Importing Necessary Dependencies

```
# Import necessary packages
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import missingno as msno

# For interactive visualizations (optional, for later visualizations)
import plotly.express as px

# Load the CSV file from Google Drive or local storage
# If using Google Colab, you can upload the file manually or mount Google Drive
from google.colab import files

# Upload file
uploaded = files.upload()

# Once uploaded, load the CSV file using pandas
import io
file_path = next(iter(uploaded))  # Get the first uploaded file
data = pd.read_csv(io.BytesIO(uploaded[file_path]))

# Display the first few rows of the dataset to check if it loaded correctly
data.head(10)

```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving Iran_conflict_data_irn.csv to Iran_conflict_data_irn (2).csv
```

	id	relid	year	active_year	code_status	type_of_violence	conflict_dset_id	conflict_new_id	conflict_name	dyad_ds
0	NaN	NaN	#date+year	NaN	NaN	NaN	NaN	NaN	NaN	
1	120816.0	IRN-1990-1-260-10000	1990	1.0	Clear	1.0	205.0	205.0	Iran: Kurdistan	
2	115843.0	IRN-1990-1-260-2	1990	1.0	Clear	1.0	205.0	205.0	Iran: Kurdistan	
3	115822.0	IRN-1990-1-260-4	1990	1.0	Clear	1.0	205.0	205.0	Iran: Kurdistan	
4	115821.0	IRN-1990-1-260-3	1990	1.0	Clear	1.0	205.0	205.0	Iran: Kurdistan	
5	115844.0	IRN-1990-1-260-5	1990	1.0	Clear	1.0	205.0	205.0	Iran: Kurdistan	
6	115494.0	IRN-1990-1-260-6.1	1990	1.0	Clear	1.0	205.0	205.0	Iran: Kurdistan	
7	120886.0	IRN-1990-1-260-6.2	1990	1.0	Clear	1.0	205.0	205.0	Iran: Kurdistan	
8	115501.0	IRN-1990-1-260-7	1990	1.0	Clear	1.0	205.0	205.0	Iran: Kurdistan	
9	115841.0	IRN-1990-1-260-8.1	1990	1.0	Clear	1.0	205.0	205.0	Iran: Kurdistan	

10 rows × 50 columns

```
#Check for DataFrame Information
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 449 entries, 0 to 448
Data columns (total 50 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   id                 448 non-null    float64
 1   relid              448 non-null    object 
 2   year               449 non-null    object 
 3   active_year        448 non-null    float64
 4   code_status        448 non-null    object 
 5   type_of_violence   448 non-null    float64
 6   conflict_dset_id   448 non-null    float64
 7   conflict_new_id    448 non-null    float64
 8   conflict_name      448 non-null    object 
 9   dyad_dset_id       448 non-null    float64
 10  dyad_new_id        448 non-null    float64
 11  dyad_name          448 non-null    object 
 12  side_a_dset_id     448 non-null    float64
 13  side_a_new_id      448 non-null    float64
 14  side_a             449 non-null    object 
 15  side_b_dset_id     448 non-null    float64
 16  side_b_new_id      448 non-null    float64
 17  side_b             449 non-null    object 
 18  number_of_sources  448 non-null    float64
 19  source_article     449 non-null    object 
 20  source_office      258 non-null    object 
 21  source_date        258 non-null    object 
 22  source_headline    259 non-null    object 
 23  source_original    382 non-null    object 
 24  where_prec         448 non-null    float64
 25  where_coordinates  449 non-null    object 
 26  where_description  409 non-null    object 
 27  adm_1              400 non-null    object 
 28  adm_2              331 non-null    object 
 29  latitude           449 non-null    object 
 30  longitude          449 non-null    object 
 31  geom_wkt           448 non-null    object 
 32  priogrid_gid       448 non-null    float64
 33  country            449 non-null    object 
 34  iso3               449 non-null    object 
 35  country_id         448 non-null    float64
 36  region             449 non-null    object 
 37  event_clarity      448 non-null    float64
 38  date_prec          448 non-null    float64
 39  date_start         449 non-null    object 
 40  date_end           449 non-null    object 
 41  deaths_a           448 non-null    float64
 42  deaths_b           448 non-null    float64
 43  deaths_civilians   448 non-null    float64
 44  deaths_unknown     448 non-null    float64
 45  best               449 non-null    object 
 46  high               448 non-null    float64
 47  low                448 non-null    float64
 48  gwnoa              447 non-null    float64
 49  gwnob              2 non-null      float64
dtypes: float64(25), object(25)
memory usage: 175.5+ KB
```

DATA Pre-Processing

