

Clinical and Translational Science
Informatics and Technology

Pre-Interview Report
on
A Problem with Presidents Challenge

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A Problem with Presidents; a data to information challenge

1 Introduction

Beginning from July 4, 1776, the United States has been served by 46 presidents, starting with George Washington in 1789 to our current president Joe Biden. The presented challenge is focused on the life expectancy distribution of all American presidents and deriving meaningful conclusions from the data provided.

2 Source Code

Programming Language: Python

Python code with execution in the form of a Jupyter notebook can be found with the filename "[Solution Shivam HiringChallenge \(1\).ipynb](https://github.com/shivamgupta-7/a_problem_with_presidents)" in the GitHub repository "https://github.com/shivamgupta-7/a_problem_with_presidents". The screenshots included in the later sections of the report are taken from the code and are visualizations of the data to derive conclusions.

3 Methodology

The raw input data had certain NaN and NaT values in the death columns for presidents that are still alive. The data thus was subjected to data cleaning by first populating the cells which had NaN values in the "LOCATION OF DEATH" column with a value 'Living', for computational ease. The "DEATH DATE" for these data points was then set to the current date and time so as to compute the age of each individual President as of today.

The NaN and NaT values are visible when the data is first presented after importing and then can be seen after data cleaning. All data manipulations and calculations are performed using NumPy and Pandas in Python.

4 Observations

4.1 Top 10 Longest-Lived Presidents

According to the data used as input, President Jimmy Carter is currently the oldest president still alive at 98.28 years old, while President George Bush had the longest life expectancy when he passed away at 94.46. The top 10 presidents who lived the longest are listed in the table below.

	PRESIDENT	BIRTH DATE	BIRTH PLACE	DEATH DATE	LOCATION OF DEATH	BIRTH	DEATH	living	lived_days	lived_months	lived_years
37	Jimmy Carter	Oct 1, 1924	Plains, Georgia	Living	Living	1924-10-01	2023-01-12 12:57:58.519931	2023-01-12 12:57:58.519931	35897.540261	1179.409524	98.284127
39	George Bush	June 12, 1924	Milton, Mass.	Nov 30, 2018	Houston, Texas	1924-06-12	2018-11-30 00:00:00.000000	2018-11-30 00:00:00.000000	34504.000000	1133.624920	94.468743
36	Gerald Ford	July 14, 1913	Omaha, Nebraska	Dec 26, 2006	Rancho Mirage, Cal.	1913-07-14	2006-12-26 00:00:00.000000	2006-12-26 00:00:00.000000	34133.000000	1121.435758	93.452980
38	Ronald Reagan	Feb 6, 1911	Tampico, Illinois	June 5, 2004	Los Angeles, Cal.	1911-02-06	2004-06-05 00:00:00.000000	2004-06-05 00:00:00.000000	34088.000000	1119.957289	93.329774
1	John Adams	Oct 30, 1735	Quincy, Mass.	July 4, 1826	Quincy, Mass.	1735-10-30	1826-07-04 00:00:00.000000	1826-07-04 00:00:00.000000	33119.000000	1088.120906	90.676742
29	Herbert Hoover	Aug 10, 1874	West Branch, Iowa	Oct 20, 1964	New York, New York	1874-08-10	1964-10-20 00:00:00.000000	1964-10-20 00:00:00.000000	32943.000000	1082.338446	90.194871
31	Harry S. Truman	May 8, 1884	Lamar, Missouri	Dec 26, 1972	Kansas City, Missouri	1884-05-08	1972-12-26 00:00:00.000000	1972-12-26 00:00:00.000000	32373.000000	1063.611162	88.634264
3	James Madison	Mar 16, 1751	Port Conway, Va.	June 28, 1836	Orange Co., Va.	1751-03-16	1836-06-28 00:00:00.000000	1836-06-28 00:00:00.000000	31150.000000	1023.429639	85.285803
2	Thomas Jefferson	Apr 13, 1743	Albemarle Co., Va.	July 4, 1826	Albemarle Co., Va.	1743-04-13	1826-07-04 00:00:00.000000	1826-07-04 00:00:00.000000	30397.000000	998.689911	83.224159
35	Richard Nixon	Jan 9, 1913	Yorba Linda, Cal.	Apr 22, 1994	New York, New York	1913-01-09	1994-04-22 00:00:00.000000	1994-04-22 00:00:00.000000	29688.000000	975.395799	81.282983

