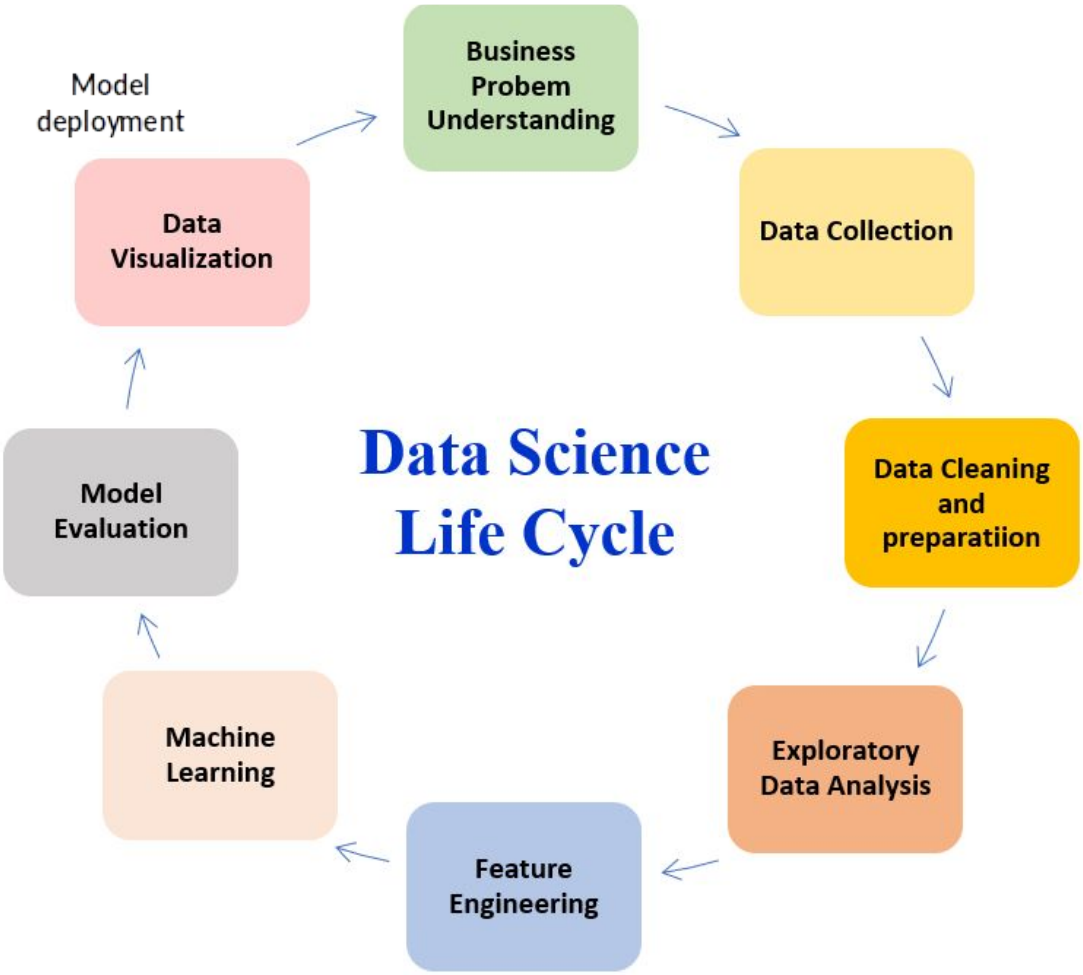
Data Science First Steps


Data Science
Life Cycle
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Probem
Understanding
Data Collection
Data Cleaning
and
