdeen Twp                                          -0.035
Absecon City                                          -0.003

             Inventory of Homes for Sales  \
City
Aberdeen Twp                           31
Aberdeen Twp                           38
Aberdeen Twp                           39
```

```
Aberdeen Twp                          50
Absecon City                          85

              Inventory of Homes for Sale % Change (YoY)  Months of Supply  \
City
Aberdeen Twp                                     -0.295               2.1
Aberdeen Twp                                     -0.240               2.4
Aberdeen Twp                                     -0.188               2.5
Aberdeen Twp                                     -0.138               3.1
Absecon City                                     -0.158               6.2

              Months of Supplies % Change (YoY)
City
Aberdeen Twp                             -0.276
Aberdeen Twp                             -0.314
Aberdeen Twp                             -0.242
Aberdeen Twp                             -0.244
Absecon City                             -0.151
```

[66]:
```
# Will be using this dataset going forward to train all models
X = data[['Median Sales Prices', 'New Listings', 'Closed Sales', 'Days on␣
 ↪Markets', 'Percent of Listing Price Received', 'Inventory of Homes for␣
 ↪Sales', 'Months of Supply']]
X = X[data[['Median Sales Prices', 'New Listings', 'Closed Sales', 'Days on␣
 ↪Markets', 'Percent of Listing Price Received', 'Inventory of Homes for␣
 ↪Sales', 'Months of Supply']] != 0]
X = X.dropna()
X.head()
```

[66]:
```
              Median Sales Prices  New Listings  Closed Sales  \
City
Aberdeen Twp             342500.0           6.0           9.0
Aberdeen Twp             355000.0          12.0          21.0
Aberdeen Twp             380000.0          13.0          11.0
Aberdeen Twp             376000.0          19.0          15.0
Absecon City             190000.0          11.0          18.0

              Days on Markets  Percent of Listing Price Received  \
City
Aberdeen Twp             40.0                              0.992
Aberdeen Twp             48.0                              0.973
Aberdeen Twp             84.0                              0.973
Aberdeen Twp             56.0                              0.974
Absecon City             83.0                              0.962

              Inventory of Homes for Sales  Months of Supply
City
```

```
Aberdeen Twp                    31.0              2.1
Aberdeen Twp                    38.0              2.4
Aberdeen Twp                    39.0              2.5
Aberdeen Twp                    50.0              3.1
Absecon City                    85.0              6.2
```

[67]:
```
# These features are on completely different scales and will require␣
↪standardization/normalization
X.describe().round(2)
```

[67]:
```
       Median Sales Prices  New Listings  Closed Sales  Days on Markets  \
count             24633.00      24633.00      24633.00         24633.00
mean             552197.76         15.50         12.68            44.84
std              448864.89         16.57         13.69            33.95
min               10000.00          1.00          1.00             1.00
25%              317500.00          5.00          4.00            23.00
50%              449500.00         10.00          8.00            36.00
75%              636250.00         20.00         16.00            56.00
max            12750000.00        205.00        209.00           585.00

       Percent of Listing Price Received  Inventory of Homes for Sales  \
count                           24633.00                      24633.00
mean                                1.01                         34.84
std                                 0.05                         45.04
min                                 0.57                          1.00
25%                                 0.98                         10.00
50%                                 1.00                         20.00
75%                                 1.03                         40.00
max                                 1.81                        737.00

       Months of Supply
count          24633.00
mean               2.82
std                2.24
min                0.10
25%                1.50
50%                2.20
75%                3.40
max               39.50
```

3 Correlation matrix for the target data set

3.0.1 Correlation: Unit of measurement of how two variables change with respect to one another

Correlations worth noting:

1. Median Sales Prices: Weak correlations with other features. 0.12 correlation with Months of

Supply

2. New Listings: Very strong positive correlation (0.82) with Closed Sales and Inventory of Homes for Sales (0.67)
3. Closed Sales: Strong correlation with Inventory of Homes for Sale (0.63)
4. Days on Markets: Semi-strong negative correlation with Percent of Listong Prices Received (-0.425) and Months of Supply (0.27)
5. Percent of Listing Prices Received: Semi-strong negative correlation with Months of Supply (-0.296)

[68]:
```
X.corr()
```

[68]:

	Median Sales Prices	New Listings	Closed Sales	Days on Markets	Percent of Listing Price Received	Inventory of Homes for Sales	Months of Supply
Median Sales Prices	1.000000	-0.081203	-0.089761	0.092728	-0.081821	-0.067601	0.122587
New Listings	-0.081203	1.000000	0.815420	-0.048853	0.089906	0.659787	0.023898
Closed Sales	-0.089761	0.815420	1.000000	-0.082559	0.106724	0.623398	-0.085192
Days on Markets	0.092728	-0.048853	-0.082559	1.000000	-0.441308	0.092321	0.291219
Percent of Listing Price Received	-0.081821	0.089906	0.106724	-0.441308	1.000000	-0.099902	-0.309631
Inventory of Homes for Sales	-0.067601	0.659787	0.623398	0.092321	-0.099902	1.000000	0.465619
Months of Supply	0.122587	0.023898	-0.085192	0.291219	-0.309631	0.465619	1.000000

	Months of Supply
Median Sales Prices	0.122587
New Listings	0.023898
Closed Sales	-0.085192
Days on Markets	0.291219
Percent of Listing Price Received	-0.309631
Inventory of Homes for Sales	0.465619
Months of Supply	1.000000

4 Covariance

4.0.1 Covariance: A measure of how two variables move together with respect to each other

Additional Info:

1. Helpful to determine the type of relationship between variables
2. Magnitude not easily interpretable
3. Higher magnitude means more dependent relationship. An increase in one variable would lead to an increase in another variable
4. A negative covaraince denotes an inverse relationship between the two varaibles

[71]:
```
X.cov()
```

[71]:

	Median Sales Prices	New Listings
Median Sales Prices	2.014797e+11	-603785.430247
New Listings	-6.037854e+05	274.402656
Closed Sales	-5.516932e+05	184.956865
Days on Markets	1.412941e+06	-27.471327
Percent of Listing Price Received	-1.727145e+03	0.070037
Inventory of Homes for Sales	-1.366710e+06	492.271304
Months of Supply	1.233801e+05	0.887664

	Closed Sales	Days on Markets
Median Sales Prices	-551693.162358	1.412941e+06
New Listings	184.956865	-2.747133e+01
Closed Sales	187.495261	-3.837599e+01
Days on Markets	-38.375994	1.152382e+03
Percent of Listing Price Received	0.068723	-7.045098e-01
Inventory of Homes for Sales	384.474432	1.411587e+02
Months of Supply	-2.615656	2.216676e+01

	Percent of Listing Price Received
Median Sales Prices	-1727.144816
New Listings	0.070037
Closed Sales	0.068723
Days on Markets	-0.704510

```
Percent of Listing Price Received                          0.002212
Inventory of Homes for Sales                              -0.211607
Months of Supply                                          -0.032649

                                 Inventory of Homes for Sales  \
Median Sales Prices                                -1.366710e+06
New Listings                                        4.922713e+02
Closed Sales                                        3.844744e+02
Days on Markets                                     1.411587e+02
Percent of Listing Price Received                  -2.116067e-01
Inventory of Homes for Sales                        2.028680e+03
Months of Supply                                    4.702427e+01

