FINAL REPORT OF TRAINEESHIP PROGRAM 2023

On

"Analyse Death Age Difference of Right Handers with Left Handers"

MEDTOUREASY

28th August 2023

ACKNOWLDEGMENT

The traineeship experience with MedTourEasy has been nothing short of transformative, offering me a profound opportunity to delve into the complexities of Data Analytics. This journey has not only enriched my academic understanding but has also contributed significantly to my personal and professional growth.

Foremost, my heartfelt appreciation goes to the Training & Development Team at MedTourEasy for extending to me the chance to partake in this enriching journey within their esteemed organization. Their support has been a cornerstone of this experience.

In retrospect, this traineeship with MedTourEasy has been a pivotal chapter in my growth, equipping me with skills and insights that will undoubtedly shape my future endeavours.

With heartfelt Thanks,

Tejasva Maurya

ABSTRACT

There is a popular myth that left-handed people die younger than right-handed people. This myth has its roots in a series of flawed papers published in the late 1980s and early 1990s. The studies were conducted in Southern California, where lists are published of everyone who has died. The researchers took a list of the people who had recently died and contacted their families, asking whether or not their relative had been right- or left-handed. Looking at 2,000 cases, they saw that the average age at death of the left-handers was about nine years younger than of the right-handers. On that basis, they concluded that left-handers died earlier.

However, critics of these studies have noted that their methodologies were flawed, as they assumed a static proportion of left and right-handed people throughout time, despite the fact that many people who were born in early 1900s were likely pressured to become right-handed at an early age and would not identify as left-handed at death. Chris McManus, professor of psychology and medical education at University College London and the author of Right Hand, Left Hand, explains that the researchers made a "very subtle error" by only looking at the dead. The point is that left-handers are more common now than they used to be, so - at least at the time the research was published - left-handers were on average younger than right-handers.

In conclusion, there is no scientific evidence to support the claim that left-handed people die younger than right-handed people. The myth is based on flawed research and has been debunked by experts in the field.

Therefore, in this project we will explore this phenomenon using age distribution data to see if we can reproduce a difference in average age at death purely from the changing rates of left-handedness over time, refuting the claim of early death for left-handers. By using pandas and Bayesian statistics to analyze the probability of being a certain age at death given that you are reported as left-handed or right-handed.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 About the company:-

MedTourEasy, a global healthcare company, provides you the informational resources needed to evaluate your global options. MedTourEasy provides analytical solutions to our partner healthcare providers globally.

1.2 About the Project:-

There is a urban legend that says "**Lefties Die Earlier than Righties**". A 1991 study (Handedness and Life Span) reported that left-handed people die on average of nine years earlier than right-handed peple.

A National Geographic survey in 1986 resulted in over a million responses that included age, sex, and hand preference for throwing and writing. Researchers Avery Gilbert and Charles Wysocki analyzed this data and noticed that rates of left-handedness were around 13% for people younger than 40 but decreased with age to about 5% by the age of 80. They concluded based on analysis of a subgroup of people who throw left-handed but write right-handed that this age-dependence was primarily due to changing social acceptability of left-handedness. This means that the rates aren't a factor of age specifically but rather of the year you were born.

In that reference, it is extremely crucial to find the the probability of being a certain age at death given that you are reported as left-handed or right-handed to analyze this myth. Additionally, MedTourEasy, being one of the global upcoming tele-medicine company in global healthcare, it is important for the firm to verify the truthfulness of this myth to gain valuable insight on death. Also, based on the result of analysis, we can say whether being left-handed or right-handed influence early death or not.

Hence, in this project aims to analyze large datasets to find the probability of death at certain age on the basis of left-handed or right-handed in order to gain meaningful insights.

1.3 Objectives and Deliverables:

In this project, our primary focus is on investigating a highly debated assertion regarding left-handedness – the alleged link to premature death. Utilizing techniques for data analysis and statistical methodologies, our objective is to thoroughly assess the credibility of this assertion and explore the underlying factors that could potentially clarify the observed differences in life expectancy between individuals who are left-handed and those who are right-handed.

Additionally, we aim to explore the changing patterns of left-handedness rates over different time periods and various geographical regions. Through a careful analysis, we hope to decipher the significance of these fluctuations, thus deepening our understanding of this complex phenomenon.

We will utilize pandas to efficiently manage and visually present the data. Moreover, our toolkit will encompass Bayesian statistics, enabling us to estimate the probabilities of reaching specific ages at the time of death based on whether an individual identifies as left-handed or right-handed. Our investigation will also involve examining how the prevalence of left-handedness has evolved over time due to the influence of societal and cultural factors. The intricate interplay of these dynamics will provide insights into comparing the average age at death between these two distinct groups.

Ultimately, the goal of this project is to offer a well-founded evaluation of the assertion concerning left-handedness and its potential connection to early mortality. By employing a multi-faceted approach that combines data analysis, statistical inference, and historical examination, we anticipate uncovering novel insights into this captivating phenomenon.