preparatiion
Exploratory
Data Analysis
Feature
Engineering
Machine
Learning
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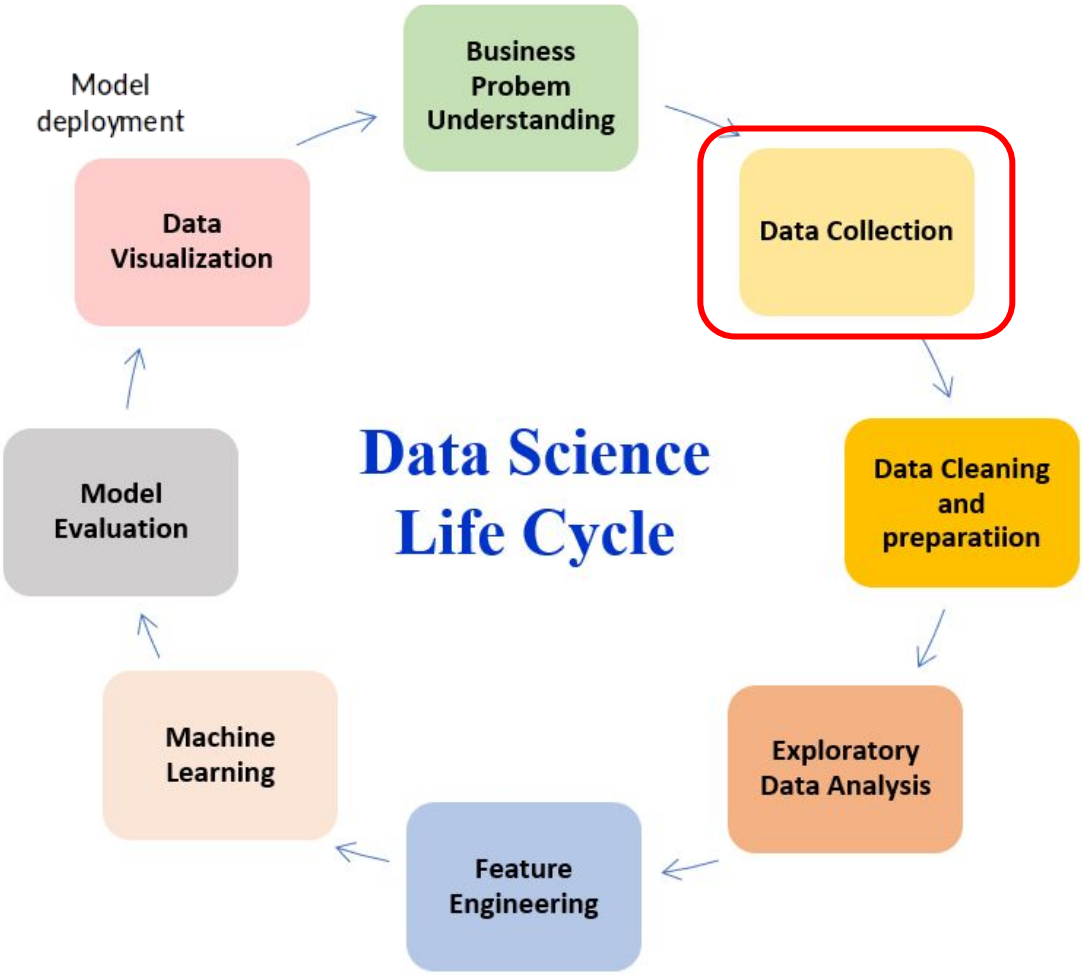
Business problem understanding

