Analysis of the Impact of Employment after the Covid-19 Based on Python

Yuxuan He[1+,] Congxiao Huang[2*+,] Dongsheng Lian[3+,] Yanhong Di[4+,] Weiyi Chen[5+]

[1]*University of Shanghai for Science and Technology, Shanghai, 200093, China*
[2]*School of Computer Science, College of Engineering, North Carolina State University, Raleigh, North Carolina, 27606, The United States, allenh0412@gmail.com*
[3]*School of Electrical Engineering, Penn State University (park), State College PA, 16801, The United States of America*
[4]*No.3 Shanghai Weiyu High School, Shanghai 200231, China*
[5]*Interlake High School, Bellevue Washington U.S. 98008*
+*These authors contributed equally to this work and should be considered co-first authors.*

ABSTRACT

Under the raging novel coronavirus pneumonia, the world has been pressed by the pause button, and people have started home segregation, which led to the suspension of their work. It is of great importance to analyze the contemporary situation in the labor market to help the government take action to improve the recovery of the economy. In this work, the python method will be used to automatically crawl the data displayed on the website of the U.S. Bureau of Labor Statistics. February 2020 is marked as the advent of the pandemic in the U.S. and this work will compare the unemployment rate before and after February. The work is divided into two dimensions. The first part is the analysis of the numbers crawled out in different states and the unemployment rate in different industries. The second part is to compare the results along the timeline. The result shows that both the economy and the labor market have been greatly impacted by the incoming of Covid-19 and that the government should take different solutions to revive different states and industries.

Keywords: *web crawler, unemployment rate, economic development1.*

1.INTRODUCTION

The Covid-19 spread exponentially at the start of 2020 which led that people with little knowledge of this novel coronavirus failing to cope with this panic scenario. With the soaring increase in the number of people found dying of pandemic in China, the U.S. Government declared the pandemic as a public health emergency on February 3.（A J M C）Complying with the appeal not to gather outside and to avoid social interaction, several businesses suffered from the temporary shutdown, leading to many of the workers being forced to leave the workplace. The U.S. the government implemented the policies including helping employers to pay for the unemployment insurance tax and providing unemployed individuals with financial aids. Granted, there have been several research projects conducted on evaluating the policy implemented confronting Covid-19. However, what is going to happen cannot be predicted when there is a recurring and pressing pandemic in the potential future. Apart from exploring the reasonable governments' economic responses when facing the increasing number of unemployment rates in an emergency, it is also important to pay close attention to the weakness of some fields and consequently, we can conclude that we should prioritize development in that area. The research topic we discuss is about analyzing the appropriate progressive development of industry after the economy has recovered. Economic development in three industrial fields including primary industry, secondary industry, and tertiary industry all has been threatened. Consequently, we want to explore the unemployment rate in all these three fields and the changing rate before and after the pandemic which can help us further investigate the field that was most influenced.

2.METHOD

2.1.Basic Information of Python

"Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built-in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together" [1]. Python was developed in C, but Python no longer has complex data types like Pointers in C. Meanwhile, Python has a strong object-oriented trait and simplifies object-oriented implementation. It eliminates the protection of object-oriented elements such as types, abstract classes, interfaces, and so on. Thus, Python has plenty of unique merits over other programming languages.

2.1.1.The Advantages and Usage of Python

"Are you looking for an easy-to-learn programming language to help with your scientific work? Look no further than Python" [2]. Python is widely used in various fields around the world. It's no exaggeration to say that Python is one of the most popular programming languages. "According to the database's index for December 2020, Python saw the highest increase in ratings throughout 2020, seeing a positive change of 1.90% overall. In terms of overall popularity, Python now ranks as the third most widely used programming language worldwide with a rating of 12.21%" [3]. Since Python came out in 1990, tons of applications merged along with more than 30 years of development of Python, the applications include system programming, Graphics processing, mathematical processing, text processing, database programming, network programming, multimedia applications, pymo engine, Hacker programming, artificial intelligence, data analyzing, web crawler, etc. In many applications of python, crawler technology is one of the most widely used.

2.2.Introduction to Web Crawler

What is a crawler? A web crawler (also known as a web spider, a web robot, or, within the FOAF community, more often as a web chaser) is a program or script that automatically crawls information from the World Wide Web according to certain rules. "According to the implemented technology and structure, web crawlers can be divided into general web crawlers, focused web crawlers, incremental web crawlers, and deep web crawlers" [4]. Other less commonly used names are ants, automated indexes, simulators, or worms. It is to obtain the data you want on the Web page through the program, which is to automatically grab the data. What can a crawler do? You can crawl pictures of your sister, videos of the island you're interested in, or

anything else you want if the resources you want are accessible through a browser. What is the essence of a crawler? The above definition of what a crawler can do is based on the premise that any resource can be accessed by a browser, especially for scholars who know the web request life cycle, the nature of a crawler is much simpler. The essence of the crawler is to simulate the browser to open the web page and get the part of the target data in the web page. The process by which a browser opens a web page:

- In the browser's input address bar, enter the URL you want to visit.

