In [ ]:
```
import pandas as pd
import numpy as np
import datetime as dt
import matplotlib.pyplot as plt
import seaborn as sns
import missingno as msno
pd.options.display.max_columns = None
```

LA GRAN PANDEMIA

contenido del data set COVID

The dataset was provided by the Mexican government (link). This dataset contains an enormous number of anonymized patient-related information including pre-conditions. The raw dataset consists of 21 unique features and 1,048,576 unique patients. In the Boolean features, 1 means "yes" and 2 means "no". values as 97 and 99 are missing data.

- sex: 1 for female and 2 for male.
- age: of the patient.
- classification: covid test findings. Values 1-3 mean that the patient was diagnosed with covid in different
- degrees. 4 or higher means that the patient is not a carrier of covid or that the test is inconclusive.
- patient type: type of care the patient received in the unit. 1 for returned home and 2 for hospitalization.
- pneumonia: whether the patient already have air sacs inflammation or not.
- pregnancy: whether the patient is pregnant or not.
- diabetes: whether the patient has diabetes or not.
- copd: Indicates whether the patient has Chronic obstructive pulmonary disease or not.
- asthma: whether the patient has asthma or not.
- inmsupr: whether the patient is immunosuppressed or not.
- hypertension: whether the patient has hypertension or not.
- cardiovascular: whether the patient has heart or blood vessels related disease.
- renal chronic: whether the patient has chronic renal disease or not.
- other disease: whether the patient has other disease or not.
- obesity: whether the patient is obese or not.
- tobacco: whether the patient is a tobacco user.
- usmr: Indicates whether the patient treated medical units of the first, second or third level.
- medical unit: type of institution of the National Health System that provided the care.
- intubed: whether the patient was connected to the ventilator.
- icu: Indicates whether the patient had been admitted to an Intensive Care Unit.
- date died: If the patient died indicate the date of death, and 9999-99-99 otherwise.

Limpieza de datos

Realizaremos una exploracion de los datos para buscar datos faltantes, duplicados y en su caso extremos.

In [ ]:
```
df_covid = pd.read_csv('../Covid Data.csv')
```

In [ ]:
```
df_covid.head()
```

Out[ ]:

	USMER	MEDICAL_UNIT	SEX	PATIENT_TYPE	DATE_DIED	INTUBED	PNEUMONIA	AGE	PREGNANT	DIABETES	COPD	ASTHMA	INMSUPR	HIPERTENSION	OTHER_DISEASE
0	2	1	1	1	03/05/2020	97	1	65	2	2	2	2	2	1	2
1	2	1	2	1	03/06/2020	97	1	72	97	2	2	2	2	1	2
2	2	1	2	2	09/06/2020	1	2	55	97	1	2	2	2	2	2
3	2	1	1	1	12/06/2020	97	2	53	2	2	2	2	2	2	2
4	2	1	2	1	21/06/2020	97	2	68	97	1	2	2	2	1	2

In [ ]:
```
df_covid.shape
```

Out[ ]:
```
(1048575, 21)
```

In [ ]:
```
df_covid.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1048575 entries, 0 to 1048574
Data columns (total 21 columns):
 #   Column                Non-Null Count    Dtype
---  ------                --------------    -----
 0   USMER                 1048575 non-null  int64
 1   MEDICAL_UNIT          1048575 non-null  int64
 2   SEX                   1048575 non-null  int64
 3   PATIENT_TYPE          1048575 non-null  int64
 4   DATE_DIED             1048575 non-null  object
 5   INTUBED               1048575 non-null  int64
 6   PNEUMONIA             1048575 non-null  int64
 7   AGE                   1048575 non-null  int64
 8   PREGNANT              1048575 non-null  int64
 9   DIABETES              1048575 non-null  int64
 10  COPD                  1048575 non-null  int64
 11  ASTHMA                1048575 non-null  int64
 12  INMSUPR               1048575 non-null  int64
 13  HIPERTENSION          1048575 non-null  int64
 14  OTHER_DISEASE         1048575 non-null  int64
 15  CARDIOVASCULAR        1048575 non-null  int64
 16  OBESITY               1048575 non-null  int64
 17  RENAL_CHRONIC         1048575 non-null  int64
 18  TOBACCO               1048575 non-null  int64
 19  CLASIFFICATION_FINAL  1048575 non-null  int64
 20  ICU                   1048575 non-null  int64
dtypes: int64(20), object(1)
memory usage: 168.0+ MB
```

