⭐ kütüphanleri yükleyelim

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import plotly.express as px
import seaborn as sns
import pandas as pd

import warnings
warnings.filterwarnings("ignore")
```

⭐ veri setini okutalım

```
df_ = pd.read_csv("/content/diabetes.csv")
```

```
df = df_.copy()
```

❓ KEŞFEDİCİ VERİ ANALİZİ

✓ EDA deki ana fikir varsayimlar yapmadan onceden veriye bakmaktir. Verideki pattern dedigimiz duzen ve kalibi bulmamiz ve sira disi olaylari gozlemlememizin yaninda ayrica degiskenler arasindaki iliskiyi bulmamiza yardim eder.

✓ Veri bilimcileri kesfedici veri analizini hem duzen bulmak hem sira disi olaylari kesfetmek hemde degiskler arasindaki iliskiyi bulmak icin kullanirlar. Bunun yani sira bazi is sorularini cevaplayabilirler.

✓ kesfedici analizlerle ayrica dogru sorulari sorup sormadigimizi da anlayabiliriz

✓ kesfedici analizler istatistiki bilgileri bulmamiza da yardimci olur, mesela, standard sapma, ortalama deger gibi.

✓ Kesfedici analizler yapildiktan sonra uretilen feature (degisken) ve bilgiler kullanilarak machine learning modelleri uretilebilir

✅ Pregnancies: Hamilelik sayısı

✅ Glucose: Glikoz

✅ BloodPressure: Kan basıncı (Diastolic(Küçük Tansiyon))

✅ SkinThickness: Cilt Kalınlığı

✅ Insulin: İnsülin.

✅ BMI: Beden kitle indeksi.

✅ DiabetesPedigreeFunction: Soyumuzdaki kişilere göre diyabet olma ihtimalimizi hesaplayan bir fonksiyon.

✅ Age: Yaş (yıl)

✅ Outcome: Kişinin diyabet olup olmadığı bilgisi. Hastalığa sahip (1) ya da değil (0)

```
df.head()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Out
0	6	148	72	35	0	33.6	0.627	50	
1	1	85	66	29	0	26.6	0.351	31	
2	8	183	64	0	0	23.3	0.672	32	
3	1	89	66	23	94	28.1	0.167	21	
4	0	137	40	35	168	43.1	2.288	33	

```
# null değerlere ve veri tiplerine bakalım
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Pregnancies               768 non-null    int64  
 1   Glucose                   768 non-null    int64  
 2   BloodPressure             768 non-null    int64  
 3   SkinThickness             768 non-null    int64  
 4   Insulin                   768 non-null    int64  
 5   BMI                       768 non-null    float64
 6   DiabetesPedigreeFunction  768 non-null    float64
 7   Age                       768 non-null    int64  
 8   Outcome                   768 non-null    int64  
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
```

```
df.dtypes
```

```
Pregnancies                 int64
Glucose                     int64
BloodPressure               int64
SkinThickness               int64
Insulin                     int64
BMI                       float64
DiabetesPedigreeFunction  float64
Age                         int64
Outcome                     int64
dtype: object
```

```
df.describe([0.10, 0.20, 0.25, 0.50, 0.75, 0.90, 0.95, 0.99]).T
```

	count	mean	std	min	10%	20%	25%	50%	
Pregnancies	768.0	3.845052	3.369578	0.000	0.000	1.0000	1.00000	3.0000	6.00
Glucose	768.0	120.894531	31.972618	0.000	85.000	95.0000	99.00000	117.0000	140.25
BloodPressure	768.0	69.105469	19.355807	0.000	54.000	60.0000	62.00000	72.0000	80.00
SkinThickness	768.0	20.536458	15.952218	0.000	0.000	0.0000	0.00000	23.0000	32.00
Insulin	768.0	79.799479	115.244002	0.000	0.000	0.0000	0.00000	30.5000	127.25
BMI	768.0	31.992578	7.884160	0.000	23.600	25.9000	27.30000	32.0000	36.60
DiabetesPedigreeFunction	768.0	0.471876	0.331329	0.078	0.165	0.2194	0.24375	0.3725	0.62
Age	768.0	33.240885	11.760232	21.000	22.000	23.0000	24.00000	29.0000	41.00
Outcome	768.0	0.348958	0.476951	0.000	0.000	0.0000	0.00000	0.0000	1.00

❌ veride boş değer olmaması ve birkaç kolon min değerlerinin 0 olması garip (bmı ı 0 olan insan yada glucose değerinin sıfır olması ?))

```
# outcome değeri int tipinde ama 0 ve 1 olarak 2 kategorik değeri var o yüzden type ı kategorik olarak değiştirelim
df.Outcome.unique()
```

