Deep Q Learning for Visual Cue Game Play with Snake

February 19, 2017

1 Group members

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2 Abstract of the project

Q-learning is a fundamental approach when dealing with reinforcement learning problems wherein the problem has been modeled as a Markov Decision Process (MDP). Using Q-learning for models with finite decision states, we are quickly able to find the expected utility of each action at an MDP state and accordingly find the optimal course of action. A recent application of Q-learning to deep learning, by Google DeepMind, titled "deep reinforcement learning" or "deep Q-networks", has been successful at playing some Atari 2600 games at expert human levels. Preliminary results were presented in 2014, with a paper published in February 2015 in Nature[1].

Our project idea is to explore this theme of Deep Q learning in the context of the classic game Snake[2]. We will be using multiple variations of the game with varying constraints and model it as a reinforcement learning process by developing a policy to maximize a score given an alive-penalty. The model will have the game canvas grid itself as input (as an matrix encoding or pixel values) and will have no knowledge of positions. In the initial models, we will have a static length snake and try to develop a policy for its motion. This is trivially an MDP. Complexity of the model increases when we introduce obstacles and increase the grid size. The MDP model, we believe, should still be able to maximize the utility under these circumstances.

The Markov assumption breaks down[1] when we allow the snake to grow in length with time and incorporate active history of previous actions. In this exploratory phase of the project, we want to analyses the performance of deep Q learning as well as research and develop techniques of modeling this variation.

NOTE: No additional data resources are required for this project.

References

[1] V. Mnih, K. Kavukcuoglu, D. Silver, A. Graves, I. Antonoglou, D. Wierstra, and M. A. Riedmiller, "Playing atari with deep reinforcement learning," *CoRR*, vol. abs/1312.5602, 2013. [Online]. Available: `http://arxiv.org/abs/1312.5602`

[2] Snake (video game). (2017, January 26). In Wikipedia, The Free Encyclopedia. Retrieved 17:05, February 19, 2017, from `https://en.wikipedia.org/w/index.php?title=Snake_(video_game)&oldid=762031031`

[1] In fact, it might be possible to model this variation as an MDP. We won't be exploring this idea.

QUESTION ANSWERING SYSTEM

1 Group members

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2 Abstract of the project

We will make a Question Answer based System where user will give input in audio form and get output in audio form,in the background text to text communication between users is done.We will use api.AI to process natural language.For Converting speech to text we will use Google Liv.api that will enables developers to convert audio to text by applying powerful neural network models in an easy way. For Retriving answers to the asked question we will follow 3 steps..
1)Process the query(Parsing,Query Translation,Query Reformulation).
2)Process the data(Parsing,Annotation,Indexing,Lexicon Construction).
3)give the answers.
This approach we have followed from the TREC(Text Retrieval Conference) and LCC(Language Computer Corporation).

2.1 Data sources

1)https://www.udemy.com/chatbots/
2)https://www.chatbots.org/country/in
3)https://github.com/chrisenytc/liv-api
4)http://www.nactem.ac.uk/resources.php
5) Paper on"LIBRISPEECH: AN ASR CORPUS BASED ON PUBLIC DOMAIN AUDIO BOOKS" by Vassi Panayotov, Guoguo Chen , Daniel Povey , Sanjeev Khudanpur

Game Bot

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2 Abstract of the project

The aim of this project is to create a game bot which will learn to play a game from its own experience. We plan to use Neural Network and Genetic Algorithm. This project was inspired by MarI/O, which is a similar bot developed by Seth Bling and demonstrated in his youtube video (Link in Data Sources).

2.1 Data sources

MarI/O
Artificial Intelligence in Google's Dinosaur

Solar Energy Prediction

28 Feb 2017

1 Group members

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2 Abstract of the project

Electricity providing companies need accurate forecasts of energy production (which fluctuates with weather conditions) to have the right balance of renewable and fossil fuels available. Errors in this prediction will lead to large expenses to compensate for the smaller amount of electricity produced from renewable resources.

The goal of this project is to give the best short term predictions of solar energy production using a deep learning neural network. Daily solar energy data were provided by Oklahoma Mesonet.

