## 1. Data Understanding & Cleaning

- **Load the dataset and examine its structure.**
- **Identify missing or inconsistent data and suggest appropriate handling techniques.**
- **Analyze the distribution of each variable using summary statistics.**
- **Discuss potential data transformations (e.g., normalization, scaling).**

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**Solution:**

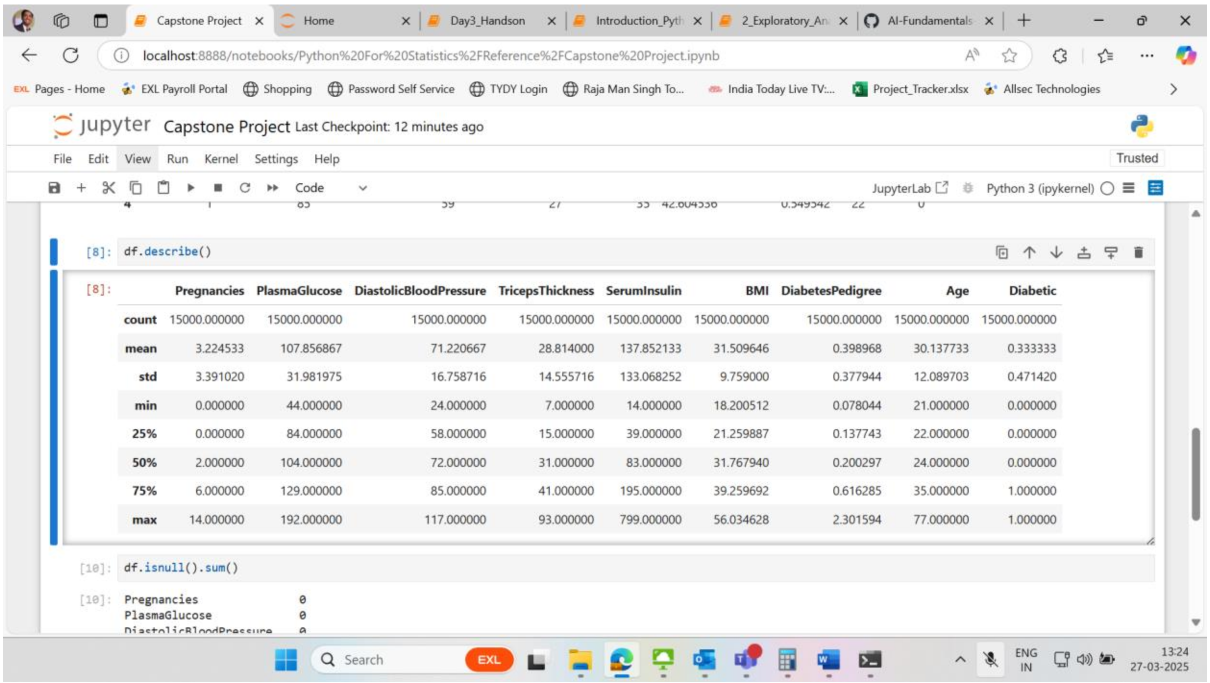
- ID REMOVED since it is not required

- Data is numerical

- Missing value handling:

    - No Null values found

- Since Measures of central tendencies are different, we **normalize** the data



Capstone Project Last Checkpoint: 12 minutes ago

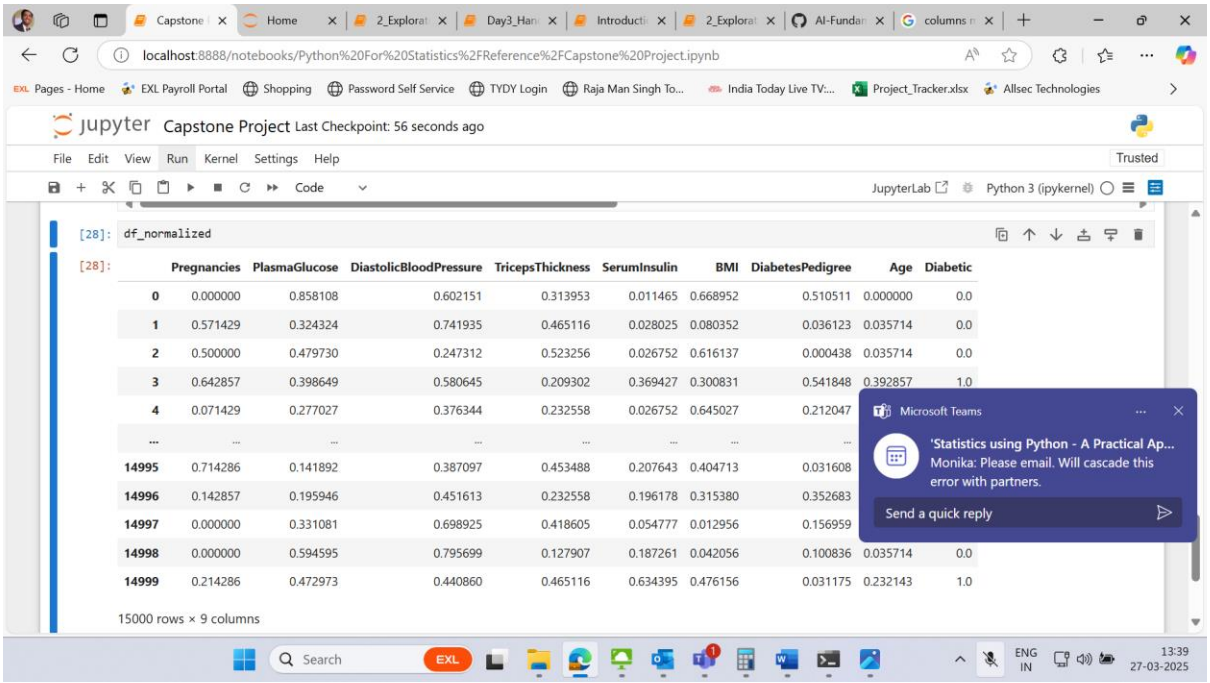
[8]:
```
df.describe()
```

[8]:

