

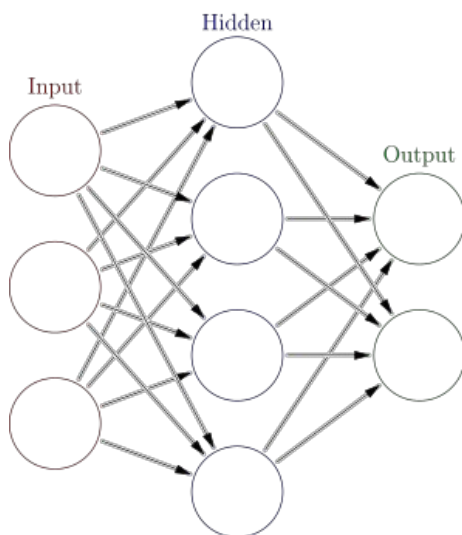
I am very thankful for the opportunity to take part in an internship with the Math and Computer Science Department under the McGriff-Burton Fund. My internship during the summer of 2015 was called Algorithmic Composition using Neural Networks, which was made up of two projects. First, I upgraded the program Grid Music to be able to run on the new operating systems by updating the program to work with an updated library. The second part was creating a neural network program. These two parts of my internship helped me develop important skills under the guidance and help of Dr. Stephen Carl.

Grid Music is a program that was created by Dr. Stephen Carl that allows a user to select notes in a grid format and then play the music. The problems that needed to be addressed about the program were the library ControlP5 was updated, which made the program not work. The library was updated to version 2.0.4, which made a lot of changes from the previous version. For example, some of the code in the program used to be correct and now are not covered under the updated library, because the developers of the library decided to change some variables and commands. The largest visual change that the library made was the use of two windows is not supported anymore. This made me change the program to have only one window. This was not desirable for the program, but it still works the same. The other major problem that I ran into was the casting of such variables that are available from the library that changed their position in the inheritance in the class. One example of such variable is Radio, which its place in the hierarchy of the library is different from the previous version. This gave me many problems until finally figuring out how to cast the variable correctly so that the program would compile and run correctly. When I completed updating Grid Music to run with the updated ControlP5 library and run smoothly on the newest operating systems the next step was

to upgrade the program itself. This led to the second part of the internship of creating a neural network.

Updating and maintaining programs is an extremely popular job in the computer science field. It is a difficult job, because you have to take someone's work and combine it with your own to make the program run correctly and better. This is what I did with Grid Music, because the original program was written by Dr. Stephen Carl and I took his code and combined it with my code to update the program. The best everyday software example is Microsoft Office, because the program is still the same as it was when it first came out, except for the people taking that original code and making it better and updating it. This experience that I gained from my internship is not something that is taught very much in the classroom. This is why the internship was helpful in my development of these skills.

The second part of my internship was working on creating a neural network. A neural network is a computer based network that is supposed to work like the brain. The diagram on the left shows



what a neural network looks like on paper where each circular node represents a neuron and an arrow represents a connection from the output of one neuron to the input of another. After doing some reading on programming a neural network and my experience with them from CS290: Data Mining, where we used neural networks for data analysis. I felt more confident in attempting to create one, because the previous times that I worked with neural networks it was a

package that I called in the program and added the correct data in the command call. Then it would

output information that would help me analyze a data set, which was easy and now this time there was no dataset that I was using or a package. I was creating the neural network to take the data set and produce relevant information for Grid Music. It was difficult at first, because this was the first time that I was creating a file from scratch that there were not set examples to base my work off like you do in a classroom assignment. We did however have an article that we were basing the mathematical computations from which was called Artificial Neural Networks: A Tutorial by Anil K. Jain and Jianchang Mao. This is where the guidance of Dr. Stephen Carl was extremely helpful as we worked together to create the neural network working through one method at a time until we achieved a compiling class file. We kept on doing this until we ran out of time, due to the internship ending. So, at the present moment we are still working on it.

The experience of creating an independent program that would be a feature of Grid Music was a great experience. It was the first time that I took a mathematical idea from the article Artificial Neural Networks: A Tutorial that did not include code and create a program out of it. This is a skill that I will use throughout the rest of my collegiate career and in the computer science field to help programs become better.

The internship taught me how much I really enjoyed doing computer science development. I liked getting up every day and attempting to solve the problems that I ran into when updating Grid Music as well as creating my own program. It gave me a sneak peek into a type of computer science job that I would enjoy in the future. It as well taught me the type of programming I like the most. I thoroughly enjoyed the experience and will carry the lessons learned with me.

The internship was a fantastic learning experience for the future that will help me have the most fulfilled career after college. I would like to thank Dr. Stephen Carl and the McGriff-Burton fund

for the opportunity and to let me grow as a programmer and as a person. I hope more students get to experience such a great internship like I did.