**Monday, October 6th**

Today Mrs. Ruzycki introduced us to the Science Fair. She was super serious and asked each and every student if they were ready for the intense competition and that if they weren’t ready to commit they might as well drop out right away.

Some people said they’d study water pipe leakages, while others were interested in space exploration. I did two tesla-themed science projects in the past, so I might either do another one or find another topic.

We will be meeting again on Tuesday, October 15th.

**Tuesday, October 15th**

We met once again in Mrs. Ruzycki’s classroom.

I still don’t know what I’m going to do my project about, but I found some research information on teslas on the weekend that said teslas had computers inside them for their autopilot feature, but they only use 9.13% of that processing power while driving. Using that info, I thought of a project where people could rent out their computers so that the rest of that computing power could be utilized for other purposes.

I thought it would be an interesting topic to research about but I’m not sure how people would feel about renting out their electronics because of all the personal information inside of it, especially with all the identity thefts going on, so that might be something I have to look at and research more about.

Mrs. Ruzycki said she was only picking 7 students to attend Science Fair, so I probably have to try really hard in order to get picked.

We will be having our next science fair meeting on Thursday, October 3rd.

**Thursday, October 23rd**

We met again.

Anyway, on the weekend I researched more about my idea and it was actually really fascinating, so I think I’m going to stick with that project idea. Mrs. Ruzycki also said that she thought the application was really good.

Our next meeting will be next Tuesday after school from 3:00 to 3:45.

**Thursday, October 23rd**

Mrs. Ruzycki told me that I would be attending Science Fair. She already ordered the trifolds, which are enormous. They’re taller than me, (which I suppose shouldn’t be a surprise) though I might have trouble decorating it.

We will have to research a significant amount (for a month), and then come up with a very specific question that we will focus on that we got from our research.

Mrs. Ruzycki went through the papers on the trifold with us:

Background Research (quite a few sheets)

Problem/Testable Question

Hypothesis/Thesis (a statement giving an original point of view based on your background research)

Scientific Principles (make sure you understand)

Concepts (Graphs and Statistics help)

Results (keep a complete record of research in logbook)

Conclusion

Future Work

We won’t be meeting for a month, which will be used to do a ton of research on our projects.

**Saturday, November 23**

I just came back from my vacation in Maui and decided to work on some science fair on the weekend. Everyone else has already done a lot of work on their projects, so I’m very behind, as I didn’t research at all when I was on vacation.

**Sunday, November 24**

I should add that my project is very similar to platforms like AirBnB and Uber. This may not seem the case, but I’ll explain: for example, with AirBnB, AirBnB technically doesn’t own any of the houses it sells to customers, those houses are owned by other people. But those people wanted to rent out their houses, so AirBnB helped them tell people that their house is available for renting. The person renting the house gets money, but AirBnB also gets money.

My future platform would let users sell computing power to the platform so that others who needed that better, faster computer experience could get it - for a fee. They would find someone willing to sell computing power to them and pay them, USING the platform, so the platform gets money and the person “renting” out their computing power also gets money, and the person who *needed* that computing power would get the desired computing power. There are many, many computing power uses, so for simplicity I only focused on bitcoin mining to calculate one source of income.

Another example is Uber. Uber doesn’t technically own any of the cars you see pop up on the app screen, but it makes a profit by letting people “rent” their cars for it. If you have the app, you’ll see that you can just insert where you want to go, and a bunch of available cars pop up on the screen. Those people are using Uber by offering their car and their driving services in return for the payment Uber gets from us, the people who need transportation. It’s honestly kind of brilliant, as nowadays Uber is much more popular than Taxis, because for Taxis those people need to buy all the taxis and hire the drivers themselves, while Uber just uses people and people’s cars, making it more convenient and easy to get transportation (though obviously those drivers have to pass a test in order to be qualified to transport people).

We’ll be having a brief science fair check-in at lunch tomorrow.

**Friday, November 29**

The meeting was about telling everyone when the next meeting would be - next Tuesday after school. I still have a whole lot of research to do.

**Thursday, December 12**

After all my research, I came up with this question:

Can the platform make a profit using the computing power of idle devices available for rent?

And a bunch of hypotheses:

* Such a platform would be viable if the revenue generated exceeds the costs incurred.
* Using the income generated from selling those bitcoins can be one source of income for the platform.
* The higher the CPU Usage, the higher the power consumption (in watts).
* If we can predict electricity prices within the next 24 hours and use computing power during valleys, we can lower the costs.
* If we can predict bitcoin prices within the next 24 hours, we can sell the mined bitcoin when prices are relatively higher.
* The predicted electricity and bitcoin prices will be mostly accurate.