2.1 Data sources

https://www.kaggle.com/c/ams-2014-solar-energy-prediction-contest/data

AMAZON BOOK REVIEWS

1 Group members

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2 Abstract of the project:

In this project we will do Sentiment Analysis on Amazon Book Reviews. We will be using Deep Neural Network for this Sentiment Analysis. Sentiment Analysis can be of three types:

1. Positive
2. Negative
3. Neutral

This analysis can be done using any of this following methods:

1. Baseline Method.
2. Naive Bayes.
3. Maximum Entropy.
4. Support Vector Machine.

Using this method we will calculate the positive, negative and neutral sentiment. Then we will compare it with the actual result to find the accuracy.

2.1 Data sources:

We are taking data from amazon book reviews for the list of books:

Gone Girl, The Girl on the Train, The Fault in our Stars, Fifty Shades of Grey, Unbroken, The hunger games, The Goldfinch, The Martian.

Link for data: http://archive.ics.uci.edu/ml/datasets/Amazon+book+reviews

2.2 Reference:

1. Sentiment Analysis and Opinion Mining by Bing Liu.
2. Opinion mining and sentiment analysis by Bo Pang and Lillian Lee.
3. Transfer Learning for Cross-Lingual Sentiment Classification with Weakly Shared Deep Neural Networks by Guangyou Zhou, Zhao Zeng, Jimmy Xiangji Huang, and Tingting He.

Car Evaluation

02/March/2017

1 Group members

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2 Abstract of the project

Car Evaluation Dataset evaluate the target concept(CAR) with 3 other intermediate concept. PRICE(overall price),TECH(technical characteristic) and COMFORT(comfort). Now totally we have 6 attribute, each attribute is a part of one of the intermediate concept as described above. These attributes are :
1. Buying(buying price)
2. Maint(price of maintenance)
3. Doors(number of doors)
4. Persons(capacity in terms of persons to carry)
5. *Lug_Boot*(the size of luggage bot)
6. Safety(estimated safety of the car)

The number of the instances in the training data are 1728 , and there are 6 number of attributes as mentioned above. This is basically a multi-class classification problem. we will classify the instance into 4 classes:

Here are the attribute values:

Table 1: **Attribute values**

buying	{v-high, high, med, low}
maint	{v-high, high, med, low}
doors	{2, 3, 4, 5- more}
persons	{2, 4, more}
lug_boot	{small, med, big}
safety	{low, med, high}

Table 2: **Class Distribution (number of instance per class)**

unacc	1210
acc	384
good	69
v-good	65

2.1 Data sources

https://archive.ics.uci.edu/ml/datasets/Car+Evaluation

On KDD cup Dataset (Intrusion Detector Learning)

1 Group members

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2 Abstract of the project

I am going to do my project on KDD cup data set. This data is based in intrusion detection types. Data is given separately for training and testing. For the given training dataset, I have to build the model using the method(Neural network, Support vector machine, Regression Technique) , not clear this time. After building the model, we are going to test the accuracy of our model on the testing dataset or it can also be possible for the given training data set(70 percent for the training the model and 30 percent for the testing). In the KDD cup data set forty one features are given and there are basically four types of attacks are given. For building the model I have to used these given features.

2.1 Data sources

http://archive.ics.uci.edu/ml/datasets/KDD+Cup+1998+Data

Lung Cancer Detection

18 February 2017

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2 Abstract of the project

The count of lung cancer patient is increasing day by day. It would be a boon if cancer can be detected earlier. Researchers are looking forward to use CT images for detecting lung cancer. Some areas of lung become abnormal for a cancerous patient. Abnormal areas can be both cancerous or non-cancerous. We are planning to design a deep learning network that can detect whether abnormal areas are cancerous or not. The data set consists of several CT scan images. The basic aim is to analyze the pattern of abnormal cancerous area in lung so that given any CT image, it can be accurately detected whether the patient is cancerous or not.

2.1 Data sources

The data sources are available at: *https://www.kaggle.com/c/data-science-bowl-2017*. The data contains many CT images in 'DICOM' format.

Message Classification for Twitter Data

1 Group members

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2 Abstract of the project

Chat Bot which is also named as Conversational Agent or Dialogue System is a computer program which communicates with human or machine via text or auditory methods. The input to this programme is natural language text and this application will give the best possible class/label about the messages.Chat bots are used now a days for various practical purposes including customer service or information acquisition. In this project we are going to solve the problem of message classification using natural language processing and deep learning techniques. The Chat Bot will read the message and classify the message into different categories named as Normal, Place, Schedule and very important. Here, each categories can also have various sub-categories like Call, Meeting, Question.