| | Pregnancies | PlasmaGlucose | DiastolicBloodPressure | TricepsThickness | SerumInsulin | BMI | DiabetesPedigree | Age | Diabetic |
|---|---|---|---|---|---|---|---|---|---|
| count | 15000.000000 | 15000.000000 | 15000.000000 | 15000.000000 | 15000.000000 | 15000.000000 | 15000.000000 | 15000.000000 | 15000.000000 |
| mean | 3.224533 | 107.856867 | 71.220667 | 28.814000 | 137.852133 | 31.509646 | 0.398968 | 30.137733 | 0.333333 |
| std | 3.391020 | 31.981975 | 16.758716 | 14.555716 | 133.068252 | 9.759000 | 0.377944 | 12.089703 | 0.471420 |
| min | 0.000000 | 44.000000 | 24.000000 | 7.000000 | 14.000000 | 18.200512 | 0.078044 | 21.000000 | 0.000000 |
| 25% | 0.000000 | 84.000000 | 58.000000 | 15.000000 | 39.000000 | 21.259887 | 0.137743 | 22.000000 | 0.000000 |
| 50% | 2.000000 | 104.000000 | 72.000000 | 31.000000 | 83.000000 | 31.767940 | 0.200297 | 24.000000 | 0.000000 |
| 75% | 6.000000 | 129.000000 | 85.000000 | 41.000000 | 195.000000 | 39.259692 | 0.616285 | 35.000000 | 1.000000 |
| max | 14.000000 | 192.000000 | 117.000000 | 93.000000 | 799.000000 | 56.034628 | 2.301594 | 77.000000 | 1.000000 |

[10]:
```
df.isnull().sum()
```

[10]:
```
Pregnancies        0
PlasmaGlucose      0
```



[28]: `df_normalized`

[28]:

| | Pregnancies | PlasmaGlucose | DiastolicBloodPressure | TricepsThickness | SerumInsulin | BMI | DiabetesPedigree | Age | Diabetic |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000000 | 0.858108 | 0.602151 | 0.313953 | 0.011465 | 0.668952 | 0.510511 | 0.000000 | 0.0 |
| 1 | 0.571429 | 0.324324 | 0.741935 | 0.465116 | 0.028025 | 0.080352 | 0.036123 | 0.035714 | 0.0 |
| 2 | 0.500000 | 0.479730 | 0.247312 | 0.523256 | 0.026752 | 0.616137 | 0.000438 | 0.035714 | 0.0 |
| 3 | 0.642857 | 0.398649 | 0.580645 | 0.209302 | 0.369427 | 0.300831 | 0.541848 | 0.392857 | 1.0 |
| 4 | 0.071429 | 0.277027 | 0.376344 | 0.232558 | 0.026752 | 0.645027 | 0.212047 | [illegible] | [illegible] |
| ... | ... | ... | ... | ... | ... | ... | ... | [illegible] | [illegible] |
| 14995 | 0.714286 | 0.141892 | 0.387097 | 0.453488 | 0.207643 | 0.404713 | 0.031608 | [illegible] | [illegible] |
| 14996 | 0.142857 | 0.195946 | 0.451613 | 0.232558 | 0.196178 | 0.315380 | 0.352683 | [illegible] | [illegible] |
| 14997 | 0.000000 | 0.331081 | 0.698925 | 0.418605 | 0.054777 | 0.012956 | 0.156959 | [illegible] | [illegible] |
| 14998 | 0.000000 | 0.594595 | 0.795699 | 0.127907 | 0.187261 | 0.042056 | 0.100836 | 0.035714 | 0.0 |
| 14999 | 0.214286 | 0.472973 | 0.440860 | 0.465116 | 0.634395 | 0.476156 | 0.031175 | 0.232143 | 1.0 |