- State clearly the problem to be solved and why.
- Define the potential value of the project.
- Identify the project risks including ethical considerations.
- Develop and communicate a high-level, flexible project plan.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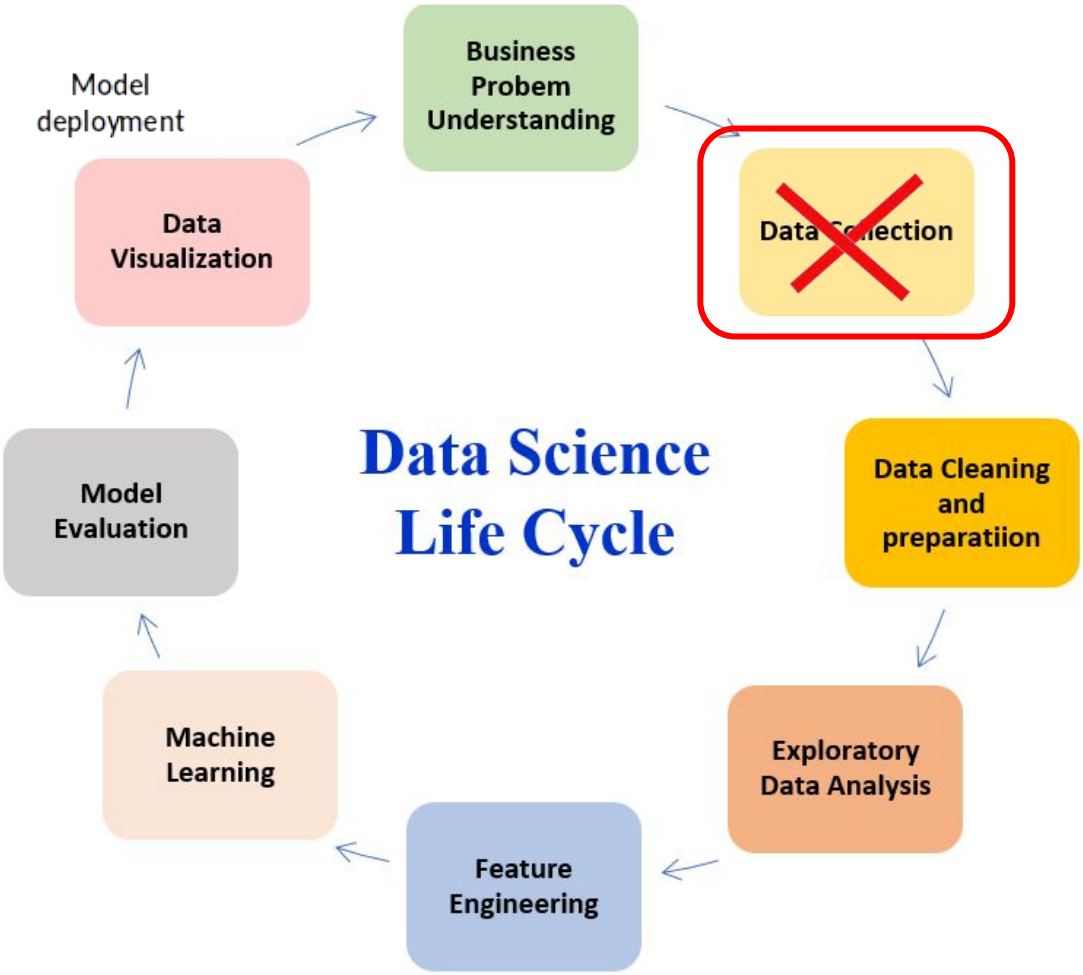
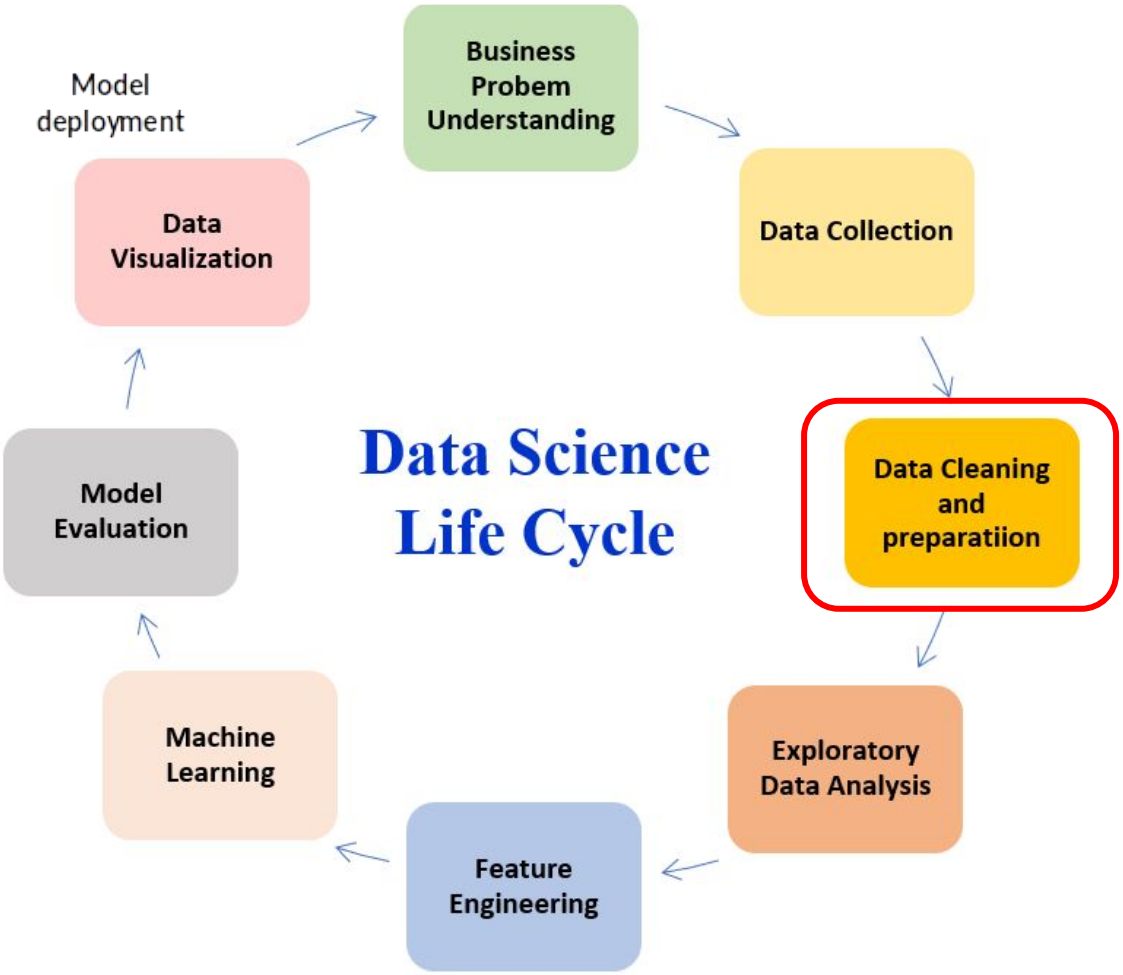