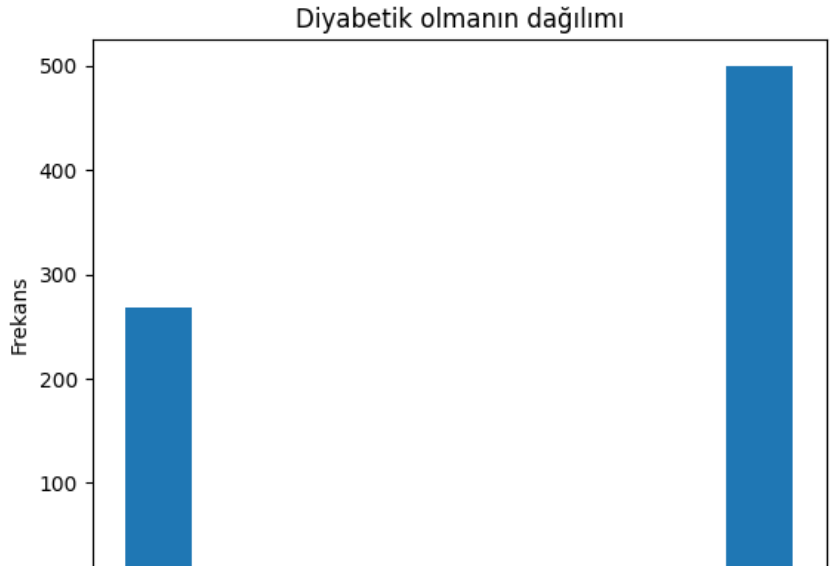
```
array([1, 0])
```

```
df.Outcome = df.Outcome.astype(str)
df.dtypes
```

```
Pregnancies                 int64
Glucose                     int64
BloodPressure               int64
SkinThickness               int64
Insulin                     int64
BMI                       float64
DiabetesPedigreeFunction  float64
Age                         int64
Outcome                    object
dtype: object
```

```
# histogram
plt.hist(df["Outcome"])
plt.title("Diyabetik olmanın dağılımı")
plt.xlabel("Sonuç")
plt.ylabel("Frekans")
```

```
Text(0, 0.5, 'Frekans')
```




```
df.Outcome.value_counts()  # hangi değerden kaç adet var
```

```
0    500
1    268
Name: Outcome, dtype: int64
```

```
df.Outcome.value_counts(normalize=True) # benzersiz değerlerin % sayısı
```

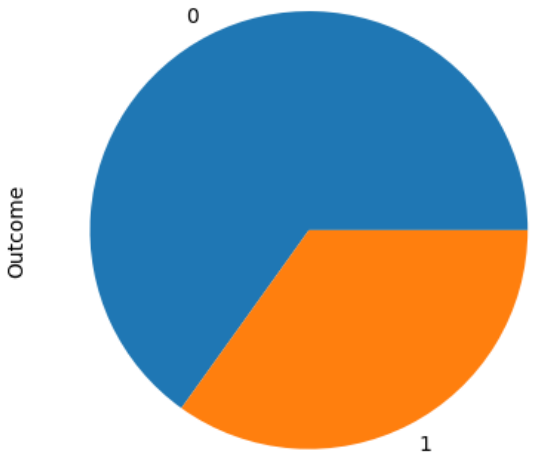
```
0    0.651042
1    0.348958
Name: Outcome, dtype: float64
```

```
df['Outcome'].value_counts(normalize = True). to_frame().style.format('{:.2%}')
```

	Outcome
0	65.10%
1	34.90%

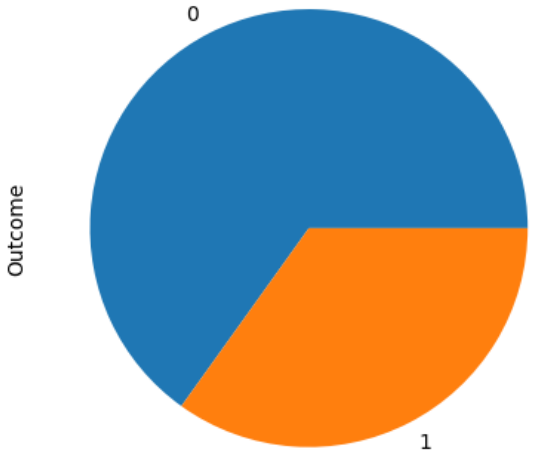
```
df.Outcome.value_counts(normalize=True).plot(kind='pie', table=True)
```

```
<Axes: ylabel='Outcome'>
```