- Find the server host through the DNS server and send a request to the server.

- The server returns the result to the user after parsing (including HTML, JS, CSS files and etc.).

- The browser receives the results, interprets them, and presents the results to the user through the browser screen.

2.3.Operation of Web Crawler

Mainstream said above that the essence of a crawler is to simulate the browser to automatically send a request to the server, obtain, process, and parse the results of the automation program. Furthermore, the key points for crawlers: simulated requests, parse processing, automation. The basic flow of the crawler is shown below,

- The initiating: Make a request to the target site through the HTTP library and contains additional headers and so on, waiting for the server to respond.

- Get the response: If the server responds properly, it will get a Response. The content of the Response is the content of the page. The type may be HTML, json string, binary data (images or videos), etc.

- Parse the content: The resulting content may be HTML, which can be parsed using regular expressions, page parsing libraries, or json, which can be directly converted to json object parsing, or binary data, which can be saved or further processed.

- Save the data: It can be saved as text, to a database, or to a file in a specific format.

2.4.Specific Implement

At this moment, the strategy and goal are clear. Therefore, the process to achieve the goal will be very smooth. Above all, a blueprint of the basic steam of thought should be drawn as figure 1 below. Programming

starts after everything is ready.

First, the program imports some of the necessary package, including requests, json, time, random, and plt are shown in Figure 1. After the first step, collect all the states in the USA and name them as their abbreviation shown in Figure 2. Furthermore, collecting state-level data and dump into one file by using raw data and json.dump specifically as Figure 3. Next, collecting data for the whole USA from the previously found database. Then, the most foremost part of the programming is parsing the raw data collected and filtering them and saving the json if any errors were found. All these significant steps are achieved in a class as figure 4. Last but not the least, drawing the graphics to show the comparison between the states, the difference before and after the outbreak of Covid-19, and the unemployment rates for a different field.
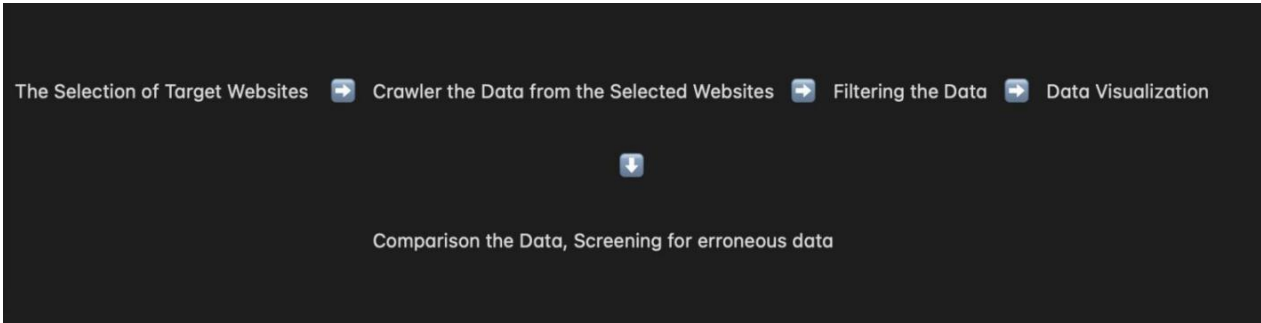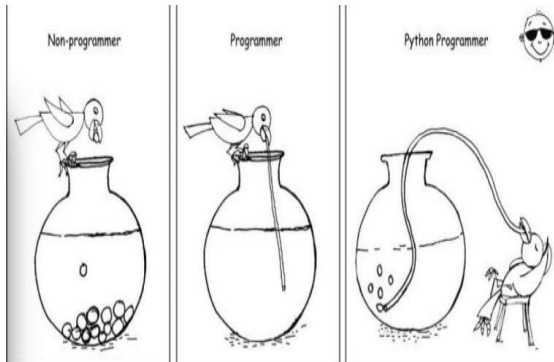

Figure 1. The Flow Chart

Figure 2. Python

```
import requests
import json
import time
import random
import matplotlib.pyplot as plt
```