Model deployment
Business Probem Understanding
Data Collection
Data Cleaning and preparatiion
Exploratory Data Analysis
Feature Engineering
Machine Learning
Model Evaluation
Data Visualization
Data Science Life Cycle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First Inspection

- Check the dataset dimensions.
- Look at the columns and their values.
- Check column types (int, float, etc.).
- Convert some columns to a specific type (e.g., int, datetime ,etc.).

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- Look at the columns and their values. → **Pandas: head, tail, describe, info**
- Check column types (int, float, etc.). → **Pandas: .dtypes, info**
- Convert some columns to a specific type (e.g., int, datetime ,etc.). → **Pandas: astype, to_datetime**

Data cleaning and preparation

- Remove unnecessary features.

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  - Value imputation: mean, median, mode, apply ML.

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- Outliers:
  - Remove or impute them if errors.
  - Decide what to do if they are not errors.

Data cleaning and preparation

- Remove unnecessary features. → **Pandas: drop**
- Deal with null values: → **Pandas: isnull, isna**
  - Remove whole row. → **Pandas: dropna**
  - Remove whole column. → **Pandas: dropna**
  - Value imputation: mean, median, mode, apply ML. → **Pandas: fillna, mean, median, KNNImputer**
- Remove duplicates if errors. → **Pandas: duplicated, drop_duplicates**
- Outliers:
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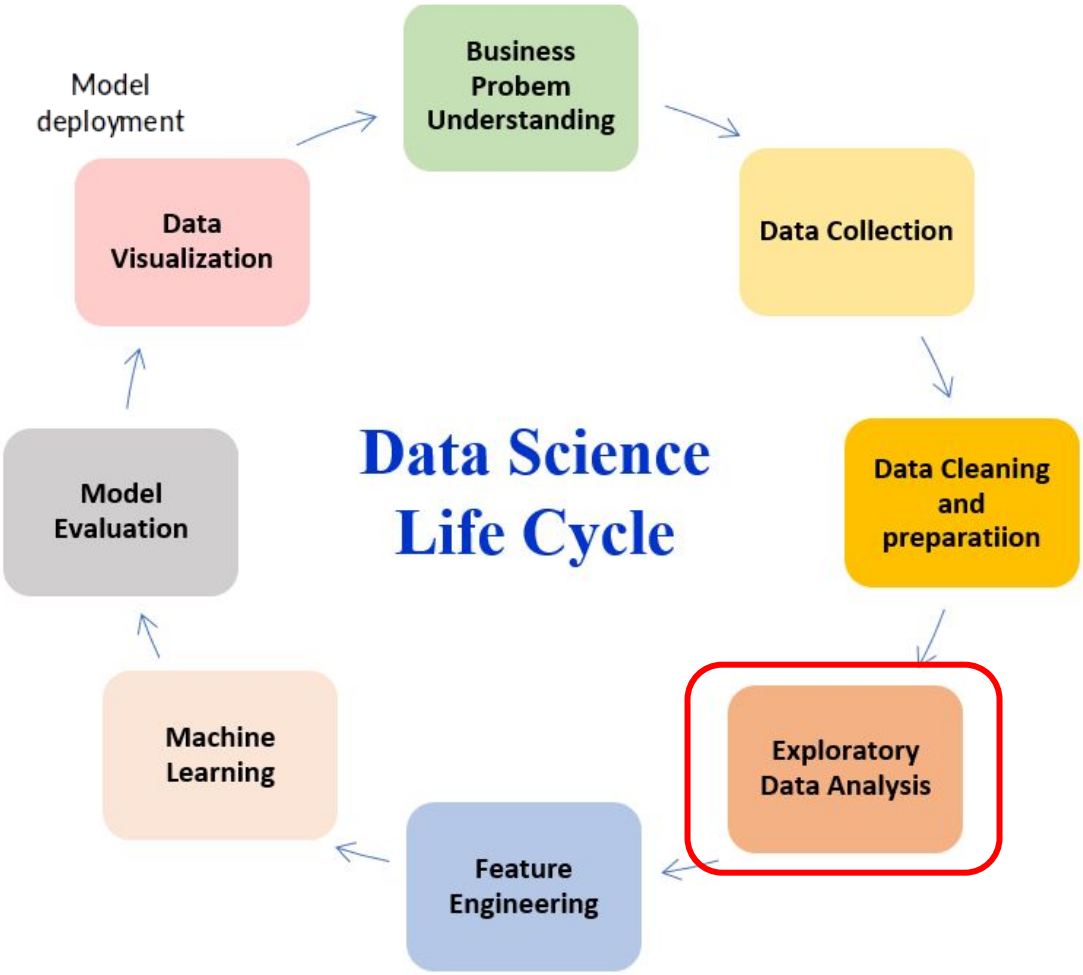
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Exploratory Data Analysis (EDA)

Summarize main characteristics with visualizations. Some common ideas:

- Distributions of all features: histogram, boxplot, bar plot.

