

BITCOIN PREDICTION USING MACHINE LEARNING WITH ARDUINO

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ABSTRACT:

The goal of this paper is to ascertain with what accuracy the direction of Bitcoin price in USD can be predicted. The price data is sourced from the Bitcoin Price Index. The task is achieved with varying degrees of success through the implementation. The Random Forest achieves the highest classification accuracy. Finally, both deep learning models are benchmarked on both a GPU and a CPU with the training time on the GPU outperforming the CPU implementation by 67.7%. Also the temperature of the mining machine is identified by temperature sensor and controlled by the CPU fan and peltier module and gives the notifications if the temperature is increased.

I INTRODUCTION

Bitcoin is the world's most valuable cryptocurrency and is traded on over 40 exchanges worldwide accepting over 30 different currencies. It has a current market capitalization of 9 billion USD according to <https://www.blockchain.info/> and sees over 250,000 transactions taking place per day. As a currency, Bitcoin offers a novel opportunity for price prediction due to its relatively young age and resulting volatility, which is far greater than that of fiat currencies. It is also unique in relation to traditional fiat currencies in terms of its open nature; no complete data exists regarding cash transactions or money in circulation for fiat currencies.

1. Prediction of mature financial markets such as the stock market has been researched at length. Bitcoin presents an interesting parallel to this as it is a time series prediction problem in a market still in its transient stage. Traditional time series prediction methods such as Holt-Winters's exponential smoothing models rely on linear assumptions and require data that can be broken down

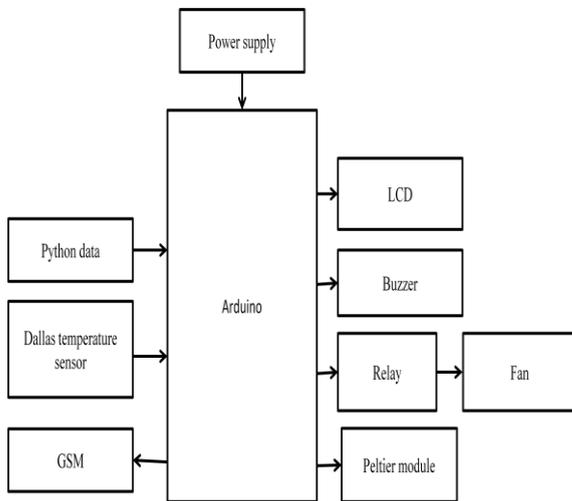
into trend, seasonal and noise to be effective. This type of methodology is more suitable for a task such as forecasting sales where seasonal effects are present.

2. Due to the lack of seasonality in the Bitcoin market and its high volatility, these methods are not very effective for this task. Given the complexity of the task, deep learning makes for an interesting technological solution based on its performance in similar areas. The recurrent neural network (RNN) and the long short-term memory (LSTM) are favored over the traditional multilayer perceptron (MLP) due to the temporal nature of Bitcoin data.

The aim of this paper is to use the Arduino controller, it will read the data sent by the python. Bitcoin prediction is done by python this data will be sent to the Arduino. Arduino will receive the data, if the price is high then Arduino will process and send the information to the GSM, GSM will send the message to the person who should know about it. Temperature sensor will measure the temperature of the device when temperature increases then GSM will send message and Buzzer will generate the alerts.

II METHODOLOGY

Block diagram



The system makes use of Arduino Circuit and a supply of rectified electricity. The Python data which contains the predicted Bitcoin value is used by the Arduino. The Temperature of the Bitcoin mining machine is monitored by the temperature sensor and is controlled by the peltier module and to control this module we require the fan. Also the buzzer is used for the alerts. A 16*2 LCD panel connected to the Arduino board to display the information of the temperature. Using an Arduino module, the temperature can be known and also a message sent through the GSM to registered mobile numbers as an alert if the temperature increases. Also the arduino identifies if the price of the bitcoin suddenly rises or falls down and it and sends the message immediately.

III LITERATURE SURVEY

[1] S. NAKAMOTO, "Bitcoin: A Peer-To-Peer Electronic Cash System," 2008

A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer- to-peer network. The network timestamps

transactions by hashing them into an ongoing chain of hash-based proof-of- work, forming a record that cannot be changed without redoing the proof-of- work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.

[2] M. BRIERE, K. OOSTERLINCK, AND A. SZAFARZ, "Virtual currency, tangible return: Portfolio diversification with bitcoins," *Tangible Return: Portfolio Diversification with Bitcoins* (September 12, 2013), 2013.