Buscamos datos nulos

En nuestro dataset los valores 97 y 99 se consideran como data faltante. Por lo tanto, los reemplazaremos por NaN y luego se quitaran.

In [ ]:
```
# reemplazamos todos los 97 y 99 por NaN

df_covid.replace(97, np.nan, inplace=True)
df_covid.replace(98, np.nan, inplace=True)
df_covid.replace(99, np.nan, inplace=True)

df_covid.isnull().sum()
```

Out[ ]:
```
USMER                        0
MEDICAL_UNIT                 0
SEX                          0
PATIENT_TYPE                 0
DATE_DIED                    0
INTUBED                 855869
PNEUMONIA                16003
AGE                        345
PREGNANT                527265
DIABETES                  3338
COPD                      3003
ASTHMA                    2979
INMSUPR                   3404
HIPERTENSION              3104
OTHER_DISEASE             5045
CARDIOVASCULAR            3076
OBESITY                   3032
RENAL_CHRONIC             3006
TOBACCO                   3220
CLASIFFICATION_FINAL         0
ICU                     856032
dtype: int64
```

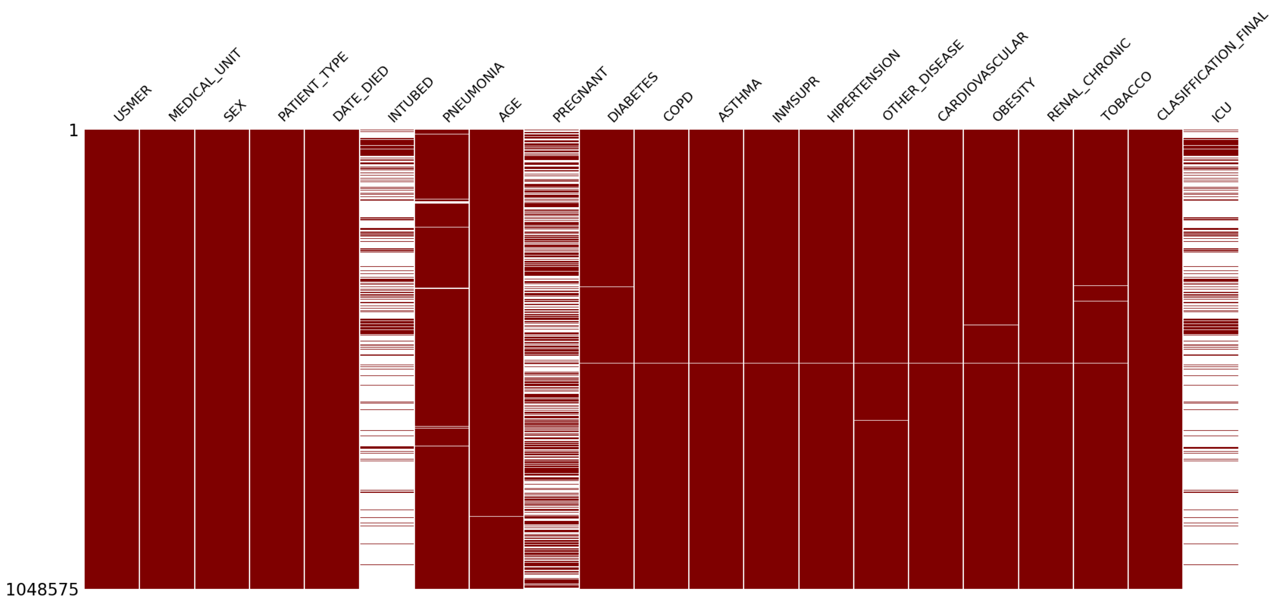
In [ ]:
```
#porcentaje de datos faltantes por columna

df_covid.isnull().sum()/df_covid.shape[0]
```