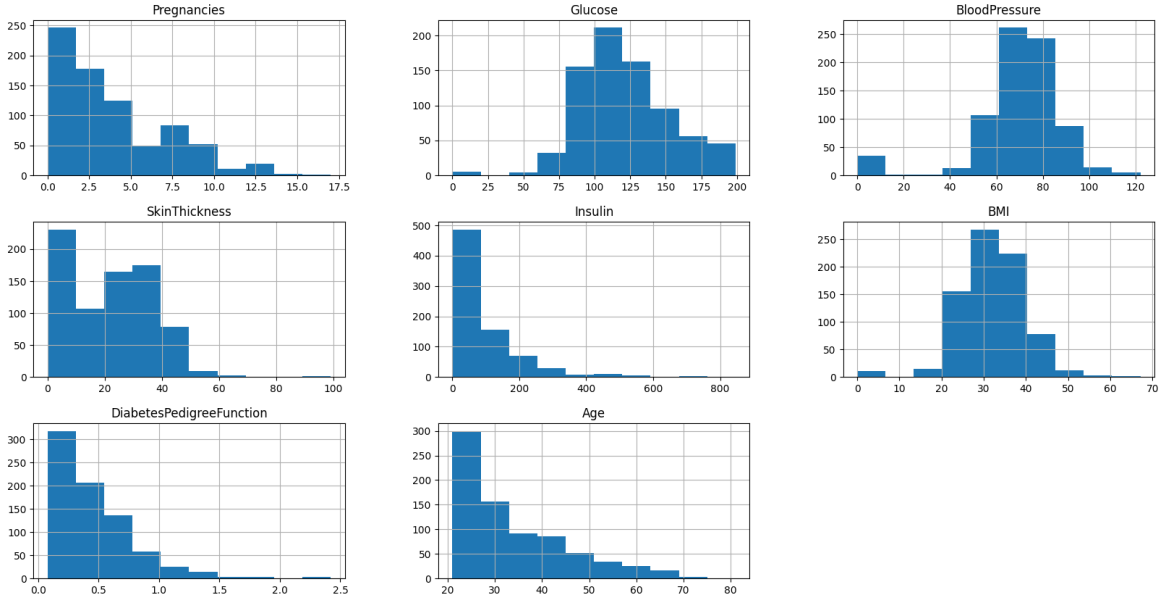

```
df.Outcome.value_counts(normalize=True).plot(kind='pie', table=True)
```

```
<Axes: ylabel='Outcome'>
```



	0	1
Outcome	0.6510416666666666	0.3489583333333333

```
# özellik değerlerinin dağılımlarına bakalım :
df.hist(figsize=(20,10));  # ; olmayınca x ve y ile ilgili bilgiler geliyor
```



⭐ özellik müh ve veri temizleme

```
df.describe().T
```

	count	mean	std	min	25%	50%	75%	max
Pregnancies	768.0	3.845052	3.369578	0.000	1.00000	3.0000	6.00000	17.00
Glucose	768.0	120.894531	31.972618	0.000	99.00000	117.0000	140.25000	199.00
BloodPressure	768.0	69.105469	19.355807	0.000	62.00000	72.0000	80.00000	122.00
SkinThickness	768.0	20.536458	15.952218	0.000	0.00000	23.0000	32.00000	99.00
Insulin	768.0	79.799479	115.244002	0.000	0.00000	30.5000	127.25000	846.00

```
df[df["SkinThickness"] >90]   # sadece 1 değer var ( aykırı değer)
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	C
579	2	197	70	99	0	34.7	0.575	62	

```
# yeni veriyi skinthicness değeri 90 dan küçük olanlar şeklinde güncelleyelim
df = df[df.SkinThickness < 90]
```

```
df[df.Pregnancies >15]
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	C
159	17	163	72	41	114	40.9	0.817	47	

```
df = df[df.Pregnancies < 15]
```

```
df.describe().T
```

	count	mean	std	min	25%	50%	75%	max
Pregnancies	765.0	3.815686	3.317219	0.000	1.000	3.000	6.000	14.00
Glucose	765.0	120.720261	31.875250	0.000	99.000	117.000	140.000	199.00
BloodPressure	765.0	69.099346	19.393434	0.000	62.000	72.000	80.000	122.00
SkinThickness	765.0	20.392157	15.705834	0.000	0.000	23.000	32.000	63.00
Insulin	765.0	79.819608	115.422143	0.000	0.000	29.000	128.000	846.00
BMI	765.0	31.970719	7.890247	0.000	27.300	32.000	36.500	67.10
DiabetesPedigreeFunction	765.0	0.471707	0.331522	0.078	0.244	0.371	0.626	2.42
Age	765.0	33.172549	11.721195	21.000	24.000	29.000	40.000	81.00

⭐ eksik bilgileri olan kolonları tespit edelim

```
# muhtemelen eksik değerleri yerine otomatikman 0 değeri atanmış o yüzden "outcome" hariç diğer 0 sahibi kolonları seçelim
eksik_bilgiler = [col for col in df.columns if (df[col].min() == 0 and df[col].dtypes != "O") ]
eksik_bilgiler = [col for col in eksik_bilgiler if "Pregnancies" not in col ]
eksik_bilgiler
```

```
['Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI']
```

```
#seçtiğimiz kolonlaedaki 0 değerleri yerine nan değer atalım
df[eksik_bilgiler] = np.where(df[eksik_bilgiler] == 0, np.nan, df[eksik_bilgiler])
```