15000 rows × 9 columns

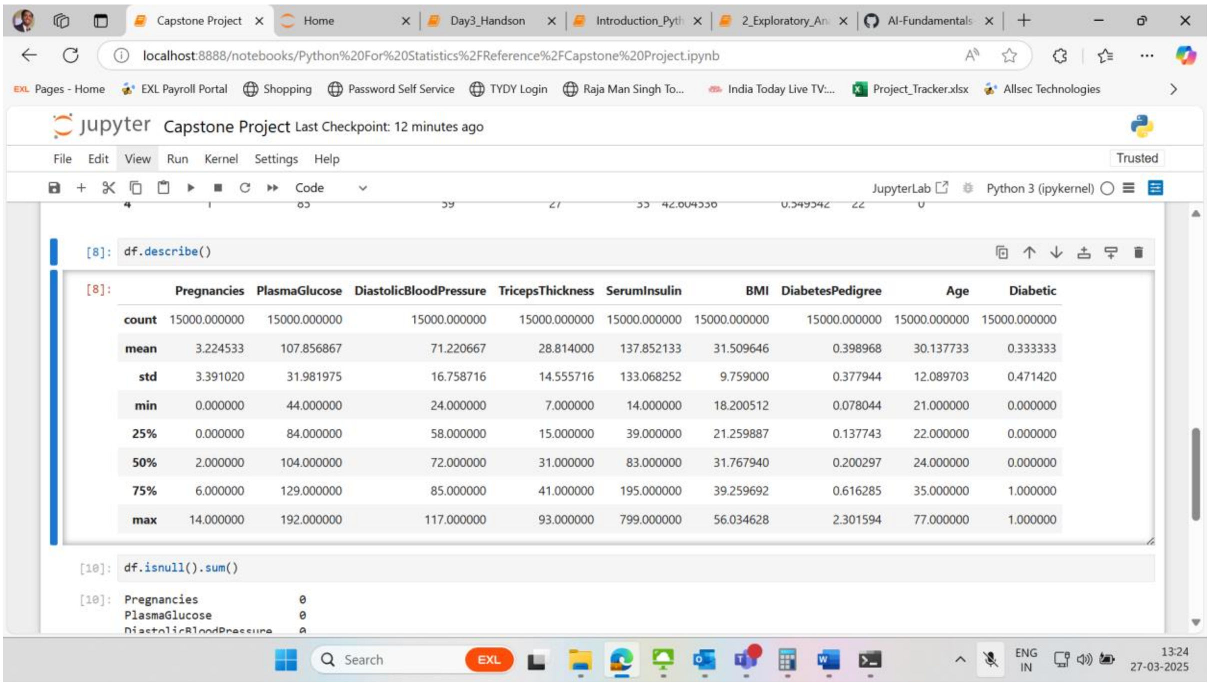
## 2. Descriptive Statistics

**Compute central tendency measures (mean, median, mode) for all numerical variables.**

**Calculate dispersion metrics (variance, standard deviation, interquartile range).**

**Create frequency distributions for categorical variables.**

**Identify outliers using boxplots and discuss their potential impact.**



[8]: `df.describe()`