Bitcoin is a major virtual currency. Using weekly data over the 2010-2013 period, we analyze a Bitcoin investment from the standpoint of a U.S. investor with a diversified portfolio including both traditional assets (worldwide stocks, bonds, hard currencies) and alternative investments (commodities, hedge funds, real estate). Over the period under consideration, Bitcoin investment had highly distinctive features, including exceptionally high average return and volatility. Its correlation with other assets was remarkably low. Spanning tests confirm that Bitcoin investment offers significant diversification benefits. We show that the inclusion of even a small proportion of Bitcoins may dramatically improve the risk-return trade-off of well- diversified portfolios. Results should however be taken with caution as the data may reflect early-stage behavior which may not last in the medium or long run.

[3] I. KAASTRA AND M. BOYD, "Designing a neural network for forecasting financial and economic time series," *Neurocomputing*, vol. 10, no. 3, pp. 215–236, 1996

Artificial neural networks are universal and highly flexible function approximators first used in the fields of cognitive science and engineering. In recent years, neural network applications in finance for such tasks as pattern recognition, classification, and time series forecasting have dramatically increased. However, the large number of parameters that must be selected to develop a neural network forecasting model have meant that the design process still involves much trial and error. The objective of this paper is to provide a practical introductory guide in the design of a neural network for forecasting economic time series data. An eight-step procedure to design a neural network forecasting model is explained including a discussion of tradeoffs in parameter selection, some common pitfalls, and points of disagreement among practitioners.

[4] H. WHITE, "Economic prediction using neural networks: The case of ibm daily stock returns," in Neural Networks, 1988., IEEE International Conference on. IEEE, 1988, pp. 451–458.

A report is presented of some results of an ongoing project using neural-network modeling and learning techniques to search for and decode nonlinear regularities in asset price movements. The author focuses on the case of IBM common stock daily returns. Having to deal with the salient features of economic data highlights the role to be played by statistical inference and requires modifications to standard learning techniques which may prove useful in other contexts.

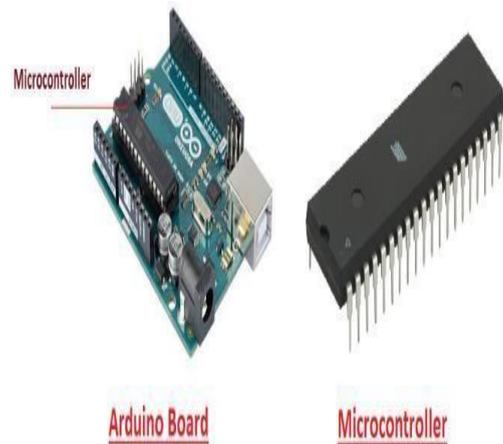
IV COMPONENTS

Arduino:

The Uno with Cable is a micro-controller board base on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs); 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything need to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to getstarted.

Specifications:

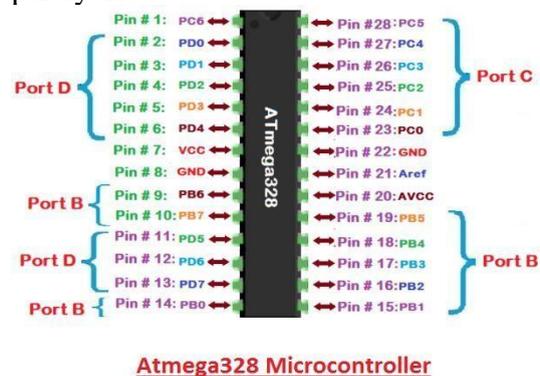
- Microcontroller: ATmega328P.
- Operating Voltage: 5V.
- Input Voltage (recommended): 7-12V.
- Inout Voltage (limit): 6-20V.
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- PWM Digital I/O Pins: 6.
- Analog Input Pins: 6.
- DC Current per I/O Pin: 20 mA.



Arduino Uno boards are quite similar to other boards in Arduino family in terms of use and functionality,

Features of Arduinio

Arduino Uno comes with USB interface i.e. USB port is added on the board to develop serial communication with the computer. Atmega328 microcontroller is placed on the board that comes with a number of features like timers, counters, interrupts, PWM, CPU, I/O pins and based on a 16MHz clock that helps in producing more frequency and number of instructions per cycle.



DS18B20 Temp Sensor

The DS18B20 is one type of temperature sensor and it supplies 9-bit to 12-bit readings of temperature. These values show the temperature of a particular device. The DS18B20 digital thermometer provides 9-bit to 12-bit Celsius temperature measurements and has an alarm function with nonvolatile user-programmable upper and lower trigger points.



Specifications:

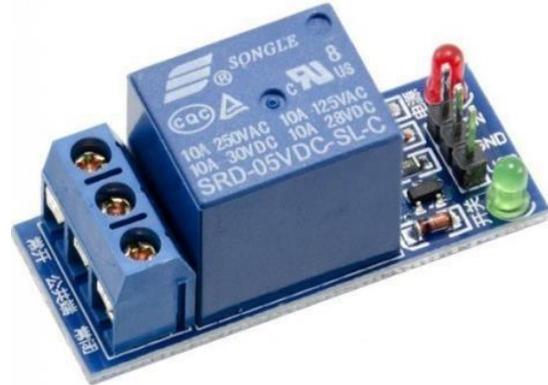
- Usable temperature range: -55 to 125 °C (-67 °F to +257 °F)
- 9 to 12 bit selectable resolution.
 - Uses 1-Wire interface- requires only one digital pin for communication.
- Unique 64 bit ID burned into chip.
- Multiple sensors can share one pin.

