CS 540 – AI, Final Exam

COVID-19 Summer Project Proposal

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Program Name: COVID-19 Budget Calculator, `covid19calc.py`

Goal: The purpose of this program is to take certain personal information and spending habits amidst COVID-19 and calculate an effective budget plan for individuals, businesses, or the government while also taking COVID-19 case growth over the next year into consideration. I anticipate the project to take ~1.5 months.

Proposal:

In light of COVID-19 and the hard-hitting impacts to the economy and businesses nationally and worldwide, spending and investment habits among households have changed dramatically. Additionally, government spending has seen a large increase in the past couple of months due to Economic Impact Payments[1] (stimulus checks) to households and small businesses and other relief efforts.

Putting these (consumer spending, investment, and government spending) all together can be formulated into the macroeconomic GDP formula,

$$GDP = C + I + G + NX$$

For those unfamiliar, all of the variables equate to the following:

C = consumer spending; any purchase made by a household for domestic use or consumption.
I = investment; domestic investment or saving, anything that may increase productivity.
G = government spending/investment; purchases or investments made at the government level
NX = net exports, (exports – imports); from a national perspective, *we will discount trade due to ongoing trade stoppages/shortages.*

Taking this information into account, we are able to split up a **person's role in the economy** when they want to calculate any budget plans. We will primarily focus on the C component of the formula since consumer spending takes up roughly 60-70% of GDP each year. In the consumer spending component, many additional factors must be considered when calculating a budget plan. Given the circumstances with the pandemic, some factors can be whether a person is still working, monthly income, unemployment status, etc. I have written this in Python to get and store user data for calculation later:

```
pos = input("Enter your budgeting position ([C] consumer, [B] business owner, [G] gov. personnel): ")
if pos == 'C':
    c = True
elif pos == 'B':
    b = True
elif pos == 'G':
    g = True

state = input("What state would you like to budget for? ")
working = input("Are you currently working [Y / N]? ")
if working == "Y":
    m_income = input("What is your monthly income (no $ sign)? ")
elif working == "N":
    unemp = input("Have you filed for unemployment [Y / N]? ")
    if unemp == "Y":
        m_unemp_income = input("What is your monthly unemployment income (no $ sign)? ")
    elif unemp == "N":
        no_imcome = input("Given your past answers, is it fair to assume that you have no current income [Y / N]? ")
```

Figure 1

This provides us a basic idea of how much a person is currently making during the pandemic. Moving forward, we will need some data on spending/investment habits.

To get the most accurate information on spending habits, I'd personally recommend that the user downloads the Intuit Mint app (or mint.com) which provides a great summary of all spending/saving habits throughout the month. Here is a quick example snapshot (all numbers are completely arbitrary):

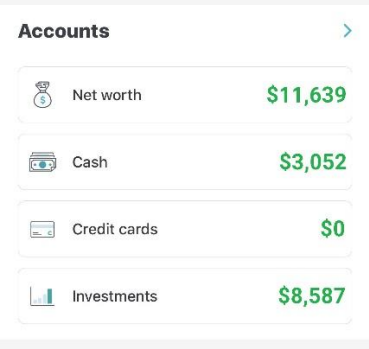

Figure 2

Similar to what I performed with getting basic information about the user, I will do the same to collect this data and store it in local variables in Python. Now that we have the data, what does it mean and what can we compare it to? Conveniently, most of the information we need is posted yearly by the Bureau of Labor Statistics[2] (bls.gov) in what are known as "CE Tables" or Consumer Expenditure tables which are filled with data taken from surveys conducted by the BLS which show monthly expenditures (or purchases) made by various age groups. I've imported the .csv files into my program and we will sit on this data for the time being.