Controlled variables will be: historical time and prices, parameters that could have affected those prices, the LSTM Model being used, feature extraction, and hyper parameter screening.

Manipulated variables: mining and trading schedule, the training, validation and testing datasets, the training batch, and the number of epochs used.

Responding variables: the predicted electricity prices, predicted bitcoin prices, the MSEs, the model accuracy level, and the total calculated profit that the platform would make.

I will start my experiment as soon as I’ve finished writing my code.

**Tuesday, January 14**

We’re in 2025!

I already started my code to simulate my project’s future app, so when I finish I can run it and it will detect connected devices and list out the parameters such as the processor speed, the memory capacity, etc. for each device and determine their CPU Usage, which will see how much computing power they used, and for which processes. I also mapped out my procedure:

1. First, I will do some research on LSTM, Bitcoin, Picture Recognition, Convolutional Neural Networks, etc.
2. Secondly, I will create some Python code to run my LSTM Model, Bitcoin Price Prediction Model, Picture Recognition Code, Stress Test, and the code that will turn on a computer remotely.
3. Next, I will conduct experiments by simulating computing power consumption by stress-testing a computer’s CPU%, GPU%, RAM% etc., and compare it to the electricity cost.
4. Then, I will simulate running computing tasks (with my code) on a computer while testing the voltage, frequency, and current and checking my computer’s CPU Usage.
5. After that, I will determine the exact timing of the mining schedule using the electricity price predictions, and simulate mining bitcoin with the schedule.
6. I will then use an upgraded LSTM model incorporated with a professional financial analyst library to predict bitcoin prices 1 minute into the future.
7. Afterwards, I’ll try to make stock trading automatic by assuming that a user has $1M to start with and trades the bitcoins when prices are high.
8. I’m also going to simulate stock trading automation to sell bitcoins when prices are high and keep them for later use when prices are not high enough, and calculate how much money could be made from that.
9. Finally, I will summarize the information I gathered from my research, experiments, and predictions, and determine if this platform can make a profit.

We met at lunch today again. Mrs. Ruzycki told us that we could ask her for our trifolds whenever we were ready, and that she also had materials that we could use to decorate it. She also said that our trifolds had to be done a month prior to the fair so we could have some time to practice before April. I don’t think I have a lot of time, so I hope this work can fit into my schedule.

**Tuesday, January 21**

Today I went onto Google Docs and worked on some of the information that would be displayed on my trifold. I still haven’t finished coding my LSTM platform/app yet, so I can’t do the experiment and therefore cannot do the Observations, Analysis, Conclusion, and Application parts of my project, so I mainly worked on the Project Description, Question, Hypothesis, and Procedure part. I still have to do my variables and also find some pictures that I can use to decorate my trifold with later on.

Hopefully I can finish my code soon!

**Friday, January 31**

I worked more on my Science Fair Trifold Sheets, and I got the variables written out. Mrs. Ruzycki said that the Science Fair trifolds had to be completed by March 14. Today’s the last day of January, so I really have to get on with my experiment, preferably next week. I still have about a month to - let’s see - finish up the last of my code, do my experiment, write my observations/analysis, conclusion, application, limitations, future work, citations, and acknowledgements, print all the papers out, print some images, get my notes ready, glue the papers on the trifold, decorate the trifold, and practice my presentation. Though, if I finish my experiment, the rest will be pretty easy.

**Friday, February 15**

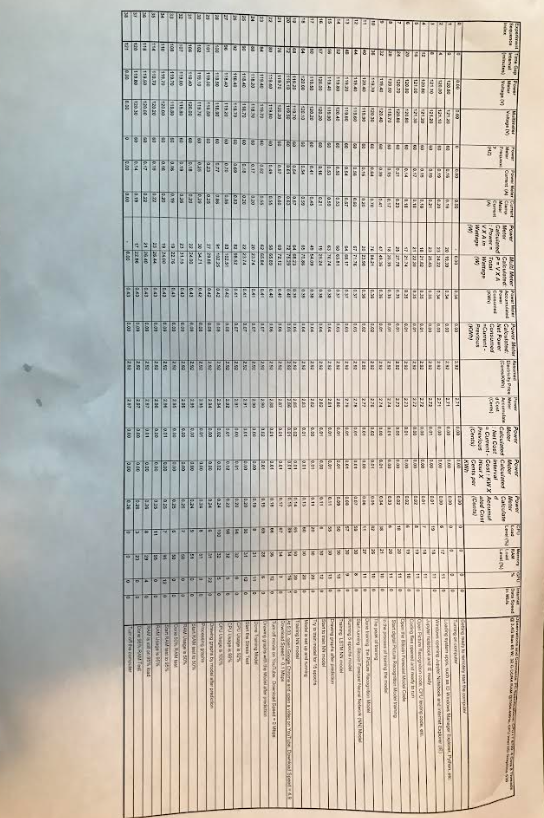
I still haven’t done my experiment, but I did work more on my project. I found a nice font and printed out my title, but I still have to cut those 3D letters out and glue them onto my trifold. I also worked more on my notes, did more research, and tried to come up with a design for my trifold. Now I have 27 days left to complete the trifold.