Figure 3. Import Necessary Package

```
# collect all states
states = ['AL', 'AK', 'AZ', 'AR', 'CA', 'CO',
'IN', 'IA', 'KS', 'KY', 'LA', 'ME', 'MD', 'MA
'NM', 'NY', 'NC', 'ND',  'OH', 'OK', 'OR', 'P
'WA', 'WV', 'WI', 'WY']
```

Figure 4. Name all States

```
raw_data = dict()
for state in states:
    resp = requests.
state.lower())
    raw_data[state] =
    time.sleep(randor
json.dump(raw_data, (
```

Figure 5. Collect the Data

```
simple_dic = dict()
for k in raw_data:
    try:
        simple_dic[k]
    except KeyError:
        print(k)
        json.dump(raw_
        continue
json.dump(simple_dic,


simple_dic=json.load(o
```

Figure 6. Parse Raw Data

3.RESULT ANALYSIS

3.1.The data were collected from U.S. BUREAU OF LABOR STATISTICS (https://beta.bls.gov/dataQuery/find?st=40&r=20&q=unemployment&more=0)

3.2.The employment rate of U.S

From the perspective of U.S country level, the total unemployment before Covid-19 was 5.8 million population, but after covid-19, the total unemployment growth up to 50 million population, which increased about 862% showing in Figure 3. From the perspective of the state level, no state has unemployment higher than 1 million before covid-19, but after covid-19, there are 50% of states have a 1 million above unemployment, the