Figure 1: Top 10 Presidents of the United States by age lived, longest-lived first

4.2 Top 10 Shortest-Lived Presidents

President John F Kennedy who was slain at the early age of 46.48 was deemed to be the president with the shortest lifespan based on the input data. President Barack Obama is the only living president who made the list at 61.44 years of age. The top 10 presidents who had the shortest lives are listed in the table below.

	PRESIDENT	BIRTH DATE	BIRTH PLACE	DEATH DATE	LOCATION OF DEATH	BIRTH	DEATH	living	lived_days	lived_months	lived_years
33	John F. Kennedy	May 29, 1917	Brookline, Mass.	Nov 22, 1963	Dallas, Texas	1917-05-29	1963-11-22 00:00:00.000000	1963-11-22 00:00:00.000000	16978.000000	557.810222	46.484185
19	James A. Garfield	Nov 19, 1831	Cuyahoga Co., Ohio	Sep 19, 1881	Elberon, New Jersey	1831-11-19	1881-09-19 00:00:00.000000	1881-09-19 00:00:00.000000	18202.000000	598.024600	49.835383
10	James K. Polk	Nov 2, 1795	Mecklenburg Co., N.C.	June 15, 1849	Nashville, Tennessee	1795-11-02	1849-06-15 00:00:00.000000	1849-06-15 00:00:00.000000	19583.000000	643.397195	53.616433
15	Abraham Lincoln	Feb 12, 1809	LaRue Co., Kentucky	Apr 15, 1865	Washington, D.C.	1809-02-12	1865-04-15 00:00:00.000000	1865-04-15 00:00:00.000000	20516.000000	674.050802	56.170900
20	Chester Arthur	Oct 5, 1829	Fairfield, Vermont	Nov 18, 1886	New York, New York	1829-10-05	1886-11-18 00:00:00.000000	1886-11-18 00:00:00.000000	20863.000000	685.451447	57.120954
27	Warren G. Harding	Nov 2, 1855	Morrow County, Ohio	Aug 2, 1923	San Francisco, Cal.	1855-11-02	1923-08-02 00:00:00.000000	1923-08-02 00:00:00.000000	21091.000000	692.942360	57.745197
23	William McKinley	Jan 29, 1843	Niles, Ohio	Sep 14, 1901	Buffalo, New York	1843-01-29	1901-09-14 00:00:00.000000	1901-09-14 00:00:00.000000	21412.000000	703.488778	58.624065
24	Theodore Roosevelt	Oct 27, 1858	New York, New York	Jan 6, 1919	Oyster Bay, New York	1858-10-27	1919-01-06 00:00:00.000000	1919-01-06 00:00:00.000000	21985.000000	722.314627	60.192886
28	Calvin Coolidge	July 4, 1872	Plymouth, Vermont	Jan 5, 1933	Northampton, Mass.	1872-07-04	1933-01-05 00:00:00.000000	1933-01-05 00:00:00.000000	22099.000000	726.060083	60.505007
42	Barack Obama	Aug 4, 1961	Honolulu, Hawaii	Living	Living	1961-08-04	2023-01-12 12:57:58.519931	2023-01-12 12:57:58.519931	22441.540261	737.314204	61.442850

Figure 2: Top 10 Presidents of the United States by age lived, shortest-lived first

4.3 Inferences based on Statistical Analysis

Statistic	Age (Days)	Age (Years)
Mean Age	26325.213048	72.123871
Weighted Mean Age	26252.899128	71.925751
Median Age	26030.000000	71.315068
Mode Age	[24455]	[67.0]
Maximum Age	35897.540261	98.349425
Minimum Age	16978.000000	46.515068
Standard Deviation	4671.554524	12.798780

Figure 3: Statistical Analysis of the data on the Ages of Presidents of the US

Over the "days lived" column, the necessary statistical distributions were generated. The ages of each president were initialized with random weights in the range [0, 1] in order to calculate the weighted average. Figure 4 illustrates all of these statistics by plotting the standard deviations on either side of the mean age.