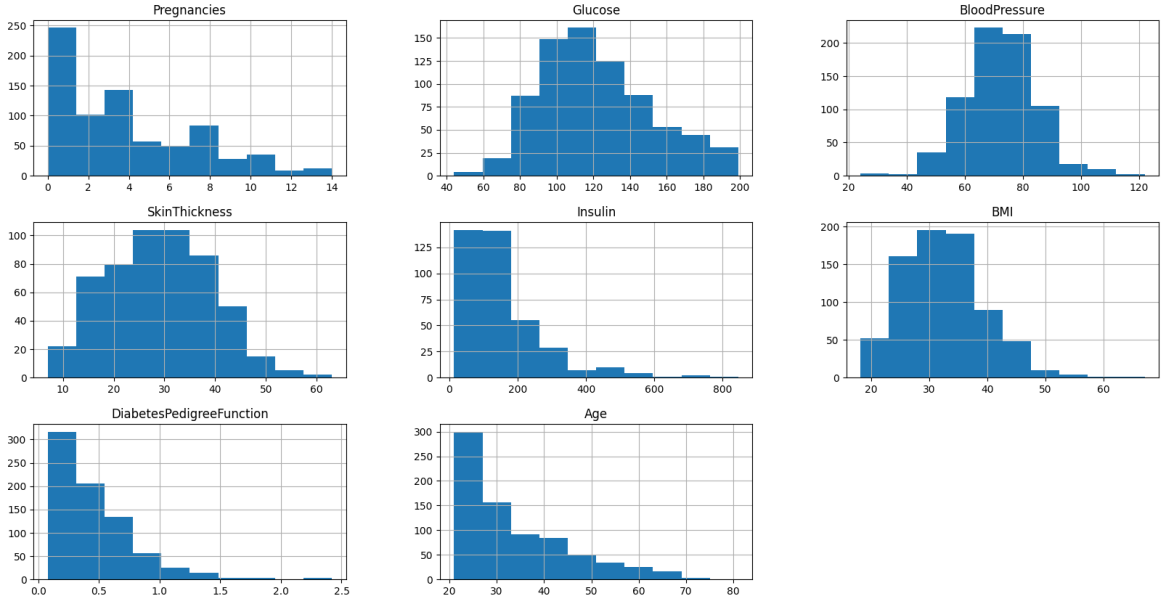
```
# verimize tekrsr bakalım
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 765 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Pregnancies               765 non-null    int64  
 1   Glucose                   760 non-null    float64
 2   BloodPressure             730 non-null    float64
 3   SkinThickness             538 non-null    float64
 4   Insulin                   392 non-null    float64
 5   BMI                       754 non-null    float64
 6   DiabetesPedigreeFunction  765 non-null    float64
 7   Age                       765 non-null    int64  
 8   Outcome                   765 non-null    object 
dtypes: float64(6), int64(2), object(1)
memory usage: 59.8+ KB
```

```
# verimizde boş değer var mı yok mu daha net öğrenelim
df.isnull().any()
```

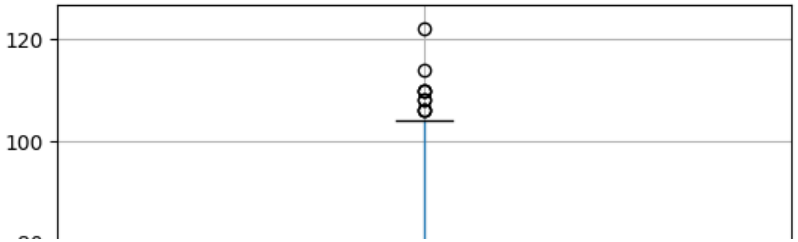
```
Pregnancies                False
Glucose                     True
BloodPressure               True
SkinThickness               True
Insulin                     True
BMI                         True
DiabetesPedigreeFunction    False
Age                         False
Outcome                     False
dtype: bool
```

```
df.hist(figsize=(20,10));
```




```
df.boxplot(["BloodPressure"])
```

```
<Axes: >
```




```
df_yari_temiz = df.fillna(df.median()) # boş değerleri ilgili sütunun medyanı ile dolduralım
```

```
df_yari_temiz.isnull().any()
```

```
Pregnancies                 False
Glucose                     False
BloodPressure               False
SkinThickness               False
Insulin                     False
BMI                         False
DiabetesPedigreeFunction    False
Age                         False
Outcome                     False
dtype: bool
```

```
# yaşı kendi içinde kategorilere bölelim
df['age_bins'] = pd.cut(x=df["Age"], bins=[20,30,40,50,60,70,80,90])
```

```
df['age_bins'] = df['age_bins'].astype(str)
```

```
df.head()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Out
0	6	148.0	72.0	35.0	NaN	33.6	0.627	50	
1	1	85.0	66.0	29.0	NaN	26.6	0.351	31	
2	8	183.0	64.0	NaN	NaN	23.3	0.672	32	
3	1	89.0	66.0	23.0	94.0	28.1	0.167	21	
4	0	137.0	40.0	35.0	168.0	43.1	2.288	33	