Factoring in COVID-19 data:

I was doing some additional research on the internet for accurate case reports of confirmed COVID-19 data; since this is a very popular topic, I was able to locate the data very quickly on a GitHub repository (@albertsun, github.com/nytimes/covid-19-data) that displayed all of the data in a .csv file. Here is a look at some of the data that it provides:

```
# getting COVID-19 from GitHub repository
r = requests.get('https://raw.githubusercontent.com/nytimes/covid-19-data/master/us-states.csv')
print("COVID-19 data was successfully loaded as a .csv. Starting calculator.")

date,state,fips,cases,deaths
2020-01-21,Washington,53,1,0
2020-01-22,Washington,53,1,0
2020-01-23,Washington,53,1,0
2020-01-24,Illinois,17,1,0
2020-01-24,Washington,53,1,0
2020-01-25,California,06,1,0
2020-01-25,Illinois,17,1,0
2020-01-25,Washington,53,1,0
2020-01-26,Arizona,04,1,0
2020-01-26,California,06,2,0
2020-01-26,Illinois,17,1,0
2020-01-26,Washington,53,1,0
2020-01-27,Arizona,04,1,0
2020-01-27,California,06,2,0
2020-01-27,Illinois,17,1,0
2020-01-27,Washington,53,1,0
```

Figure 3

My plan with this data is to filter by state according to the user's answer to "What state would you like to budget for?" as seen in Figure 1 and calculate the **daily growth rate** in order to see whether a state is still in exponential growth or not.

Calculating a person's budget:

Although I do not have a specific equation for calculating a budget right now, I believe that looking at key dates in the COVID-19 timeline will allow me to create a budget plan for the future. A few dates that I have in mind (specifically for Wisconsin) are:

- March 24, 2020: Governor Evers orders a stay-at-home order for the State of Wisconsin. In the weeks following, many non-essential businesses began closing which means a lot of people had no income.
- April 16, 2020: The Federal Government begins to send out stimulus checks for families earning under $75,000, income increases.
- May 1, 2020: Plans to reopen the State of Wisconsin begin, stay-at-home order still expected to stay in place until May 26. Businesses begin reopening plans as well.

These dates are key in determining a person's budget plan for the next few months as they play a huge part in how much money they have the ability to earn.

Another large factor to take into consideration is the **daily growth rate** that the .csv file in Figure 3 allows us to calculate. This is will tell us if a state is *growing or shrinking* in the number of cases as well as whether or not a state is in *exponential growth*. To check for exponential growth, we would simply need a date range and use the equation below.

$$Growth\ Rate = \frac{\frac{(\#\ Cases_{present\ day} - \#\ Cases_{past\ day})}{\#\ Cases_{past\ day}}}{\#\ Days\ in\ between}$$

If Growth Rate > 1, then that state is still growing in cases exponentially indicating that stay-at-home orders could extend. Depending on the information that the user initially submitted, I would ideally be able to calculate a *minimized* spending/investing plan for the user for the next 12 months.

If Growth Rate ≤ 1, then that state is not growing at all or people are being cured. Because of this, we can assume that the state's operations will soon go back to normal and a more *aggressive* spending/investing plan can be taken.

Anticipated Program Output/Milestone (in Console):

After considering all data entered by the user and taking into account growth rates and major changes made either nationally or locally, I anticipate producing a budget plan similar to below based on whether or not a person chose an individual, business, or government approach:

```
        Monthly Recommendations (maximum for spend, minimum for invest):

MAY 2020          JUNE 2020         JULY 2020         AUGUST 2020       . . . .
SPEND: $301.51    SPEND: $374.88    SPEND: $460.21    SPEND: $475.80    . . . .
INVEST: $60.39    INVEST: $78.02    INVEST: $101.73   INVEST: $130.18   . . . .
```

I believe most financial applications (like Intuit Mint) have recommendations similar to what I have but I believe that this stands apart from others because it factors in *specifically* the current COVID-19 crisis with up-to-date data. I anticipate that the formula for calculating a complete budget plan may take ~30 days to complete.

Sources:

[1] Economic Impact Payments: https://www.irs.gov/coronavirus/economic-impact-payments. IRS.
[2] Bureau of Labor Statistics: https://www.bls.gov/cex/tables.htm. BLS.
The New York Times, https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html, May 2020