**Saturday, February 23**

Today I did my experiment: finding out the electricity cost and computing power it takes to run a simulation of computing projects. My stress test code malfunctioned suddenly during the experiment, and there seemed to be errors in the code, but it turned out alright because I found a website that could do the same thing. First I trained my Number Recognition Code with 5 epochs, then with 15 epochs. Next was my Bitcoin Price Prediction Code, again each with 5 epochs and 15 epochs (The one with 15 epochs took much longer for this one). Then I tried the Stress Test with a website, and the CPU Usage was 100% for the split of a second, so it was definitely effective. After that I did a RAM test, making the CPU Usage go to 50% the first time and 90% the next time. Lastly, I closed all the tabs, windows, and processes on my computer, and the CPU Usage dropped down to 2%.I wrote down the voltage, current, frequency, and more parameters of electricity every 4 minutes for 120 minutes, so I could calculate the watts of electricity used during the experiment to compare it to the CPU Usage (computing power used).

The calculated power wattage was in the range of 17 W to 91W, with 17 W being the baseline for Windows to run and 91 being the peak point when the CPU Percentage was 100%. My graphs also showed that the electricity wattage power or cost was highly correlated to CPU% and GPU% workload. However, the RAM and Network Card were practically negligible during the stress test, and didn’t affect the CPU or electricity much.

Experiment Data:



I also finished training my deep-learning models (with the code) and made graphs displaying the accuracy rates.

Code/Accuracy Rate Observations:

* From the LSTM Price Prediction experiment, the predicted electricity prices for four out of the five cities I trained the model with each had a high accuracy rate.
* For my experiment using the mining schedule, a decent profit could be made in all the 4 cities that I tested.
* For the Bitcoin Price Prediction model, the statistic showed that it had 54.76% of successful trades.
* From the predicted electricity price tables, if you choose to yield with the grid, it is calculated that a Tesla owner could make a profit of $22.807 in a 24-hours span with just one Tesla Model3.
* Assuming 10% of the 475,592 Tesla vehicles registered in the State of California deploy my strategy, these Tesla owners can, in total, harvest $1,081,191.8 in a day! If the platform charges a 10% royalty fee, it could make a daily profit of $108,119.18, from one state alone!

**Saturday, March 1**

I got my conclusion, application, limitations, and future work written out.

Conclusion:

(✅ means hypothesis was correct, ❌ means hypothesis was incorrect)

* The platform theoretically *can* make a profit. ✅
* CPU Usage (computing power used) and Electricity Consumption (and cost) are highly correlated. ✅
* The predicted electricity and bitcoin prices both had reasonable accuracy rates. ✅ (Except for Ankara, Turkey, due to high volatility. Since electricity prices can be predicted with adequate accuracy rates, we can lower electricity costs by running devices during valleys. The same is for bitcoin prices, so we can trade accordingly, though further work will be to improve the trading code, since it only had 54.76% of successful trades.) Therefore, it’s feasible that users, and especially Tesla owners, could use my app to mine bitcoins during off-peak hours and make a profit.

Application:

With this project, we can:

* Save and make money by adopting this dynamic schedule.
* Transform idle computers into vital resources.
* Optimize the electricity grid and unused computer power, helping to minimize carbon footprint.
* Help reduce reliance on expensive, high-emission energy sources by running computations at the cheapest time.
* Have more sustainable computing practices by maximizing the efficiency of existing devices.
* Lessen the strain on the electricity grid by running devices during valleys instead of peaks (while saving money too!).
* Reduce the strain on the currently centralized cloud services and distribute computing in a more energy-efficient way.
* Make computing smarter, cheaper, and greener.

