STAT 6500

Statistical Machine Learning

Land Use Cover - EDA

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ahskjdfh asdkj hfkjsadh fkjdsa

```
#load in training and test data
train = pd.read_csv('training.csv')
test = pd.read_csv('testing.csv')
print("Rows and Columns(Train): ",train.shape)
```

```
## Rows and Columns(Train):  (168, 148)
```

```
print("Rows and Columns(Test) : ",test.shape)
```

```
## Rows and Columns(Test) :  (507, 148)
```

```
# check for missing values although it is clear there are none
train.isnull().any().any()
```

```
## False
```

```
# duplicate function of pandas returns a duplicate row as true and others as false
sum(train.duplicated())
```

```
## 0
```

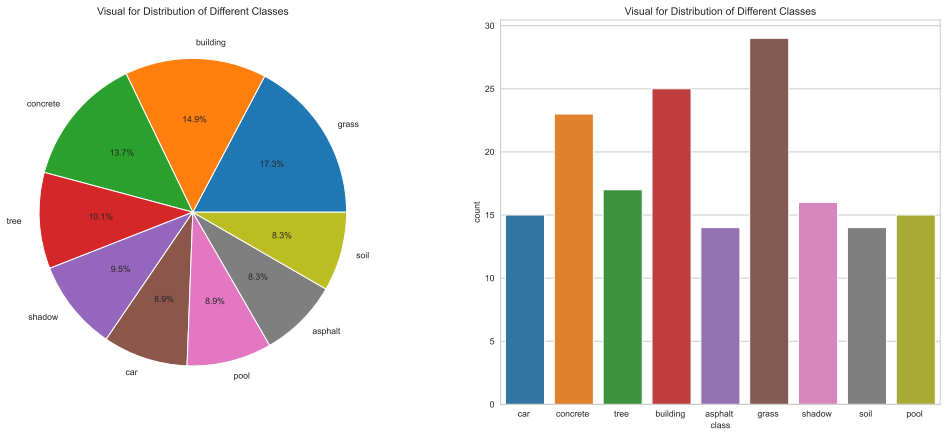
```
# basic statistical details
fig = train.describe().T
fig = fig.round(5)  # round to 5 decimal places
table = go.Table(
    columnwidth=[0.8]+[0.5]*8,
    header=dict(
        values=['Attribute'] + list(fig.columns),
        line = dict(color='darkslategray'),
        fill = dict(color='royalblue'),
    ),
    cells=dict(
        values=[fig.index] + [fig[k].tolist() for k in fig.columns[:]],
        line = dict(color='darkslategray'),
        fill = dict(color=['paleturquoise', 'white'])
    )
)
plot([table], filename='table-of-data.html')
```

```
## 'table-of-data.html'
```

```
# more general data exploration
print(train['class'].value_counts())
```

```
## grass        29
## building     25
## concrete     23
## tree         17
## shadow       16
## car          15
## pool         15
## asphalt      14
## soil         14
## Name: class, dtype: int64
```

```
f,axes=plt.subplots(1,2,figsize=(20,8))
train['class'].value_counts().plot.pie(autopct='%1.1f%%',ax=axes[0])
axes[0].set_title('Visual for Distribution of Different Classes')
axes[0].set_ylabel('')
sns.countplot('class',data=train,ax=axes[1]) # sns.countplot is used
                                             # like a histogram but for
                                             # categorical data
axes[1].set_title('Visual for Distribution of Different Classes')
plt.show()
```