2.1 Data sources

The data source will be twitter data, messages and some of the data relating to various situations created manually by us.

Stock Market Prediction using Daily News Articles

1 Group members

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2 Abstract of the project

With the exponential growth of the Internet, the amount of daily news articles have experienced a significant growth. There is some lag between when the news article is released and when the market has moved. Now a day, the news articles serve the purpose of circulating organization, social or budget related information to the public and reflect their trading strategies on the stock market. It is become necessary to deeply analyze the information to support the investors to make smart trading decision before making real investments. However, the most important point in the stock market prediction task is not always the accuracy of classifiers.
The aim of this project is to predict future stock values by using daily news feeds and can it be significantly improved by the inclusion of specific public mood dimensions. Here we will investigate whether the measurements of collective mood states derived from largescale daily news feeds are correlated to the value of the stock market over time.

2.1 Data sources

https://www.kaggle.com/aaron7sun/stocknews
https://finance.yahoo.com/quote/

Image Classification : Face Detection and Recognition

February 19, 2017

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2 Abstract of the project

Detection and recognition of human faces is a very important problem for surveillance application. By, detection persons across frames of a video we can identify persons of interest and track their movement across the location where the surveillance is active. In this project we will start firstly with the CIFAR dataset [1], train a convnet over it, to enhance our implementation skills for the network. Then we will proceed towards face detection. We will develop methods which can recognize faces similar to HAAR Cascades, an OpenCV technique for face detection. We will try to generate dataset by extracting faces of persons from multiple videos. Train our network over it and try to test images to detect faces. Later on we will try to extend this over detecting person in frames of video by detecting their faces with the help of our convnet.

2.1 Data sources

1. The CIFAR-10 dataset [http://www.cs.toronto.edu/ kriz/cifar.html]
2. Building powerful image classification models using very little data [https://blog.keras.io/building-powerful-image-classification-models-using-very-little-data.html]

Street View House Number Recognition using Deep Convolutional Neural Networks

1 Group members

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2 Abstract of the project

Recognizing arbitrary multi-digit numbers from Street View imagery is one of the challenging task which can be tackled with the help of deep learning. To achieve this proposed target, we will use deep convolution neural network with multiple hidden layers that operates directly on image pixels. Having gone through some of the literature, we infer the knowledge that to achieve such aim, we will have to perform per digit recognition task. If we want to train on the digit-level, we should define a fixed rectangle size and use sliding window approach to tackle this. We will use Python to implement our code. We will use TensorFlow, numpy and any other libraries which will be required during the implementation time.

2.1 Data sources

We will take the help of publicly available Street View House Number (SVHN) dataset.

Sentiment Analysis of Book Reviews

1 Group members

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2 Abstract of the project

Our project topic is Sentiment Analysis of Book reviews. In this project we will do automatic classification of subjectivity of Amazon.com book reviews. For data collection we will collect data(book reviews) from amazon.com. The corpus will be divided into training set and testing set.

Input will be in the form of review statements and output will be in the form of sentiment (positive, negative or neutral).

2.1 Data sources

1. http://archive.ics.uci.edu/ml/datasets/Amazon+book+reviews

Multilingual Question Answering

17 Feb 2017

1 Group members

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2 Abstract of the project

Hindi is not so fortunate language with respect to English in terms of the number of tools available and quality of these tools. So we can use Cross Language Learning which can use annotated resources available in some resource fortunate language to bring NLP capability to a less fortunate language. Aim is to learn a common representation from two language of the same data such that: (i) any single language can be reconstructed from the common representation, (ii) a single language can be predicted from the representation of another language and (iii) the representations learned for the two language are correlated. Now a days other languages like Hindi etc. are getting importance like English language in digital contents. So many researches are going on to make other language NLP tools and there quality equivalent to English. An obvious solution to this problem is to improve the annotated inventory of these languages but the involved cost, time, and effort act as a natural deterrent to this. Better way of achieving this is to project parameters learned from the annotated data of one language to another language. These projections are enabled by a bilingual resource such as a Machine Translation tool, a parallel corpus or a bilingual dictionary. Alternatively, one can exploit such bilingual resources to learn a shared representation for two languages.
This project is basically Multilingual Question Answering. In which source data is in English and user can ask question in Hindi and the answer will be in Hindi only.