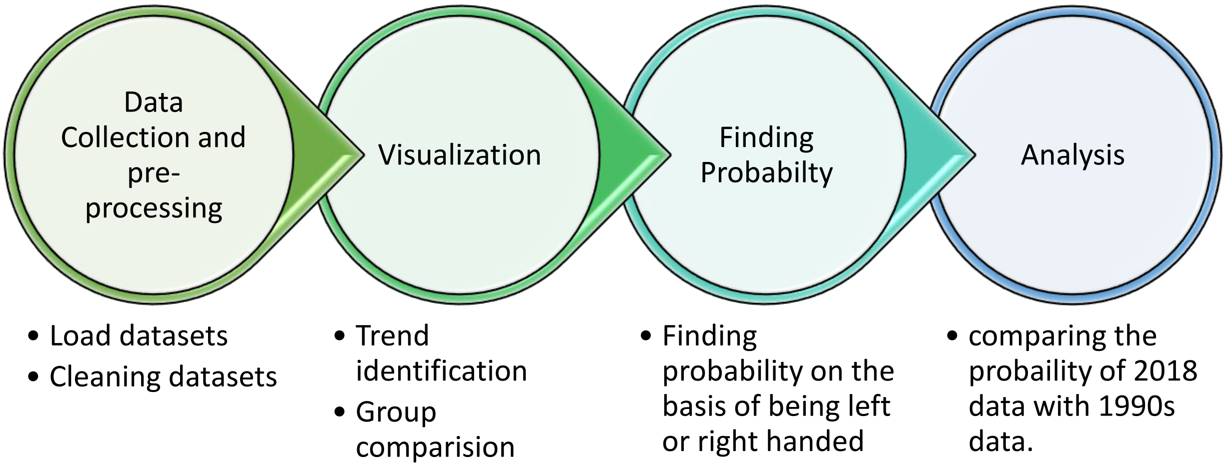
Deliverables of this analysis are :-

i. Graphical representation of male and female left-handedness rates vs Age.
ii. Comparing Rates of left-handedness over time
iii. Overall probability of left-handedness.
iv. Graph to show probability of death at a certain age given that you are left handed.
v. Summary report that highlights of the main finding and conclusion of the analysis, supported by relevant graphs and statistics.

2. METHODOLOGY

2.1 Work-Flow Diagram :-

The project followed the following steps to accomplish the desired objectives



2.2 Language and Platform Used :-

Language :- Python

Python has emerged as a dynamic and widely embraced programming language for data analytics. Its user-friendly syntax, accompanied by powerful libraries like NumPy, pandas, and Matplotlib, has transformed data manipulation, analysis, and visualization into seamless tasks.

It's key features are :

- **Simplified Syntax:** Python's clear and intuitive syntax simplifies coding, encompassing essentials like loops, conditionals, and functions for effective data handling.
- **Efficient Data Handling:** The NumPy library ensures efficient data processing through array support and mathematical operations, catering to extensive datasets.
- **Flexible Structures:** Python accommodates diverse data structures, empowering analysts to adapt to various data formats, from lists to dictionaries.
- **Visualization Capabilities:** Libraries like Matplotlib and Seaborn facilitate interactive visualizations, enhancing data interpretation and presentation.
- **Interactivity with Jupyter:** Jupyter Notebooks provide an interactive platform, fusing code and visuals, fostering an iterative approach to analysis.
- **Advanced Analytics:** Python extends beyond conventional statistics, enabling machine learning and predictive modeling, bolstering analytical potential.

In conclusion, Python's versatility, propelled by its libraries and interactive tools, positions it as an indispensable asset in the realm of data analytics.

2.3 IDE :-

JupyterLab

JupyterLab stands as a dynamic data science environment, unifying code cells, interactive visuals, and text for comprehensive analysis and collaboration.

It's key features are :-

- **Modular Interface:** Its customizable layout adapts to workflows, promoting organized and efficient data exploration.
- **Language Versatility:** Supporting Python, R, Julia, and more, JupyterLab accommodates diverse analysis needs.
- **Interactive Output:** Real-time plots and widgets enrich analysis, enhancing engagement and insights.
- **Collaborative Integration:** Git integration aids teamwork, ensuring version control and seamless sharing.
- **Extensions and Sharing:** Extend functionality with plugins and share notebooks effortlessly for collaborative research.
- **Iterative Coding:** Cell-based execution enables testing and refining code snippets iteratively.

In essence, JupyterLab offers a versatile workspace where code, analysis, and visuals converge, catering to data scientists and researchers with agility and interactivity.

2.4 Packages Used:

- **NumPy:** NumPy is a fundamental package for numerical computations in Python. It introduces support for arrays and matrices, along with a plethora of mathematical functions to perform operations efficiently. It's a cornerstone for scientific computing and data manipulation.
- **pandas:** pandas is a versatile data analysis and manipulation library. It offers data structures like DataFrames and Series that simplify handling and analyzing structured data. With functions for data cleaning, transformation, and aggregation, it's an essential tool for data professionals.
- **Matplotlib:** Matplotlib is a powerful data visualization library. It allows you to create a wide variety of charts, plots, and graphs to represent data visually. Its customizable nature makes it suitable for both basic and advanced visualization needs.

4. TASK, CODE AND OUTPUTS:-

Task 1 :-

Instructions :-

- Load the handedness data from the National Geographic survey and create a scatter plot.
- Import pandas as pd and matplotlib.pyplot as plt.
- Load the data into a pandas Data Frame named lefthanded_data using the provided data_url_1. Note that the file is a CSV file.
- Use the .plot() method to create a plot of the "Male" and "Female" columns vs. "Age".

