CRYPTO CURRENCY PREDICTION USING DEEP LEARNING

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Abstract— Inside the beyond 8 years of bitcoin's history, the economic system has visible the charge of bitcoin hastily grow due to its promising outlook on the future for crypto currencies. Traders have taken observe of numerous blessings crypto provides over the traditional banking system. One such trait is that crypto forex lets in for decentralized banking, meaning bitcoin or any alternate coins(normally referred as alt coins) can't be regulated by way of powerful banks. There may be also a marketplace cap of 21 million bitcoins that can be in movement, therefore a surplus of bitcoins cannot be "revealed" which would bring about inflation. Bitcoin resolves the difficulty with transaction protection by way of using a block chain, or a ledger, which statistics the records of each transaction ever made into one long hexadecimal "chain" of nameless transactions, which continues transaction records obvious, but also exclusive. Recurrent neural networks (RNN) with long term memory cells(LSTM) cells can be used . We show that the price of crypto coins can be expected with machine learning.

INTRODUCTION

Our project mainly aims to predict the cryptocurrency prices using deep learning, a subset of Machine Learning. As we need features for any machine learning model, we use all the trading features like price, open price, close price, high, low, volume values from a crypto currency prices datasets
Generally crypto prices are plotted in the form of candlesticks. We can produce them in the form of datasets with above said features and use them to train our model.
As the market erupted in 2017, crypto currencies gained much popularity.
The prices of cryptocurrencies depend on a lot of factors like technological progress, internal competition, pressure on the markets to deliver, economic problems, security issues, political factor etc. Their high volatility leads to the great potential of high profit if intelligent inventing strategies are taken.

Unfortunately, due to their lack of indexes, cryptocurrencies are relatively unpredictable compared to traditional financial predictions like stock market prediction.

We take a rough four step process to predict cryptocurrency prices:
1. Getting real-time cryptocurrency data.
2. Prepare data for training and testing.
3. Predict the price of cryptocurrency using tensor flow
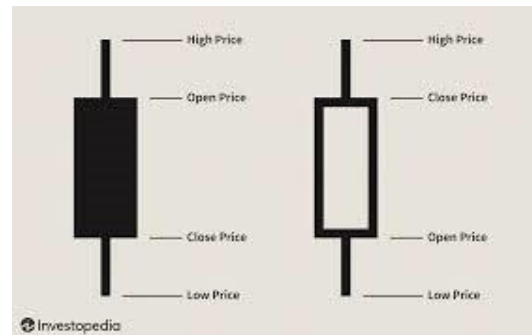4. Visualize the prediction results.

fig: Candle stick [1]

DEEP LEARNING

Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called **artificial neural networks**.[2]

Machine learning can be divided into two categories: supervised learning and unsupervised learning. Supervised learning includes modeling datasets with labelled items, whereas unsupervised learning needs no labels. In supervised learning, each example may be represented as a fixed set of attributes and goal training. Those attributes are mapped into target lessons. Examples of supervised learning strategies encompass neural networks and support vector machines. In the case of unsupervised learning, similar data instances are grouped into clusters. Examples of unsupervised learning include clustering strategies. The multilayer perceptron (mlp) is a simple feed-forward neural network community that is maximum normally utilized in type obligations. In terms of neural network terminology, examples fed to the version are known as inputs, and predicted values are called outputs. Every modular subfunction is a layer. A version includes input
and output layers, with layers between those referred to as hidden layers. Every output of such a layers is a unit that can be taken into consideration analogous to a neuron within the brain. Connections among these gadgets are called the weight, which is similar to a synapse within the mind. The weight defines the characteristic of the version considering that this weight is the parameter this is adjusted whilst schooling a model. But, the mlp's effectivenessis restricted with the vanishing-gradient problem. Right here, as layers and time steps of the network are associated with every different through multiplication, derivatives are at risk of exploding or vanishing gradients. Vanishing gradients are greater of a challenge as they are able to become too small for the network to examine, whereas exploding gradients can be restrained the usage of regularization. Some other hassle of the mlp is that its indicators only bypass ahead in a