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| min | 0.000000 | 44.000000 | 24.000000 | 7.000000 | 14.000000 | 18.200512 | 0.078044 | 21.000000 | 0.000000 |
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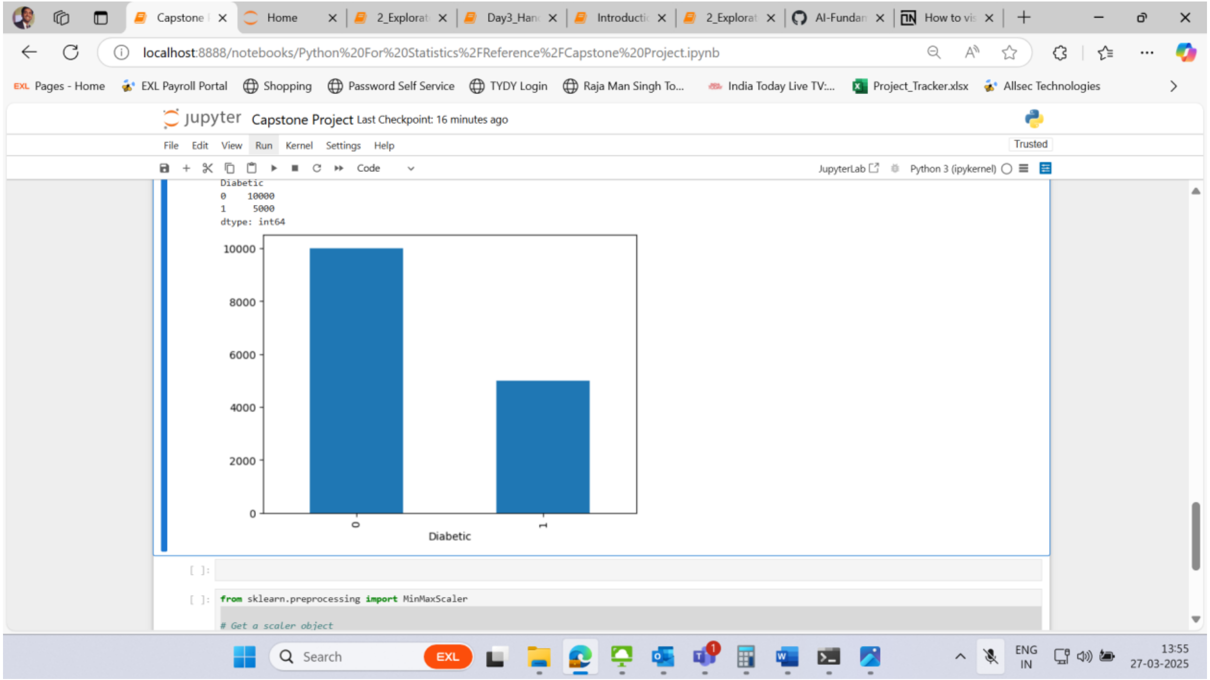
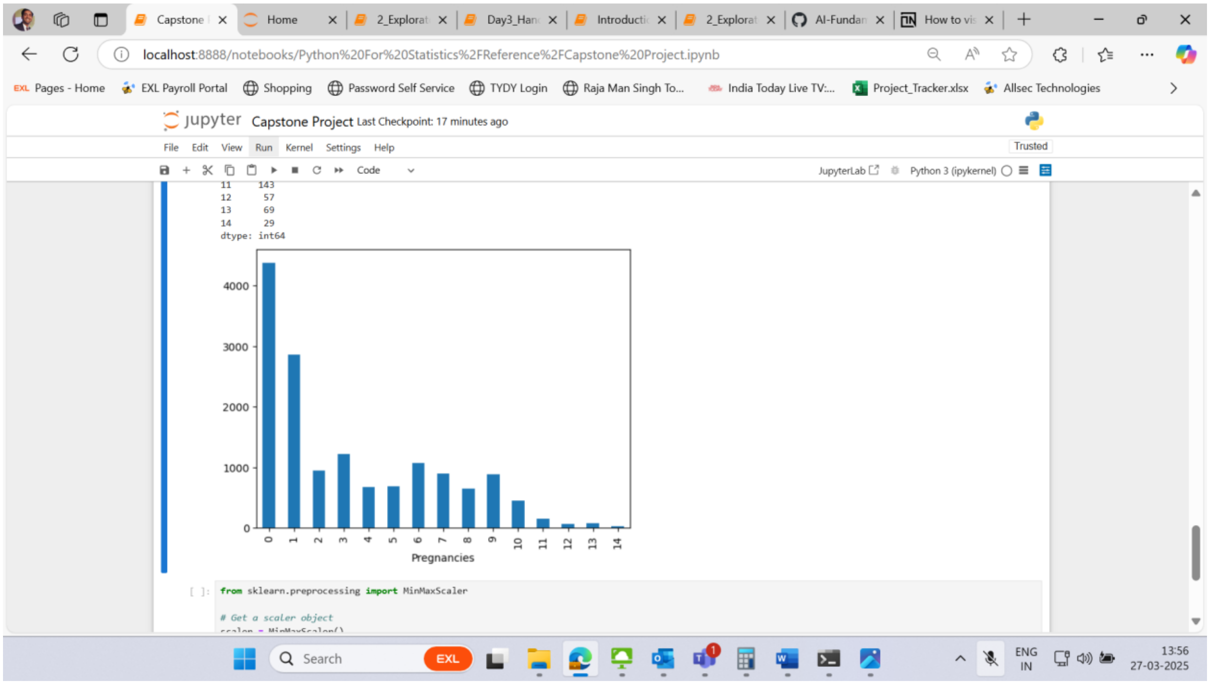
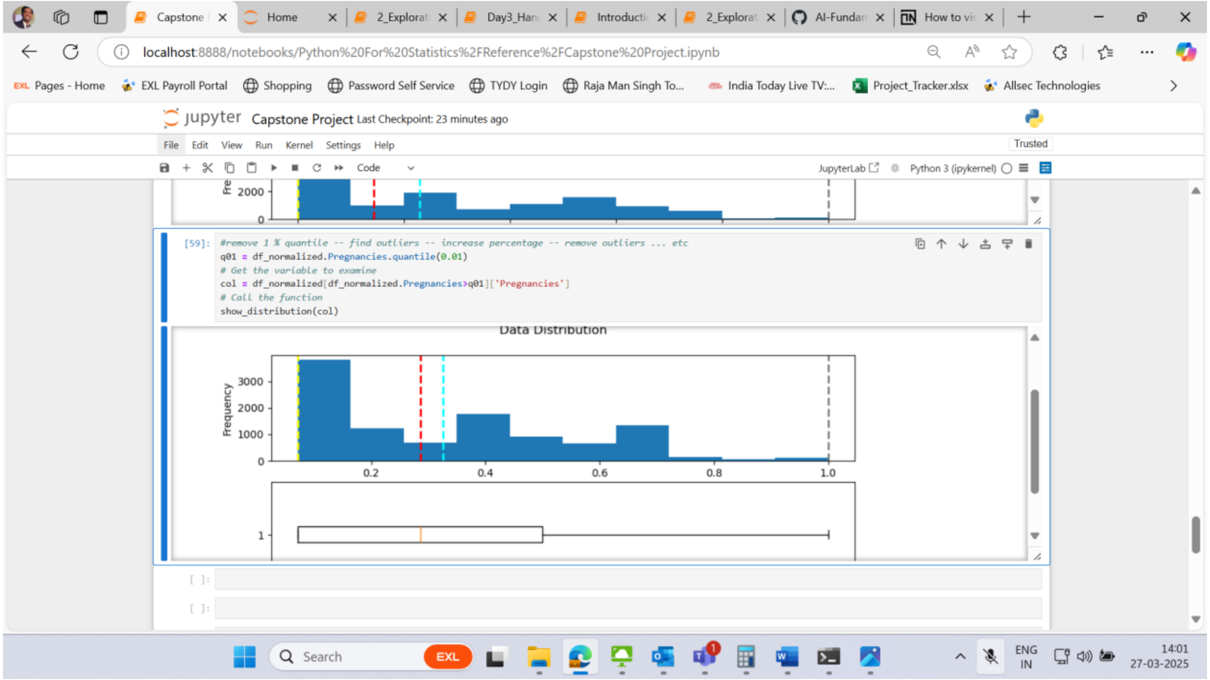
[10]: `df.isnull().sum()`