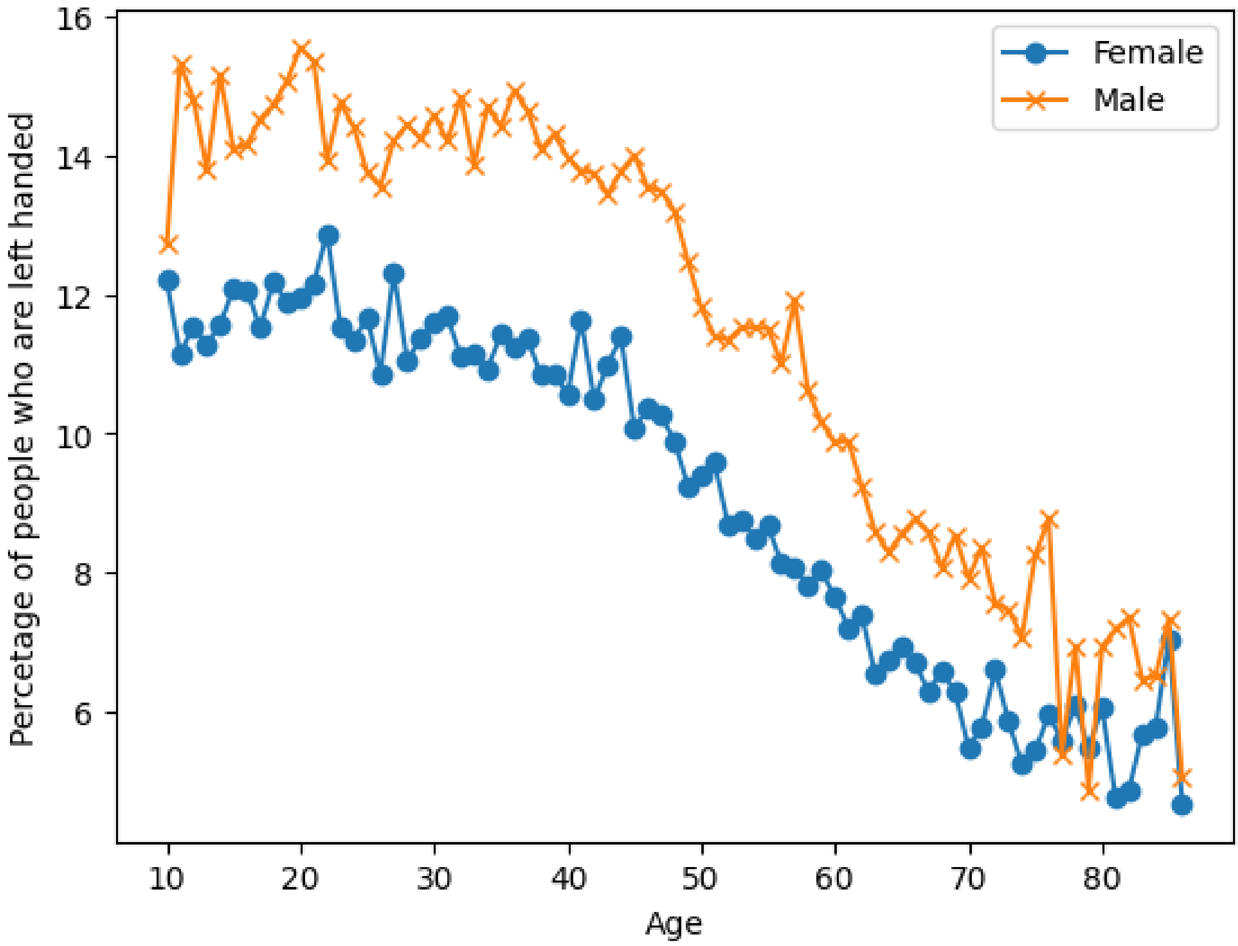
Code 1:-

```python
# import libraries
# ... YOUR CODE FOR TASK 1 ...
import pandas as pd
import matplotlib.pyplot as plt

# load the data
data_url_1 = "https://gist.githubusercontent.com/mbonsma/8da0990b71ba9a09f7de395574e54df1/raw/aec88b30af87fad8d45da7e774223f91dad09e88/lh_data.csv"
lefthanded_data = pd.read_csv(data_url_1,sep = ",")

# plot male and female left-handedness rates vs. age
%matplotlib inline
fig, ax = plt.subplots() # create figure and axis objects
ax.plot("Age", "Female", data = lefthanded_data, marker = 'o') # plot "Female" vs. "Age"
ax.plot("Age", "Male", data = lefthanded_data , marker = 'x') # plot "Male" vs. "Age"
ax.legend() # add a legend
ax.set_xlabel('Age')
ax.set_ylabel("Percetage of people who are left handed")
```

Output 1 :-



TASK 2 :-

Instructions :-

Add two new columns, one for birth year and one for mean left-handedness, then plot the mean as a function of birth year.

- Create a column in lefthanded_data called Birth_year, which is equal to 1986- Age (since the study was done in 1986).
- Create a column in lefthanded_data called Mean_lh which is equal to the mean of the Male and Female columns.
- Use the .plot() method to plot Mean_lh vs. Birth_year.