                                 Months of Supply
Median Sales Prices                  123380.139880
New Listings                              0.887664
Closed Sales                             -2.615656
Days on Markets                          22.166764
Percent of Listing Price Received        -0.032649
Inventory of Homes for Sales             47.024273
Months of Supply                          5.027694
```

5 Seaborn Paiplot Findings

There's a possible linear relationship between New Listings and Closed Sales but outside of that, there seems to be no linear relationships between the data. This may possibly mean that a multiple regression model may not produce accurate results.

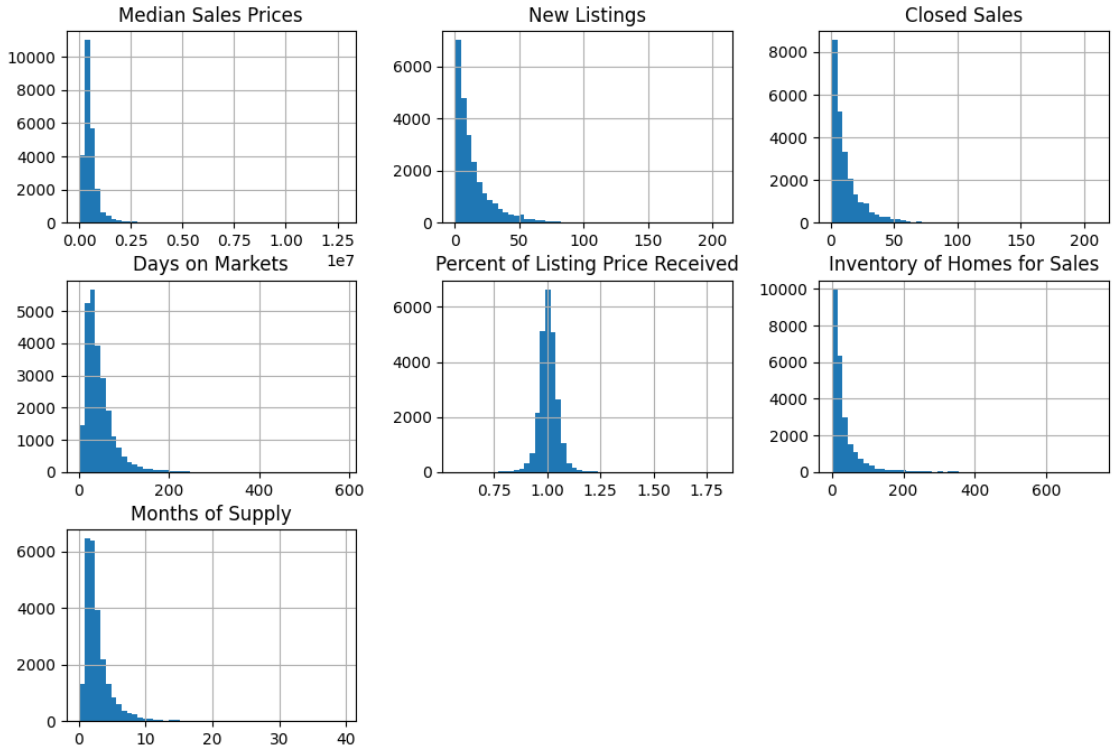
[72]:
```
sns.pairplot(X, y_vars='Median Sales Prices', hue='Median Sales Prices')
plt.show()
```

6 Histogram

The scale for the Median Sales Prices in the Seaborn and Matplotlib plot are heavily misaligned. Its on a 1e7 scale and ALL of the data is skewed right between 0 and1.275e7 which is 12,750,000 which doesnt show an ideal visualization of the data.

The scale of all the data are not aligned are good candidates to be transformed and standardized

[73]:
```
X.hist(bins=50, figsize=(12,8))
plt.show()
```



#Transformations

#####After visualizing the relationships between the dependent and independent variables, as well as the distribution of the independent variables, it is clear that we need to implement some transformations to create a more normal distribution amongst the data and standardize the scales.

#####There needs to be a global transformaton as well as a local transformation used on the data. The global transformation used will be Standardization. Currently, the scales of the data ranges from 0 - 200 for New Listings and Closed Sales, 0 - 600 for Days on the Market and Inventory of Homes for Sale, 0 - 40 for Months of Supply, 0 - 1.75 for Percent of Listing Price Received (PoLPR) and 0 - 1,250,000 for Median Sales Prices. The Standardization scaler will squash these values down to a smaller range but wont change the shape or the distribution of the data.

#####However, before using the Standardization transformation, the data needs to be evenly distributed. Based on the pairplot and historgram plots, the only data that seems to be evenly distributed in the PoLPR. All other feature columns to have heavy tails (right or positively skewed). When dealing with right skewed data, it is best to use log-transforms to help make that distribution more even.

[74]:
```
# Create a train, test, split on the data before initiating the transforms
y = X['Median Sales Prices']
x = X.drop(columns=['Median Sales Prices'])
```

```
# It is industry standard to use an 80/20 split for the test and training data
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2,␣
 ↪random_state=3)
orginal_y_train = y_train.copy()
```

[75]:
```
# Create a sklearn pipeline to apply the log-transform on the columns which are␣
 ↪right-skewed then StandardScalar()
# Use the FunctionTransformer method to apply the np.log transform
# Use the ColumnTransformer() to properly apply the transforms  to the target␣
 ↪columns based on what it needs

standarizer = StandardScaler()
log_transform = FunctionTransformer(np.log, inverse_func=np.exp)
log_pipeline = make_pipeline(log_transform, standarizer)
default_pipeline = make_pipeline(standarizer)

log_target_features = ['New Listings', 'Closed Sales', 'Days on Markets',␣
 ↪'Inventory of Homes for Sales', 'Months of Supply']
default_target_features = ['Percent of Listing Price Received']

pre_processing = ColumnTransformer([('log', log_pipeline, log_target_features),
                                    ('default', default_pipeline,␣
 ↪default_target_features)])
```

[76]:
```
def target_label_transformer(labels, inverse=False, standard_func=None):
  standarizer= StandardScaler()
  if inverse is False:
    trans_label = log_transform.fit_transform(labels)
    trans_label = standarizer.fit_transform(trans_label.to_frame())