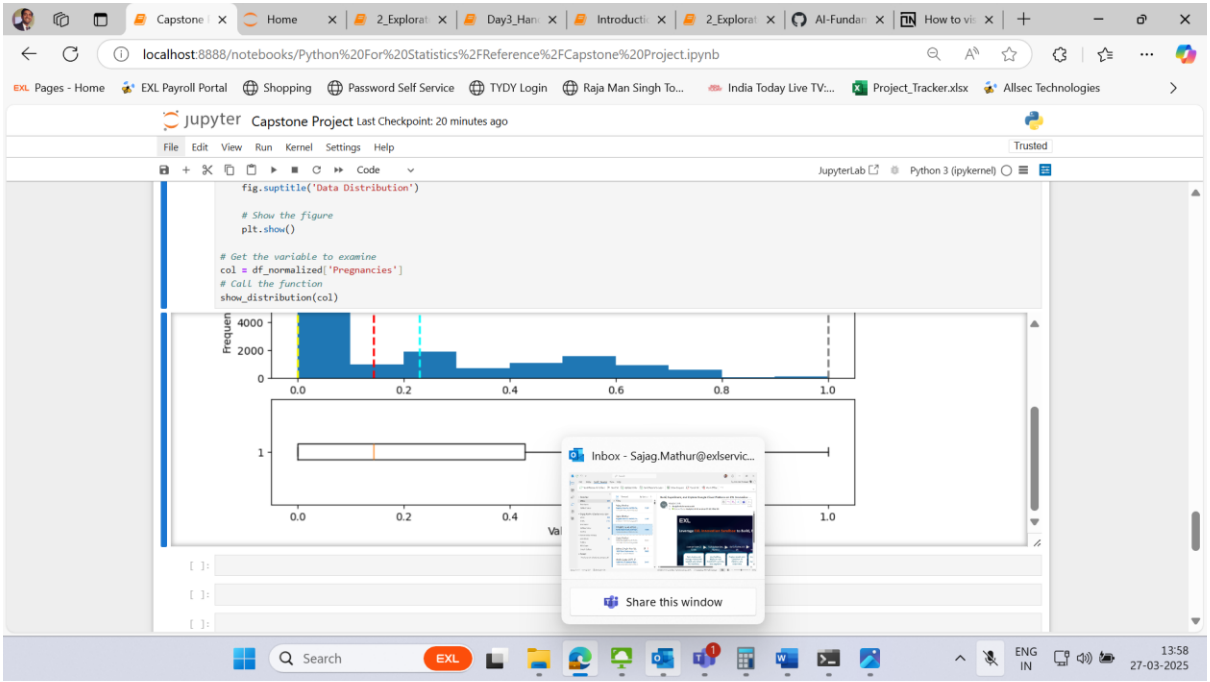
```
[10]: Pregnancies            0
      PlasmaGlucose          0
      DiastolicBloodPressure 0
```

Creating pregnencies and diabatic frequency distribution:







Outliers removed using box plot.