2.1 Data sources

1. English annotated corpus.
2. Hindi annotated corpus.
3. Hindi English Parallel corpus.

Fish Species Likelihood Prediction

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1 Group members

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2 Abstract of the project

Kaggle - The Nature Conservancy Fisheries Monitoring

In this project we intend to detect and classify different species of fish which appears on a fishing boat, based on images captured from boat cameras of various angles.

Our goal is to predict the likelihood of fish species in each picture. Eight target categories are available in this dataset: Albacore tuna, Bigeye tuna, Yellowfin tuna, Mahi Mahi, Opah, Sharks, Other (meaning that there are fish present but not in the above categories), and No Fish (meaning that no fish is in the picture). Each image has only one fish category, except that there are sometimes very small fish in the pictures that are used as bait.

2.1 Data sources

The data consists of images of the fishing vessel, containing one fish category. The dataset was compiled by The Nature Conservancy in partnership with Satlink, Archipelago Marine Research, the Pacific Community, the Solomon Islands Ministry of Fisheries and Marine Resources, the Australia Fisheries Management Authority, and the governments of New Caledonia and Palau.

List of data sources:

- **train.zip** - zipped folder of all train images. The train folders are organized by fish species labels.
- **test_stg1.zip** - zipped folder of all test images in stage 1
- **test_stg2.zip** - zipped folder of all test images in stage 2 (not available until the second stage of the competition)
- **sample_submission_stg1.csv** - a sample submission file in the correct format
- **sample_submission_stg2.csv** - a sample submission file in the correct format (not available until the second stage of the competition)

  link: The Nature Conservancy Fisheries Monitoring dataset

Tackling Black Box Learning using Neural Networks

1 Group members

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2 Abstract of the project

The project aims at developing a neural network architecture to tackle the problem of representation learning. We will train a classifier to predict labels on a dataset that is not human readable, without the knowledge of what the data consists of. We plan of creating a deep learning model that can learn from both labeled and unlabeled data, because the amount of annotated data is very less and a large number of unsupervised examples are provided for training. The system will be tested on 10,000 instances from a data distribution whose source is again unknown.
The idea is inspired from the **Black Box Challenge** on Kaggle as part of *ICML 2013 Challenges in Representation Learning* and the training and test data is obtained from there.
Some of the interesting approaches used for solving this problem include using a sparse filtering technique [1] and an autoencoder architecture using ensemble learning [2].

2.1 Data sources

Challenges in Representation Learning: The Black Box Learning Challenge
ICML 2013 Challenges in Representation Learning

References

[1] L. Romaszko, "A deep learning approach with an ensemble-based neural network classifier for black box icml 2013 contest," in *Workshop on Challenges in Representation Learning, ICML*, pp. 1–3, 2013.

[2] J. Xie, B. Xu, and Z. Chuang, "Horizontal and vertical ensemble with deep representation for classification," *arXiv preprint arXiv:1306.2759*, 2013.

MAKING NEURAL PROGRAMMING ARCHITECTURES GENERALIZE VIA RECURSION

28th February, 2017

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2 Abstract of the project

Neural nets can be used to learn algorithms from given inputs and outputs. However, it has been observerd that learning just that, the model does not scale properly for larger inputs.

The first paper below introduces the idea of recursion to augment neural nets. The paper introduces the concept of recursion in the Neural-Programmer Interpreter framework to make it generalize better and ignore other useless parameters like input length. The paper talks about grade school addition, bubblesort, topsort and quicksort, and it not only learns faster with less examples, but also scales to more complex inputs.

In this project, we plan to implement one or more recursive algorithms. If time allows, it can be wrapped in a chat bot interface for more user friendly use.

2.1 Data sources

List of data sources.

1. Jonathon Cai, Richard Shin, Dawn Song, "Making Neural Programming Architectures Generalize via Recursion".

2. Scott Reed and Nando de Freitas. Neural programmer-interpreters. ICLR , 2016.