```
# Check for missing values in each column
missing_values = data.isnull().sum().sum()
print("#Total Missing Values in the Dataset",missing_values)

# Check for NAN Values in a Dataset
total_nan = data.isna().sum().sum()
print("#Total NaN values in the dataset:", total_nan)

#Check for missing values in each column
missing_values = data.isnull().sum()
print("#Missing Values in Each Column\n",missing_values)
```

```
#Total Missing Values in the Dataset 1323
#Total NaN values in the dataset: 1323
#Missing Values in Each Column
 id                    1
relid                 1
year                  0
active_year           1
code_status           1
type_of_violence      1
conflict_dset_id      1
conflict_new_id       1
conflict_name         1
```

```
dyad_dset_id           1
dyad_new_id            1
dyad_name              1
side_a_dset_id         1
side_a_new_id          1
side_a                 0
side_b_dset_id         1
side_b_new_id          1
side_b                 0
number_of_sources      1
source_article         0
source_office        191
source_date          191
source_headline      190
source_original       67
where_prec             1
where_coordinates      0
where_description     40
adm_1                 49
adm_2                118
latitude               0
longitude              0
geom_wkt               1
priogrid_gid           1
country                0
iso3                   0
country_id             1
region                 0
event_clarity          1
date_prec              1
date_start             0
date_end               0
deaths_a               1
deaths_b               1
deaths_civilians       1
deaths_unknown         1
best                   0
high                   1
low                    1
gwnoa                  2
gwnob                447
dtype: int64
```

```python
# Convert numeric columns to proper types where applicable and handle missing data

# Replace missing numeric values with 0 (or another relevant placeholder based on the column meaning)
numeric_columns = ['deaths_a', 'deaths_b', 'deaths_civilians', 'deaths_unknown', 'best', 'high', 'low', 'latitude', 'longitude']

# Replace missing numeric values with 0
data[numeric_columns] = data[numeric_columns].fillna(0)

# Convert columns to appropriate data types
data['latitude'] = pd.to_numeric(data['latitude'], errors='coerce')
data['longitude'] = pd.to_numeric(data['longitude'], errors='coerce')

# Convert date columns to datetime format
date_columns = ['date_start', 'date_end']
for col in date_columns:
    data[col] = pd.to_datetime(data[col], errors='coerce')

# Drop rows where critical data is missing (e.g., conflict name, year)
#Rows with missing critical data (e.g., conflict name, year) were dropped.
cleaned_data = data.dropna(subset=['conflict_name', 'year'])