highest unemployment state, California, reached 6 million, which were higher than the total unemployment population before covid-19. All states had a more than 400% increase in unemployment population after covid-19 showing in Figure 4. The data shows in Figure 5, the financial activities, Trade transportation and Utilities, Finance and insurance, retail Trade and etcetera decreased in an average of 9% from covid-19, which didn't have a direct ratio with unemployment.
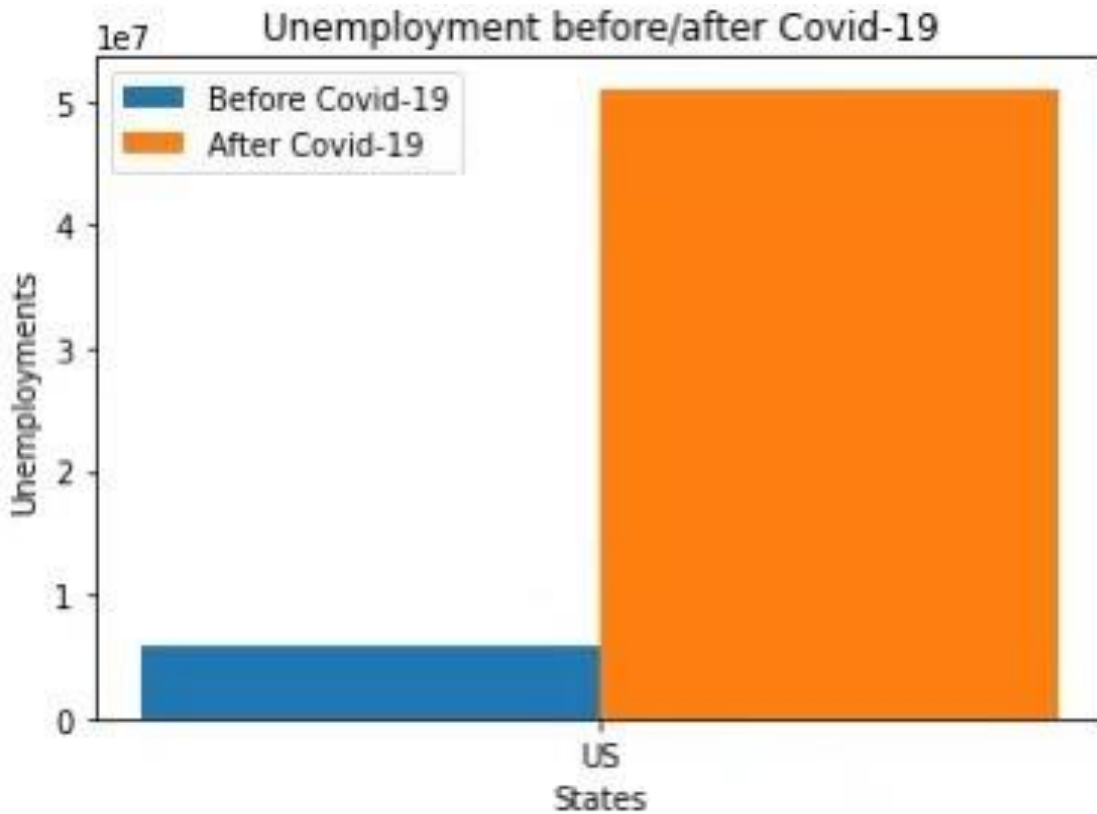
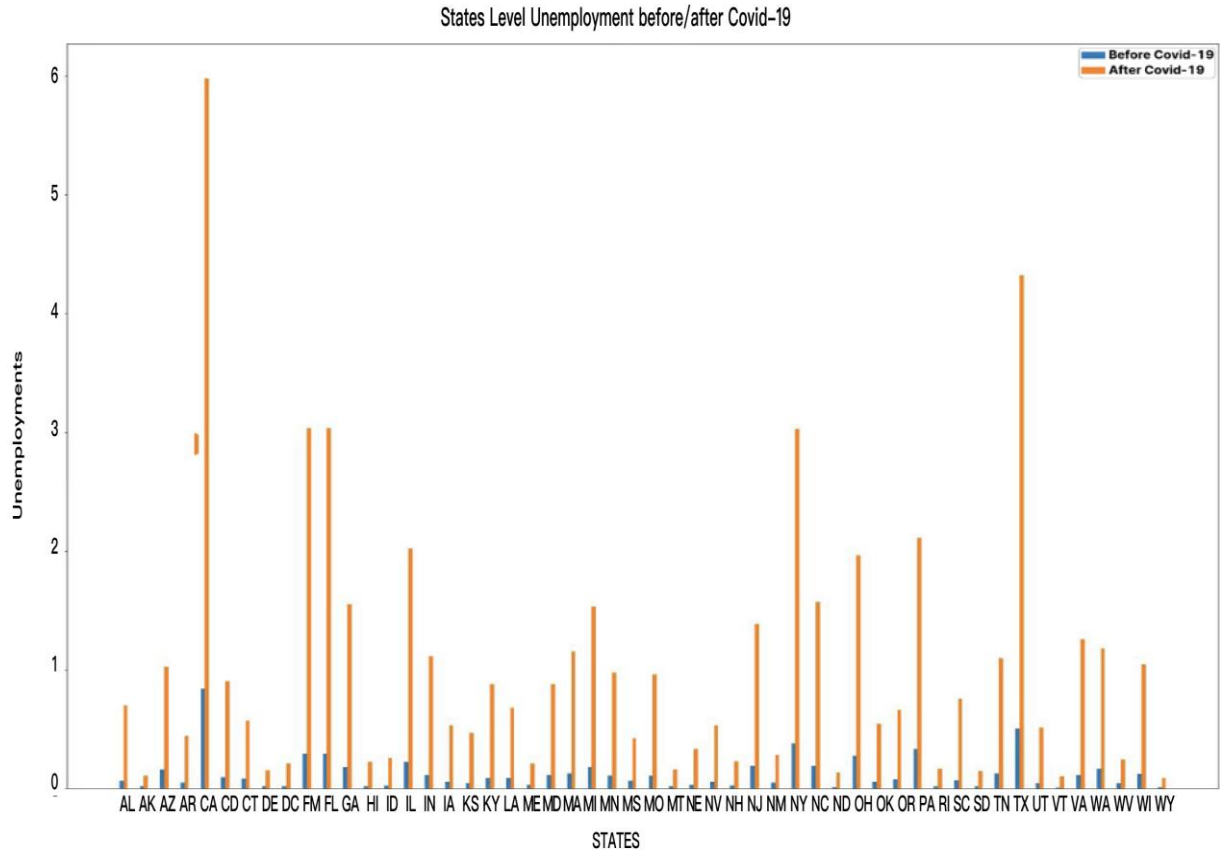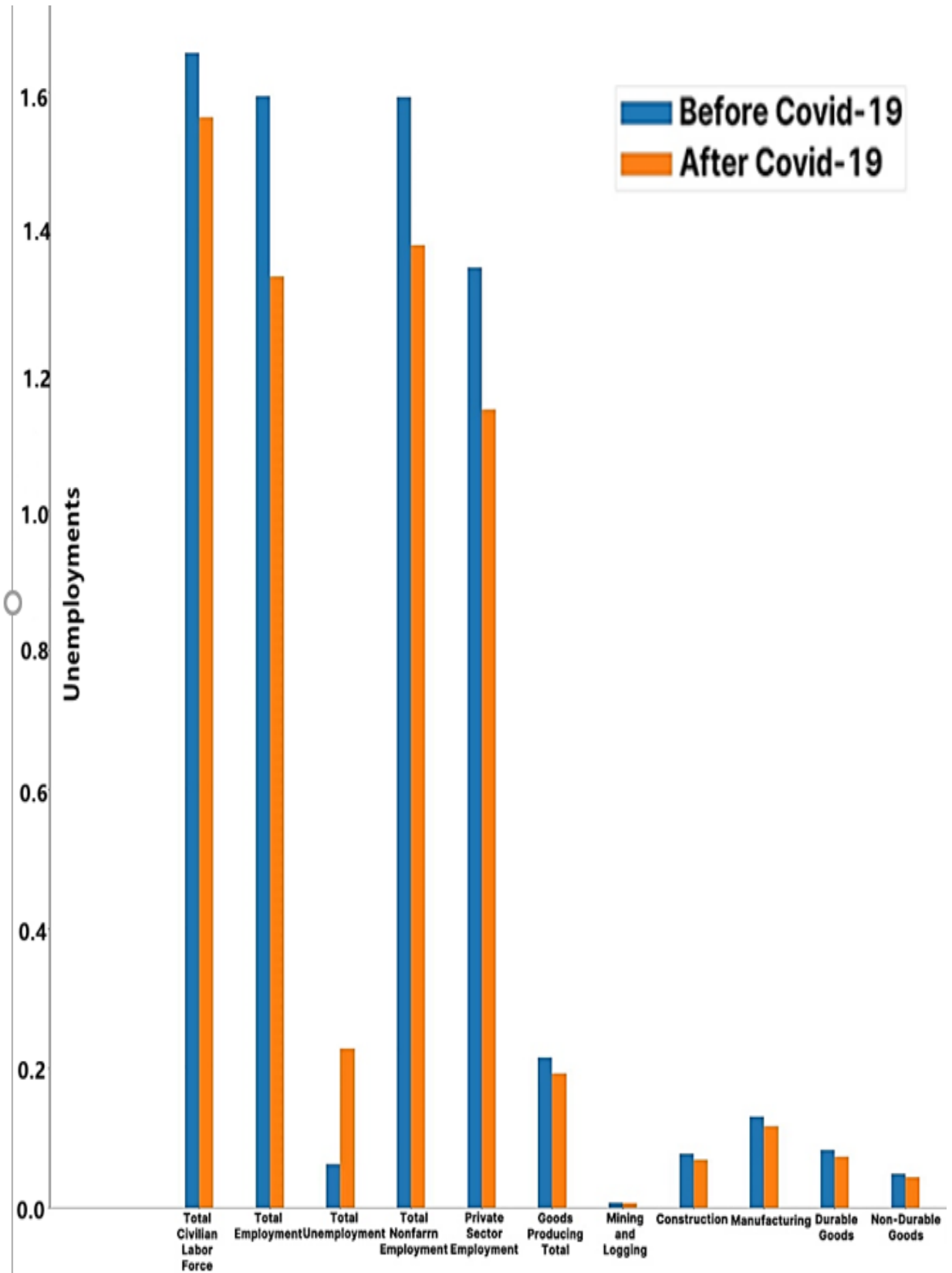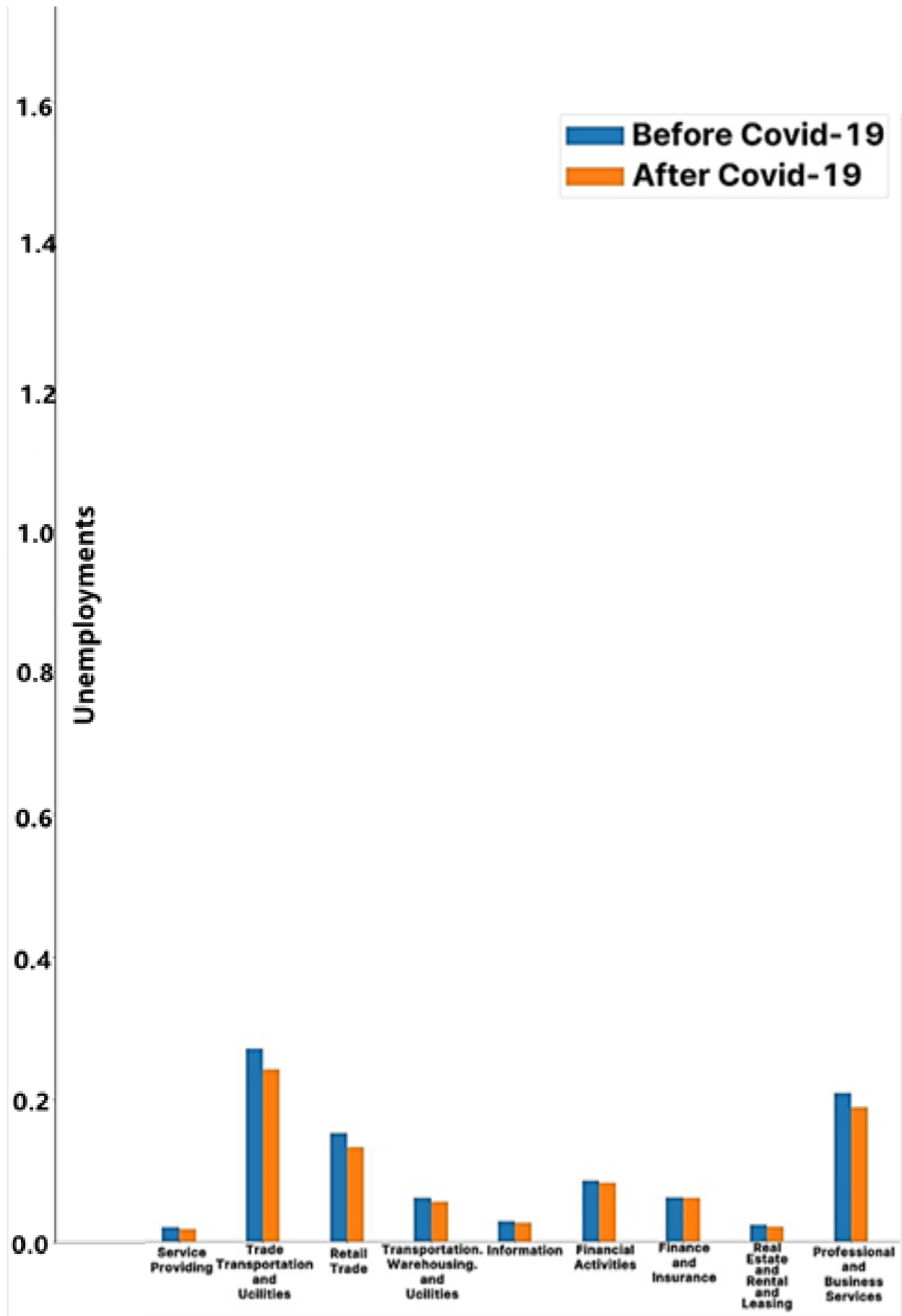