    return trans_label, standarizer

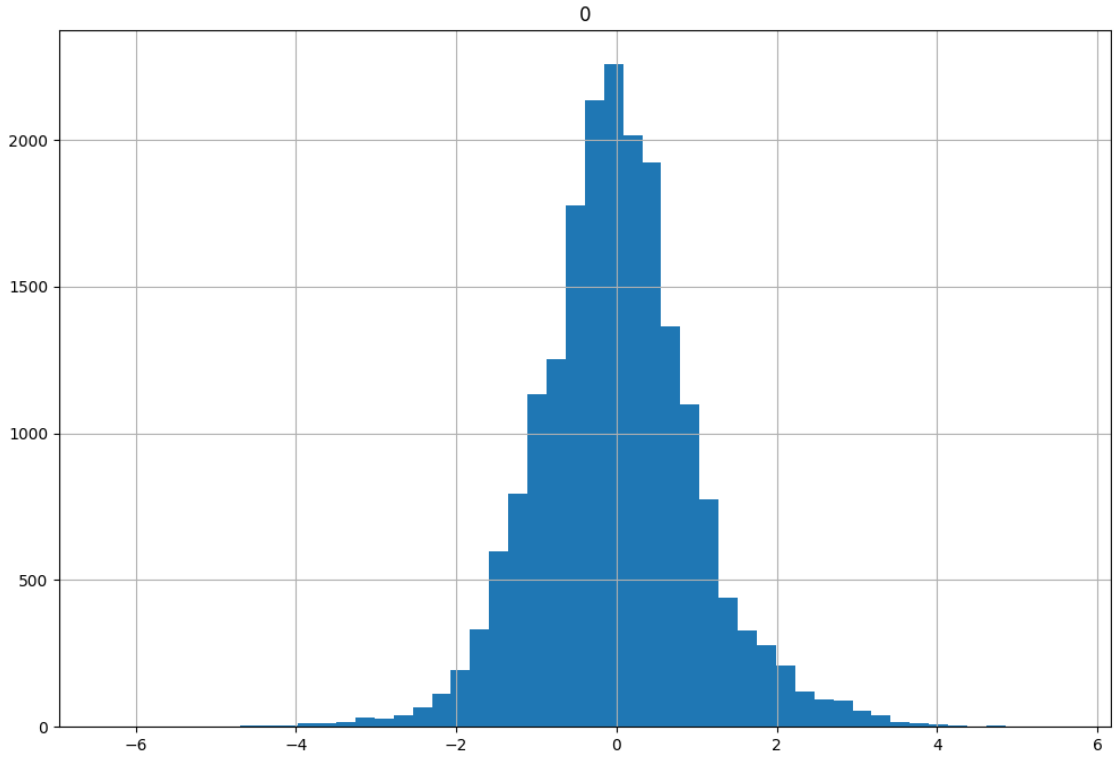
  elif inverse is True:
    trans_label = standard_func.inverse_transform(labels)
    trans_label = np.exp(trans_label)

    return trans_label
```

###Standardized 'Median Sales Prices'

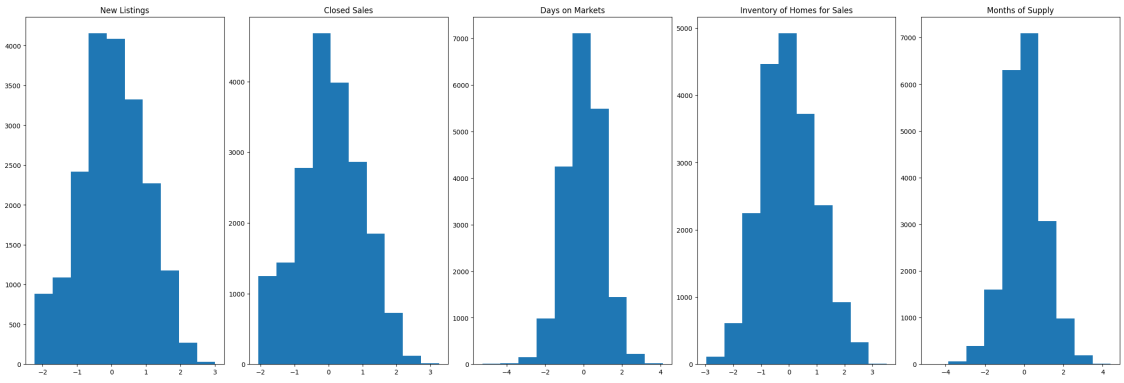
[77]:
```
new_labels, standarizer_func = target_label_transformer(y_train, inverse=False)
y_train = pd.DataFrame(new_labels)
y_train.hist(bins=50, figsize=(12,8))
```

[77]:
```
array([[<Axes: title={'center': '0'}>]], dtype=object)
```



6.0.1 Standardized Features

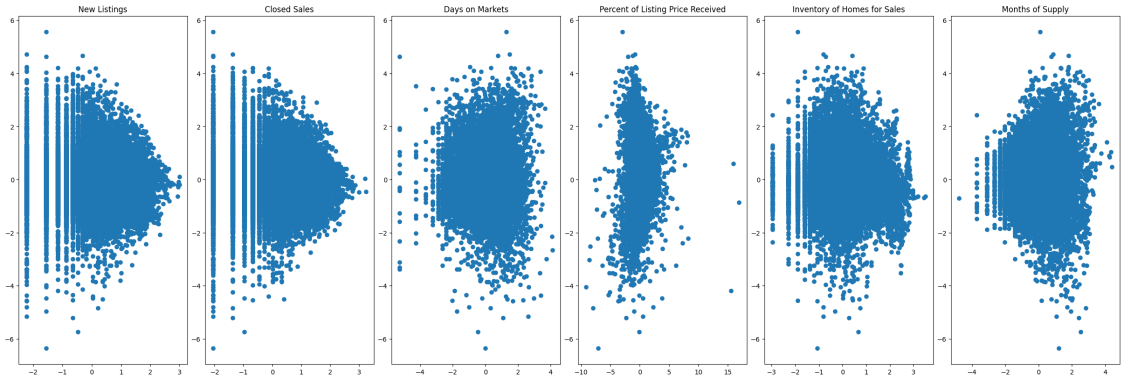
[78]:
```
fig, axs = plt.subplots(ncols=5, figsize=(24,8), layout='constrained')
for idx, col in enumerate(log_target_features):
  #td means transformed data
  td, standarizer_func = target_label_transformer(x_train[col])
  axs[idx].hist(td)
  axs[idx].set_title(col)
```



###Scatterplots of 'Median Sales Prices' vs. other feature elements to check for correlation

[79]:
```
target, standarizer_func = target_label_transformer(orginal_y_train)
fig, axs = plt.subplots(ncols=6, figsize=(24,8), layout='constrained')
for idx, col in enumerate(x_train.columns):
  #td means transformed data
  if col == 'Percent of Listing Price Received':
    td = StandardScaler().fit_transform(x_train[col].to_frame())
  else:
    td, standarizer_func = target_label_transformer(x_train[col])

  axs[idx].scatter(td, target)
  axs[idx].set_title(col)
```



[80]:
```
# Create another pipeline which links the pre-processing var and the␣
 ↪LinearRegression() method then train the model on the training data and␣
 ↪score it
x_prepared = pre_processing.fit_transform(x_train)

# The target values need to be standardized as well
training_y, standarizer_func1 = target_label_transformer(orginal_y_train,␣
 ↪inverse=False)
# model = TransformedTargetRegressor(LinearRegression(),␣
 ↪transformer=StandardScaler())
model = LinearRegression()
model.fit(x_prepared, training_y)
y_hat = model.predict(pre_processing.fit_transform(x_test))

rmse = math.sqrt(mean_squared_error(y_test, target_label_transformer(y_hat,␣
 ↪inverse=True, standard_func=standarizer_func1)))
print("Mean squared error: %.2f" % rmse)
print("Coefficient of determination: %.2f" % r2_score(y_test,␣
 ↪target_label_transformer(y_hat, inverse=True,␣
 ↪standard_func=standarizer_func1)))
```

```
# plt.scatter(x_test, pd.DataFrame(target_label_transformer(y_hat,
↪inverse=True, standard_func=standarizer_func1)))
```