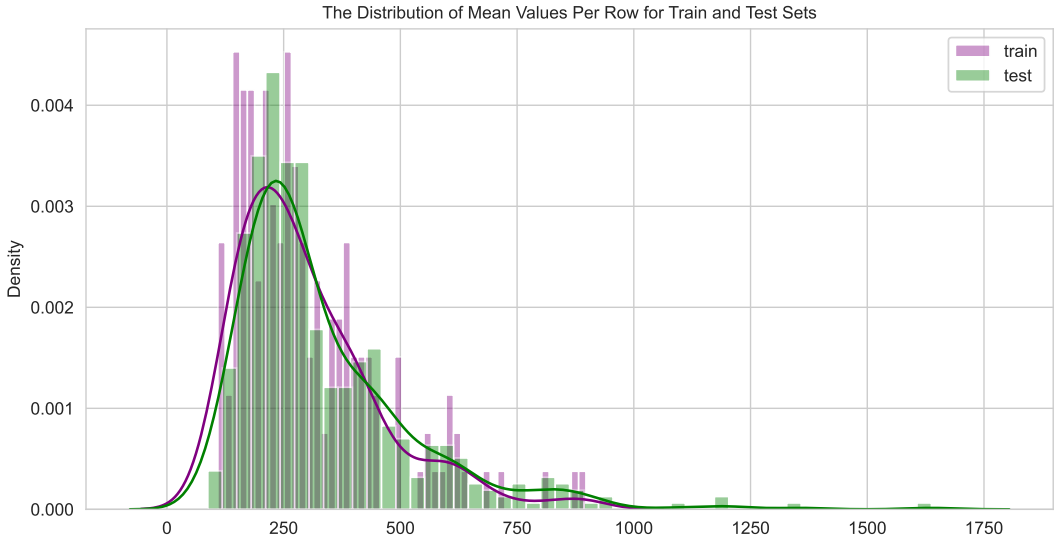



```
# Lets take a look at any outliers that could be potential issues
from collections import Counter
def examine_outliers(train_data, n, features):
  outlier_indicator = []
  for out in features:
    Q1 = np.percentile(train_data[out], 25)
    Q3 = np.percentile(train_data[out], 75)
    IQR = Q3 - Q1
    outlier_step = 1.5 * IQR # IQR method of dealing with outliers, 1 of 2 methods
    outlier_list_out = train_data[
            (train_data[out] < Q1 - outlier_step) | (train_data[out] > Q3 +
            outlier_step)].index
    outlier_indicator.extend(outlier_list_out)
    outlier_indices = Counter(outlier_indicator)
    multiple_outliers = list(k for k, j in outlier_indices.items() if j > n)
    return multiple_outliers
```

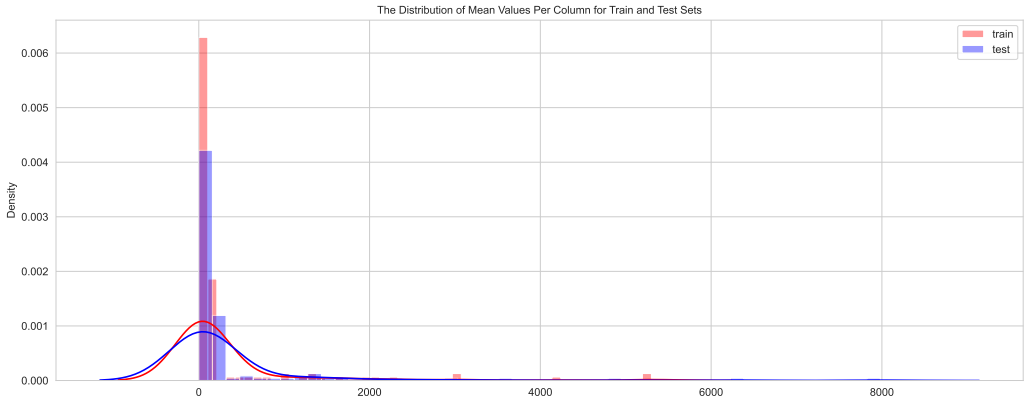
```
# find outliers that should be removed
list_atributes = train.drop('class', axis=1).columns
outliers_to_remove = examine_outliers(train, 2, list_atributes)
len(outliers_to_remove)
#outliers_to_remove
#train.loc[outliers_to_remove]
```

```
## 0
```

```
# lets look at mean values per row and column for train test data
# mean for rows
plt.figure(figsize=(10,5))
features = train.columns.values[1:148]
plt.title("The Distribution of Mean Values Per Row for Train and Test Sets",
          fontsize=10)
sns.distplot(train[features].mean(axis=1),color="purple", kde=True,bins=50,
             label='train') # kde is kernel density estimation
sns.distplot(test[features].mean(axis=1),color="green", kde=True,bins=50,
             label='test')
plt.legend()
plt.show()
```