```
df_temiz = df.fillna(df.groupby(['Pregnancies', 'Outcome', 'age_bins']).transform('median'))
```

```
df_temiz.isnull().any()
```

```
Pregnancies                False
Glucose                    False
BloodPressure               True
SkinThickness               True
Insulin                     True
BMI                         True
DiabetesPedigreeFunction   False
Age                        False
Outcome                    False
age_bins                   False
dtype: bool
```

```
df.groupby(['Outcome', 'age_bins', 'Pregnancies']).count()
```

			Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFu
Outcome	**age_bins**	**Pregnancies**						
0	**(20, 30]**	**0**	61	58	47	35	58	
		1	93	96	87	68	96	
		2	76	72	62	49	74	
		3	37	35	29	23	36	
		4	28	28	19	14	28	
...	**...**	**...**	...	...	...	...	...	
1	**(50, 60]**	**12**	1	1	1	1	1	
	(60, 70]	**0**	1	1	0	0	1	
		2	1	1	0	0	1	
		4	3	3	1	0	3	
		6	1	1	0	0	1	

115 rows × 7 columns

```
# yaş altı hamilelik sayısını azalan şekilde sıralayalım
df[df["Age"] < 25].sort_values(by="Pregnancies", ascending=False)[0:10]
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	C
731	8	120.0	86.0	NaN	NaN	28.4	0.259	22	
49	7	105.0	NaN	NaN	NaN	NaN	0.305	24	
121	6	111.0	64.0	39.0	NaN	34.2	0.260	24	
98	6	93.0	50.0	30.0	64.0	28.7	0.356	23	
457	5	86.0	68.0	28.0	71.0	30.2	0.364	24	

```
# age_bins ve outcome i kendi medyanları ile değiştirelim

df_temiz = df_temiz.fillna(df_temiz.groupby(['Outcome', 'age_bins']).transform('median'))
```

```
df_temiz.describe().T
```

	count	mean	std	min	25%	50%	75%	max
Pregnancies	765.0	3.815686	3.317219	0.000	1.000	3.000	6.000	14.00
Glucose	765.0	121.481699	30.358024	44.000	99.000	117.000	140.000	199.00
BloodPressure	764.0	72.400524	12.206042	24.000	64.000	72.000	80.000	122.00
SkinThickness	764.0	29.047120	8.966978	7.000	23.000	29.000	35.000	63.00
Insulin	758.0	149.141161	99.073541	14.000	88.000	122.000	177.500	846.00
BMI	765.0	32.421307	6.883376	18.200	27.500	32.100	36.500	67.10
DiabetesPedigreeFunction	765.0	0.471707	0.331522	0.078	0.244	0.371	0.626	2.42
Age	765.0	33.172549	11.721195	21.000	24.000	29.000	40.000	81.00

```
df_temiz.isnull().any()
```

```
Pregnancies                 False
Glucose                     False
BloodPressure                True
SkinThickness                True
Insulin                      True
BMI                         False
DiabetesPedigreeFunction    False
Age                         False
Outcome                     False
age_bins                    False
dtype: bool
```

```
# Outcome değerine göre diğer kolonların na değerlerini medyanı ile doldur
df_temiz = df_temiz.fillna(df_temiz.groupby(['Outcome']).transform('median'))
```

```
df_temiz.describe().T
```

	count	mean	std	min	25%	50%	75%	max
Pregnancies	765.0	3.815686	3.317219	0.000	1.000	3.000	6.000	14.00
Glucose	765.0	121.481699	30.358024	44.000	99.000	117.000	140.000	199.00
BloodPressure	765.0	72.397386	12.198360	24.000	64.000	72.000	80.000	122.00
SkinThickness	765.0	29.044444	8.961413	7.000	23.000	29.000	35.000	63.00
Insulin	765.0	149.240523	98.651920	14.000	88.000	122.000	176.000	846.00
BMI	765.0	32.421307	6.883376	18.200	27.500	32.100	36.500	67.10
DiabetesPedigreeFunction	765.0	0.471707	0.331522	0.078	0.244	0.371	0.626	2.42
Age	765.0	33.172549	11.721195	21.000	24.000	29.000	40.000	81.00

```
df_corr = df_temiz.copy()
```

```
df_corr['Outcome'] = df_corr['Outcome'].astype(int)
```

```
df_corr.dtypes
```