```
Mean squared error: 492639.38
Coefficient of determination: -0.05
```

###Results

#####Multiple Linear Regression doesnt seem to be the best generalizing function to find the effects of different independent variables on the Median Sales Price. Even looking at each individual independent feature vs Median Sale Prices shows no indication of linear correleation between the variables. I believe this checks out well with the correlation matrix generated in the beginning of the project. I will need to choose a stronger model to determine any type of insights or trends

###Questions

#####1) Can I preview the correlation matrix to determine the relationship between the dependent and independent variables to determine if this is a good candidate for multiple linear regression? #####2) Can data have very little correlation but very high covariance? #####3) Would adding the month and year varaibles to the model make a difference? #####4) Are there any previous steps that were done incorrectly to lead me to these conclusions? #####5) Would using a regualrized(Ridge or Lasso) regression model make a difference? #####6) Is this bad data? Is there any feature engineering I can do to improve the data?

[81]:
```
X.corr()
```

[81]:
```
                                Median Sales Prices  New Listings  \
Median Sales Prices                        1.000000     -0.081203
New Listings                              -0.081203      1.000000
Closed Sales                              -0.089761      0.815420
Days on Markets                            0.092728     -0.048853
Percent of Listing Price Received         -0.081821      0.089906
Inventory of Homes for Sales              -0.067601      0.659787
Months of Supply                           0.122587      0.023898

                                Closed Sales  Days on Markets  \
Median Sales Prices                -0.089761         0.092728
New Listings                        0.815420        -0.048853
Closed Sales                        1.000000        -0.082559
Days on Markets                    -0.082559         1.000000
Percent of Listing Price Received   0.106724        -0.441308
Inventory of Homes for Sales        0.623398         0.092321
Months of Supply                   -0.085192         0.291219

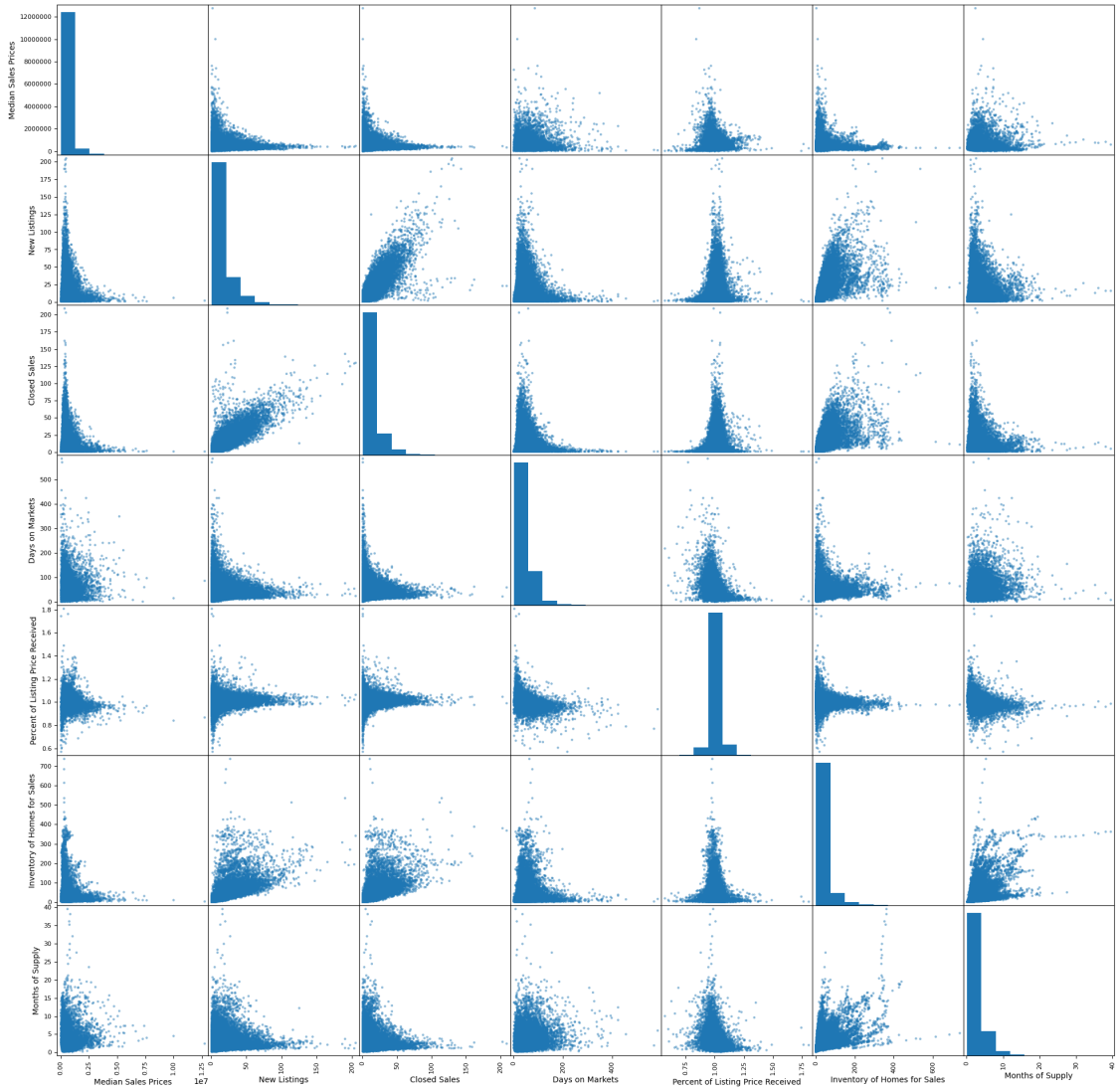
                                Percent of Listing Price Received  \
Median Sales Prices                                     -0.081821
New Listings                                             0.089906
Closed Sales                                             0.106724
```

```
Days on Markets                                    -0.441308
Percent of Listing Price Received                   1.000000
Inventory of Homes for Sales                       -0.099902
Months of Supply                                   -0.309631

                                  Inventory of Homes for Sales  \
Median Sales Prices                                 -0.067601
New Listings                                         0.659787
Closed Sales                                         0.623398
Days on Markets                                      0.092321
Percent of Listing Price Received                   -0.099902
Inventory of Homes for Sales                         1.000000
Months of Supply                                     0.465619

                                  Months of Supply
Median Sales Prices                       0.122587
New Listings                              0.023898
Closed Sales                             -0.085192
Days on Markets                           0.291219
Percent of Listing Price Received        -0.309631
Inventory of Homes for Sales              0.465619
Months of Supply                          1.000000
```

[82]:
```
from pandas.plotting import scatter_matrix
scatter_matrix(X, figsize=(24,24))
plt.show()
```



6.0.2 Multiple Linear Regression: Feature Engineering

As a real estate agent, I know there are many factors which effect home prices; and one of those major factors are mortgage rates. I'm interested to see if adding 'Mortgage Rates' as a feature of the data will convey any correlation to the 'Median Home Prices'

[83]:
```
new_data = pd.read_excel('NJ 10k Real Estate Data 2024-01-25.xlsx',␣
 ↪sheet_name='All Months')
new_data = new_data[['Dates', 'Median Sales Prices', 'New Listings', 'Closed␣
 ↪Sales', 'Days on Markets', 'Percent of Listing Price Received', 'Inventory␣
 ↪of Homes for Sales', 'Months of Supply']]
new_data = new_data[new_data[['Dates', 'Median Sales Prices', 'New Listings',␣
 ↪'Closed Sales', 'Days on Markets', 'Percent of Listing Price Received',␣
 ↪'Inventory of Homes for Sales', 'Months of Supply']] != 0]
```

