A RETROSPECT INTO THE COMPUTER SCIENCE PROGRAM

CRYPTOCURENCY: SUSTAINABLE FOR THE FUTURE OR NOT?

A Thesis Prospectus

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By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction & Research Question

My technical project will involve my experience during my internship during the fall 2022 semester and a reflection of the UVA Computer Science department in preparing me for this position. The question I will be covering for this project will be whether I believe I received adequate experience from my classes to prepare me for this internship.

The technology I will be exploring in my STS project is cryptocurrency. Cryptocurrency is a new type of currency that has emerged in the 21st century that involves a series of algorithms and computations to generate digital currency, all the while being a form of transaction outside the bounds of typical government. For my STS project, my research question involves the sustainability of cryptocurrency to determine whether this technology should continue to exist in our society. This question is extremely important given that we are currently in a climate crisis here on Earth and the process to create cryptocurrency generates significantly large tons of carbon emissions. Bitcoin, a leader within the cryptocurrency realm and a single instance of this technology, has around 21.5 to 53.6 metric tons of carbon dioxide emitted into the atmosphere year globally (Stoll et. al, 2018, p. 2). Modifications must be made for this technology, otherwise it is simply unsustainable for life.

The roadmap for this prospectus is as follows. First, I will begin with my internship experience and what I believe the Computer Science department could improve with to better prepare future Computer Science graduates. Second, I will mention cryptocurrencies and the environmental impact on the world, and whether any modifications can be made to make this technology sustainable for long time use on Earth. Last, I shall mention what texts I used to obtain key information regarding the question about cryptocurrency's environmental impact and if it can be reversed or mitigated.

Technical Project

For my technical project, I will be talking about my experience with RevArt through UVA's Internship Placement Program (IPP) program. This experience was extremely valuable in teaching me the core foundations of what a software developer is truly like. I was able to obtain numerous skills while working as a software engineering intern. Such skills I received was more web development skills, a new coding language called JavaScript, and communication skills. However, while in the position I had many moments where I felt unprepared with my prior coding experience. The only experience that was comparable prior to this position I had dealt with in my classes was in Advanced Software Development. This class taught me the agile development cycle and web development architecture through GitHub, Django, and Heroku. Beyond this class, my experience with other classes in the computer science program did not directly correlate with preparing me specifically for web development.

STS Project

Money has been a medium that has evolved through several different stages throughout the lifetime of humans. Bartering, the gold standard, fiat currency being some examples of this evolutionary process. The next claimed step in this process for money has been argued to be found in cryptocurrency. Cryptocurrency has recently become another way for individuals to perform transactions with one another, with an added level of security using an algorithm called a blockchain ("What is blockchain technology?"). Not only can transactions be done on the blockchain, but new currency can be made through a process called mining through one's computer. Cryptocurrency has an immense toll when it comes to carbon emissions however, requiring an intense amount of power to maintain and add transactions to the blockchain. Earth is going through an extreme climate crisis right now from the numerous amounts of fossil fuels

humans consume daily for the past hundred or so years. The environmental impacts of cryptocurrencies impact the whole world and measures must be done to mitigate the effects from this technology if it is to be sustainable for future generations. The limited resources we have here on Earth should not be taken for granted. So, is it possible for such an enormous change to occur industry wide for cryptocurrency? If it is not, this technology should be cast aside never to be touched again.

There are only a few social groups that are directly impacted by cryptocurrency itself. The social groups who are directly involved are those who host the physical servers for the blockchain, or the computers involved in cryptocurrency mining; those who host the servers or computers can range from being an individual, group of people, a company, or a national government. An expensive cost goes into maintaining these servers and computers due to the huge energy output that is needed for this technology to work, directly affecting the monetary earnings of these people. Environmentally, however, all of humanity is a social group that is to be considered here. Carbon emissions are the primary greenhouse gas that helps aid in climate change and affects the entire globe, not just a single area of the world.

The method framework I will be taking this research from is through that of synthesis of literature involving the key texts in the section below, along with some additional texts that I have found that have dealt with the environmental impacts of cryptocurrencies and efforts taken in the field to lessen these impacts. By synthesizing all these texts, I will be able to obtain a definitive answer regarding the sustainability of cryptocurrencies in our modern world and whether the technology could possibly be modified to a degree where the effects of carbon emissions are lessened. The timeline for the completion of this project is throughout the fall 2022

semester, winter break, and the spring 2023 semester. During this timeline I will also gather more extensive resources from the library to better formulate the project.

Key Texts

Going forward with my research into the effects of cryptocurrency on the environment, I have gathered four important texts. The first of which comes from a MIT research paper regarding the carbon emissions from Bitcoin. This study goes into detail about how many carbon emissions are produced by Bitcoin from those conducting transactions and mining for currency on the blockchain. The work provides numerical values regarding the output of these emissions from Bitcoin, providing very useful numerical data about the technology to the reader.

The second key text comes from The New Yorker referring to how cryptocurrencies like Bitcoin are extremely bad for the environment. The article goes on to proclaim the relative energy consumption compared to other everyday tasks. A single transaction that occurs on the Bitcoin blockchain uses as much as the monthly energy consumption of a single American house and a million times that of a single Visa transaction (Kolbert, 2021). This is incredibly useful information as these relative measures are easier to understand and compliment the numbers that the MIT text had mentioned.

The third text comes from Forbes with a specific case of cryptocurrency affecting the surrounding environment of a town. Many cryptocurrency miners entered the town to take advantage of the cheap energy offered by the dams from the St. Lawrence River, which ultimately drove up prices for everyone else in the town (D'Ambrosio, 2018). This then led to a ban on mining for cryptocurrency within the town due to this energy consumption, even though it was from a renewable resource. A point the article does not mention as well is that these

miners had to verify their transactions through a blockchain, which more than likely is running off fossil fuels and is emitting tons of carbon emissions from these "renewable" miners.

The fourth text comes from Decrypt and mentions Ethereum, which is another type of cryptocurrency, and their strides to decreasing carbon emissions. Ethereum moved its blockchain virtually overnight to a greener model, reducing their emissions to that of 99.6-99.99% less than what their initial carbon emissions were (Hayward, 2022). This text is extremely important as it shows that these companies have the capabilities to switch over to a green model and can very well be sustainable for years to come.

Citations

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