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Machine Learning and Bayesian Program Synthesis

Section 1: Introduction

Machine learning is the use of computers to recognize patterns and make predictions. The process of machines learning requires massive amounts of data which are labelled and inserted as examples into the system, which over many iterations learns trends and becomes more accurate in its predictions. The two primary forms of machine learning are supervised learning and reinforcement learning. In supervised learning the software learns to predict the outcome of an event, while researchers monitor the input streams and make adjustments to make the program more accurate. While in reinforcement learning the results of the data analysis are not immediately visible since the software has total control of all the decisions made, with the program being rewarded or punished based on how well it runs [1].

One of the primary problems with machine learning is that it takes massive amounts of data to get the program to learn trends accurately. Recently an advancement in machine learning from Boston start up Gamalon called Bayesian Program Synthesis (BPS) enables programs to decipher trends using much less data points [3].

Section 2: Concept Description

The biggest difference between Bayesian Program Synthesis and conventional machine learning is that BPS uses probabilistic programming, which is code that deals in probabilities rather than specific variables in order to build a predictive model that explains a particular data set. Because of this BPS enables much faster and accurate trends to be learned. For example Google showed its machine learning program different drawings and had it analyze what was drawn and determine what it is. Google's program was able to identify objects but only if the previous objects shown to it represented the same object, thus confusing the program if the shown object was different. However, using BPS the program was able determine multiple different objects even in the same drawing [2].

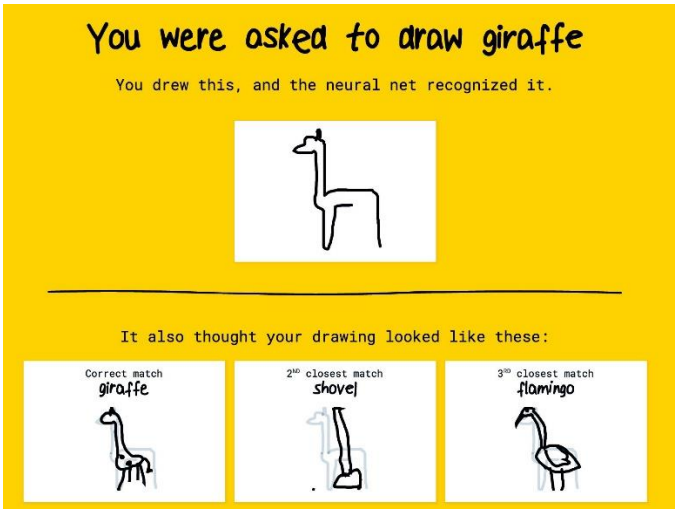

Figure 1: Google's Machine Learning Drawing Game

Section 3: Analysis

Bayesian Program Synthesis solves many of the traditional problems facing machine learning. First of all, BPS uses substantially less data points in order to make predictions thus allowing the intelligence of the system to develop much faster than traditional means, reducing R&D. Secondly, current methods of machine learning require the data input to be labelled manually thus taking significant amounts of time from researchers. BPS alternatively does not require the data input into it to be labelled at all, thus largely automating the process of machine learning while all accelerating it. Thirdly, by lowering the amount of data needed BPS enables a much broader roll out of machine learning since it has historically been limited to a select number of companies that can afford the massive computers needed and have access to immense fields of data [2].

Section 4: Discussion/Conclusion

Bayesian Program Synthesis has the possibility to the change the world of machine learning in every way, making it both faster, more accurate, less data-hungry, and more automated. For years the industry has marveled at all the possibilities and implications of machine learning, such as automating many human tasks and using personal data in order to better serve to the individual's needs. These far-fetched dreams have always been right on the horizon but now with the development of BPS, machine learning will advance in leaps and bounds as it is implemented into every section of our lives. Before machine learning required too much computational power, but now it could be deployed on your phone so that it can learn about the user and provide suggestions, eventually knowing the user better than the user knows themselves. From here we must further implement BPS into our current applications of machine learning and from there apply it to new and groundbreaking applications as we learn more about BPS and its capabilities [4].

References

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[4] Vigoda, Ben. "Eliminating the Human Cost of Training AI – Bayesian Program Synthesis." *O'Reilly*. N.p., n.d. Web.