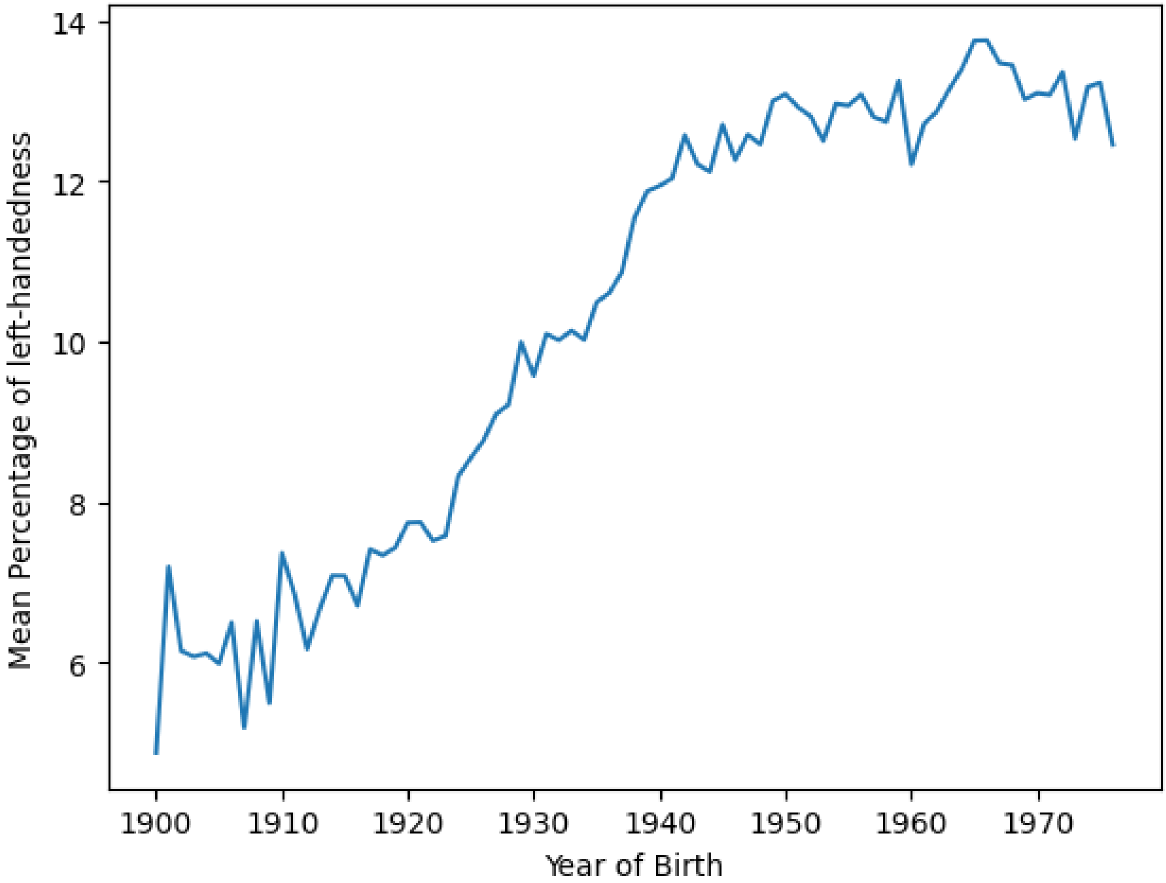
Code 2 :-

```
# create a new column for birth year of each age
# ... YOUR CODE FOR TASK 2 ...
lefthanded_data["Birth_year"] = 1986 - lefthanded_data["Age"]

# create a new column for the average of male and female
# ... YOUR CODE FOR TASK 2 ...
lefthanded_data["Mean_lh"] = (lefthanded_data.Female + lefthanded_data.Male )/2


# create a plot of the 'Mean_lh' column vs. 'Birth_year'
fig, ax = plt.subplots()
ax.plot("Birth_year", "Mean_lh", data = lefthanded_data) # plot 'Mean_lh' vs. 'Birth_year'
ax.set_xlabel("Year of Birth") # set the x label for the plot
ax.set_ylabel("Mean Percentage of left-handedness") # set the y label for the plot
```

<u>Output 2 :-</u>



TASK 3 :-

<u>Instructions :-</u>

- Create a function that will return P(LH | A) for particular ages of death in a given study year.
- Import the NumPy package aliased as np.
- Use the last ten Mean_lh data points to get an average rate for the early 1900s. Name the resulting DataFrame early_1900s_rate.

- Use the first ten Mean_lh data points to get an average rate for the late 1900s. Name the resulting DataFrame late_1900s_rate.
- For the early 1900s ages, fill in P_return with the appropriate left-handedness rates for ages_of_death. That is, input early_1900s_rate as a fraction, i.e., divide by 100.
- For the late 1900s ages, fill in P_return with the appropriate left-handedness rates for ages_of_death. That is, input late_1900s_rate as a fraction, i.e., divide by 100.
- When calculating early_1900s_rate and late_1900s_rate, remember that because the original data was from youngest age to oldest age, that means that the data is organized from latest birth year to earliest birth year. You will use the first ten Mean_lh data points to get an average rate for the late 1900s and the last ten for the early 1900s.

Code 3 :-

```
# import library
# ... YOUR CODE FOR TASK 3 ...
import numpy as np

# create a function for P(LH | A)
def P_lh_given_A(ages_of_death, study_year = 1990):
    """ P(Left-handed | ages of death), calculated based on the reported rates of left-handedness.
    Inputs: numpy array of ages of death, study_year
    Returns: probability of left-handedness given that subjects died in `study_year` at ages `ages_of_death` """

    # Use the mean of the 10 last and 10 first points for left-handedness rates before and after the start
    early_1900s_rate = lefthanded_data["Mean_lh"][-10:].mean()
    late_1900s_rate = lefthanded_data["Mean_lh"][:10].mean()
    middle_rates = lefthanded_data.loc[lefthanded_data['Birth_year'].isin(study_year - ages_of_death)]['Mean_lh']
    youngest_age = study_year - 1986 + 10 # the youngest age is 10
    oldest_age = study_year - 1986 + 86 # the oldest age is 86

    P_return = np.zeros(ages_of_death.shape) # create an empty array to store the results
    # extract rate of left-handedness for people of ages 'ages_of_death'
    P_return[ages_of_death > oldest_age] = early_1900s_rate/100
    P_return[ages_of_death < youngest_age] = late_1900s_rate/100
    P_return[np.logical_and((ages_of_death <= oldest_age), (ages_of_death >= youngest_age))] = middle_rates / 100

    return P_return
```

TASK 4 :-

Instructions :-

- Load death distribution data for the United States and plot it.
- Load death distribution data in the provided data_url_2 into death_distribution_data,setting sep = '\t' and skiprows=[1] to account for the dataset's format.
- Drop the NaN values from the Both Sexes column.
- Use the .plot() method to plot the number of people who died as a function of their age.