DS18B20 Sensor Working

Temperature sensors work by providing readings via electrical signals. Sensors are composed of two metals that generate an electrical voltage or resistance when a temperature change occurs by measuring the voltage across the diode terminals. When the voltage increases, the temperature also increases.

Relay

A relay is an electromagnetic switch that is used to turn on and turn off a circuit by a low power signal, or where several circuits must be controlled by one signal. Most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

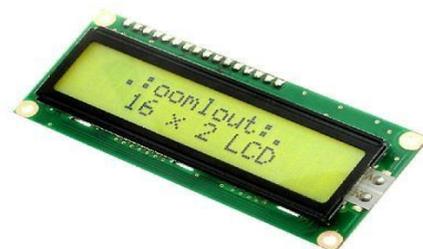


LCD

- The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc.
- These displays are mainly preferred for multi-segment light emitting diode and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.

Specifications:

The operating voltage of this display ranges from 4.7V to 5.3V
 The display bezel is 72 x 25mm
 The operating current is 1mA without a backlight
 LED color for backlight is green or blue
 Number of columns – 16
 Number of rows – 2
 Number of LCD pins – 16
 Characters – 32



GSM Module

- A GSM modem requires a SIM card to be operated and operates over a

network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection.

- A GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network.

Specifications:

Dual-Band 900/ 1800 MHz.

GPRS multi-slot class 10/8GPRS mobile station class B.

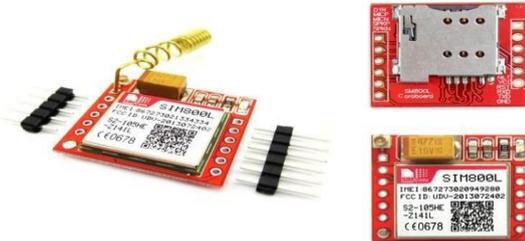
Compliant to GSM phase 2/2+

Dimensions: 24*24*3 mm.

Weight: 3.4g.

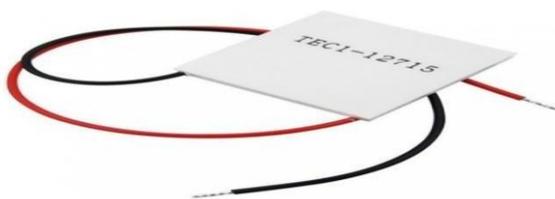
Supply voltage range : 5V.

Low power consumption: 1.5mA (sleepmode)



Peltier Module:

- Thermoelectric cooling uses the Peltier effect to create a heat flux at the junction of two different types of materials.
- It can be used either for heating or for cooling, although in practice the main application is cooling. It can also be used as a temperature controller that either heats or cools.



Specifications:

Model number: TEC1-12706.Operating

Voltage: 12V.

Maximum Voltage Umax (V) : 15.4V.Maximum Current

Imax (A) : 6A. Maximum Power: 92 W.

Maximum Temperature: 138°C.Power Cord:

200mm.

V PROPOSED WORK

In the proposed method we are using Arduino controller it will read the data send by the python. Bitcoin prediction is done by python this data will sent to the Arduino. Arduino will receive the data, if the price is high then Arduino will process and sent the information to the GSM, GSM will send the message to the person who should know about it. Temperature sensor will measure the temperature of the device when temperature increases then GSM will send message and Buzzer will generate the alerts. then gives the information to peltire module as it can cool the machine also the fan is used to make the peltier module work efficiently.

VI SOFTWARE REQUIREMENT

ArduinoIDE:

Arduino IDE where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

Introduction to Arduino IDE:

- Arduino IDE is an open sourcesoftware that is mainly used for writing and compiling thecode into the Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get

their feet wet with the learning process.

- It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.
- This environment supports both C and C++ languages.

VII ADVANTAGES AND APPLICATIONS

Advantages:

- Reduces the losses
- More effective
- It will generate message alerts
- Low cost

Applications:

- Trading systems
- Flood alerting systems

VIII CONCLUSION

In this application, we have successfully created a model to generate future outcomes for crypto currency called Bitcoin. This is developed in a user-friendly environment using Python programming. Predicting the

future will always be on the top of the list of uses for machine learning algorithms.

This work focuses on the development of project based learning in the field of computer science engineering, by taking into account the problem definition, progression, student assessment and use of hands on activities based on use of learning algorithm to develop application.

IX REFERENCES

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