# Preview cleaned data
cleaned_data_info = cleaned_data.info()
cleaned_data_preview = cleaned_data.head()

cleaned_data_info, cleaned_data_preview

```

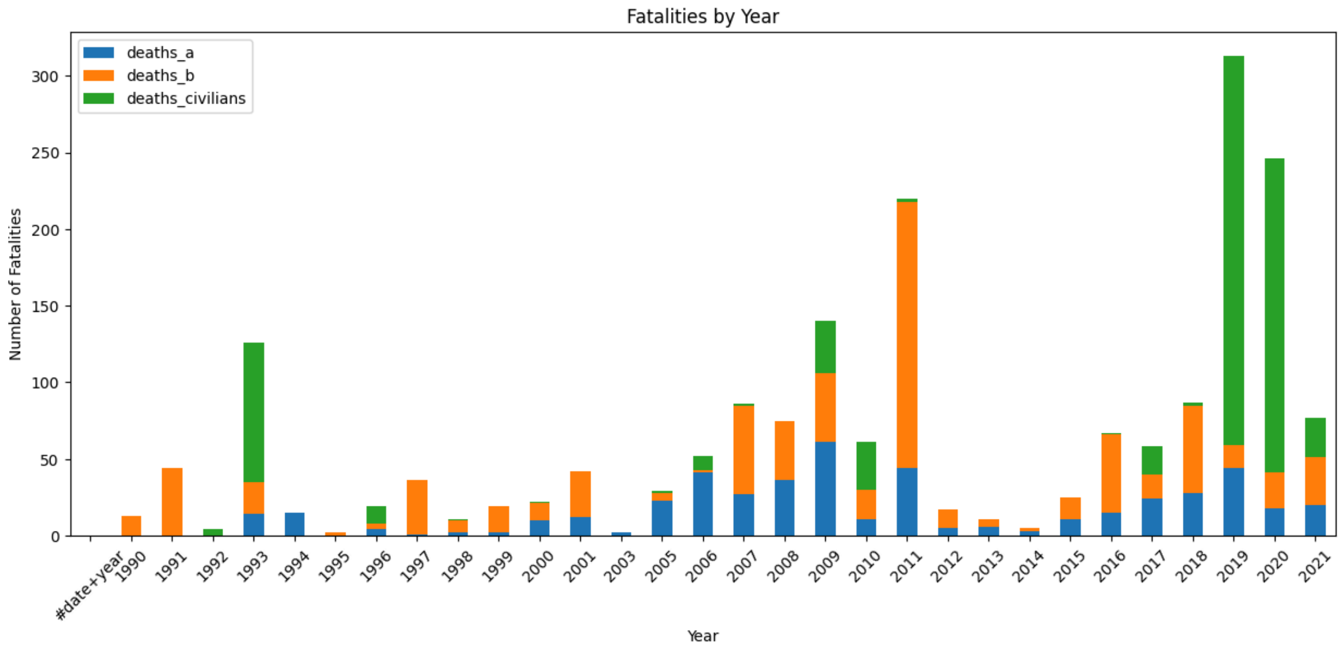
```
<class 'pandas.core.frame.DataFrame'>
Index: 448 entries, 1 to 448
Data columns (total 50 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   id                 448 non-null    float64
 1   relid              448 non-null    object
 2   year               448 non-null    object
 3   active_year        448 non-null    float64
 4   code_status        448 non-null    object
 5   type_of_violence   448 non-null    float64
 6   conflict_dset_id   448 non-null    float64
 7   conflict_new_id    448 non-null    float64
 8   conflict_name      448 non-null    object
 9   dyad_dset_id       448 non-null    float64
 10  dyad_new_id        448 non-null    float64
 11  dyad_name          448 non-null    object
 12  side_a_dset_id     448 non-null    float64
 13  side_a_new_id      448 non-null    float64
 14  side_a             448 non-null    object
 15  side_b_dset_id     448 non-null    float64
 16  side_b_new_id      448 non-null    float64
 17  side_b             448 non-null    object
 18  number_of_sources  448 non-null    float64
 19  source_article     448 non-null    object
 20  source_office      258 non-null    object
 21  source_date        258 non-null    object
 22  source_headline    258 non-null    object
 23  source_original    382 non-null    object
 24  where_prec         448 non-null    float64
 25  where_coordinates  448 non-null    object
 26  where_description  409 non-null    object
 27  adm_1              399 non-null    object
 28  adm_2              330 non-null    object
 29  latitude           448 non-null    float64
 30  longitude          448 non-null    float64
 31  geom_wkt           448 non-null    object
 32  priogrid_gid       448 non-null    float64
 33  country            448 non-null    object
 34  iso3               448 non-null    object
 35  country_id         448 non-null    float64
 36  region             448 non-null    object
 37  event_clarity      448 non-null    float64
 38  date_prec          448 non-null    float64
 39  date_start         448 non-null    datetime64[ns]
 40  date_end           448 non-null    datetime64[ns]
 41  deaths_a           448 non-null    float64
 42  deaths_b           448 non-null    float64
 43  deaths_civilians   448 non-null    float64
 44  deaths_unknown     448 non-null    float64
 45  best               448 non-null    object
 46  high               448 non-null    float64
 47  low                448 non-null    float64
 48  gwnoa              447 non-null    float64
 49  gwnob              2 non-null      float64
dtypes: datetime64[ns](2), float64(27), object(21)
memory usage: 178.5+ KB
(None,
```