What if we didn’t try to stabilize the electricity grid and let vital computing power remain unused?

* If we don't use energy wisely, we could waste more energy, spend more money, and hurt the environment.
* The capabilities and potential of devices would be wasted when idle, and users would lose money-making opportunities too.
* If people can’t access extra computing power on demand, they’ll buy new high-energy-consuming devices instead, which can lead to more e-waste and greater environmental damage.
* Without load balancing, electricity demand could spike at certain times, straining the grid.

Limitations:

* Though my CPU is similar to a Tesla model 3’s CPU, the GPU in our Lenovo M900 is slower than a real Tesla model 3 one, so I would need to find a similar GPU or a real Tesla Model 3 for better performance. If we do picture recognition training, we need to get a good GPU.
* My model’s predictions would be better if we had more recent and better-quality data (for example: some data might be missing, empty or invalid and would need lots of cleaning and validation).
* My project focused on some key factors affecting electricity prices, but there are many more elements that might affect electricity prices such as local holidays or events, the weather, oil, gas, etc.
* Batteries have a limited life and can only be charged for a limited number of times. If a user wants to use their tesla to sell electricity on a frequent basis, they might benefit from a better battery management system to increase battery life.
* The trading model wasn't tested for a long enough period, so it might fail in a more complex market with hidden influences.
* If electricity prices are too volatile, it would be hard to be accurate. (Like Ankara, Turkey.)
* Based on the Efficient Market Hypothesis (EMH), the stock prices already include all available information. This means it's nearly impossible to consistently beat the market by picking stocks or timing trades, so that has to be taken into consideration as well.
* This model is based on very short term history data. It can predict returns over very short horizons but its performance might deteriorate over time.
* Although training might be computationally extensive for big datasets, it will yield better outcomes if a larger and cleaner dataset is available and if we can find more promising hyper parameters by financial experts.
* Proper back testing of my deep learning models is necessary to manage portfolio risks and reduce financial losses
* The Bitcoin ETF stock price signal has a lot of volatility. In a practical environment, we would not want to trade excessively on every period’s signal. Use different signal thresholds for entering and exiting positions.
* If taking the trading costs into consideration, too many transactions mean a lot of money goes to transaction fees. Because there are always trading costs involved, we may want to restrict our trading to signals that are stronger than a chosen threshold. We also need a model of trading costs for penalizing excessive trading.
* Competitors or reverse engineering could easily see this strategy, so we may want some asymmetry in our trading strategy
* One can never predict the future with 100% accuracy every time just based on some historical data, so a professional evaluation team would intervene on a timely basis.

Future Work:

* Experiment with more types of computing tasks, like weather forecasting, scientific simulations, and high-intensive gaming to further explore the many uses of computing power.
* Get more recent data with better quality to train the models for a longer period.
* Consider the execution delay problem. In practice, we may not be able to trade instantly upon receiving a new signal.
* The model should recognize persistent underperformance or bugs on its own and give warnings to the administrator.
* Get more useful features and the most up to date information.
* Customize the model for each market by adding green energy sources like solar, wind, and hydro for better accuracy.
* Use the Kelly Criterion to make bets on each minute of charging, mining, and trading more efficiently.
* Design a website for users to sign up and promote this vision, mission, and technology.
* Create an app to connect devices, letting users communicate and trade.
* Look for mentorship, investment opportunities and possible support to get this science project upgraded to the next level.
* Deep learning models require accurate training and hyper parameter tuning to yield results, thus further work will be continued to refine my deep learning models and potentially improve their predicting power.
* Automate the entire process with more code.
* We don’t want to run devices to the point where they cannot be used anymore, so limits can be set to automatically stop the process if too much of a computer’s computing power is being used.
* Allow participants to choose the extent and duration of their device's involvement to help balance use and longevity.
* Confirm the money made for the revenue assumption.

(And even, if possible, negotiate a sponsorship from Tesla to conduct real experiments on their electric cars.)

My next step is printing out all my papers and decorating my trifold.

**Sunday, March 9**

Over the past few days, I worked on my trifold, and today I finally got it done. Mrs. Ruzycki told us to bring our trifolds to school on March 14, which is this Friday. For the next few days, I will focus on practicing my script to record my presentation and put it on the CYSF platform. I think I might have to shorten it a bit, though, since I just went through everything and even without the graph explanation, it was over half an hour long.

**Sunday, March 20**

Tomorrow I lose access to my online project on CYSF, so I’m going to upload this logbook onto the website, though I will keep updating it for the real fair.

22 days until the fair!