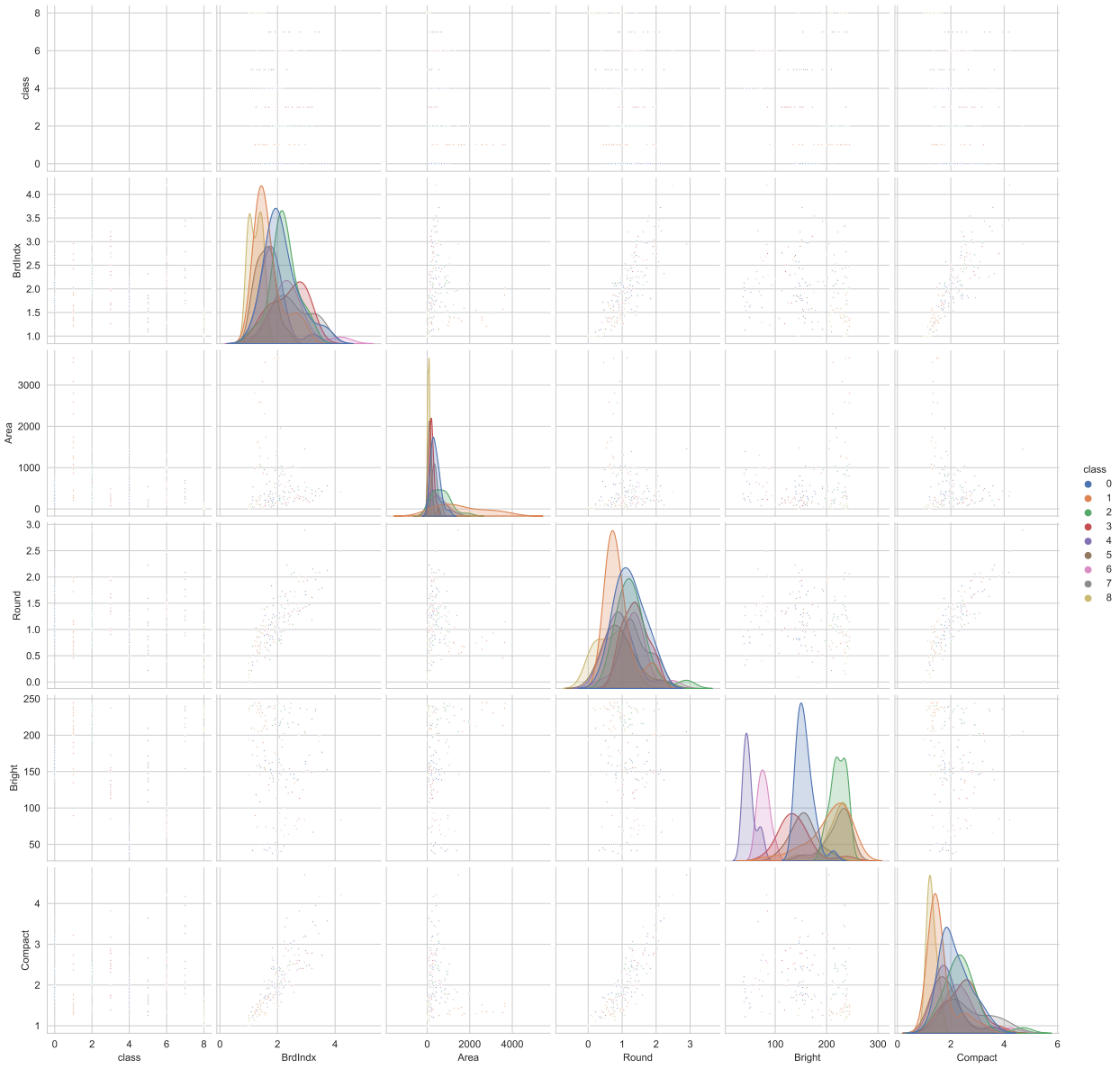

```
# mean for columns
plt.figure(figsize=(16,6))
plt.title("The Distribution of Mean Values Per Column for Train and Test Sets",
          fontsize=10)
sns.distplot(train[features].mean(axis=0),color="red",kde=True,bins=50,
             label='train')
sns.distplot(test[features].mean(axis=0),color="blue", kde=True,bins=50,
             label='test')
plt.legend()
plt.show()
```