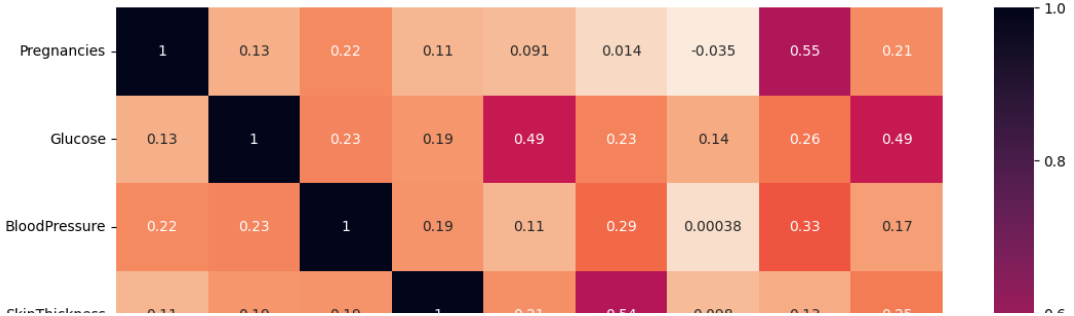
```
Pregnancies                 int64
Glucose                   float64
BloodPressure             float64
SkinThickness             float64
Insulin                   float64
BMI                       float64
DiabetesPedigreeFunction  float64
Age                         int64
Outcome                     int64
age_bins                   object
dtype: object
```

```
df_corr.corr()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	Diabet
Pregnancies	1.000000	0.125841	0.217565	0.108548	0.091245	0.013672	
Glucose	0.125841	1.000000	0.228163	0.188185	0.491978	0.233472	

```
plt.figure(figsize=(13,10))
cmap = sns.color_palette('rocket_r', as_cmap=True)
sns.heatmap(df_corr.corr(), cmap=cmap, annot=True)
```

```
<Axes: >
```



⭐ VERİ GÖRSELLEŞTİRME

```
df_temiz.head()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Out
0	6	148.0	72.0	35.0	263.0	33.6	0.627	50	
1	1	85.0	66.0	29.0	73.0	26.6	0.351	31	
2	8	183.0	64.0	37.0	170.0	23.3	0.672	32	
3	1	89.0	66.0	23.0	94.0	28.1	0.167	21	
4	0	137.0	40.0	35.0	168.0	43.1	2.288	33	

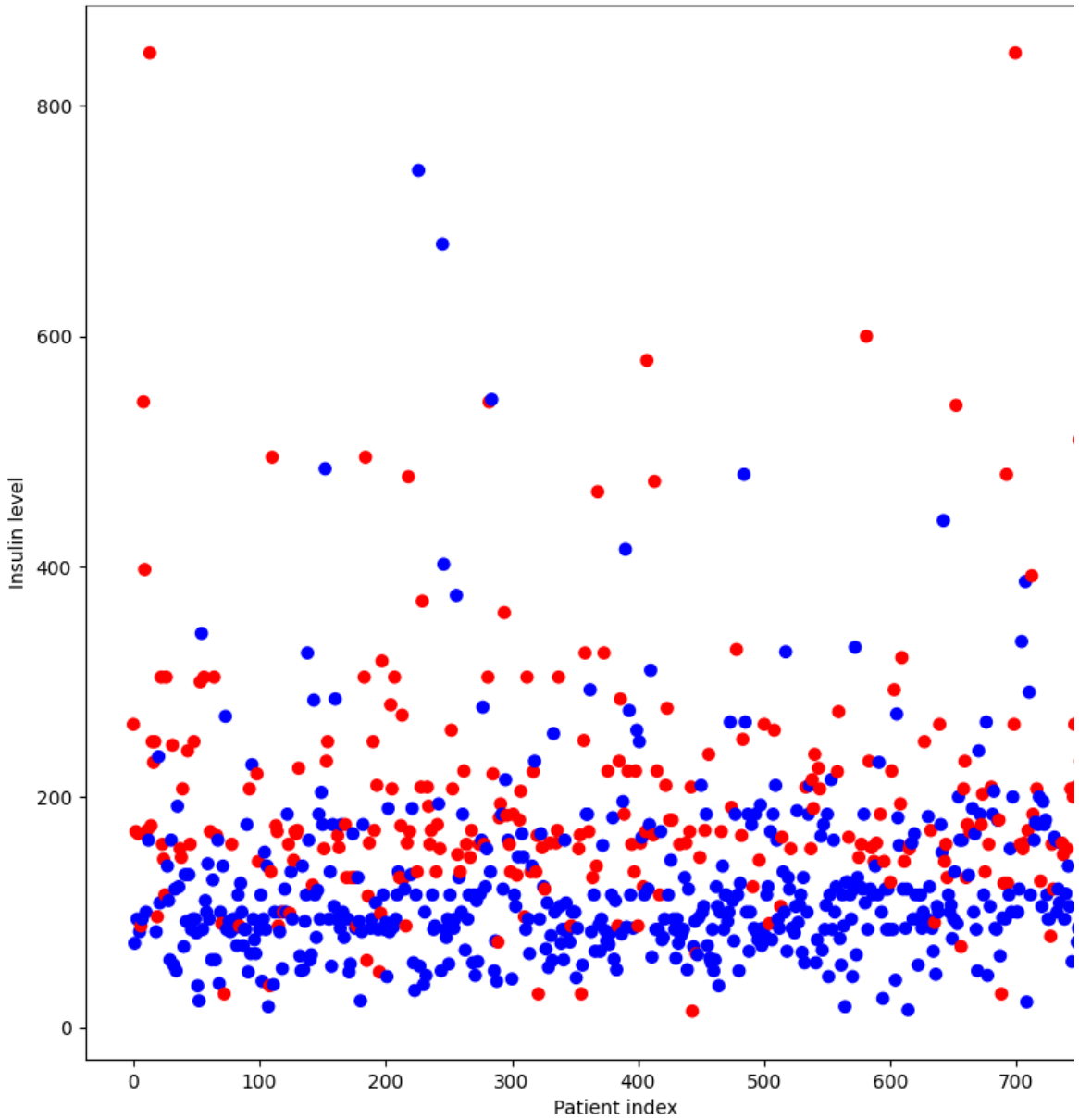
```
df_temiz.reset_index(inplace=True)
df_temiz.head()
```

