Machine Learning

COGS 108 Fall 2025
Jason Chen
Week 7

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OH: Tue, 3-5 PM

Due dates

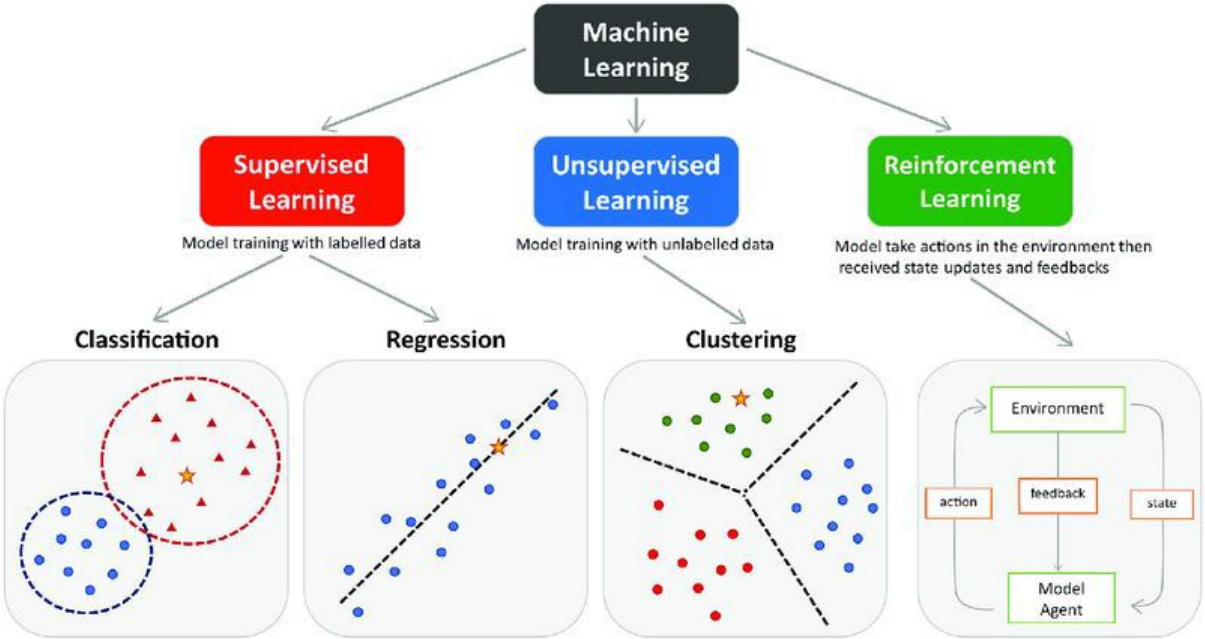
- Data Checkpoint: Wednesday (11/12)
- D6: Monday (11/17)

