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A Survey on Reinforcement Learning Approach with Machine Learning Methodologies

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ABSTRACT

Reinforcement learning differs from supervised learning in a way that in supervised learning the training data has the answer key with it so the model is trained with the correct answer itself whereas in reinforcement learning, there is no answer but the reinforcement agent decides what to do to perform the given task. In the absence of a training dataset, it is bound to learn from its experience. Reinforcement learning is an area of Machine Learning. It is about taking suitable action to maximize reward in a particular situation. It is employed by various software and machines to find the best possible behavior or path it should take in a specific situation. Machine learning methodologies analysis is helpful to understand of exactly meaningful and justify uses and behavior of technology like a human brain.

KEYWORDS: *Machine Learning, optimization, recognition, Training Data, clustering, association, Approaches, methods etc.*

1. INTRODUCTION

Reinforcement Learning is a type of machine learning algorithm that learns to solve a multi-level problem by trial and error. The machine is trained on real-life scenarios to make a sequence of decisions.

It receives either rewards or penalties for the actions it performs. Its goal is to maximize the total reward. By Deep Reinforcement Learning we mean multiple layers of Artificial Neural Networks that are present in the architecture to replicate the working of a human brain. Machine learning uses various algorithms for building mathematical models and making predictions using historical data or information**.** Currently, it is being used for various tasks such as image recognition**,** speech recognition**,** email filtering**,** Face book auto-tagging**,** recommender system, and many more.

Here we analysis the different machine learning methodologies include with reinforcement learning approach.

2. OBJECTIVE

The main objective of this menu script is to analysis of machine learning methodology with consistency of reinforcement approach. The need for machine learning is increasing day by day. The reason behind the need for machine learning is that it is capable of doing tasks that are too complex for a person to implement directly. As a human, we have some limitations as we cannot access the huge amount of data manually, so for this, we need some computer systems and here comes the machine learning to make things easy for us.

We can train machine learning algorithms by providing them the huge amount of data and let them explore the data, construct the models, and predict the required output automatically. The performance of the machine learning algorithm depends on the amount of data, and it can be determined by the cost function. With the help of machine learning, we can save both time and money.

The importance of machine learning can be easily understood by its uses cases, Currently, machine learning is used in self-driving cars**,** cyber fraud detection**,** face recognition**,** and friend suggestion by Facebook**,** etc. Various top companies such as Netflix and Amazon have build machine learning models that are using a vast amount of data to analyze the user interest and recommend product accordingly.

Research Methodology

Machine learning is the ability of computers to learn without being explicitly programmed. A machine learning algorithm, also called model, is a mathematical expression that represents data in the context of a problem, often a business problem. The aim is to go from data to insight. For example, if an online retailer wants to anticipate sales for the next quarter, they might use a machine learning algorithm that predicts those sales based on past sales and other relevant data. Similarly, a windmill manufacturer might visually monitor important equipment and feed the video data through algorithms trained to identify dangerous cracks. Regression, Classification, Clustering , Dimensionality Reduction, Ensemble Methods , Neural Nets and Deep Learning ,Transfer Learning , Reinforcement Learning , Natural Language Processing, Word Embeddings are different methodology of machine learning.

As there are two general categories of machine learning: supervised and unsupervised. We apply supervised ML techniques when we have a piece of data that we want to predict or explain. We do so by using previous data of inputs and outputs to predict an output based on a new input.

Major Techniques of Machine Learning

Regression / Estimation

Predict Continous Values. This technique is used for predicting a continuous value; E.g. predicting things like the price of a house based on its characteristics, or to estimate the CO2 emission from a car's engine.

Classification

Predicting the item class/category of a case.. A Classification technique is used for Predicting the class or category of a case. E.g. if a cell is benign or malignant, or whether or not a customer will churn.

Clustering

Finding the structure of data; summarization. Clustering groups of similar cases. E.g. Can find similar patients, or can be used for customer segmentation in the banking field.

Anomaly Detection

Discovering abnormal and unusual cases. Anomaly detection is used to discover abnormal and unusual cases. E.g. It is used for credit card fraud detection.

Dimension Reduction

Reducing the size of data (PCA). Dimension reduction is used to reduce the size of data.
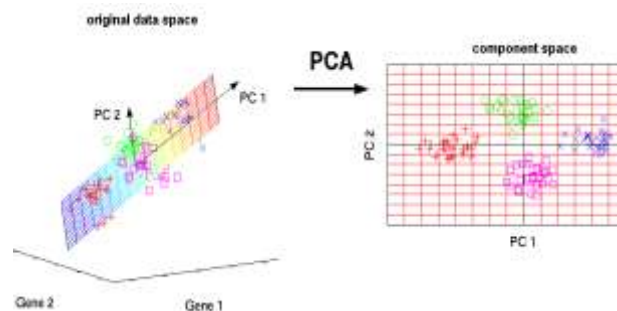

Figure (1) Dimension reduction –reducing the size of data (PCA)

Recommendation Systems

Recommending Items. This associates people's preferences with others who have similar tastes and recommends new items to them.E.g. Recommended Books or Food.