Figure 7. Unemployment Compare Chat

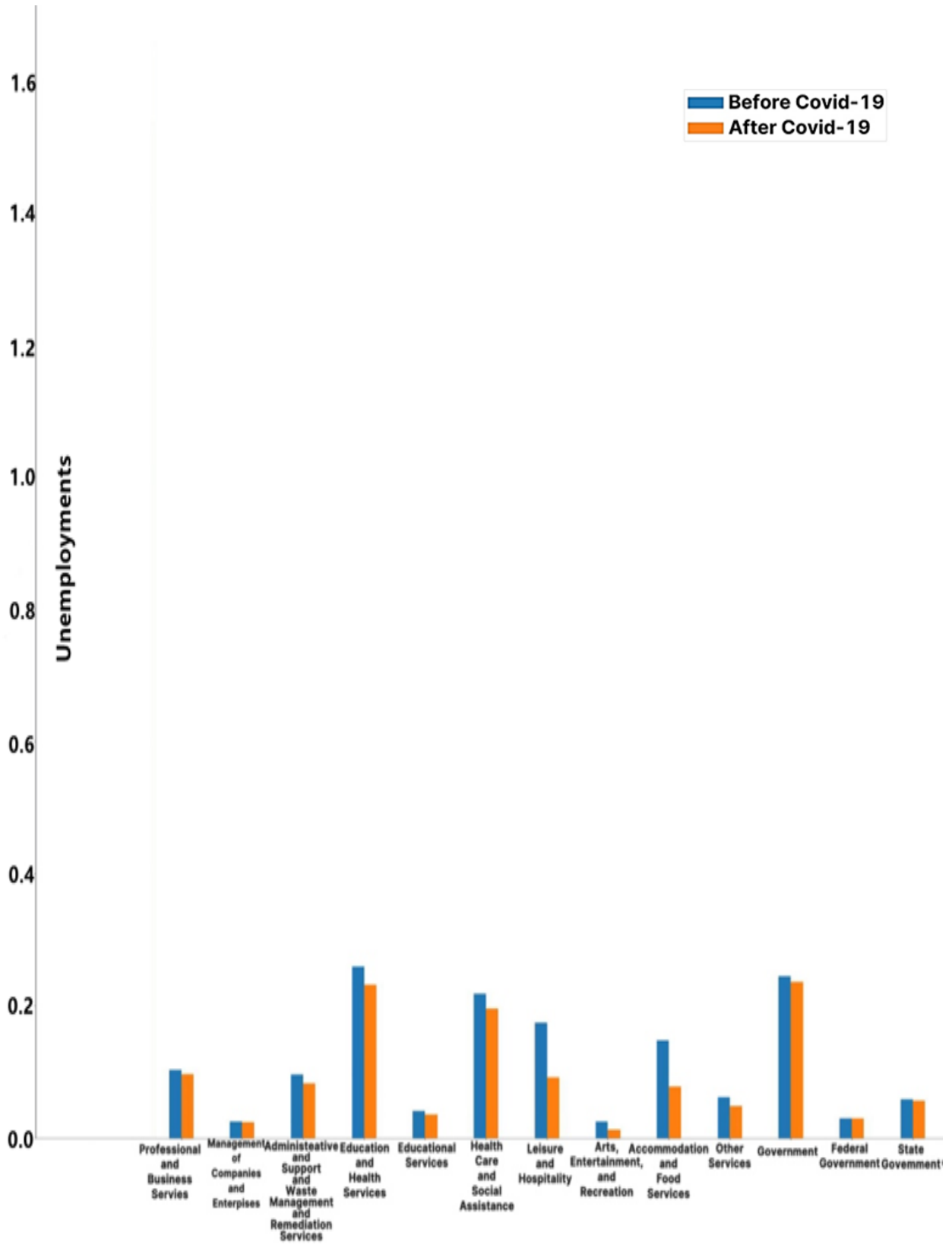**Figure 8.** Unemployment Compare Chat in all States