Data Checkpoint

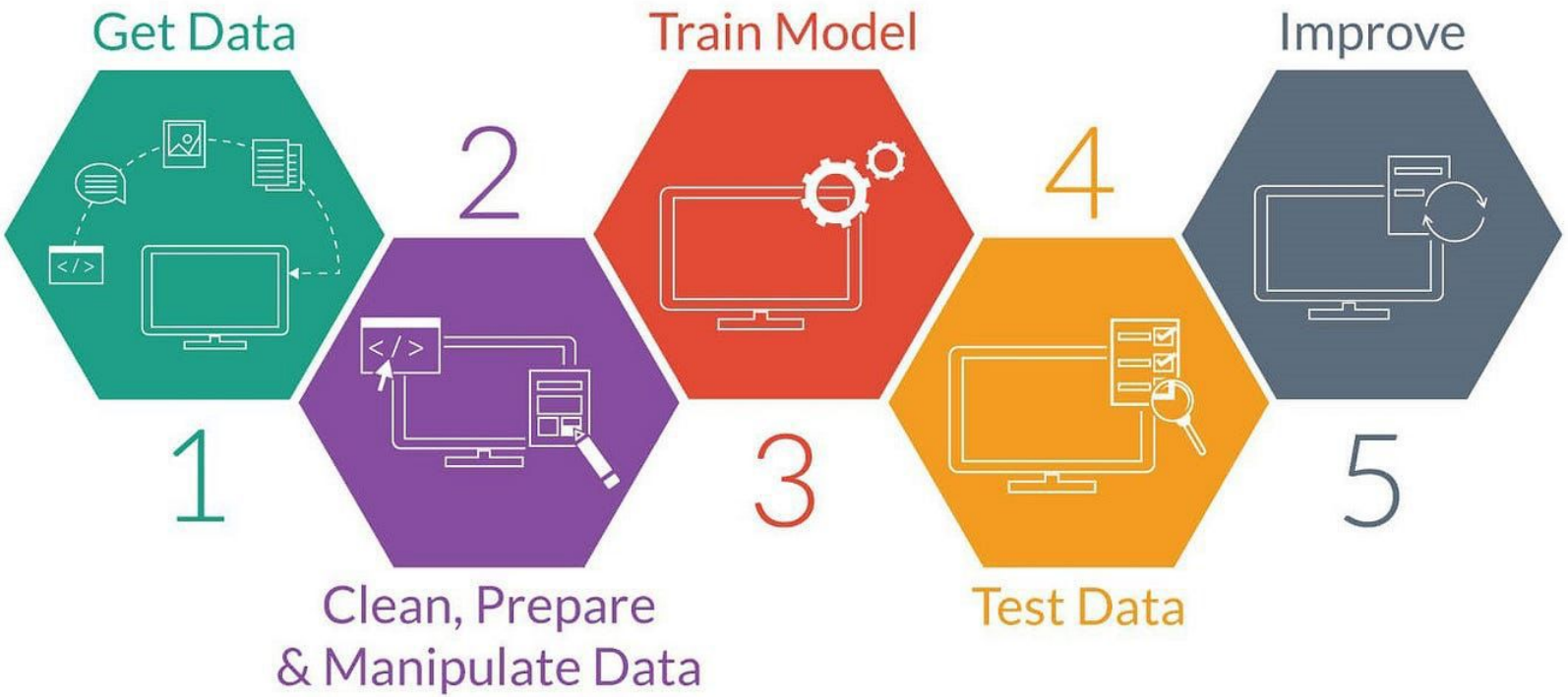
- Address proposal feedback in the checkpoint
- Proposal grade will be adjusted if issues are addressed

What is Machine Learning

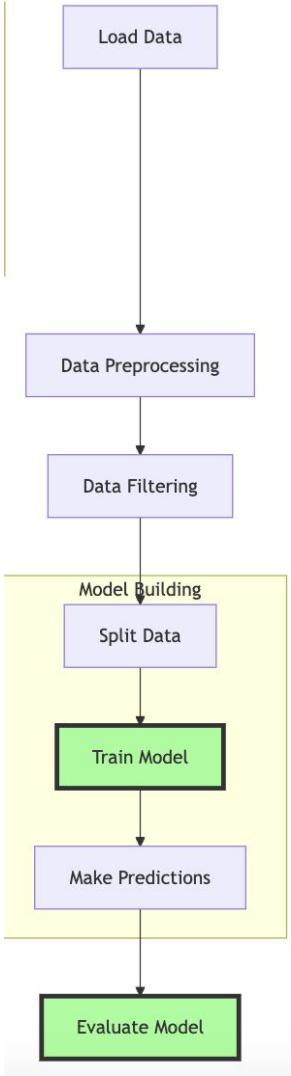
- Machine learning is a subset of artificial intelligence that focuses on the development of algorithms and statistical models that enable computers to learn and make predictions or decisions without being explicitly programmed.