Code 4 :-

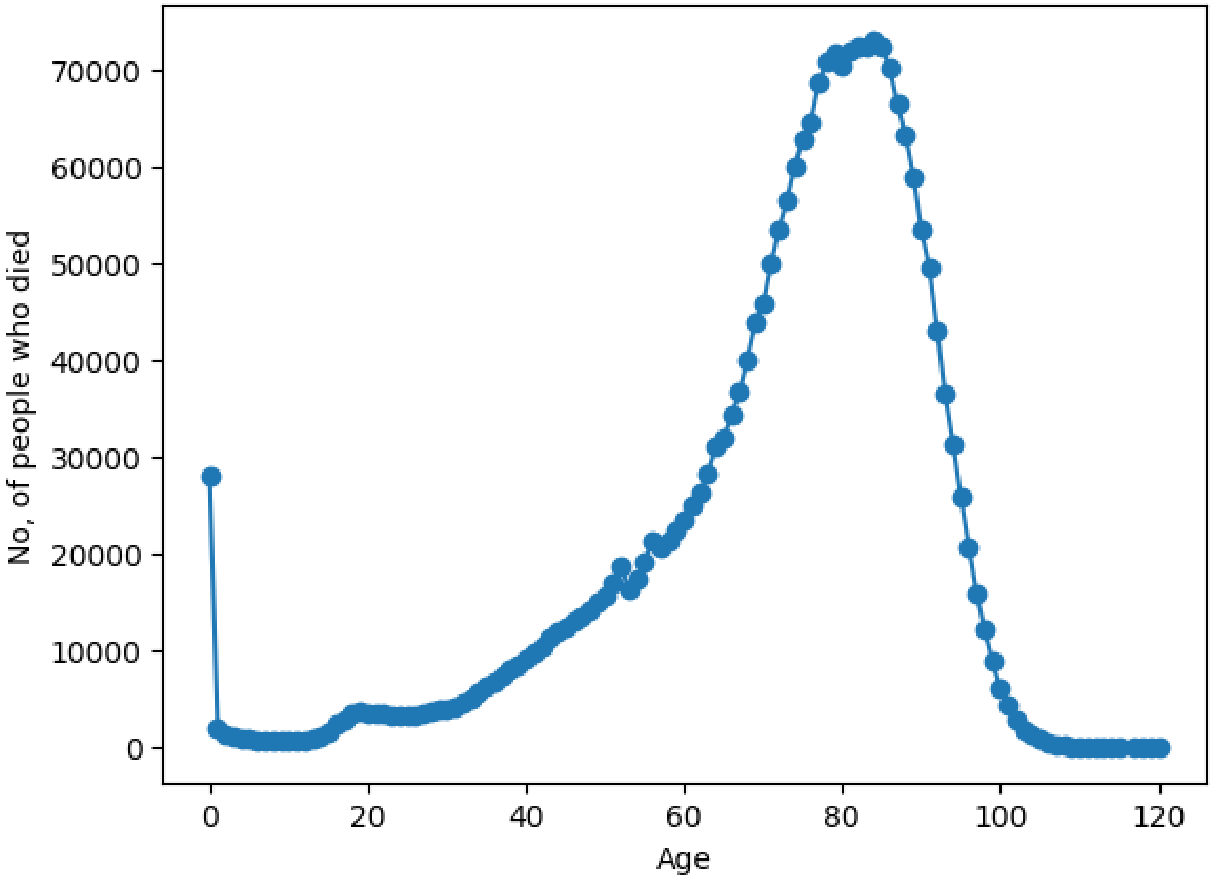
```python
# Death distribution data for the United States in 1999
data_url_2 = "https://gist.githubusercontent.com/mbonsma/2f4076aab6820ca1807f4e29f75f18ec/raw/62f3ec07514c7e31f5979beeca86f19991540796/cdc_vs00199_table310.tsv"

# load death distribution data
# ... YOUR CODE FOR TASK 4 ...
death_distribution_data = pd.read_csv(data_url_2, sep="\t", skiprows = [1])


# drop NaN values from the `Both Sexes` column
# ... YOUR CODE FOR TASK 4 ...
death_distribution_data = death_distribution_data.dropna(subset = ["Both Sexes"] )

# plot number of people who died as a function of age
fig, ax = plt.subplots()
ax.plot("Age", "Both Sexes", data = death_distribution_data , marker='o') # plot 'Both Sexes' vs. 'Age'
ax.set_xlabel("Age")
ax.set_ylabel("No, of people who died")
```

Output 4 :-



TASK 5 :-

Instructions :-

- Create a function called P_lh() which calculates the overall probability of left-handedness in the population for a given study year.
- Create a series, p_list, by multiplying the number of dead people in the Both Sexes column with the probability of their being lefthanded using P_lh_given_A().
- Set the variable p equal to the sum of that series.
- Divide p by the total number of dead people by summing death_distribution_data over the Both Sexes column. Return result from the function. P(LH | A) was defined in TASK3. N(A) is the value of Both Sexes in the death_distribution_data DataFrame

where the Age column is equal to A. The denominator is total number of dead people, which you can get by summing over the entire data frame in the Both Sexes column.