	index	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	A
0	0	6	148.0	72.0	35.0	263.0	33.6	0.627	
1	1	1	85.0	66.0	29.0	73.0	26.6	0.351	
2	2	8	183.0	64.0	37.0	170.0	23.3	0.672	
3	3	1	89.0	66.0	23.0	94.0	28.1	0.167	
4	4	0	137.0	40.0	35.0	168.0	43.1	2.288	

```
# DF_TEMİZ İÇİN ;
colors ={"0":'blue', "1":'red'}
plt.figure(figsize=(10,10))
plt.scatter(df_temiz.index,df_temiz.Insulin, c=df_temiz['Outcome'].map(colors))
plt.xlabel('Patient index')
plt.ylabel('Insulin level')
```

```
# insilün seviyesinin azaldığı yerlerde mavi ( diyabet olamama) yoğunlukta
```

```
Text(0, 0.5, 'Insulin level')
```




```
df_yari_temiz.dtypes
```

```
Pregnancies                 int64
Glucose                   float64
BloodPressure             float64
SkinThickness             float64
Insulin                   float64
BMI                       float64
DiabetesPedigreeFunction  float64
Age                         int64
Outcome                    object
dtype: object
```

```
# DF_yarı_TEMİZ İÇİN ;
colors ={"0":'blue', "1":'red'}
plt.figure(figsize=(10,10))
plt.scatter(df_yari_temiz.index,df_yari_temiz.Insulin, c=df_temiz['Outcome'].map(colors))
plt.xlabel('Patient index')
plt.ylabel('Insulin level')

# grafikte de yarı_temizde problem olduğu bariz
```

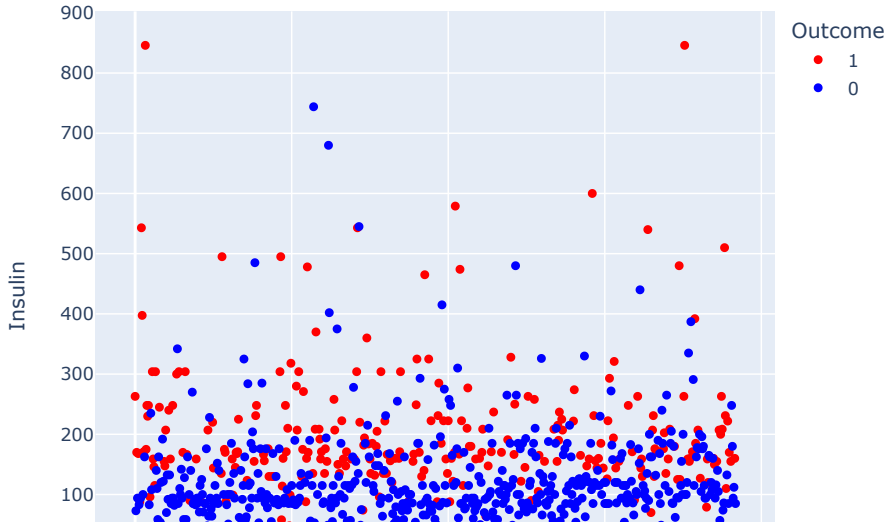
```
Text(0, 0.5, 'Insulin level')
```


```
df_temiz.reset_index(drop=False, inplace=True)
df_temiz
```

	level_0	index	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigree
0	0	0	6	148.0	72.0	35.0	263.0	33.6	
1	1	1	1	85.0	66.0	29.0	73.0	26.6	
2	2	2	8	183.0	64.0	37.0	170.0	23.3	
3	3	3	1	89.0	66.0	23.0	94.0	28.1	
4	4	4	0	137.0	40.0	35.0	168.0	43.1	
...	...	...	...	...	...	...	...	...	
760	760	763	10	101.0	76.0	48.0	180.0	32.9	
761	761	764	2	122.0	70.0	27.0	94.0	36.8	
762	762	765	5	121.0	72.0	23.0	112.0	26.2	
763	763	766	1	126.0	60.0	28.5	160.0	30.1	
764	764	767	1	93.0	70.0	31.0	85.0	30.4	