network in a static nature. As a end result, it does no longer apprehend the temporal element of a time collection assignment in an effective manner when you consider that its reminiscence can be taken into consideration frozen in time. The mlp can be considered to deal with all inputs as a bucket of objects without a specific order in terms of time. As a result, the same weight is carried out to all incoming facts, that is a naive approach. The rnn, additionally referred to as a dynamic neural community, addresses a number of those limitations [3]. The shape of the rnn is much like that of the mlp, however alerts may be each back and forth in an iterative way. To facilitate this, every other layer known as the context layer is added. Similarly to passing inputs among layers, the output of each layer is fed to the context layer to be fed into the next layer with the next enter. In this context, the country is overwritten at each timestep. This gives the advantage of permitting the community to assign specific weights to occasions that arise in a series as opposed to the identical weight to all inputs, as with the mlp. This outcomes in a dynamic network. In a single sense, the duration of the temporal window is the period of the community reminiscence. It's miles the appropriate technique for a time series prediction project [4, 5]. At the same time as this addresses the temporal problem in a time collection undertaking, vanishing gradient can nevertheless be a difficulty. Similarly, some studies have observed that, at the same time as the rnn can manage long-time period dependencies, it frequently fails to analyze in practice due to difficulties between gradient descent and longterm dependencies [6, 7]. Lstm units cope with each these problems [8]. They allow the protection of weights which are ahead and returned-propagated via layers. That is in evaluation to the rnn, wherein the nation receives overwritten at every step. LSTM devices also permit the network to preserve mastering over many time steps by using preserving a greater consistent blunders. This lets in the community to study lengthy-time period dependencies. An LSTM cell includes forget/don't forget gates that allow the mobile to decide what records to block or pass based on information power and significance. As a end result, susceptible indicators may be blocked, stopping the vanishing gradient. Lstm cellular states have 3 dependencies that may be generalized as previous mobile states, previous hidden states, and current time steps. These states are chargeable for memorizing matters, and special gates are used for manipulating this memory. Those gates are forget gates, input gates, and output gates. Because the call indicates, forget about gates cast off information that is not obligatory for the lstm. Any addition of new information to the cellular nation is done using the input gate. The input gate uses the tanh feature, which gives the output in the form of -1 to +1. The input gate ensures that each one redundant information is removed and only the most essential records is gift. The choice of the maximum useful data from the cell nation and its display are the most important task of the output gate.

IMPLEMENTATION

This task is implemented as an internet application made with exclusive popular technology stacks. Quick information of all the technology used is python, flask, the front end technology(html, css, javascript), mysql, tensorflow, pandas, numpy etc ML modules.

Python

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built-in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and canbe freely distributed. [9]

We made a web application using Flask framework in python. Not just that, python also helped us in providing best machine learning libraries including tensorflow which we used for backend machine learning in our web app.

Flask:

Flask is a web Framework built on python. It is categorized as a microframework as it does not require unique tools or libraries. The term micro was used in its documentation. "Micro" does not mean that your whole web application has to fit into a single Python file (although it certainly can), nor does it mean that Flask is lacking in functionality. The "micro" in microframework means Flask aims to keep the core simple but extensible. Flask won't make many decisions for you, such as what database to use. Those decisions that it does make, such as what templating engine to use, are easy to change. Everything else is up to you, so that Flask can beeverything you need and nothing you don't.[10]
a few main additives of flask are werkzeug , jinja , markupsafe , itsdangerous.. Werkzeug is a flask library to attain net server gateway interface and it's miles licensed below bsd license. It supports all python 3. 5 and later versions. Jinja is a template engine for python that handles templating inside html documents the use of jinja syntax that is similar to python, it's also licensed below the bsd license. Markupsafe is string copying with the library for python programming language which is likewise certified under bsd. The eponymous markup-secure extends the python string kind and marks the contents as "comfortable" combining markup-safe with ordinary strings robotically. Itsdangerous is a at ease records serialization library for the python programming language, licensed beneath a bsd license. It's miles used to preserve the consultation of a flask software in a cookie with out allowing users to tamper with the consultation contents.

MySQL:

MySQL is an open-source Relational Database Model System(RDBMS) that follows Structured query

language(SQL) as its syntax and is licensed under GNU, it is publicly available to everyone. MySQL is used by around 80% of existing business applications including big companies like Facebook, NetFlix, Google, Amazon as its Database System for storing most of their data.[11]

Web App Design:

FrontEnd technology is very important as it is the user interface which actually a user will see on the client-side, to make it simple we have used basic technologies on the frontend like HTML, CSS, and Javascript so that the user can view and interact with that data.[13]

The goal of frontend technology is to provide easy access to the tool without any problem.[13]

Html is the spine of web sites, it acts as the skeleton of any net application the trendy version of html is html5 posted in october 2014 by way of w3 hints. Css controls the style of the web page which makes the components of the website look clean and without difficulty handy to the person without any hassle on any tool. Javascript enables event-pushed duties and makes the page dynamic, to enhance the user revel in when used various occasions like a mouse click on, scroll, etc.

TensorFlow:

Tensorflow is an opensource library for deep learning and machine learning. It uses python to provide API in front and run models in the backend.

TensorFlow is an end-to-end open source platform for machine learning. It has a comprehensive, flexible ecosystem of tools, libraries and community resources that lets researchers push the state-of-the-art in ML and developers easily build and deploy ML powered applications.[14]

WORKING MODEL:

This model is currently deployed as a web application for user convenience.