```
# # Check for missing values(null,Nan) in each column
missing_values = cleaned_data.isnull().sum().sum()
total_nan_after = cleaned_data.isna().sum().sum()

# Verify changes
print("Total Missing Values",missing_values)
print("Total NaN values after filling:", total_nan_after)
```

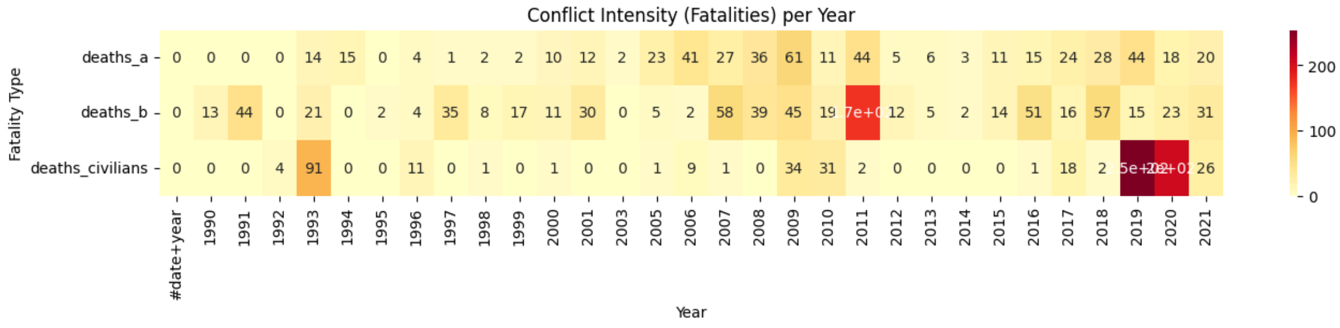
```
Total Missing Values 1289
Total NaN values after filling: 1289
```

Visualization of the Dataset

```
# Aggregate fatalities by year
fatalities_per_year = data.groupby('year')[['deaths_a', 'deaths_b', 'deaths_civilians']].sum()

# Plot Stacked Bar Chart
fatalities_per_year.plot(kind='bar', stacked=True, figsize=(15,6))
plt.title('Fatalities by Year')
plt.xlabel('Year')
plt.ylabel('Number of Fatalities')
plt.xticks(rotation=45)
plt.show()
```



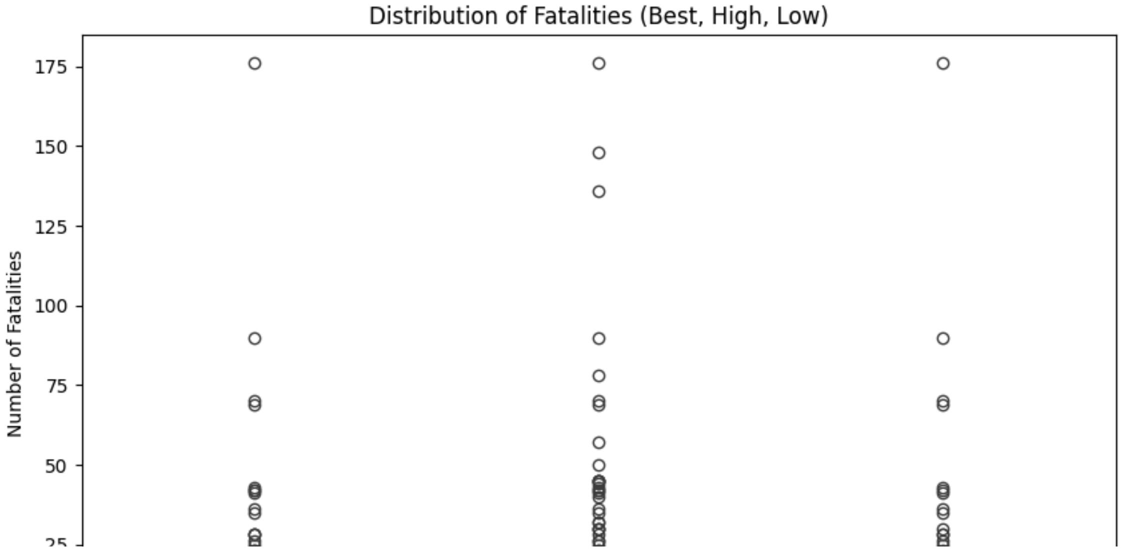
```
# Plot heatmap using Seaborn for fatalities per year
plt.figure(figsize=(16,2))
sns.heatmap(fatalities_per_year.T, cmap='YlOrRd', annot=True)
plt.title('Conflict Intensity (Fatalities) per Year')
plt.xlabel('Year')
plt.ylabel('Fatality Type')
plt.show()

```



	#date+year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
deaths_a	0	0	0	0	14	15	0	4	1	2	2	10	12	2	23	41	27	36	61	11	44	5	6	3	11	15	24	28	44	18	20
deaths_b	0	13	44	0	21	0	2	4	35	8	17	11	30	0	5	2	58	39	45	19	1.7e+02	12	5	2	14	51	16	57	15	23	31
deaths_civilians	0	0	0	4	91	0	0	11	0	1	0	1	0	0	1	9	1	0	34	31	2	0	0	0	0	1	18	2	2.5e+02	2e+02	26