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### 3. Exploratory Data Analysis (EDA)

- Generate visualizations (histograms, scatter plots, heatmaps) to explore data distribution and correlations.
- Examine relationships between features such as **BMI vs. PlasmaGlucose**, **Age vs. Diabetes Pedigree**, etc.

- Analyze the correlation matrix to determine the strength of relationships between variables.
- Perform segmentation analysis by dividing patients into age groups and evaluating diabetes risk.

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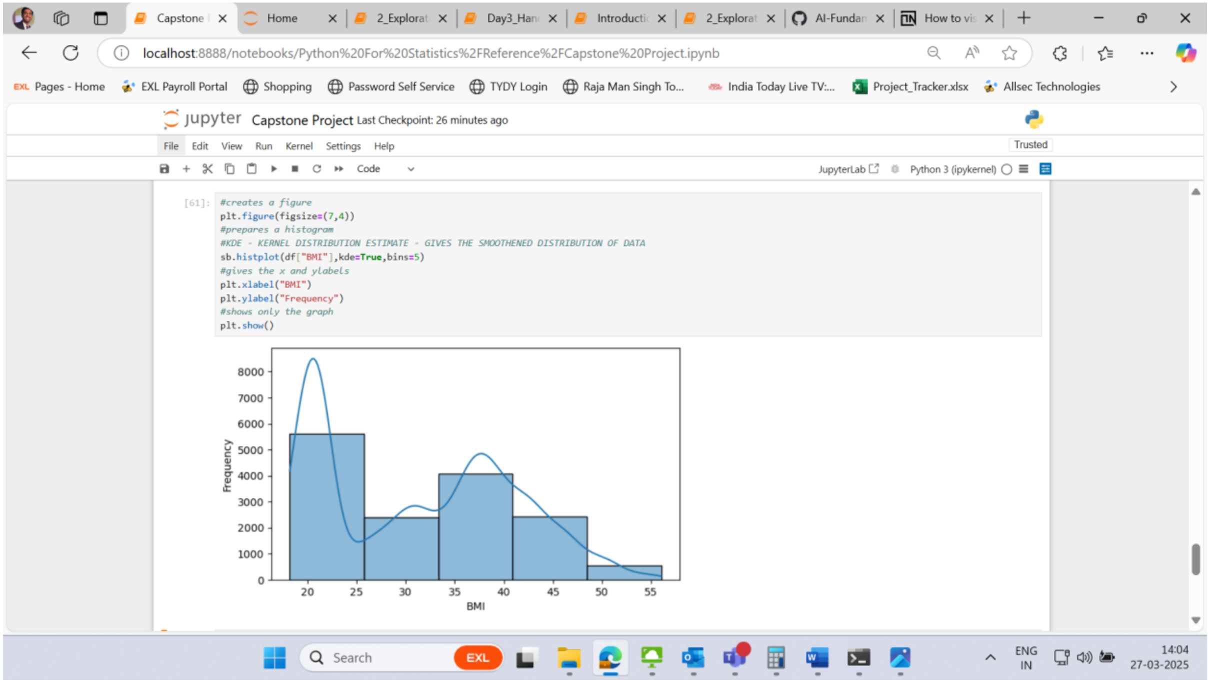
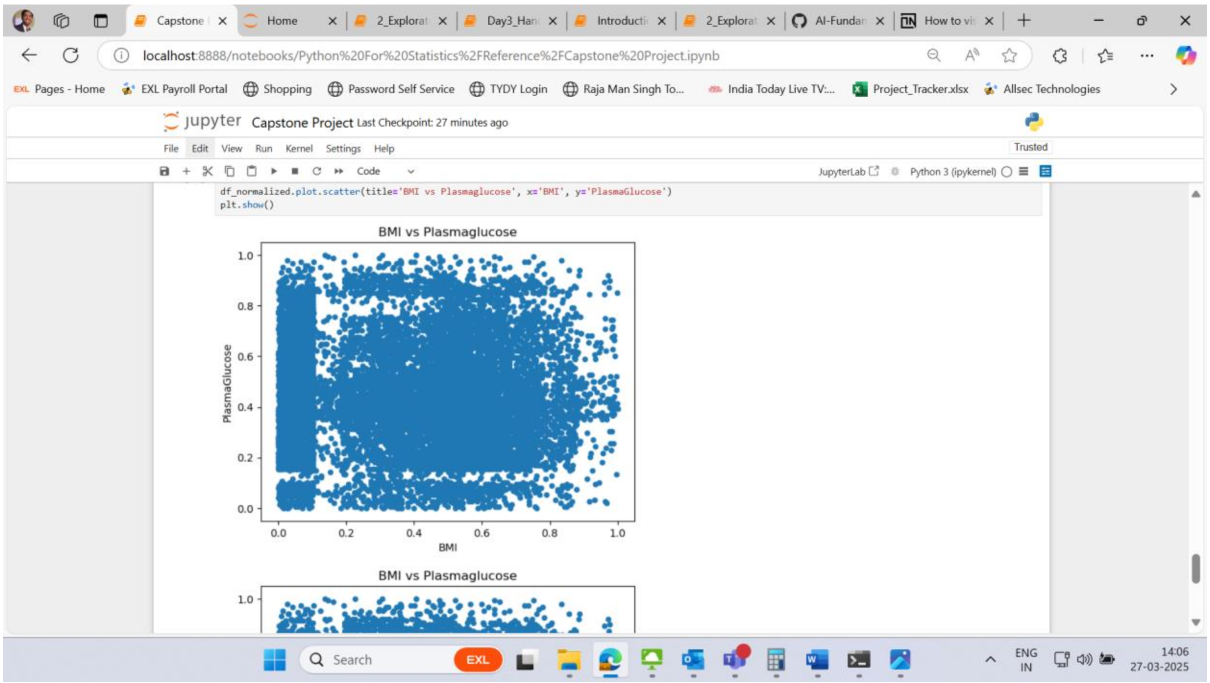
**Historgram:**