Code 5 :-

```
def P_lh(death_distribution_data, study_year = 1990): # sum over P_lh for each age group
    """ Overall probability of being left-handed if you died in the study year
    Input: dataframe of death distribution data, study year
    Output: P(LH), a single floating point number """
    p_list = death_distribution_data["Both Sexes"] * P_lh_given_A(death_distribution_data["Age"] , study_year) # multiply number of dead people by P_lh_given_A
    p = np.sum(p_list) # calculate the sum of p_list
    return p/np.sum(death_distribution_data["Both Sexes"]) # normalize to total number of people (sum of death_distribution_data['Both Sexes'])

print(P_lh(death_distribution_data))
```

Output 5 :-

```
0.07766387615350638
```

TASK 6 :-

Instructions :-

- Write a function to calculate P_A_given_lh().
- Calculate P_A, the overall probability of dying at age A, which is given by
- death_distribution_data at age A divided by the total number of dead people (the sum of the Both Sexes column of death_distribution_data).
- Calculate the overall probability of left-handedness P(LH) using the unction defined in TASK 5.
- Calculate P(LH | A) using the function defined in TASK 3.

Code 6 :-

```
def P_A_given_lh(ages_of_death, death_distribution_data, study_year = 1990):
    """ The overall probability of being a particular `age_of_death` given that you're left-handed """
    P_A = death_distribution_data["Both Sexes"][ages_of_death]/ np.sum(death_distribution_data["Both Sexes"])
    P_left = P_lh(death_distribution_data, study_year) # use P_lh function to get probability of left-handedness overall
    P_lh_A = P_lh_given_A(ages_of_death, study_year) # use P_lh_given_A to get probability of left-handedness for a certain age
    return P_lh_A*P_A/P_left
```

TASK 7 :-

Instructions :-

- Write a function to calculate P_A_given_rh().
- Calculate P_A, the overall probability of dying at age A, which is given by death_distribution_data at age A divided by the total number of dead people. (This value is the same as in TASK 6.)
- Calculate the overall probability of right-handedness P(RH), which is
- 1-P(LH).•Calculate P(RH | A), which is 1 - P(LH | A).

Code 7 :-

```python
def P_A_given_rh(ages_of_death, death_distribution_data, study_year = 1990):
    """ The overall probability of being a particular `age_of_death` given that you're right-handed """
    P_A = death_distribution_data["Both Sexes"][ages_of_death]/ np.sum(death_distribution_data["Both Sexes"])
    P_right = 1-P_lh(death_distribution_data,study_year) # either you're left-handed or right-handed, so P_right = 1 - P_left
    P_rh_A = 1-P_lh_given_A(ages_of_death, study_year) # P_rh_A = 1 - P_lh_A
    return P_rh_A*P_A/P_right
```

TASK 8 :-

Instructions :-

- Plot the probability of being a certain age at death given that you're left or right-handed for a range of ages.
- Calculate P_A_given_lh and P_A_given_rh using the functions defined in TASK 6.
- Use the .plot() method to plot the results versus age.

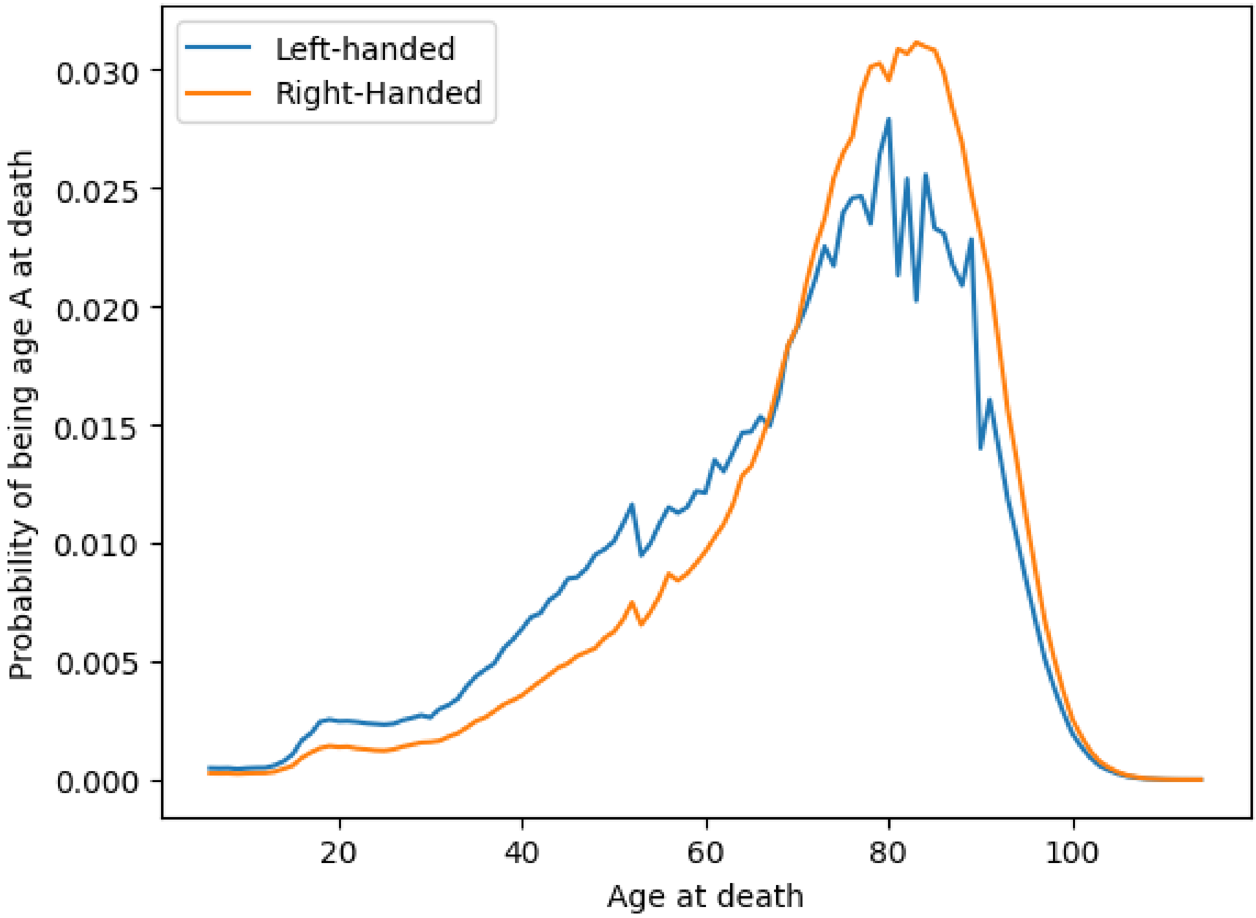
Code 8 :-

```python
ages = np.arange(6, 115, 1) # make a list of ages of death to plot

# calculate the probability of being left- or right-handed for each
left_handed_probability = P_A_given_lh(ages, death_distribution_data)
right_handed_probability = P_A_given_rh(ages,death_distribution_data)

# create a plot of the two probabilities vs. age
fig, ax = plt.subplots() # create figure and axis objects
ax.plot(ages, left_handed_probability, label = "Left-handed")
ax.plot(ages, right_handed_probability , label = "Right-Handed")
ax.legend() # add a legend
ax.set_xlabel("Age at death")
ax.set_ylabel(r"Probability of being age A at death")
```