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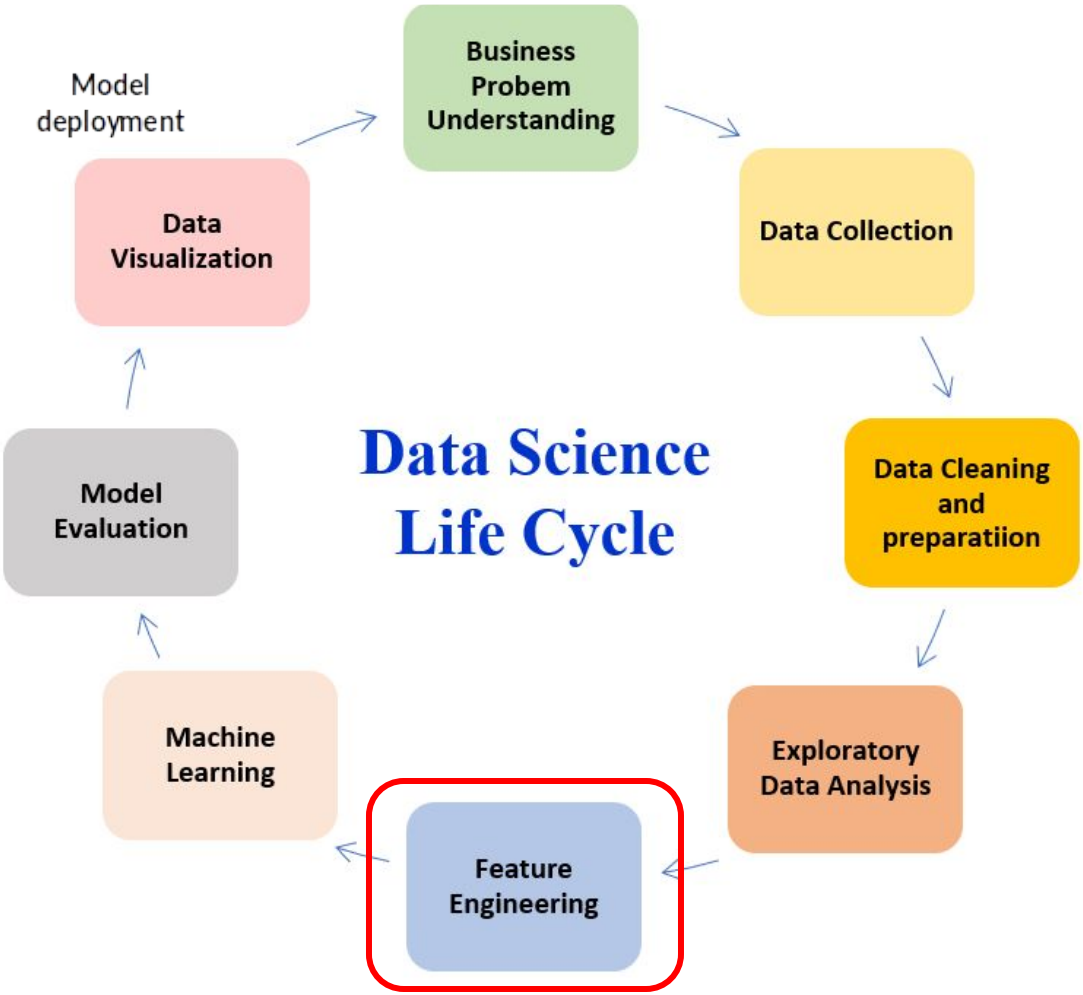
Summarize main characteristics with visualizations. Some common ideas:

- Distributions of all features: histogram, boxplot, bar plot. → **Matplotlib: hist, boxplot, barplot**
- Correlation matrix between all pairs of features. → **Pandas: corr; Seaborn: heatmap**
- Pair plot. → **Seaborn: pairplot**
- Correlations of features with target. → **Pandas: corr**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Feature Engineering

- Preprocessing data:
  - Encode categorical features: one-hot encoding, label encoding.
  - Binning.
  - Drop highly correlated features.

One-Hot Encoding

id	color
1	red
2	blue
3	green
4	blue

id	color_red	color_blue	color_green
1	1	0	0
2	0	1	0
3	0	0	1
4	0	1	0

Ordinal Encoding

SAFETY-LEVEL (TEXT)	SAFETY-LEVEL (NUMERICAL)
None	0
Low	1
Medium	2
High	3
Very-High	4