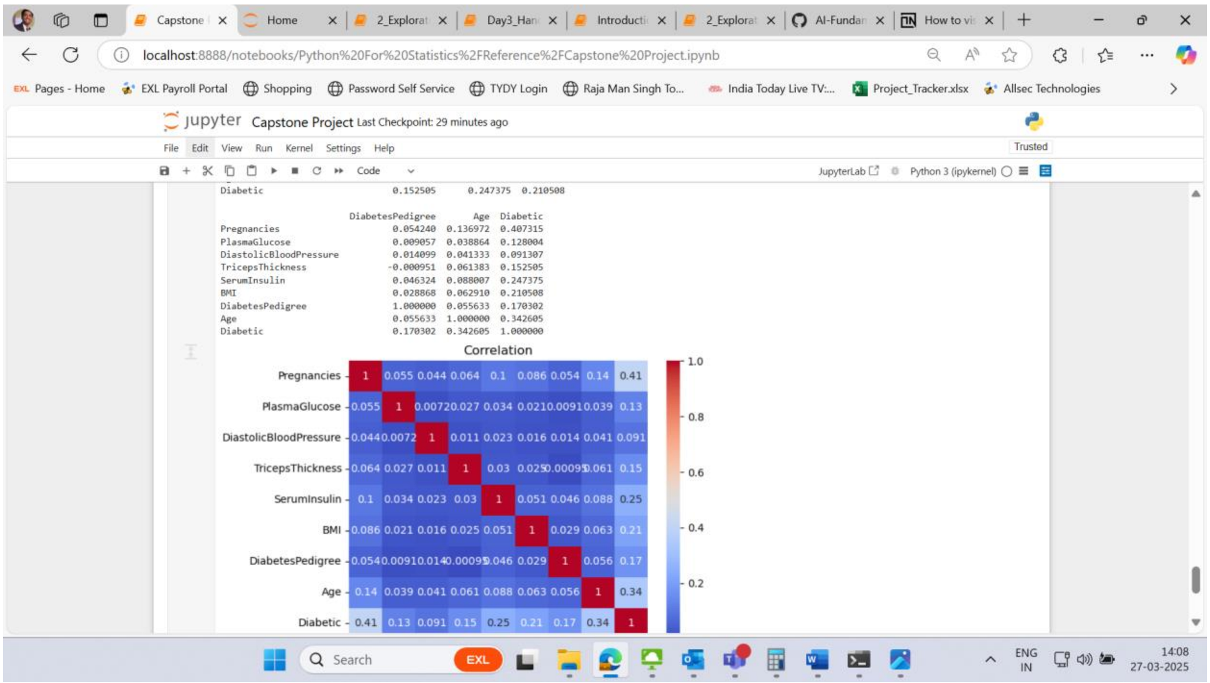


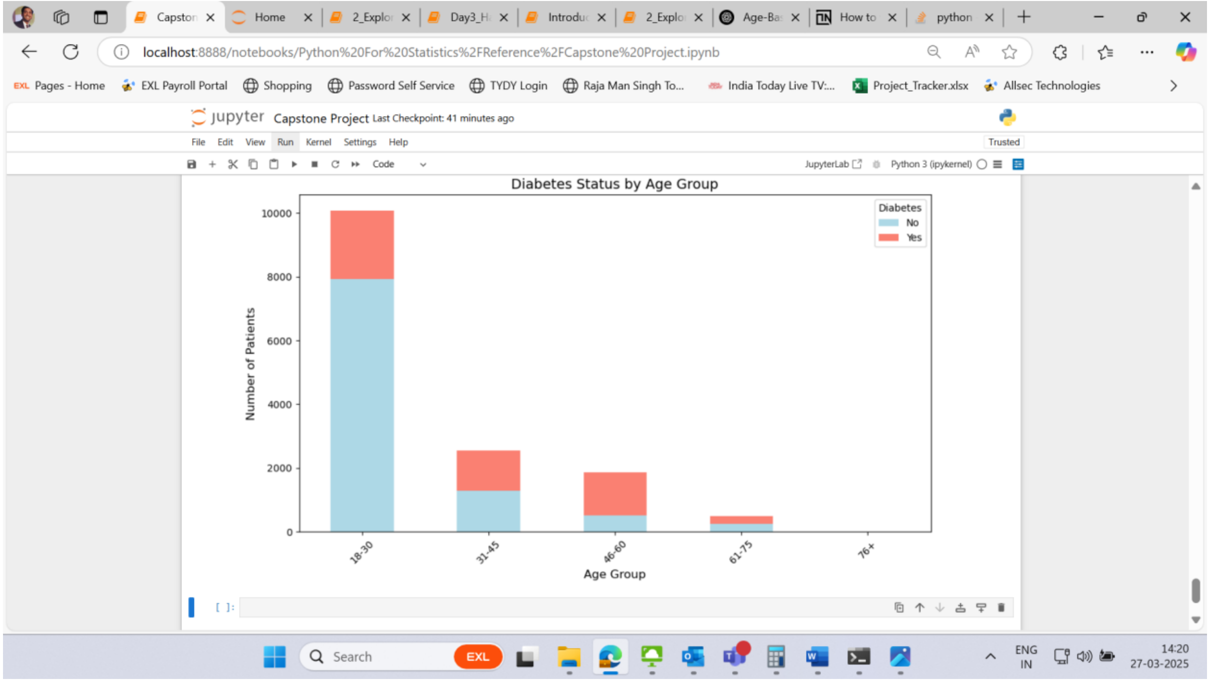

**BMI Vs Plasma Glucose – Scatterplot**

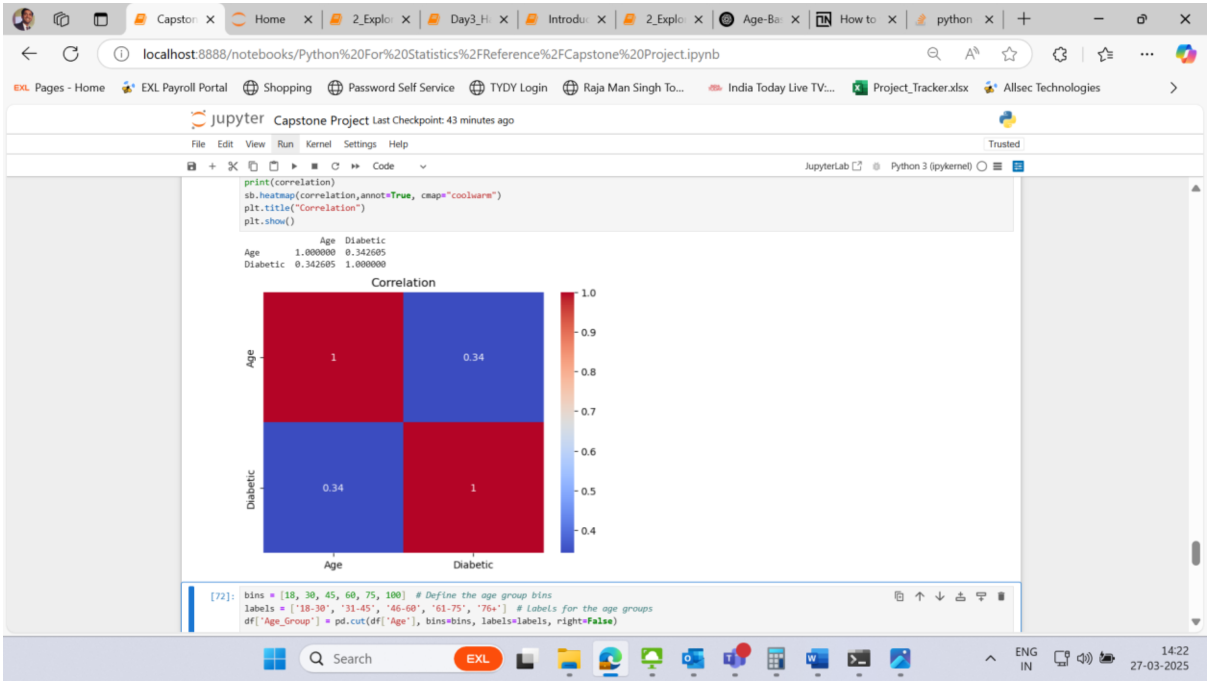



No clear relationship between the two.

**Correlation Matrix**:



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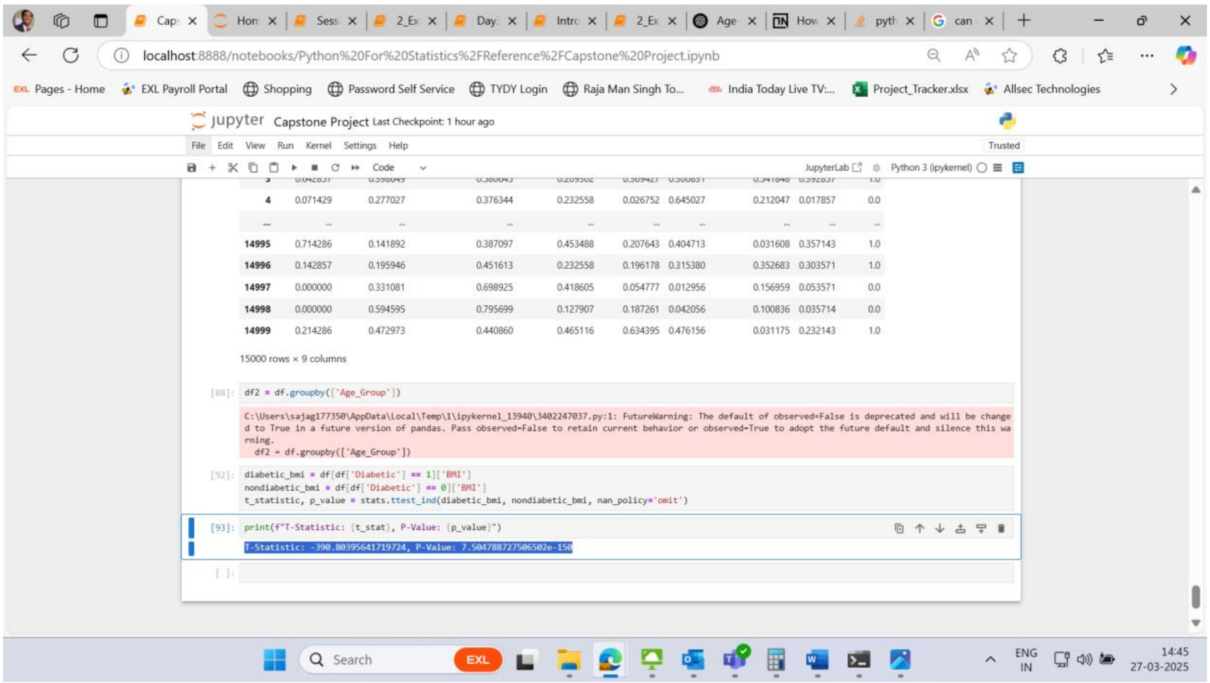
## 4. Inferential Statistics