```
new_data = new_data.dropna()
modify_dates = new_data['Dates'].to_list()
modify_dates = [str(i)[:7] for i in modify_dates]
new_data.drop(columns=['Dates'], inplace=True)
new_data.insert(0, 'Dates', pd.to_datetime(modify_dates, format='%Y-%m'))
new_data.set_index('Dates', inplace=True, drop=False)
new_data['Mortgage Rates'] = 0
```

[84]:
```
mortgage_data = pd.read_excel('Mortgage Rates 1971 - 2024.xlsx')
observation_dates = mortgage_data['observation_date'].to_list()
observation_dates = [str(i)[:7] for i in observation_dates]
mortgage_data.drop(columns=['observation_date'], inplace=True)
mortgage_data.insert(0, 'Dates', pd.to_datetime(observation_dates,␣
 ↪format="%Y-%m"))
```

[85]:
```
def get_mortgage_rate(mortgage_df, main_df):
    mortgage_df = mortgage_df.loc[2515:]
    for idx, date in enumerate(set(mortgage_df['Dates'].to_list())):
        median_mortgage_rate = mortgage_df[mortgage_df['Dates'] == date]
        main_df.loc[date, 'Mortgage Rates'] =␣
 ↪median_mortgage_rate['MORTGAGE30US_20240229'].mean()

    return main_df
```

[86]:
```
new_df = get_mortgage_rate(mortgage_data, new_data)
new_df.set_index('Dates', inplace=True, drop=False)
new_df.describe()
```

[86]:

	Median Sales Prices	New Listings	Closed Sales	Days on Markets
count	2.463300e+04	24633.000000	24633.000000	24633.000000
mean	5.521978e+05	15.500954	12.680997	44.838956
std	4.488649e+05	16.565104	13.692891	33.946754
min	1.000000e+04	1.000000	1.000000	1.000000
25%	3.175000e+05	5.000000	4.000000	23.000000
50%	4.495000e+05	10.000000	8.000000	36.000000
75%	6.362500e+05	20.000000	16.000000	56.000000
max	1.275000e+07	205.000000	209.000000	585.000000

	Percent of Listing Price Received	Inventory of Homes for Sales
count	24633.000000	24633.000000
mean	1.006126	34.839808
std	0.047027	45.040873
min	0.571000	1.000000
25%	0.982000	10.000000
50%	1.005000	20.000000
75%	1.030000	40.000000
max	1.807000	737.000000

```
       Months of Supply  Mortgage Rates
count      24633.000000    24643.000000
mean           2.815508        4.508294
std            2.242252        1.684395
min            0.100000        2.684000
25%            1.500000        3.016000
50%            2.200000        3.688000
75%            3.400000        6.342500
max           39.500000        7.620000
```

[87]:
```
new_df.corr()
```

```
<ipython-input-87-326e7bbec5b0>:1: FutureWarning: The default value of
numeric_only in DataFrame.corr is deprecated. In a future version, it will
default to False. Select only valid columns or specify the value of numeric_only
to silence this warning.
  new_df.corr()
```

[87]:

	Median Sales Prices	New Listings	Closed Sales	Days on Markets	Percent of Listing Price Received	Inventory of Homes for Sales	Months of Supply	Mortgage Rates
Median Sales Prices	1.000000	-0.081203	-0.089761	0.092728	-0.081821	-0.067601	0.122587	0.127868
New Listings	-0.081203	1.000000	0.815420	-0.048853	0.089906	0.659787	0.023898	-0.147793
Closed Sales	-0.089761	0.815420	1.000000	-0.082559	0.106724	0.623398	-0.085192	-0.153428
Days on Markets	0.092728	-0.048853	-0.082559	1.000000	-0.441308	0.092321	0.291219	-0.164820
Percent of Listing Price Received	-0.081821	0.089906	0.106724	-0.441308	1.000000	-0.099902	-0.309631	

```
Mortgage Rates                                          0.178073

                                Inventory of Homes for Sales  \
Median Sales Prices                                -0.067601
New Listings                                        0.659787
Closed Sales                                        0.623398
Days on Markets                                     0.092321
Percent of Listing Price Received                  -0.099902
Inventory of Homes for Sales                        1.000000
Months of Supply                                    0.465619
Mortgage Rates                                     -0.103271

                                Months of Supply  Mortgage Rates
Median Sales Prices                     0.122587       0.127868
New Listings                            0.023898      -0.147793
Closed Sales                           -0.085192      -0.153428
Days on Markets                         0.291219      -0.164820
Percent of Listing Price Received      -0.309631       0.178073
Inventory of Homes for Sales            0.465619      -0.103271
Months of Supply                        1.000000      -0.014656
Mortgage Rates                         -0.014656       1.000000
```

6.0.3 Conclusion

The additional feature of 'Mortgage Rates' didnt seem to have any material effect on the 'Median Sales Price' or any of the other features for that matter. While knowing that mortgage rates have an effect on the housing market in real life, it may be difficult to show it's relationship here. Additionally, this study leads me to believe that home prices are effected more by the intrinsic values of the home and other factors not captured in this data set. I've determined that multiple linear regression

[ ]:
```
!sudo apt-get install texlive-xetex texlive-fonts-recommended␣
↪texlive-plain-generic
!jupyter nbconvert --to pdf /content/drive/MyDrive/Colab\ Notebooks/
↪NJRealtors_ML_Project.ipynb
```

```
Reading package lists… Done
Building dependency tree… Done
Reading state information… Done
The following additional packages will be installed:
  dvisvgm fonts-droid-fallback fonts-lato fonts-lmodern fonts-noto-mono
  fonts-texgyre fonts-urw-base35 libapache-pom-java libcommons-logging-java
  libcommons-parent-java libfontbox-java libfontenc1 libgs9 libgs9-common
  libidn12 libijs-0.35 libjbig2dec0 libkpathsea6 libpdfbox-java libptexenc1
  libruby3.0 libsynctex2 libteckit0 libtexlua53 libtexluajit2 libwoff1
  libzzip-0-13 lmodern poppler-data preview-latex-style rake ruby
  ruby-net-telnet ruby-rubygems ruby-webrick ruby-xmlrpc ruby3.0
  rubygems-integration t1utils teckit tex-common tex-gyre texlive-base
```