Working of Machine learning mechanism

Figure (2): Working pattern of machine learning methodologies

Stage1: Learning

Figure (3): Implementation of approach on Trained data

Pre-Processing

The first step is we need to clean and format the data. (That is because computers are not smart when it comes to figuring out the difference between a picture or text when we send it in), so the first thing we do is usually clean the data so all our pictures are in one file and text is being processed separately. Because if we would try to process text like we do a picture we're not gonna get the right answer and vice-versa, once we pre-process the data and we've it nicely clean, we're gonna go in and start learning.

Learning

In this step, we take that data and learn from it. And here comes the supervised and unsupervised learning.

Testing

In this step, we have it a test to make sure we are getting the right answer out of it.

Stage 2 : Prediction

In this phase, we're actually using it or putting it into commercial use and that is to do a prediction and on there now we have our train model and our new data come together and output is going to be a prediction of what we are looking for. We can see that in the form of predicted data.
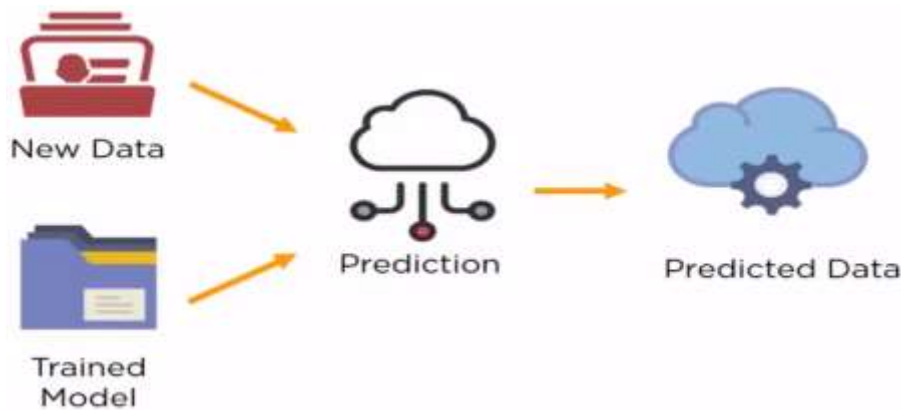

Figure (4): stage to implementation level of prediction on data

Reinforcement learning Praposed approaches:-

According to the researchers, the analysis distinguishes between several typical modes to evaluate RL performance, such as "evaluation during training" that is computed over the course of training vs "evaluation after learning", which is evaluated on a fixed policy after it has been trained. These metrics are also designed to measure different aspects of reliability, e.g. reproducibility (variability across training runs and variability across rollouts of a fixed policy) or stability (variability within training runs). Reinforcement learning (RL) is frequently used to increase performance in text generation tasks, including machine translation (MT) through the use of Minimum Risk Training (MRT) and Generative Adversarial Networks (GAN).

The reinforcement learning (RL) problem describes an agent interacting with an environment with the goal of maximizing cumulative reward through time (Sutton & Barto, 2017). Unlike other branches of control, the dynamics of the environment are not fully known to the agent, but can be learned through experience. Unlike other branches of statistics and machine learning, an RL agent must consider the effects of its actions upon future experience. An efficient RL agent must address three challenges simultaneously: 1. Generalization: be able to learn efficiently from data it collects. 2. Exploration: prioritize the right experience to learn from. 3. Long-term consequences: consider effects beyond a single timestep. The great promise of reinforcement

learning are agents that can learn to solve a wide range of important problems. According to some definitions, an agent that can learn to perform at or above human level across a wide variety of tasks is an artificial general intelligence (AGI)

Open source code, reproducible research As part of this project we open source github.com/deepmind/bsuite, which instantiates all experiments in code and automates the evaluation and analysis of any RL agent on bsuite. This library serves to facilitate reproducible and accessible research on the core issues in reinforcement learning. It includes: • Canonical implementations of all experiments, as described in Section 2. • Reference implementations of several reinforcement learning algorithms. • Example usage of bsuite with alternative codebases, including 'OpenAI Gym'. • Launch scripts for Google cloud that automate large scale compute at low cost.1 • A ready-made bsuite Jupyter notebook with analyses for all experiments. • Automated LATEX appendix, suitable for inclusion in conference submission. We provide more details on code and usage in Section 4. We hope the Behaviour Suite for Reinforcement Learning, and its open source code, will provide significant value to the RL research community, and help to make key conceptual issues concrete and precise. bsuite can highlight bottlenecks in general algorithms that are not amenable to hacks, and reveal properties and scalings of algorithms outside the scope of current analytical techniques. We believe this offers an avenue towards great leaps on key issues, separate to the challenges of large-scale engineering (Nair et al., 2015). Further, bsuite facilitates clear, targeted and unified experiments across different code frameworks, something that can help to remedy issues of reproducibility in RL research.

Conclusion: -

Machine learning Model are proving very impactful role in terms of technical growth. In this menuscript above survey covers the explaination of How different stages of machine learning are represents data in the context of a problem, often a business problem. Major techniques of machine learning i.e. expression , regression / estimation, classification, clustering, anomaly detection, dimension reduction etc. are predict continous values, predicting the class or category of a case, finding the structure of data, discovering abnormal and unusual cases, reducing the size of data .above mention expertise are ellobrate the wide and unlimited multitasking performance of machine learning technics with this survey it is also measurable the corporate or other use of trained data through pre-processing, classification , learning, testing, and prediction. With this survey we learn about reinforcement learning (RL) problem that describes an agent interacting with an environment with the goal of maximizing cumulative reward through time.

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