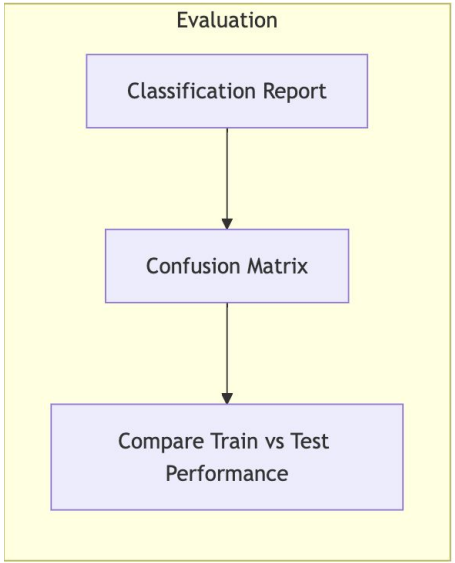


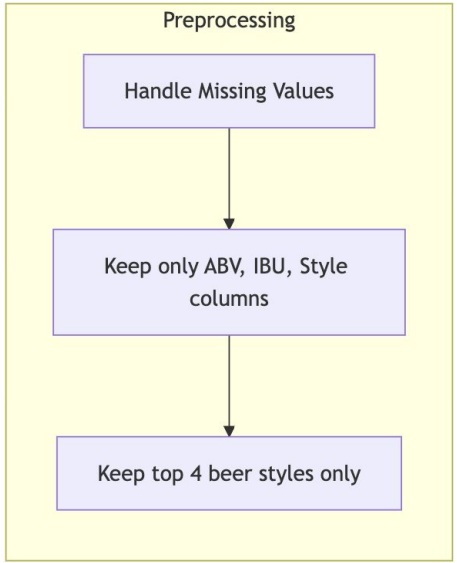
Steps Involved in ML



D6: Machine Learning







1. Data preprocessing: Handle missing values and extract ABV, IBU features
2. Filter data to keep only top 4 most common beer styles
3. Split data into training (80%) and test (20%) sets
4. Train SVM model and generate predictions
5. Evaluate model using classification reports and confusion matrices for both training and test sets

Part I : Data, Wrangling, & EDA

1. Analyze missing values(**.isnull().sum(axis=0)**)

	Name	ABV	IBU
0	Beer1	5.0	45.0
1	Beer2	NaN	60.0
2	Beer3	7.5	NaN
3	None	4.8	NaN

	Name	ABV	IBU
0	False	False	False
1	False	True	False
2	False	False	True
3	True	False	True

Name 1
ABV 1
IBU 2
dtype: int64

2. Remove rows with missing values in style, abv, ibu(**dropna(subset=[])**)

3. Merge beer and brewery datasets(left join)
   - How does left join works?
4. Filter dataset to keep only top 4 styles (**.value_counts()[:].index.tolist()**)

Part II : Prediction Model

1. Extract features (X: ABV, IBU) and labels (Y: Style)

```
data_x = beer_df[['abv','ibu']]
data_y= np.array(beer_df['style'])
```

2. Split data into train/test sets

```
beer_train_X, beer_test_X, beer_train_ Y, beer_test_ Y = train_test_split(
    beer_X, beer_ Y, test_size=0.2, random_state=42, stratify=beer_ Y
)
```

3. Train SVM model and generate predictions

```
beer_clf =  Pipeline([
    ('scaler', StandardScaler()),
    ('svm', SVC(kernel='linear'))
])
beer_clf.fit()
beer_predicted_train_ Y = beer_clf.predict()
```

Part III : Model Assessment

1. Generate classification reports (precision, recall, f1-score)

2. Create confusion matrices

3. Compare training vs testing performance
   Train accuracy vs test accuracy

4. Evaluate potential overfitting

Section Materials

Section materials can be accessed at:
https://github.com/JasonC1217/COGS108_FA25_B07-B08

THANKS!

Questions on EdStem or office hours

Office hours: Tue, 3-5 PM