The horizontal axis coordinates from left to right are: AL, AK, AZ, AR, CA, CD, CT, DE, DC,FM,F L, GA, HI, ID, IL, IN, IA,KS,KY,LA,ME,MD,MA,MI,MN,MS,MO,MT,NE,NV,NH,NJ,NM,NY,NC, ND,OH,OK, OR, PA, RI, SC, SD, TN,TX,UT,VT,VA,WA,WV,WI,WY,
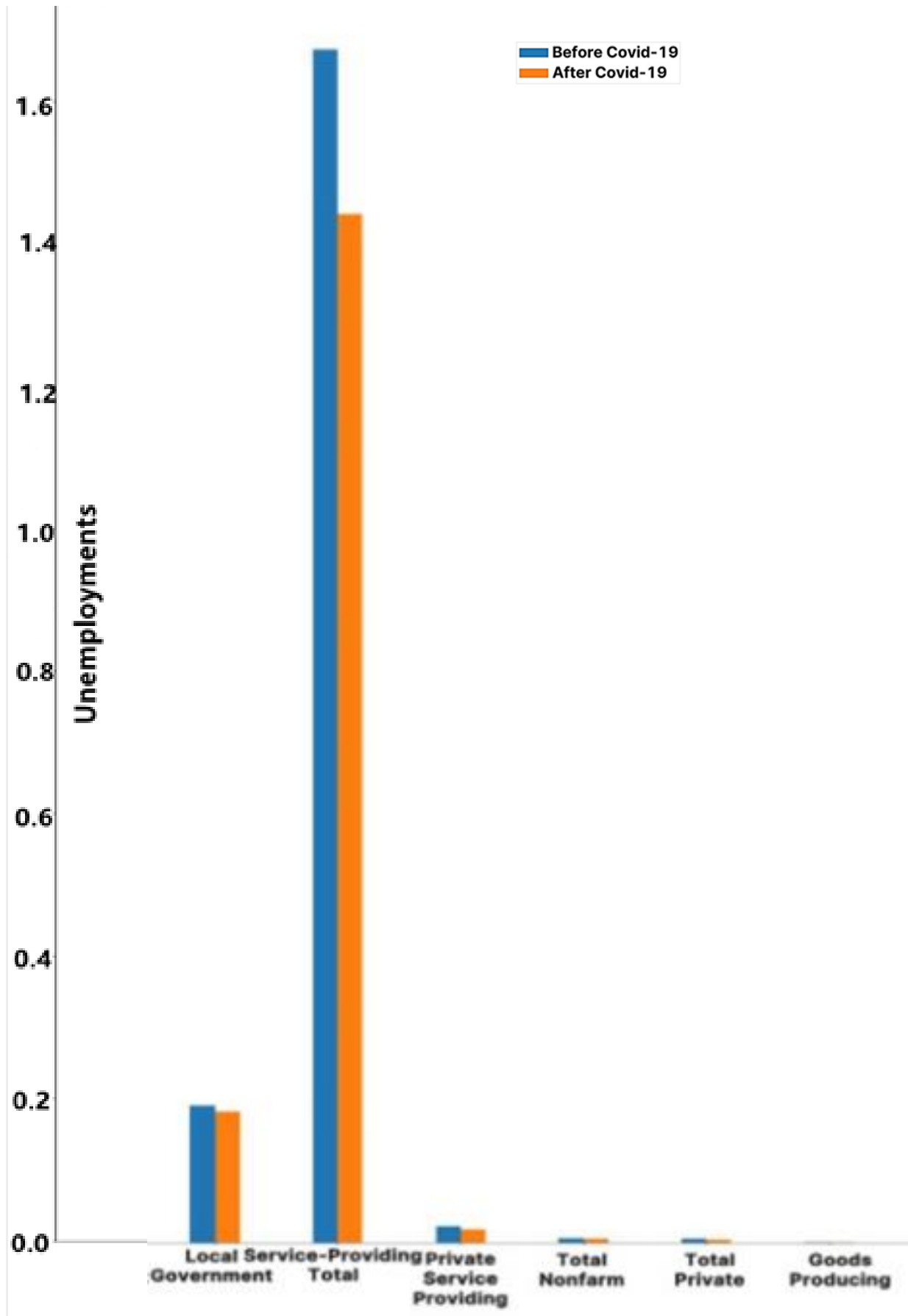
（1）