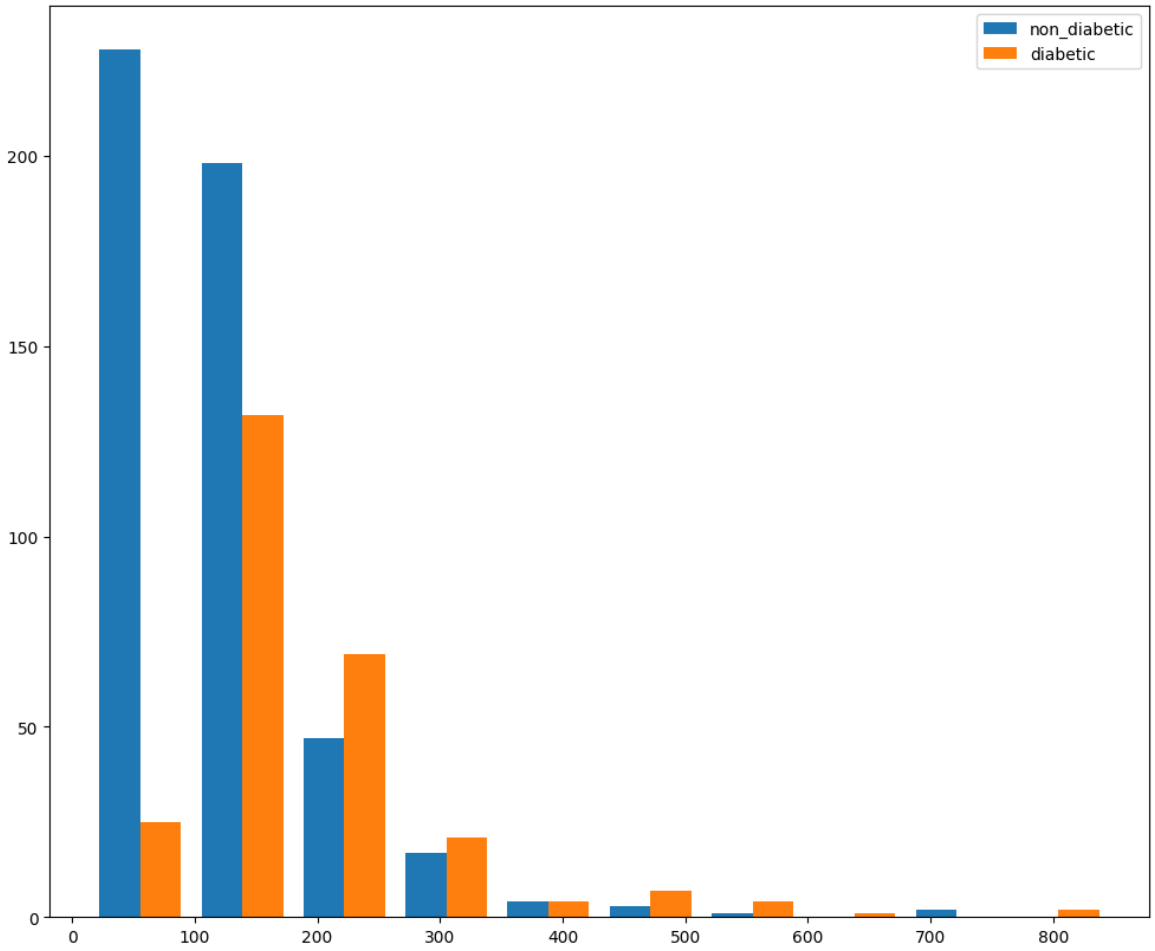
765 rows × 12 columns


```
px.scatter(df_temiz, x='index', y='Insulin', color='Outcome', color_discrete_sequence=['red', 'blue'])
# interaktif kullanmak için bu grafik gayet iyi
```




```
# diyabet olanlarla - olmayanların insülin sayılarının kıyaslanması
plt.figure(figsize=(12,10))
df_diabetic = df_temiz.loc[df_temiz.Outcome =='1'];
df_non_diabetic = df_temiz.loc[df_temiz.Outcome =='0'];
labels=['non_diabetic', 'diabetic'];
plt.hist([df_non_diabetic['Insulin'], df_diabetic['Insulin']], label=labels);
plt.legend()
```

```
<matplotlib.legend.Legend at 0x7f970d7cb370>
```



✓ 0 sn. tamamlanma zamanı: 16:12