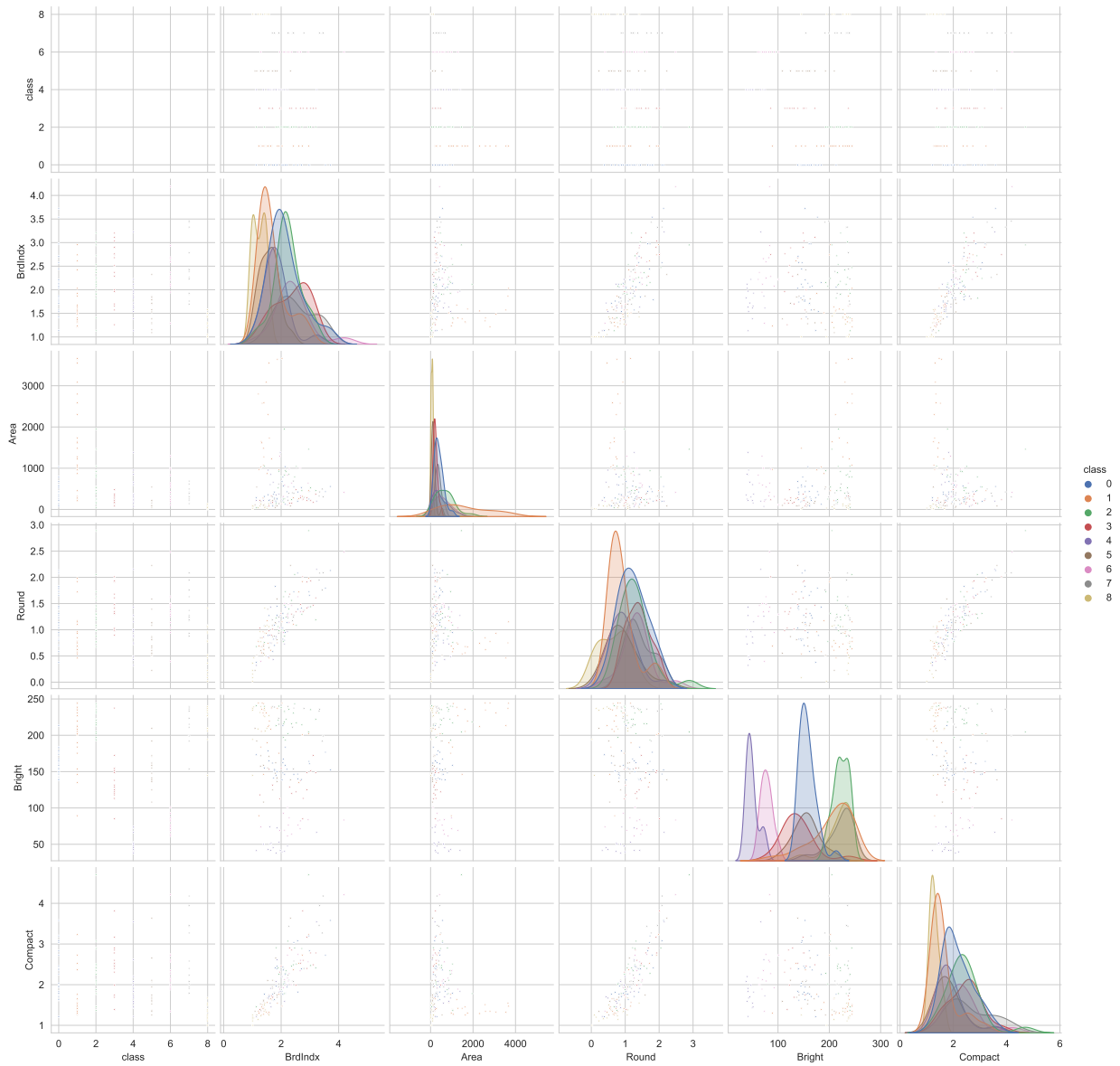

```
# lets examine correlations between features
# first the categorical variable 'class' needs to be changed to numerical variable so...
group_map = {"grass ":0,"building ":1,'concrete ':2,'tree ':3,'shadow ':4,'pool ':5,
             'asphalt ':6,'soil ':7,'car ':8}
train['class'] = train['class'].map(group_map)
test['class'] = test['class'].map(group_map)
train['class'].unique()
```

```
## array([8, 2, 3, 1, 6, 0, 4, 7, 5], dtype=int64)
```

```
# now lets look at the correlation between a few variables
sns.pairplot(train, vars=['class', 'BrdIndx','Area','Round','Bright','Compact'],
             hue='class', palette='deep', plot_kws={"s": 3})
```




```
plt.show()
```




```
# correlation of features with target
corr = train.corr().abs().unstack().sort_values(kind="quicksort").reset_index()
corr = corr[corr['level_0'] != corr['level_1']]
corr.head()
```

```
##       level_0    level_1         0
## 0        SD_R   GLCM1_60  0.000052
## 1   GLCM1_60        SD_R  0.000052
## 2   Mean_NIR  BordLngth  0.000162
## 3  BordLngth   Mean_NIR  0.000162
## 4  Mean_R_40   Round_40  0.000190
```

```
correlations = corr.loc[corr[0] == 1]
features_to_be_removed = set(list(correlations['level_1']))
correlations.shape
```

```
## (42, 3)
```