The works of MathWorks

Juan Saucedo, Daniel Herber,

Department of Mechanical/Civil/Electrical/etc.

Colorado State University, Fort Collins, CO, USA

WALTER SCOTT, JR.
COLLEGE OF ENGINEERING
COLORADO STATE UNIVERSITY

Background:

This is where you set the scene for the research. Why is this research being done? What problem exists that needs to be addressed? Feel free to use pictures, charts or diagrams on this page.

When I started to work with Dr. Herber I didn't know about MathWorks because I'm a civil engineer when started to learn that you can use MathWorks for a lot of problems in the world to find the best solution the fastest.

The research that was being done was how can coding we learn in MathWorks to problems in the real world to make it easier. With coding it makes the computer do all the work instead of us doing all the work that would take forever to do.

The problem I was working on was building a computer there so many options of what parts and how much each part cost. I need to find all the ways each different part came tougher to make a computer under $800.

Right S1, we working on another problem involving circuits and a new coding that picking random number to be bale to mastery that code to be able to able it to the new problem about circuits to see which one performs the best.

Slide 2

S1 Saucedo-Paez,Juan, 4/19/2021

Methods/Experimental Setup

Problem1:

Say we are considering building a computer and there are multiple options for the processor (CPU), graphics card (GPU), memory, and case. What are all the combinations of these components that cost less than $800? Note this ignores the other components needed and compatibility of the components for now.

```
CPUs = [200 1000]
GPUs = [50 200 400]
Case = [60 90 200]
Memory = [50 100 310]
```

Larger version:

Same question as above but with these options:

```
CPUs = [10 50 100 150 200 400 500 1000 2000 10000]
GPUs = [20 50 120 200 400 400 800 1500]
Case = [0 30 60 90 100 200]
Memory = [10 20 50 70 70 100 200 310]
```

Future questions:

How can we efficiently generate the valid options?

How can we incorporate comparability between components into our assessment? (edited)

This was the first problem I started to use MATLAB to get a little experience with coding.

Problem 2:

Some items from today's meeting. The data file contains the variables `performance`, `complexity`, and `graphs`. `performance` and `complexity` correspond to the values in the figure. `graphs` contains information on each circuit. We might use this a bit later, but you can likely ignore it for now.

2 files

In this problem was to see how I can create a graph with th ata given to me and then to create a new random data from the original data that as given. With the new data set to create a graph. With all that to create a fore loop that those that for 10 times to get a accurate dataset.

Results

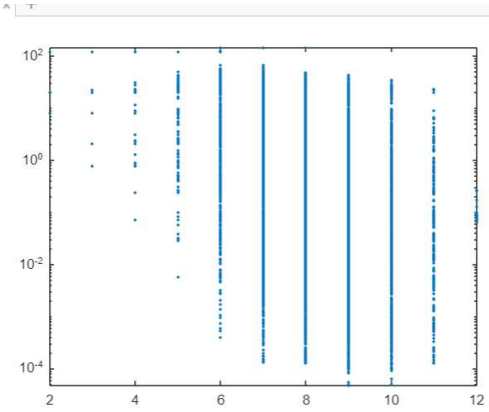
Problem 1:

```
for GPU = GPUs
end
Cases = [60 90 200];
for Case=Cases
end
Memorys = [50 100 310];
for Memory=Memorys
end

for CPU = CPUs
  for GPU = GPUs
  for Case = Cases
  for Memory = Memorys
    Cost = CPU + GPU + Memory + Case;
    disp(Cost)
  end
  end
  end
end
for iCPU = 1:length(CPUs)
    disp(iCPU)
    disp(CPUs(iCPU))

end

clac;

%  CPUs(2) + GPUs(2) + Memorys(2) + Cases (2)
budget = 800;
[~,~] = myfunction(budget,CPUs,GPUs,Cases,Memorys);


clear;
CPUs = [10 50 100 150 200 400 500 1000 2000 10000];
for CPU = CPUs
disp(CPU)
end
GPUs = [20 50 120 200 400 400 800 1500];
for GPU = GPUs
end
Cases = [0 30 60 90 100 200];
for Case=Cases
end
Memorys = [10 20 50 70 70 100 200 310];
for Memory=Memorys
end
```

This is the code I produced to figure out the problem Dr. Herber gave me to solve. I used loops, functions and try to make it smaller with short loops.

Problem 2:

```
% load the data
load("circuit_dataset_1 (1).mat")
% plot regunla data
  semilogy(complexity,performance,".")
%create a new data that comes from the regunla data
s=RandStream("circuit_dataset_1 (1).mat");
y = circuit_dataset_1 (1).mat(s,1:10,5,'Replace',false);

%plot the sample data
%run a foreloop for 10 times
```



The code on the left is he code possible to create the graph you see on the right. The x-axis is complexity, and the y-axis is performance to show the best circuit because it showing the performance and complexity for circuits. By see this we can see which one is the best one to use.

Discussion/Next Steps

The next steps that is needed is to make a new dataset with the data that is given to me and plot that new data set to.

After that to make a fore loop that picks random data off the original one to make 10 different datasets and plot them to see which one is the most frequent number chosen.

Conclusions

Learning how-to code in MATLAB

Getting to see how I can code it plots a graph for me and using different kind of coding t changes the graph without using a lot of thinking just changing the beginning of the code.

Working with Dr.Herber open my eyes to how coding can be used to figure out real word problems quicker and easier because it can test the option quicker then testing it in real life.

Also learning how to code a function help me see that MATLAB has many uses not just for coding a machine but can be used in math problems or other real-world problems.

What benefits did you get from you SURE experience?

What I learn from the SURE program was how research is done in colleges and how you must communicate with your research leader so much to make sure you are doing it correctly.

I learned how to use MATLAB and ask question based on coding to make sure I know what I was doing. With this experience I learned how coding can help answer real world problems quicker and make sure is the best way to solve the problem.

Learning this new career field that we see in mostly mechanical engineering uses MATLAB it open my eyes on what other engineers are doing compared to my that is civil engineering.

References & Acknowledgements

Thank you to the Suzanne and Walter Scott Foundation, Tointon Family Foundation, The Filsinger Family, Caterpillar Inc., and Contributors to the Dean's Innovation fund for making the SURE program possible.

Herber, Daniel R. *BibTeX Entry - Herber@CSU*, www.engr.colostate.edu/~drherber/.vendor/bibtexbrowser/bibtexbrowser.php?key=Herber2017e&bib=%2Fnet%2Fnasstore2%2Fudrives%2Facademic%2FME%2Fdrherber%2Fhome%2Fpublic_html%2Ffiles%2Fpublications.bib.

Thank you

Colorado State University