Output 8 :-



TASK 9 :-

Instructions :-

- Find the mean age at death for left-handers and right-handers.
- Multiply the ages list by the left-handed probabilities of being those ages at death, then use np.nan sum to calculate the sum. Assign the result to average_lh_age.
- Do the same with the right-handed probabilities to calculate average_rh_age.
- Print average_lh_age and average_rh_age.
- Calculate the difference between the two average ages and print it. To make your printed output prettier, try using the round() function to round your results to two decimal places.

Code 9 :-

```
# calculate average ages for left-handed and right-handed groups
# use np.array so that two arrays can be multiplied
average_lh_age =  np.nansum(ages*np.array(left_handed_probability))
average_rh_age =  np.nansum(ages*np.array(right_handed_probability))

# print the average ages for each group
# ... YOUR CODE FOR TASK 9 ...
print(round(average_lh_age,1))
print(round(average_rh_age,1))

# print the difference between the average ages
print("The difference in average ages is " + str(round(average_rh_age- average_lh_age, 1)) + " years.")
```

Output 9 :-

```
67.2
72.8
The difference in average ages is 5.5 years.
```

TASK 10 :-

Instructions :-

- Redo the calculation from TASK 8, setting the study_year parameter to 2018.
- In the call to P_A_given_lh, set age_of_death to ages,
- death_distribution_data to death_distribution_data, and study_year to 2018.
- Do the same for P_A_given_rh.

Code 10 :-

```
# Calculate the probability of being left- or right-handed for all ages
left_handed_probability_2018 = P_A_given_lh(ages,death_distribution_data, study_year=2018)
right_handed_probability_2018 = P_A_given_rh(ages,death_distribution_data, study_year=2018)

# calculate average ages for left-handed and right-handed groups
average_lh_age_2018 = np.nansum(ages*np.array(left_handed_probability_2018))
average_rh_age_2018 = np.nansum(ages*np.array(right_handed_probability_2018))

print("The difference in average ages is " +
      str(round(average_rh_age_2018 - average_lh_age_2018, 1)) + " years.")
```

Output 10 :-

```
The difference in average ages is 2.3 years.
```

5. SUMMARY OF ANALYSIS

5.1 Summary of the Methodology used :-

1. **Objective of the Investigation:** The primary goal of this investigation is to examine the proposed correlation between left-handed individuals and shorter lifespans compared to right-handed individuals.
2. **Methodology:** The analysis employs tools such as pandas (a data manipulation library) and Bayesian statistics to achieve its objectives. Bayesian statistics are known for their ability to handle probabilities and uncertainties effectively.
3. **Posterior Probabilities:** The investigation computes posterior probabilities using the Bayesian framework. These probabilities provide insights into the likelihood of being left-handed or right-handed based on the age at which individuals pass away. This framework integrates empirical survey data with carefully chosen prior probabilities.
4. **Age and Hand Preference Data:** The investigation relies on a dataset from a 1986 National Geographic survey. This dataset contains critical information such as respondents' age, gender, and hand preference. Importantly, the data reveals fluctuations in left-handedness rates across different age groups, attributed to evolving societal norms rather than biological aging.
5. **Evolution of Left-Handedness Norms:** The observed variations in left-handedness rates are explained by changing societal attitudes towards left-handedness over time.
6. **Exploration of Average Ages at Death:** The analysis goes beyond probability calculations to explore the expected average ages at death for both left-handed and right-handed individuals. This exploration aims to uncover any potential disparities between these two groups.
7. **Hypothesis Validation:** One of the investigation's goals is to test and either validate or disprove the hypothesis suggesting a difference in lifespan between left-handed and right-handed individuals.
8. **Visualizations:** The analysis employs compelling visualizations to present various facets of the datasets. These visual representations not only enrich the analysis but also serve as strong supporting evidence for the conclusions drawn.
9. **Contributions and Insights**: The investigation aspires to offer nuanced insights into the complex relationship between handedness and lifespan. By combining data-driven methodologies with Bayesian principles and strategic visualization, the analysis contributes to our understanding of how human traits intersect with the passage of time.