These web application works as in the below steps:

1. User will open the website and login if he had already registered or else register first and logs in next.

2. The user will be given an option on header "Start Predicting!" user must click it.

3. A page will be shown with versions, only project version is available now. User selects that.

4. A list of currency pairs (like BTC-USD) will be given in a dropdown menu, user must select one and click "GO".

5. The website fetches information from the dataset and apply model on it using tensorflow in the backend and sends the result of 5 day predictions in the form of graph as shown below.
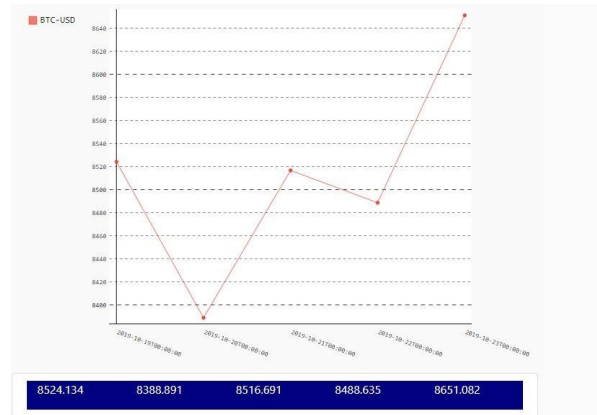

Fig2: 5 day predictions graph

Machine Learning is complex area of computer science. But implementing it is very easy now than it used to be in the past. This is because of the machine learning frameworks like TensorFlow by Google.

Tensorflow allows developers to create dataflow graphs—structures that describe how facts movements through a graph, or a chain of processing nodes. Every node in the graph represents a mathematical operation, and every connection or facet among nodes is a multidimensional records array, or tensor. Tensorflow gives all of this for the programmer via way of the python language. Python is easy to research and paintings with, and presents handy approaches to specific how excessive-level abstractions can be coupled collectively. Nodes and tensors in tensorflow are python gadgets, and tensorflow applications are themselves python programs. The actual math operations, but, aren't accomplished in python. The libraries of differences which might be available thru tensorflow are written as excessive- overall performance c++ binaries. Python just directs visitors among the portions, and gives high-degree programming abstractions to hook them together. Tensorflow programs may be run on most any goal that's handy: a neighborhood system, a cluster in the cloud, ios and android gadgets, cpus or gpus. In case you use google's very own cloud, you could run tensorflow on google's custom tensorflow processing unit (tpu) silicon for similarly acceleration. The ensuing fashions created by way of tensorflow, though, may be deployed on most any tool where they will be used to serve predictions.

Keras is a highlevel API in tensorflow. It supports back-end neural network computation engines for our project.

Keras was created to be user friendly, modular, easy to extend, and to work with Python. The API was "designed for human beings, not machines," and "follows best practices for reducing cognitive load." Neural layers, cost functions, optimizers, initialization schemes, activation functions, and regularization schemes are all standalone modules that you can combine to create new models. New modules are simple to add, as new classes and functions. Models are defined in Python code, not separate model configuration files.[15]
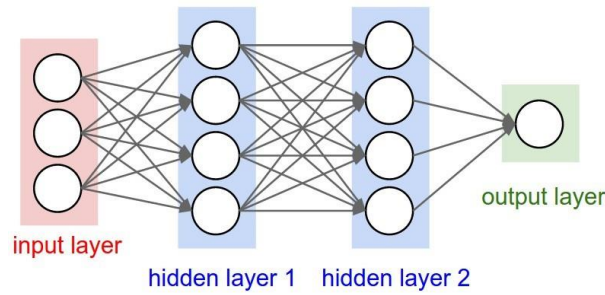
Fig 3. Neural Network model

Result

After the user clicked Go on a pair of currencies, we get a graph as a result. The result is as below for ETH/USD pair from 19OCT to 23OCT.
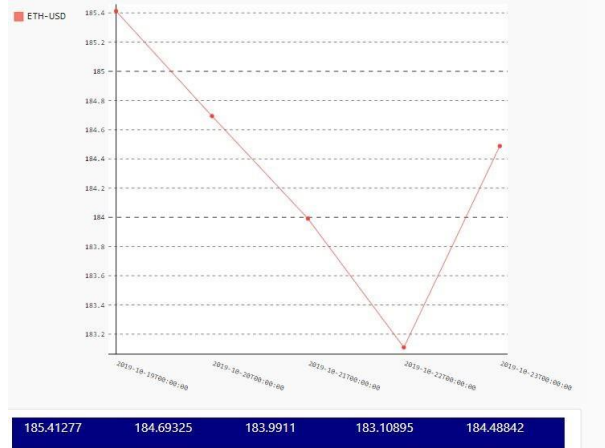

Fig5: predicted values for ETH/USD

The actual values for the same pair are as below

Fig6: Actual values for ETH/USD

From the above figures we can observe that the model correctly predicted the sharp fall of price from first day and a recovery of price on the last day.

Conclusion

Due to the decentralization of cryptocurrencies, It widely fluctuates as there is no central body to control it which alarms for an immediate need for a good prediction system. So, using deep learning we made a model and contributed towards this burning requirement. Cryptocurrency depends on various environments like Political, human-relations, market influencers, regulations, sudden rumors or misinformation. So beware of them as a good trader and if you are an investor HODL them. Thank you for using our model.

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