Research Assessment #2

Date: 9 September 2021

Subject: Machine Learning Methods

MLA Citation:

Morgado, Pablo Cresta, et al. *Practical Foundations of Machine Learning for Addiction Research. Part I. Methods and Techniques*, Europe PMC, 19 Apr. 2021, europepmc.org/article/ppr/ppr320997.

Assessment:

Machine learning has many more applications than I ever realized. I have always thought of it as lying in the realm of computer science and robotics, and while it is used often in these fields, it can really be used in any field that has large quantities of data. For example, the article talks about machine learning methods in conjunction with addiction research. I was a little unsure of the usefulness of the article for my research at first, but I quickly learned that although the application of machine learning may be different, the general principles are still the same. As a result, I was able to glean a large amount of relevant information that can help guide future research and projects.

The information about types of methods in machine learning was particularly helpful to me. From this information, I have a much better understanding of not only the general techniques for using machine learning, but their use cases and tradeoffs as well. As a result, I have a much better idea of the relative complexities of each type of technique. For any potential projects, which would likely involve a machine learning model that could be used in a robot, my inclination is to use a supervised method. An

unsupervised method, while great for finding patterns within data sets, would be difficult to incorporate with an outcome. Since supervised methods are meant to deal with this scenario and thus have a reward function, this makes them ideal (Morgado et. al 3).

At the same time, however, for an application such as computer vision, large amounts of data would still need to be processed. This could make an ensemble-type model more effective, since I could use unsupervised methods to analyze the data and use this to hone my supervised model more efficiently. This would take a lot of processing power since the computer would need to crunch large volumes of data while running two separate algorithms at the same time, which makes me wonder what type of processing power is necessary to develop machine learning algorithms? If they are not as complex, would they still need powerful machinery? I think that exploring the open-source packages that were embedded at the end of the article would help me get a better idea of what starting materials are necessary to create something using machine learning.

I was also very surprised by the amount of statistics that machine learning employs. I had never thought of the two fields as being so intertwined, but it does actually make sense. Machine learning models are predicting outcomes based on input data, and the tools required to analyze that data and draw useful conclusions out of it have to be statistics-based.

The applications for my research so far have expanded greatly in scope. I still think that it would be interesting to create a system that uses computer vision to identify objects, but I now realize that this is much more complex than it sounds. There are

countless variables incorporated in object identification that need to be accounted for, and a simple linear regression model definitely wouldn't be sufficient for this task. My research about artificial neural networks, though relevant, is put into another light with the knowledge that I know now. Neural networks are highly complex and interconnected with very limited interpretability because of it, so if I want to be able to start creating models, I need to start from the very beginning and work my way up. What do I use to start creating models and how do I get data to train them? What other areas of artificial intelligence are there? These are questions that I'll have to answer if I want to do concrete work in the field. Even though there are still many gaps in my knowledge, I feel much more confident that I'm making headway into my topic and am on my way to creating something amazing.