```
  texlive-binaries texlive-latex-base texlive-latex-extra
  texlive-latex-recommended texlive-pictures tipa xfonts-encodings
  xfonts-utils
Suggested packages:
  fonts-noto fonts-freefont-otf | fonts-freefont-ttf libavalon-framework-java
  libcommons-logging-java-doc libexcalibur-logkit-java liblog4j1.2-java
  poppler-utils ghostscript fonts-japanese-mincho | fonts-ipafont-mincho
  fonts-japanese-gothic | fonts-ipafont-gothic fonts-arphic-ukai
  fonts-arphic-uming fonts-nanum ri ruby-dev bundler debhelper gv
  | postscript-viewer perl-tk xpdf | pdf-viewer xzdec
  texlive-fonts-recommended-doc texlive-latex-base-doc python3-pygments
  icc-profiles libfile-which-perl libspreadsheet-parseexcel-perl
  texlive-latex-extra-doc texlive-latex-recommended-doc texlive-luatex
  texlive-pstricks dot2tex prerex texlive-pictures-doc vprerex
  default-jre-headless tipa-doc
The following NEW packages will be installed:
  dvisvgm fonts-droid-fallback fonts-lato fonts-lmodern fonts-noto-mono
  fonts-texgyre fonts-urw-base35 libapache-pom-java libcommons-logging-java
  libcommons-parent-java libfontbox-java libfontenc1 libgs9 libgs9-common
  libidn12 libijs-0.35 libjbig2dec0 libkpathsea6 libpdfbox-java libptexenc1
  libruby3.0 libsynctex2 libteckit0 libtexlua53 libtexluajit2 libwoff1
  libzzip-0-13 lmodern poppler-data preview-latex-style rake ruby
  ruby-net-telnet ruby-rubygems ruby-webrick ruby-xmlrpc ruby3.0
  rubygems-integration t1utils teckit tex-common tex-gyre texlive-base
  texlive-binaries texlive-fonts-recommended texlive-latex-base
  texlive-latex-extra texlive-latex-recommended texlive-pictures
  texlive-plain-generic texlive-xetex tipa xfonts-encodings xfonts-utils
0 upgraded, 54 newly installed, 0 to remove and 35 not upgraded.
Need to get 182 MB of archives.
After this operation, 571 MB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-droid-fallback all
1:6.0.1r16-1.1build1 [1,805 kB]
Get:2 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-lato all 2.0-2.1
[2,696 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy/main amd64 poppler-data all
0.4.11-1 [2,171 kB]
Get:4 http://archive.ubuntu.com/ubuntu jammy/universe amd64 tex-common all 6.17
[33.7 kB]
Get:5 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-urw-base35 all
20200910-1 [6,367 kB]
Get:6 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libgs9-common
all 9.55.0~dfsg1-0ubuntu5.6 [751 kB]
Get:7 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libidn12 amd64
1.38-4ubuntu1 [60.0 kB]
Get:8 http://archive.ubuntu.com/ubuntu jammy/main amd64 libijs-0.35 amd64
0.35-15build2 [16.5 kB]
Get:9 http://archive.ubuntu.com/ubuntu jammy/main amd64 libjbig2dec0 amd64
0.19-3build2 [64.7 kB]
```

```
Get:10 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libgs9 amd64
9.55.0~dfsg1-0ubuntu5.6 [5,031 kB]
Get:11 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libkpathsea6
amd64 2021.20210626.59705-1ubuntu0.1 [60.3 kB]
Get:12 http://archive.ubuntu.com/ubuntu jammy/main amd64 libwoff1 amd64
1.0.2-1build4 [45.2 kB]
Get:13 http://archive.ubuntu.com/ubuntu jammy/universe amd64 dvisvgm amd64
2.13.1-1 [1,221 kB]
Get:14 http://archive.ubuntu.com/ubuntu jammy/universe amd64 fonts-lmodern all
2.004.5-6.1 [4,532 kB]
Get:15 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-noto-mono all
20201225-1build1 [397 kB]
Get:16 http://archive.ubuntu.com/ubuntu jammy/universe amd64 fonts-texgyre all
20180621-3.1 [10.2 MB]
Get:17 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libapache-pom-java
all 18-1 [4,720 B]
Get:18 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libcommons-parent-
java all 43-1 [10.8 kB]
Get:19 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libcommons-logging-
java all 1.2-2 [60.3 kB]
Get:20 http://archive.ubuntu.com/ubuntu jammy/main amd64 libfontenc1 amd64
1:1.1.4-1build3 [14.7 kB]
Get:21 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libptexenc1
amd64 2021.20210626.59705-1ubuntu0.1 [39.1 kB]
Get:22 http://archive.ubuntu.com/ubuntu jammy/main amd64 rubygems-integration
all 1.18 [5,336 B]
Get:23 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 ruby3.0 amd64
3.0.2-7ubuntu2.4 [50.1 kB]
Get:24 http://archive.ubuntu.com/ubuntu jammy/main amd64 ruby-rubygems all
3.3.5-2 [228 kB]
Get:25 http://archive.ubuntu.com/ubuntu jammy/main amd64 ruby amd64 1:3.0~exp1
[5,100 B]
Get:26 http://archive.ubuntu.com/ubuntu jammy/main amd64 rake all 13.0.6-2 [61.7
kB]
Get:27 http://archive.ubuntu.com/ubuntu jammy/main amd64 ruby-net-telnet all
0.1.1-2 [12.6 kB]
Get:28 http://archive.ubuntu.com/ubuntu jammy/universe amd64 ruby-webrick all
1.7.0-3 [51.8 kB]
Get:29 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 ruby-xmlrpc all
0.3.2-1ubuntu0.1 [24.9 kB]
Get:30 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libruby3.0
amd64 3.0.2-7ubuntu2.4 [5,113 kB]
Get:31 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libsynctex2
amd64 2021.20210626.59705-1ubuntu0.1 [55.5 kB]
Get:32 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libteckit0 amd64
2.5.11+ds1-1 [421 kB]
Get:33 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libtexlua53
amd64 2021.20210626.59705-1ubuntu0.1 [120 kB]
```

```
Get:34 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libtexluajit2
amd64 2021.20210626.59705-1ubuntu0.1 [267 kB]
Get:35 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libzzip-0-13 amd64
0.13.72+dfsg.1-1.1 [27.0 kB]
Get:36 http://archive.ubuntu.com/ubuntu jammy/main amd64 xfonts-encodings all
1:1.0.5-0ubuntu2 [578 kB]
Get:37 http://archive.ubuntu.com/ubuntu jammy/main amd64 xfonts-utils amd64
1:7.7+6build2 [94.6 kB]
Get:38 http://archive.ubuntu.com/ubuntu jammy/universe amd64 lmodern all
2.004.5-6.1 [9,471 kB]
Get:39 http://archive.ubuntu.com/ubuntu jammy/universe amd64 preview-latex-style
all 12.2-1ubuntu1 [185 kB]
Get:40 http://archive.ubuntu.com/ubuntu jammy/main amd64 t1utils amd64
1.41-4build2 [61.3 kB]
Get:41 http://archive.ubuntu.com/ubuntu jammy/universe amd64 teckit amd64
2.5.11+ds1-1 [699 kB]
Get:42 http://archive.ubuntu.com/ubuntu jammy/universe amd64 tex-gyre all
20180621-3.1 [6,209 kB]
Get:43 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 texlive-
binaries amd64 2021.20210626.59705-1ubuntu0.1 [9,848 kB]
Get:44 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-base all
2021.20220204-1 [21.0 MB]
Get:45 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-fonts-
recommended all 2021.20220204-1 [4,972 kB]
Get:46 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-latex-base
all 2021.20220204-1 [1,128 kB]
Get:47 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libfontbox-java all
1:1.8.16-2 [207 kB]
Get:48 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libpdfbox-java all
1:1.8.16-2 [5,199 kB]
Get:49 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-latex-
recommended all 2021.20220204-1 [14.4 MB]
Get:50 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-pictures
all 2021.20220204-1 [8,720 kB]
Get:51 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-latex-extra
all 2021.20220204-1 [13.9 MB]
Get:52 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-plain-
generic all 2021.20220204-1 [27.5 MB]
Get:53 http://archive.ubuntu.com/ubuntu jammy/universe amd64 tipa all 2:1.3-21
[2,967 kB]
Get:54 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-xetex all
2021.20220204-1 [12.4 MB]
Fetched 182 MB in 3s (72.0 MB/s)
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based
frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line 78,
<> line 54.)
debconf: falling back to frontend: Readline
```

