Data Science :

How to deal with missing data

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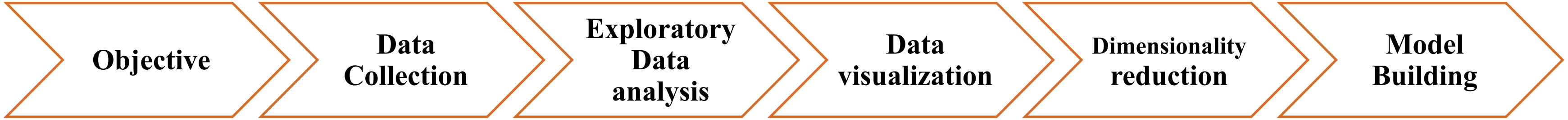
Topic

- Why – there is need of deal with missing data?
- How to deal with missing data?
  - Two Ways of handling missing data (Drop / Fill)
  - Different approaches to fill the missing data
    - Simple
    - Statistical
    - Analytical
    - Model based

Data Science Process Model



Objective

Data Collection

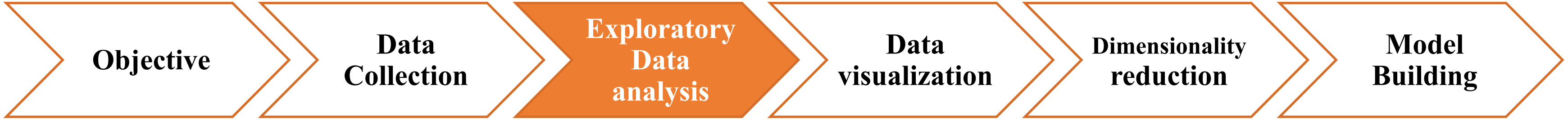
Exploratory Data analysis

Data visualization

Dimensionality reduction

Model Building

Data Science Process Model



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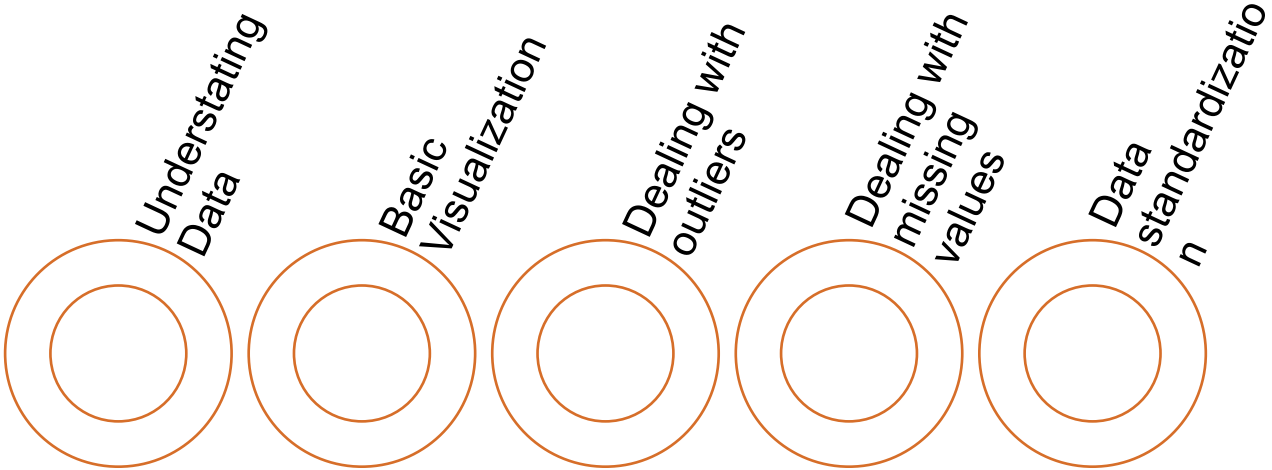
Sub-task in EDA