Out[ ]:
```
USMER                   0.000000
MEDICAL_UNIT            0.000000
SEX                     0.000000
PATIENT_TYPE            0.000000
DATE_DIED               0.000000
INTUBED                 0.816221
PNEUMONIA               0.015262
AGE                     0.000329
PREGNANT                0.502840
DIABETES                0.003183
COPD                    0.002864
ASTHMA                  0.002841
INMSUPR                 0.003246
HIPERTENSION            0.002960
OTHER_DISEASE           0.004811
CARDIOVASCULAR          0.002934
OBESITY                 0.002892
RENAL_CHRONIC           0.002867
TOBACCO                 0.003071
CLASIFFICATION_FINAL    0.000000
ICU                     0.816377
dtype: float64
```

In [ ]:
```
msno.matrix(df_covid, color=(0.5, 0, 0), sparkline=False)
```

Out[ ]:
```
<Axes: >
```



In [ ]:
```
# ver datos unicos

df_covid.nunique()
```

Out[ ]:
```
USMER                    2
MEDICAL_UNIT            13
SEX                      2
PATIENT_TYPE             2
DATE_DIED              400
INTUBED                  2
PNEUMONIA                2
AGE                    117
PREGNANT                 2
DIABETES                 2
COPD                     2
ASTHMA                   2
INMSUPR                  2
HIPERTENSION             2
OTHER_DISEASE            2
CARDIOVASCULAR           2
OBESITY                  2
RENAL_CHRONIC            2
TOBACCO                  2
CLASIFFICATION_FINAL     7
ICU                      2
fallecidos               2
mes                     12
dtype: int64
```

Podemos observar que tenemos 5 campos con datos faltantes en el dataset. El dataset cuenta con un total de 1048575 de registros. Como vemos en la tabla, los campos con datos faltantes son: Intubados, neumonia, edad, embarazo y terapita_intensiva. De estos campos, Intubados y terapia_intensiva tienen un 81% de datos faltantes y embarazos 49%. Si no fueran variables con un significativo peso dentro de la evolucion de la enfermedad se podria elimiar del dataset pero se decidio mantenerlas para su analisis.

In [ ]:
```
df_covid.shape
```

Out[ ]:
```
(1048575, 21)
```

Buscamos datos duplicados

In [ ]:
```
df_covid.duplicated().sum()
```

Out[ ]:
```
812074
```

Tenemos 814264 registros duplicados. Pero en este caso es normal por que son registros de personas contagiadas y es posible que compartan las caracteristicas con otras personas.

Creamos el campo fallecido

El campo Date died indica mediante la fecha si el paciente murio y si no murio pone 9999-99-99. Creamos un campo de fallecido que sera 1 si murio y 2 si no murio. Esto permitira una mejor lectura y un mejor uso de los datos en el momento de realizar el modelo de prediccion.