```
debconf: unable to initialize frontend: Readline
debconf: (This frontend requires a controlling tty.)
debconf: falling back to frontend: Teletype
dpkg-preconfigure: unable to re-open stdin:
Selecting previously unselected package fonts-droid-fallback.
(Reading database … 121749 files and directories currently installed.)
Preparing to unpack …/00-fonts-droid-fallback_1%3a6.0.1r16-1.1build1_all.deb
…
Unpacking fonts-droid-fallback (1:6.0.1r16-1.1build1) …
Selecting previously unselected package fonts-lato.
Preparing to unpack …/01-fonts-lato_2.0-2.1_all.deb …
Unpacking fonts-lato (2.0-2.1) …
Selecting previously unselected package poppler-data.
Preparing to unpack …/02-poppler-data_0.4.11-1_all.deb …
Unpacking poppler-data (0.4.11-1) …
Selecting previously unselected package tex-common.
Preparing to unpack …/03-tex-common_6.17_all.deb …
Unpacking tex-common (6.17) …
Selecting previously unselected package fonts-urw-base35.
Preparing to unpack …/04-fonts-urw-base35_20200910-1_all.deb …
Unpacking fonts-urw-base35 (20200910-1) …
Selecting previously unselected package libgs9-common.
Preparing to unpack …/05-libgs9-common_9.55.0~dfsg1-0ubuntu5.6_all.deb …
Unpacking libgs9-common (9.55.0~dfsg1-0ubuntu5.6) …
Selecting previously unselected package libidn12:amd64.
Preparing to unpack …/06-libidn12_1.38-4ubuntu1_amd64.deb …
Unpacking libidn12:amd64 (1.38-4ubuntu1) …
Selecting previously unselected package libijs-0.35:amd64.
Preparing to unpack …/07-libijs-0.35_0.35-15build2_amd64.deb …
Unpacking libijs-0.35:amd64 (0.35-15build2) …
Selecting previously unselected package libjbig2dec0:amd64.
Preparing to unpack …/08-libjbig2dec0_0.19-3build2_amd64.deb …
Unpacking libjbig2dec0:amd64 (0.19-3build2) …
Selecting previously unselected package libgs9:amd64.
Preparing to unpack …/09-libgs9_9.55.0~dfsg1-0ubuntu5.6_amd64.deb …
Unpacking libgs9:amd64 (9.55.0~dfsg1-0ubuntu5.6) …
Selecting previously unselected package libkpathsea6:amd64.
Preparing to unpack …/10-libkpathsea6_2021.20210626.59705-1ubuntu0.1_amd64.deb
…
Unpacking libkpathsea6:amd64 (2021.20210626.59705-1ubuntu0.1) …
Selecting previously unselected package libwoff1:amd64.
Preparing to unpack …/11-libwoff1_1.0.2-1build4_amd64.deb …
Unpacking libwoff1:amd64 (1.0.2-1build4) …
Selecting previously unselected package dvisvgm.
Preparing to unpack …/12-dvisvgm_2.13.1-1_amd64.deb …
Unpacking dvisvgm (2.13.1-1) …
Selecting previously unselected package fonts-lmodern.
Preparing to unpack …/13-fonts-lmodern_2.004.5-6.1_all.deb …
```

```
Unpacking fonts-lmodern (2.004.5-6.1) …
Selecting previously unselected package fonts-noto-mono.
Preparing to unpack …/14-fonts-noto-mono_20201225-1build1_all.deb …
Unpacking fonts-noto-mono (20201225-1build1) …
Selecting previously unselected package fonts-texgyre.
Preparing to unpack …/15-fonts-texgyre_20180621-3.1_all.deb …
Unpacking fonts-texgyre (20180621-3.1) …
Selecting previously unselected package libapache-pom-java.
Preparing to unpack …/16-libapache-pom-java_18-1_all.deb …
Unpacking libapache-pom-java (18-1) …
Selecting previously unselected package libcommons-parent-java.
Preparing to unpack …/17-libcommons-parent-java_43-1_all.deb …
Unpacking libcommons-parent-java (43-1) …
Selecting previously unselected package libcommons-logging-java.
Preparing to unpack …/18-libcommons-logging-java_1.2-2_all.deb …
Unpacking libcommons-logging-java (1.2-2) …
Selecting previously unselected package libfontenc1:amd64.
Preparing to unpack …/19-libfontenc1_1%3a1.1.4-1build3_amd64.deb …
Unpacking libfontenc1:amd64 (1:1.1.4-1build3) …
Selecting previously unselected package libptexenc1:amd64.
Preparing to unpack …/20-libptexenc1_2021.20210626.59705-1ubuntu0.1_amd64.deb
…
Unpacking libptexenc1:amd64 (2021.20210626.59705-1ubuntu0.1) …
Selecting previously unselected package rubygems-integration.
Preparing to unpack …/21-rubygems-integration_1.18_all.deb …
Unpacking rubygems-integration (1.18) …
Selecting previously unselected package ruby3.0.
Preparing to unpack …/22-ruby3.0_3.0.2-7ubuntu2.4_amd64.deb …
Unpacking ruby3.0 (3.0.2-7ubuntu2.4) …
Selecting previously unselected package ruby-rubygems.
Preparing to unpack …/23-ruby-rubygems_3.3.5-2_all.deb …
Unpacking ruby-rubygems (3.3.5-2) …
Selecting previously unselected package ruby.
Preparing to unpack …/24-ruby_1%3a3.0~exp1_amd64.deb …
Unpacking ruby (1:3.0~exp1) …
Selecting previously unselected package rake.
Preparing to unpack …/25-rake_13.0.6-2_all.deb …
Unpacking rake (13.0.6-2) …
Selecting previously unselected package ruby-net-telnet.
Preparing to unpack …/26-ruby-net-telnet_0.1.1-2_all.deb …
Unpacking ruby-net-telnet (0.1.1-2) …
Selecting previously unselected package ruby-webrick.
Preparing to unpack …/27-ruby-webrick_1.7.0-3_all.deb …
Unpacking ruby-webrick (1.7.0-3) …
Selecting previously unselected package ruby-xmlrpc.
Preparing to unpack …/28-ruby-xmlrpc_0.3.2-1ubuntu0.1_all.deb …
Unpacking ruby-xmlrpc (0.3.2-1ubuntu0.1) …
Selecting previously unselected package libruby3.0:amd64.
```