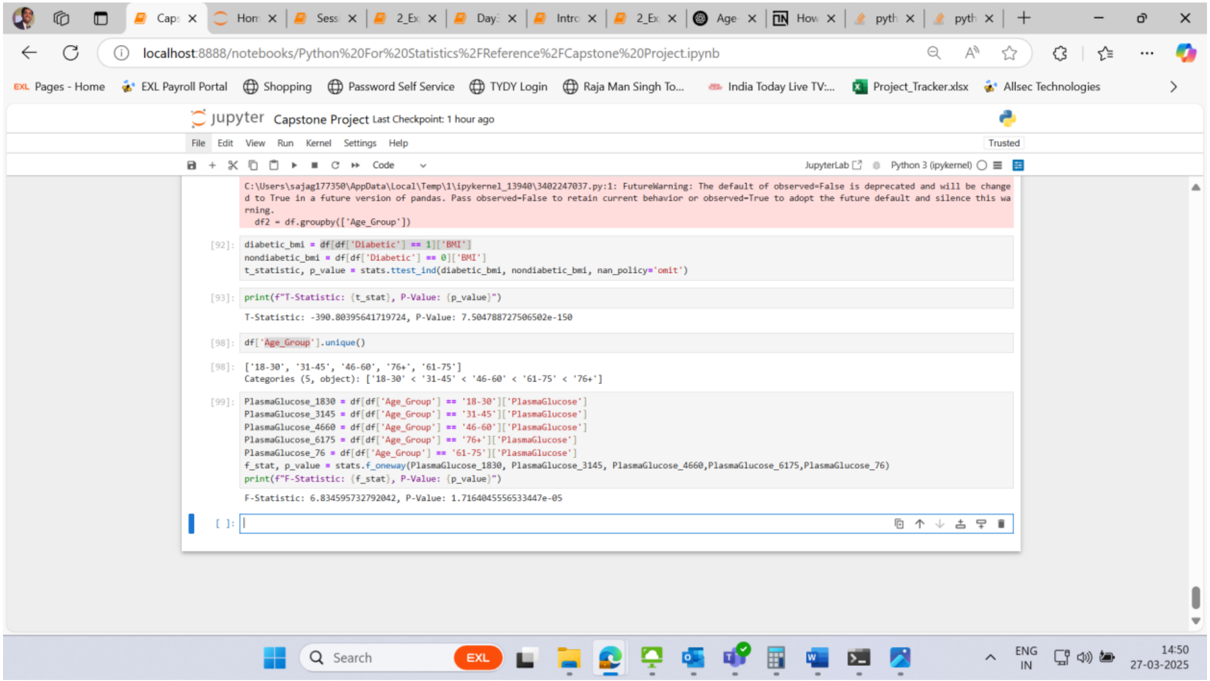
- Conduct hypothesis testing:
    - Compare the mean BMI of diabetic vs. non-diabetic patients (t-test).
    - Assess the relationship between **Pregnancies** and **Diabetes** using a chi-square test.

- Perform an ANOVA test to compare **PlasmaGlucose** levels across different age groups.
- Interpret p-values and confidence intervals to draw meaningful conclusions.

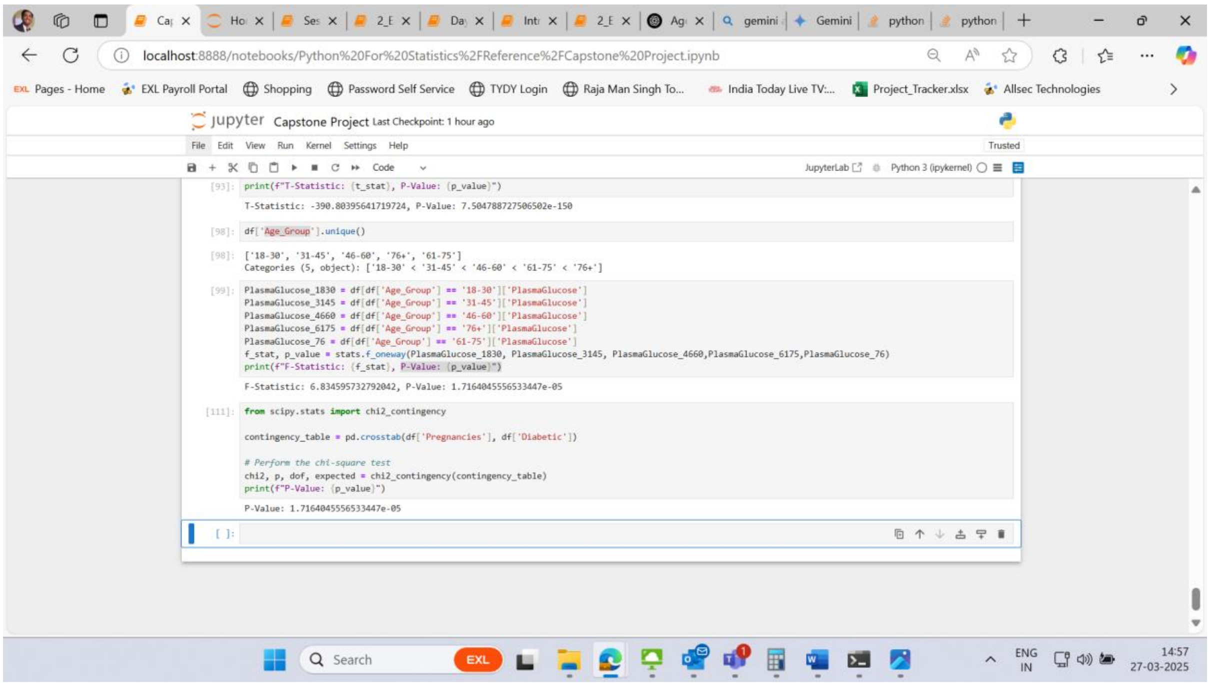



**Difference between BMI of Diabetic vs non diabetic patients is statistically significant.**

- Perform an ANOVA test to compare **PlasmaGlucose** levels across different age groups.



**PlasmaGlucose is statistically different across agegroups.**




**P Value is statistically significant. Hence, there is a relationship between pregnancies and diabetes.**

**Conclusions and Recommendations:**

Pregnencies, age and seruminsulin impact Diabetese positively. Hence, close attention should be given on these.