```
import plotly.express as px

# Add a new column for total fatalities, replacing NaN with 0
geo_data['total_fatalities'] = geo_data['deaths_a'].fillna(0) + geo_data['deaths_b'].fillna(0) + geo_data['deaths_civilians'].fillna

# Create the interactive scatter map
fig = px.scatter_geo(
    geo_data,
    lat='latitude',
    lon='longitude',
    hover_name='conflict_name',
    hover_data={
        'year': True,
        'deaths_a': True,
        'deaths_b': True,
        'deaths_civilians': True,
        'total_fatalities': True,
        'date_start': True,
        'date_end': True
    },
    color='total_fatalities',  # Color markers based on total fatalities
    size='total_fatalities',  # Adjust marker size based on total fatalities
    size_max=30,  # Increased maximum marker size for better visibility
    color_continuous_scale='Viridis',  # Use a different color scale
    title='Conflict Distribution by Location (Size & Color by Fatalities)',
    template='plotly_dark',
    projection='natural earth'  # Use a natural earth projection
)

# Improve layout: Set zoom, add geographic borders, and customize appearance
fig.update_layout(
    geo=dict(
        showland=True,
        landcolor='rgb(243, 243, 243)',
        showcountries=True,
        countrycolor='rgb(204, 204, 204)',
        coastlinecolor='rgb(204, 204, 204)',
        projection_scale=3  # Adjust zoom level (higher is more zoomed in)
    ),
    margin={"r":0,"t":50,"l":0,"b":0},  # Reduce margins for better view
    coloraxis_colorbar=dict(
        title="Total Fatalities",  # Add a color bar title
        ticks="outside"
    ),
    legend_title=dict(text="Total Fatalities")
)

# Optional: Customize marker appearance
fig.update_traces(marker=dict(opacity=0.7, line=dict(width=0.5, color='DarkSlateGrey')))  # Set opacity and border

fig.show()

```

```
# Convert 'best', 'high', 'low' to numeric for proper plotting
data['best'] = pd.to_numeric(data['best'], errors='coerce')
data['high'] = pd.to_numeric(data['high'], errors='coerce')
data['low'] = pd.to_numeric(data['low'], errors='coerce')

# Plot box plot for fatalities
plt.figure(figsize=(10,6))
sns.boxplot(data=data[['best', 'high', 'low']])
plt.title('Distribution of Fatalities (Best, High, Low)')
plt.ylabel('Number of Fatalities')
plt.show()

```


Distribution of Fatalities (Best, High, Low)
Number of Fatalities
175
150
125
100
75
50
25