Understating Data

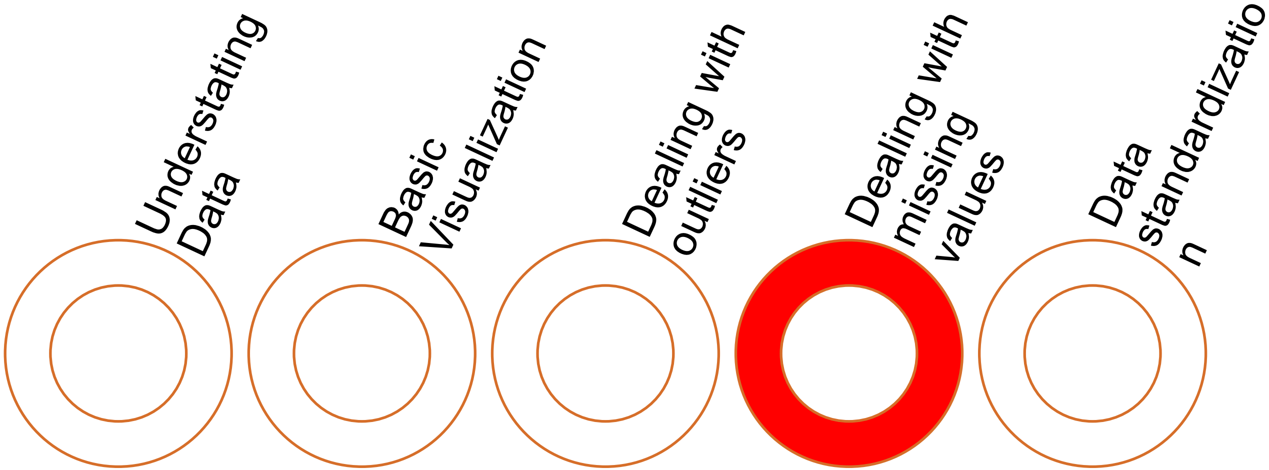
Basic Visualization

Dealing with outliers

Dealing with missing values

Data standardization

Sub-task in EDA



Why – there is need to deal with missing data?

- Improper visualization
- Can not train the model
- Can not have clear analysis of objective
- May draw wrong conclusion

How it will look?

name	gender	age	nos of call	nos of sms	bill amount	complaint
abc	M	23	450	18	518	NaN
def	M	45	200	10	250	3
ghi	NaN	60	180	52	NaN	NaN
pqr	F	NaN	NaN	NaN	400	NaN
xyz	F	18	400	40	502	3

How to deal with the missing data?

DROP
DELETE

FILL

Analysis of data

- Study about size or shape of data.
  - Rows – no of individual record
  - Columns – no of features/variables
- Application – final objective
- Analysis missing data - rows & columns wise – *df.isnull()*

Analysis of missing data - row & column wise

Data size: 5000 x 7

Feat	Name	Gender	Age	Nos of calls	Nos of SMS	Bill amount	complaint
Count	100	25	50	2	2	37	100

Decision for Drop or fill???

Record	Count
R1	3
R2	0
R3	1
R4	5
R5	2
.	
.	

Analysis missing data - row & column wise

Data size: 5000 x 6

Feat	Gender	Age	Nos of calls	Nos of SMS	Bill amount	complaint
Count	25	50	2	2	37	100

Decision for Drop or fill???

Huge data ??

For rows:
Count >= 3/4th (Nos of feat)

Record	Count
R1	3
R2	0
R3	0
R4	5
R5	2
.	
.	

Methods to fill the data

- **Structure of data:**

Features	Type	Remarks
Name	text	Already removed
Gender	binary data	male / female – (0/1)
Age	int	0 to 100
Nos of calls	int	0 to …
Nos of SMS	int	0 to …
Bill amount	float	-…. to +…
Complaint	categorical	0 -> No problem 1-> Recharge issue 2 -> problems in offer 3 -> Network problem 4 -> Any others

Method 1: Simple

- Fill with previous value - *df.fillna(method = ‘pad’)*
- Fill with next value - *df.fillna(method = ‘bfill’)*
- Fill with left side value - *df.fillna(method = ‘pad’, axis = 1)*
- Fill with right side value - *df.fillna(method = ‘bfill’, axis = 1)*
- Fill with any specific value - *df.fillna(value = 0)*
- Fill with specific value to each features - *df.fillna({ ‘age’ : 20 , ‘gender’ : ‘male’})*

Method 2: Statistical

- Fill with following statistical value (when data-type is *int* or *float*)
  - Mean
  - Median
  - Mode
  - Min
  - Max
  - Interpolate - linear

Features	Type
Age	int
Nos of calls	int
Nos of SMS	int
Bill amount	float

- When data-type – categorical or binary
  - Probability

Features	Type	Remarks
Gender	binary data	male / female – (0/1)
Complaint	categorical	0 -> No problem 1-> Recharge issue 2 -> problems in offer 3 -> Network problem 4 -> Any others

Method 3: Analytical

- Need to understand and analysis dependencies with other columns or rows

- Examples:
  - **Bill amount** can depends on **Nos of call** and **Nos of SMS**
  - **Age** cab depends on **Bill amount**

Method 4: Model based

F1	F2	F3	F4	F5	
NaN	M	25	35	0	□Test data
4	F	22	34	0	
2	M	44	30	1	
4	F	32	28	0	
NaN	F	25	26	1	□Test data

Output data

Input data

Conclusion

- What is need of deal with missing values
- What to choose? DROP / FILL
- Different methods to FILL these values
- How to choose these methods
- Drawback

Any Questions?