In summary, the investigation employs a rigorous analytical approach to explore the potential link between handedness and lifespan. By utilizing Bayesian statistics and comprehensive datasets, the analysis aims to provide valuable insights into a subject that encompasses both human attributes and temporal dynamics.

5.2 Key Findings of analysis :-

1. **<u>Changing Patterns of Left-Handedness</u>**
   The study reveals a significant shift in the average age difference between left-handed and right-handed individuals, now standing at 5.55 years, a decrease from the 9-year disparity identified in the 1990 research. This change is attributed to the evolving rates of left-handedness in the population over time. As left-handedness rates have surged from a mere 3% in the early 1900s to approximately 11% today, the study underscores that the older generations are more likely to be categorized as right-handed, thereby influencing analyses involving deceased individuals.
2. **<u>Inaccuracies and Variability in Analysis</u>**
   While shedding light on the evolving dynamics of handedness and aging, the study acknowledges certain limitations that could introduce inaccuracies in the analysis. The utilization of death distribution data from almost a decade after the study's initial year, along with the expansion of survey outcomes on left-handedness to encompass different age groups, may introduce variance in accuracy. The potential misalignment between extrapolated left-handedness rates and actual rates for specific age ranges further underscores the complexity of the analysis.
3. **<u>The Role of Methodology in Precision</u>**
   The study proposes enhancing the precision of its findings through the utilization of random sampling techniques. By applying such methodologies, the study could gauge the variability in age gaps with more accuracy. This approach involves selecting a smaller subset of recently deceased individuals and incorporating handedness probabilities derived from the survey data. This methodology would allow for a better understanding of the frequency at which a 9-year age gap would occur under the same assumptions and dataset.
4. **<u>Interplay of Handedness, Aging, and Societal Trends</u>**
   Ultimately, the study offers a compelling perspective on the intricate interplay between handedness, aging, and the shifting norms of society. The analysis delves into a landscape of statistical methodologies and draws insights from extensive datasets, revealing the nuanced complexities of human traits and the intricate weave of time. By examining the evolution of left-handedness rates across generations and its impact on the perception of age differences, the study provides a deeper understanding of the multifaceted nature of human characteristics and the dynamic influences of societal change.

6. FUTURE SCOPE

In the intricate tapestry of human characteristics, the interplay between hand preference and the disparities in death ages emerges as a captivating field of exploration. As we delve into this landscape, we uncover a multitude of interconnected avenues that offer insights into the intricate dance between genetics, lifestyle, psychology, and societal influences.

- **Holistic Longitudinal Exploration:** A comprehensive, long-term study tracking hand preferences and health outcomes across lifetimes could reveal how hand preference intertwines with aging and health, offering a nuanced understanding.
- **Influence Unraveled:** Delving into the interplay of genetics, environment, culture, and formative experiences could unravel the mystery behind age-based disparities in death ages between right-handers and left-handers.
- **Lifestyle and Well-Being:** By investigating variations in health behaviors and socioeconomic factors, we could gain insights into the interwoven tapestry of factors affecting longevity and overall well-being for diverse individuals.
- **Disease Insights and Custom Care:** Exploring handedness-related risks for age-related conditions presents an opportunity for personalized disease prevention and tailored management approaches, enriching healthcare strategies.
- **Meta-Analysis:** Beyond the Sum of Parts: Through meta-analysis, we can weave together diverse research threads to create a comprehensive fabric of understanding about how hand preference and age differences intersect.
- **Genetics and Psychology Unveiled:** Unveiling the genetic underpinnings of handedness and delving into the psychology behind it could reveal how these facets dance with health outcomes in intricate and unforeseen ways.
- **Equity and Access Impact**: Navigating the socioeconomic landscape reveals how factors like income, education, and healthcare access contribute to the mosaic of life expectancies, inspiring equitable health initiatives.
- **Actionable Interventions and Empowerment:** Guided by research, interventions could be tailored to empower individuals towards healthier lifestyles, bridging the longevity gap through targeted health-promotion strategies.

As we chart this unexplored territory, the nexus between hand preference, aging, and health disparities holds the promise of reshaping our understanding of longevity and inspiring innovative pathways for improved well-being in the years to come.

7. CONCLUSION :-

Our analysis has effectively debunked the notion that left-handers have a shorter lifespan. Contrary to popular beliefs, our thorough study has revealed that there's no noteworthy distinction in the ages at which right-handers and left-handers pass away. This discovery challenges common misconceptions and emphasizes that being left-handed is simply a natural variation, not linked to shorter lifespans. As we move forward, it's crucial to critically examine unfounded ideas, relying on solid research to gain accurate insights into how our differences contribute to the rich tapestry of human diversity.

8. REFERENCE :-

Data Sources :-

The following Links have been used to obtain input data :-

Left-Handed Data :-
https://gist.githubusercontent.com/mbonsma/8da0990b71ba9a09f7de395574e54df1/raw/aec88b30af87fad8d45da7e774223f91dad09e88/lh_data.csv

Death Distribution Data :-

https://gist.githubusercontent.com/mbonsma/2f4076aab6820ca1807f4e29f75f18ec/raw/62f3ec07514c7e31f5979beeca86f19991540796/cdc_vs00199_table310.tsv