In [ ]:
```
# creamos el campo fallecidos a partir del campo date died. Si hay fecha el paciente fallecio, si la fecha es 9999-99-99 el paciente no fallecio.

df_covid['fallecidos'] = df_covid['DATE_DIED'].apply(lambda x: 2 if x == '9999-99-99' else 1)

df_covid.head()
```

Out[ ]:

	USMER	MEDICAL_UNIT	SEX	PATIENT_TYPE	DATE_DIED	INTUBED	PNEUMONIA	AGE	PREGNANT	DIABETES	COPD	ASTHMA	INMSUPR	HIPERTENSION	OTHER_DISEASE
0	2	1	1	1	03/05/2020	NaN	1.0	65.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0
1	2	1	2	1	03/06/2020	NaN	1.0	72.0	NaN	2.0	2.0	2.0	2.0	1.0	2.0
2	2	1	2	2	09/06/2020	1.0	2.0	55.0	NaN	1.0	2.0	2.0	2.0	2.0	2.0
3	2	1	1	1	12/06/2020	NaN	2.0	53.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
4	2	1	2	1	21/06/2020	NaN	2.0	68.0	NaN	1.0	2.0	2.0	2.0	1.0	2.0

In [ ]:
```
# paso a datetime la columna date_died

df_covid['DATE_DIED'] = df_covid['DATE_DIED'].replace('9999-99-99', np.nan)


df_covid['DATE_DIED'] = pd.to_datetime(df_covid['DATE_DIED'], format='%d/%m/%Y')


# agrego una columna mes para poder hacer un analisis por mes

df_covid['mes'] = pd.to_datetime(df_covid['DATE_DIED']).dt.month

df_covid['mes_nombre'] = df_covid['DATE_DIED'].dt.strftime('%B')
```

In [ ]:
```
df_covid.head()
```

Out[ ]:

	USMER	MEDICAL_UNIT	SEX	PATIENT_TYPE	DATE_DIED	INTUBED	PNEUMONIA	AGE	PREGNANT	DIABETES	COPD	ASTHMA	INMSUPR	HIPERTENSION	OTHER_DISEASE
0	2	1	1	1	2020-05-03	NaN	1.0	65.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0
1	2	1	2	1	2020-06-03	NaN	1.0	72.0	NaN	2.0	2.0	2.0	2.0	1.0	2.0
2	2	1	2	2	2020-06-09	1.0	2.0	55.0	NaN	1.0	2.0	2.0	2.0	2.0	2.0
3	2	1	1	1	2020-06-12	NaN	2.0	53.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
4	2	1	2	1	2020-06-21	NaN	2.0	68.0	NaN	1.0	2.0	2.0	2.0	1.0	2.0

In [ ]:
```
# # paso columna mes de float a int

# df_covid['mes'].fillna(0, inplace=True)

# df_covid['mes'] = df_covid['mes'].astype(int)

# df_covid.dtypes
```

In [ ]:
```
# reemplazo los valores 2 por 0 en todo el dataset pero menos en CLASIFICACION_FINAL, USMER y mes

# Lista de columnas en las que se reemplazarán los valores 2 por 0
columnas_reemplazo = [col for col in df_covid.columns if col not in ["CLASIFFICATION_FINAL", "USMER", "mes"]]
```

```
# Reemplazo de valores

df_covid[columnas_reemplazo] = df_covid[columnas_reemplazo].replace(2, 0)





df_covid.head()
```

Out[ ]:

	USMER	MEDICAL_UNIT	SEX	PATIENT_TYPE	DATE_DIED	INTUBED	PNEUMONIA	AGE	PREGNANT	DIABETES	COPD	ASTHMA	INMSUPR	HIPERTENSION	OTHER_DISEASE
0	2	1	1	1	2020-05-03	NaN	1.0	65.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
1	2	1	0	1	2020-06-03	NaN	1.0	72.0	NaN	0.0	0.0	0.0	0.0	1.0	0.0
2	2	1	0	0	2020-06-09	1.0	0.0	55.0	NaN	1.0	0.0	0.0	0.0	0.0	0.0
3	2	1	1	1	2020-06-12	NaN	0.0	53.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2	1	0	1	2020-06-21	NaN	0.0	68.0	NaN	1.0	0.0	0.0	0.0	1.0	0.0

Guardamos el dataset limpio

In [ ]:

```
df_covid.to_csv('./covid_clean_total.csv', index=False)
```