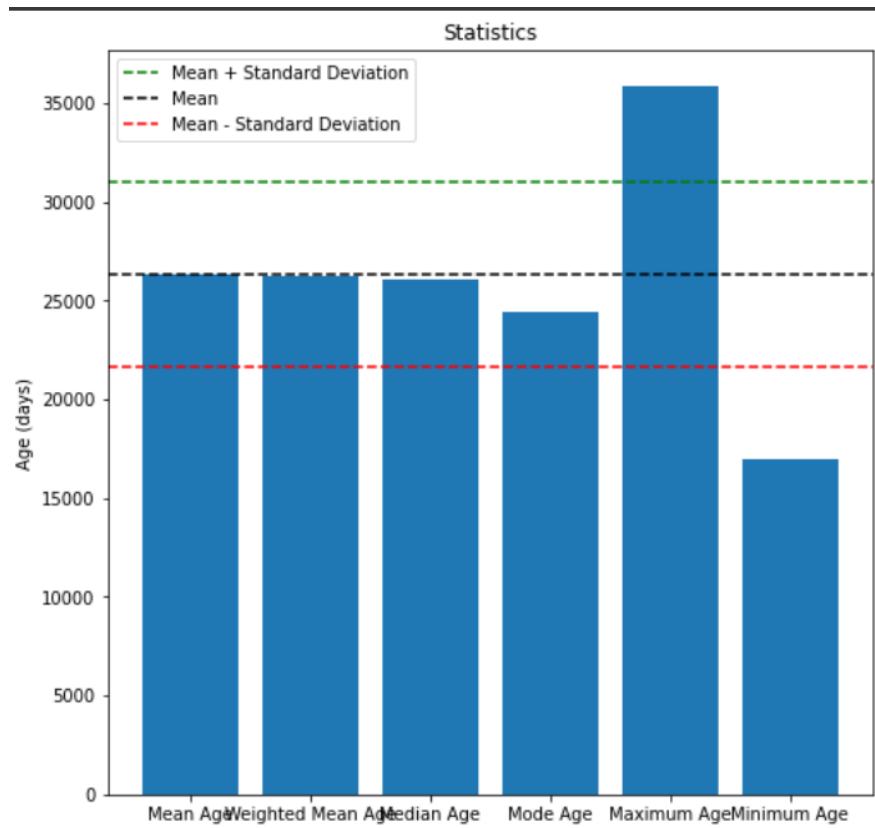


Figure 4: Bar Graph of the Statistical Analysis of the Presidents of the United States

An interesting comparison between the average life expectancy in the United States in 2022 and the ages of all deceased US presidents is shown in Figure 5. We can see that the age of the respective presidents did not increase in line with the rise in life expectancy over the past few decades.