```
Preparing to unpack …/29-libruby3.0_3.0.2-7ubuntu2.4_amd64.deb …
Unpacking libruby3.0:amd64 (3.0.2-7ubuntu2.4) …
Selecting previously unselected package libsynctex2:amd64.
Preparing to unpack …/30-libsynctex2_2021.20210626.59705-1ubuntu0.1_amd64.deb
…
Unpacking libsynctex2:amd64 (2021.20210626.59705-1ubuntu0.1) …
Selecting previously unselected package libteckit0:amd64.
Preparing to unpack …/31-libteckit0_2.5.11+ds1-1_amd64.deb …
Unpacking libteckit0:amd64 (2.5.11+ds1-1) …
Selecting previously unselected package libtexlua53:amd64.
Preparing to unpack …/32-libtexlua53_2021.20210626.59705-1ubuntu0.1_amd64.deb
…
Unpacking libtexlua53:amd64 (2021.20210626.59705-1ubuntu0.1) …
Selecting previously unselected package libtexluajit2:amd64.
Preparing to unpack
…/33-libtexluajit2_2021.20210626.59705-1ubuntu0.1_amd64.deb …
Unpacking libtexluajit2:amd64 (2021.20210626.59705-1ubuntu0.1) …
Selecting previously unselected package libzzip-0-13:amd64.
Preparing to unpack …/34-libzzip-0-13_0.13.72+dfsg.1-1.1_amd64.deb …
Unpacking libzzip-0-13:amd64 (0.13.72+dfsg.1-1.1) …
Selecting previously unselected package xfonts-encodings.
Preparing to unpack …/35-xfonts-encodings_1%3a1.0.5-0ubuntu2_all.deb …
Unpacking xfonts-encodings (1:1.0.5-0ubuntu2) …
Selecting previously unselected package xfonts-utils.
Preparing to unpack …/36-xfonts-utils_1%3a7.7+6build2_amd64.deb …
Unpacking xfonts-utils (1:7.7+6build2) …
Selecting previously unselected package lmodern.
Preparing to unpack …/37-lmodern_2.004.5-6.1_all.deb …
Unpacking lmodern (2.004.5-6.1) …
Selecting previously unselected package preview-latex-style.
Preparing to unpack …/38-preview-latex-style_12.2-1ubuntu1_all.deb …
Unpacking preview-latex-style (12.2-1ubuntu1) …
Selecting previously unselected package t1utils.
Preparing to unpack …/39-t1utils_1.41-4build2_amd64.deb …
Unpacking t1utils (1.41-4build2) …
Selecting previously unselected package teckit.
Preparing to unpack …/40-teckit_2.5.11+ds1-1_amd64.deb …
Unpacking teckit (2.5.11+ds1-1) …
Selecting previously unselected package tex-gyre.
Preparing to unpack …/41-tex-gyre_20180621-3.1_all.deb …
Unpacking tex-gyre (20180621-3.1) …
Selecting previously unselected package texlive-binaries.
Preparing to unpack …/42-texlive-
binaries_2021.20210626.59705-1ubuntu0.1_amd64.deb …
Unpacking texlive-binaries (2021.20210626.59705-1ubuntu0.1) …
Selecting previously unselected package texlive-base.
Preparing to unpack …/43-texlive-base_2021.20220204-1_all.deb …
Unpacking texlive-base (2021.20220204-1) …
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Selecting previously unselected package texlive-fonts-recommended.
Preparing to unpack …/44-texlive-fonts-recommended_2021.20220204-1_all.deb …
Unpacking texlive-fonts-recommended (2021.20220204-1) …
Selecting previously unselected package texlive-latex-base.
Preparing to unpack …/45-texlive-latex-base_2021.20220204-1_all.deb …
Unpacking texlive-latex-base (2021.20220204-1) …
Selecting previously unselected package libfontbox-java.
Preparing to unpack …/46-libfontbox-java_1%3a1.8.16-2_all.deb …
Unpacking libfontbox-java (1:1.8.16-2) …
Selecting previously unselected package libpdfbox-java.
Preparing to unpack …/47-libpdfbox-java_1%3a1.8.16-2_all.deb …
Unpacking libpdfbox-java (1:1.8.16-2) …
Selecting previously unselected package texlive-latex-recommended.
Preparing to unpack …/48-texlive-latex-recommended_2021.20220204-1_all.deb …
Unpacking texlive-latex-recommended (2021.20220204-1) …
Selecting previously unselected package texlive-pictures.
Preparing to unpack …/49-texlive-pictures_2021.20220204-1_all.deb …
Unpacking texlive-pictures (2021.20220204-1) …
Selecting previously unselected package texlive-latex-extra.
Preparing to unpack …/50-texlive-latex-extra_2021.20220204-1_all.deb …
Unpacking texlive-latex-extra (2021.20220204-1) …
Selecting previously unselected package texlive-plain-generic.
Preparing to unpack …/51-texlive-plain-generic_2021.20220204-1_all.deb …
Unpacking texlive-plain-generic (2021.20220204-1) …
Selecting previously unselected package tipa.
Preparing to unpack …/52-tipa_2%3a1.3-21_all.deb …
Unpacking tipa (2:1.3-21) …
Selecting previously unselected package texlive-xetex.
Preparing to unpack …/53-texlive-xetex_2021.20220204-1_all.deb …
Unpacking texlive-xetex (2021.20220204-1) …
Setting up fonts-lato (2.0-2.1) …
Setting up fonts-noto-mono (20201225-1build1) …
Setting up libwoff1:amd64 (1.0.2-1build4) …
Setting up libtexlua53:amd64 (2021.20210626.59705-1ubuntu0.1) …
Setting up libijs-0.35:amd64 (0.35-15build2) …
Setting up libtexluajit2:amd64 (2021.20210626.59705-1ubuntu0.1) …
Setting up libfontbox-java (1:1.8.16-2) …
Setting up rubygems-integration (1.18) …
Setting up libzzip-0-13:amd64 (0.13.72+dfsg.1-1.1) …
Setting up fonts-urw-base35 (20200910-1) …
Setting up poppler-data (0.4.11-1) …
Setting up tex-common (6.17) …
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based
frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line
78.)
debconf: falling back to frontend: Readline
update-language: texlive-base not installed and configured, doing nothing!
```

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Setting up libfontenc1:amd64 (1:1.1.4-1build3) …
Setting up libjbig2dec0:amd64 (0.19-3build2) …
Setting up libteckit0:amd64 (2.5.11+ds1-1) …
Setting up libapache-pom-java (18-1) …
Setting up ruby-net-telnet (0.1.1-2) …
Setting up xfonts-encodings (1:1.0.5-0ubuntu2) …
Setting up t1utils (1.41-4build2) …
Setting up libidn12:amd64 (1.38-4ubuntu1) …
Setting up fonts-texgyre (20180621-3.1) …
Setting up libkpathsea6:amd64 (2021.20210626.59705-1ubuntu0.1) …
Setting up ruby-webrick (1.7.0-3) …
Setting up fonts-lmodern (2.004.5-6.1) …
Setting up fonts-droid-fallback (1:6.0.1r16-1.1build1) …
Setting up ruby-xmlrpc (0.3.2-1ubuntu0.1) …
Setting up libsynctex2:amd64 (2021.20210626.59705-1ubuntu0.1) …
Setting up libgs9-common (9.55.0~dfsg1-0ubuntu5.6) …
Setting up teckit (2.5.11+ds1-1) …
Setting up libpdfbox-java (1:1.8.16-2) …
Setting up libgs9:amd64 (9.55.0~dfsg1-0ubuntu5.6) …
Setting up preview-latex-style (12.2-1ubuntu1) …
Setting up libcommons-parent-java (43-1) …
Setting up dvisvgm (2.13.1-1) …
Setting up libcommons-logging-java (1.2-2) …
Setting up xfonts-utils (1:7.7+6build2) …
Setting up libptexenc1:amd64 (2021.20210626.59705-1ubuntu0.1) …
Setting up texlive-binaries (2021.20210626.59705-1ubuntu0.1) …
update-alternatives: using /usr/bin/xdvi-xaw to provide /usr/bin/xdvi.bin
(xdvi.bin) in auto mode
update-alternatives: using /usr/bin/bibtex.original to provide /usr/bin/bibtex
(bibtex) in auto mode
Setting up lmodern (2.004.5-6.1) …
Setting up texlive-base (2021.20220204-1) …
/usr/bin/ucfr
/usr/bin/ucfr
/usr/bin/ucfr
/usr/bin/ucfr
mktexlsr: Updating /var/lib/texmf/ls-R-TEXLIVEDIST…
mktexlsr: Updating /var/lib/texmf/ls-R-TEXMFMAIN…
mktexlsr: Updating /var/lib/texmf/ls-R…
mktexlsr: Done.
```

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