（2）

(3)

(4)

Figure 9. Financial Activities Chat

3.3 The Information of The Chat Above

The horizontal axis coordinates from left to right are: Total Civilian Labor Force, Total Employment, Total Non-farm Employment, Private Sector Employment, Goods Producing Total, Mining and Logging, Construction, Manufacturing, Durable Goods, Non-Durable Goods, Service-Providing, Trade Transportation and Utilities, Retail Trade, Transportation warehousing and Utilities, Information, Financial Activities, Finance and Insurance, Real Estate and Rental and Leasing, Professional and Business Services, Professional Scientific and Technical Services, Management of Companies and Enterprises, Administrative and Support and Waste Management and Remediation Services, Education and Health Service, Health Care and Hospitality, Arts Entertainment and recreation, Accommodation and Food Service, Other Services, Government, Federal Government, State Government, Local Government, Service-Providing Total, Private Service providing, Total Non-farm ,Total Private, Goods Producing.

4. CONCLUSION

4.1 The Pandemic and its Influence on Global Economics

The COVID-19 pandemic has created enormous social and economic uncertainty around the globe. According to an article from China Development Forum, it claims that the world economy is likely to contract much more sharply than during the global financial crisis of 2008/9, some countries may even experience a recession on a par with the Great Depression of the 1930s [5]. While the current consensus expects a strong post-pandemic rebound in economic activity, there is also a widespread view that likely, economic activity will not permanently return to pre-pandemic levels.

4.2 Employment, Python, and Future Consideration

Employment, as an indivisible component of economics, has been wreaking havoc on the global Labor market by the pandemic. By using python and a series of variables such as region, salary, and financial activities to compare the unemployment rate in the United States before and after COVID-19, the analysis presents a prominent contrast that how the pandemic brings enormous shocks to the U.S. employment and economy. Last but not the least, the python crawler method is not only suitable for big data, but also different periods and multiple industries. In this case, the U.S. government should pay more attention to this epidemic.

From the United Nations' point of view, the nation needs to use existing fiscal and monetary tools, as well as debt relief, to stimulate economic and Labor demand [6]. Public investment in health systems will make a vital contribution to combating pandemics and creating decent jobs.

ACKNOWLEDGMENT

REFERENCES

[1] The PSF. (2021) **"**What Is Python? Executive Summary." *Python.org*, www.python.org/doc/essays/blurb/.

[2] Frankel, Steven. (2020) "Beginner's guide to Python" https://developer.ibm.com/articles/os-beginners-guide python/?mhsrc=ibmsearch_a&mhq=%20python

[3] Hughes, Owen. "Python on Track to Be CROWNED 'Programming Language of the Year'."*TechRepublic*, TechRepublic, 4 Dec. 2020, www.techrepublic.com/article/python-on- track-to-be-crowned-programming-language-of-the-year/.

[4] M_CC. (2021) " Web Crawler in Python" https://www.topcoder.com/thrive/articles/web-crawler-in-python

[5] "A Timeline of COVID-19 Developments in 2020." *AJMC*, https://www.ajmc.com/view/a-timeline-of-covid19-developments-in-2020

[6] "Measures." *U.S. Bureau of Labor Statistics*, U.S. Bureau of Labor Statistics, beta.bls.gov/dataQuery/find?st=40&r=20&q=unemployment&more=0.