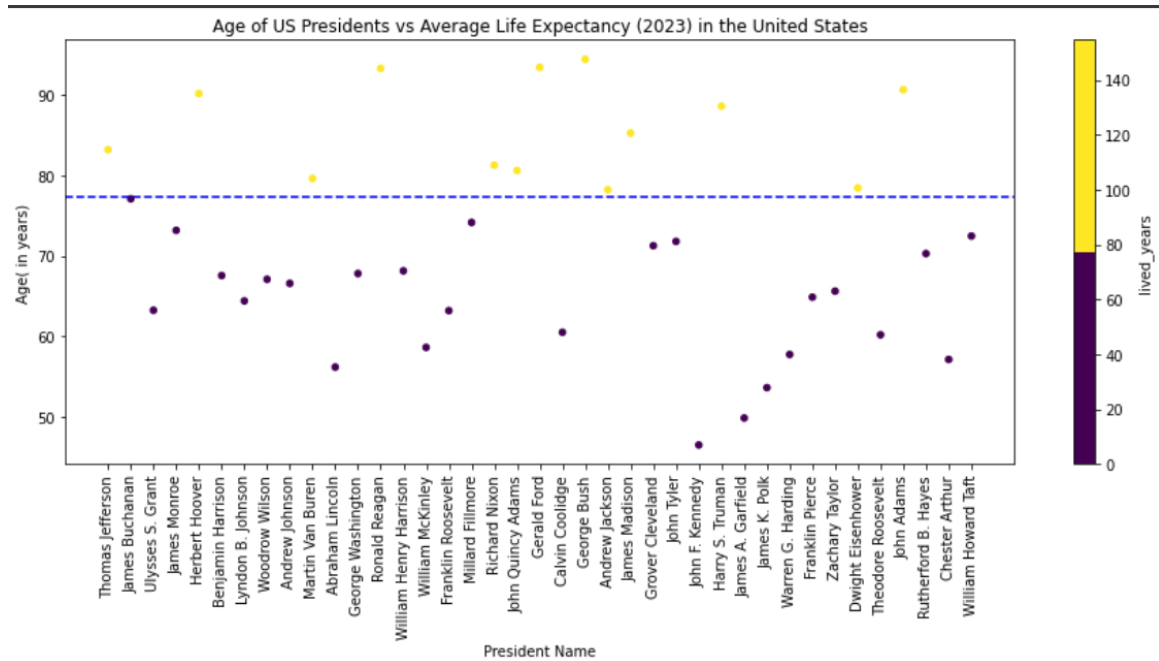


Figure 5: Age of US Presidents compared to the average life expectancy in the US in the form of Scatter Plot

The frequency of ages in sorted order of the ages of the Presidents. The mode of 67 years of age holds true with the Min being 46(President John F Kennedy) and Max being 98(President Jimmy Carter). The Plot Frequency is shown below.

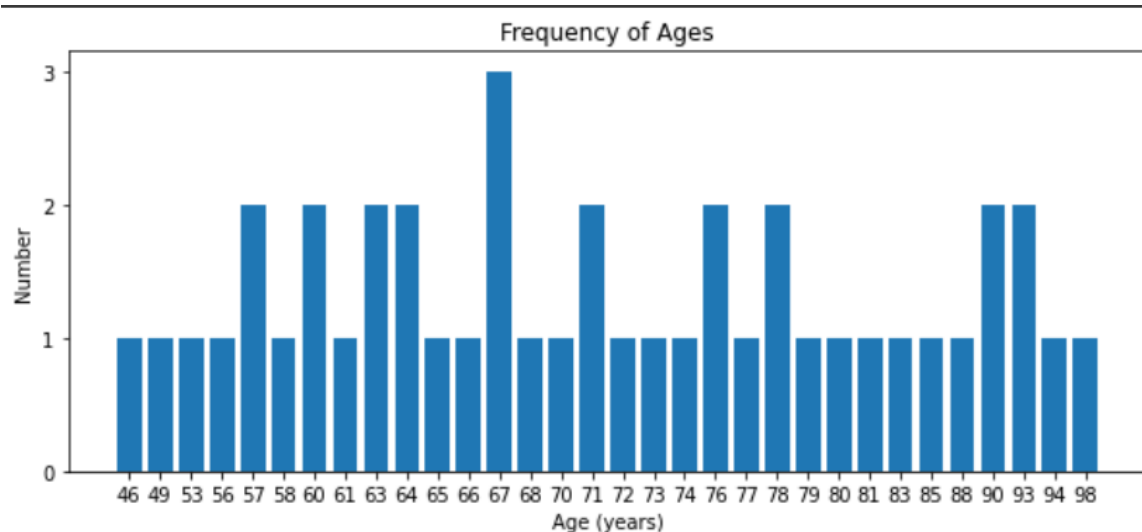


Figure 6: Frequency of the Life Spans of all the Presidents of the United States of America

5 Conclusion

Using the study of the above-mentioned data, we look at patterns in the life expectancy of presidents in this report. The age range, from 46 to 98, is substantial. A president can expect to live for 72 years on average, which is a little less than the average male life expectancy in the US, which was 77.28 years in 2022. The median age closely reflects the fact that most presidents have lived over the age of 60.

References

[1] Tanne J H. US life expectancy reaches 25-year low *BMJ* 2022; 379:o3063
doi:10.1136/bmj.o3063