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Feature Engineering

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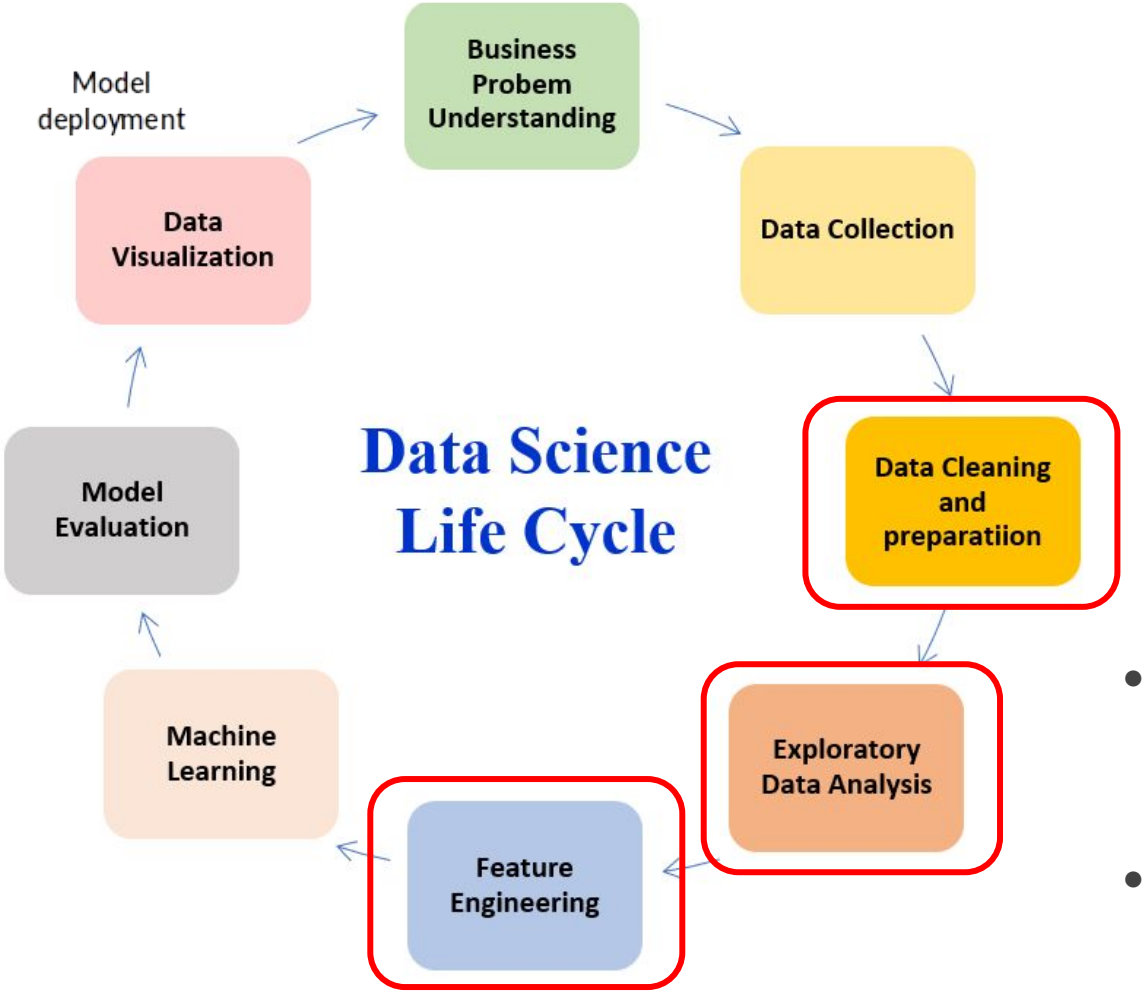
  - Encode categorical features:
    - One-hot encoding. → **Pandas: get_dummies**
    - Ordinal encoding. → **Sklearn: OrdinalEncoder**
  - Binning. → **Pandas: cut**
  - Drop highly correlated features. → **Pandas: corr**
- Feature selection: RFE, statistical tests, ML models. → **Sklearn: RFE**
- Add new features: from external datasets or derived from existing features.



- In a single notebook (different sections).

  or...

- In 3 independent notebooks.