ARKANSAS SUMMER RESEARCH INSTITUTE

BATTERY EFFICIENCY

The temperature effect

Lithium ion battery

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BACKGROUND INFORMATION

- Lithium is a natural element/mineral which constitutes about 0.002% of the world crust.
- In 2023, a certain group of scientists discovered a huge deposit of lithium mineral located in Pennsylvania.
- It has been reported that this deposit can actually be a game changer for domestic lithium supply.
- One of the main uses of lithium is in lithium battery production.
- Lithium ion batteries are widely used in electric vehicles in USA
- Temperature plays a very significant role in managing the perfomance of the battery.
- Most Lithium batteries work more efficiently between 20 to 25 degrees celcius.
- on my research I am going to analyze the effect of temperature on Lithium ion battery perfomance during discharge.

RESEARCH QUESTION

What effect does temperature have on lithium ion battery performance?

HYPOTHESIS

lithium ion batteries have a low perfomance when working under low temperatures.

PARAMETERS UNDER INVESTIGATION

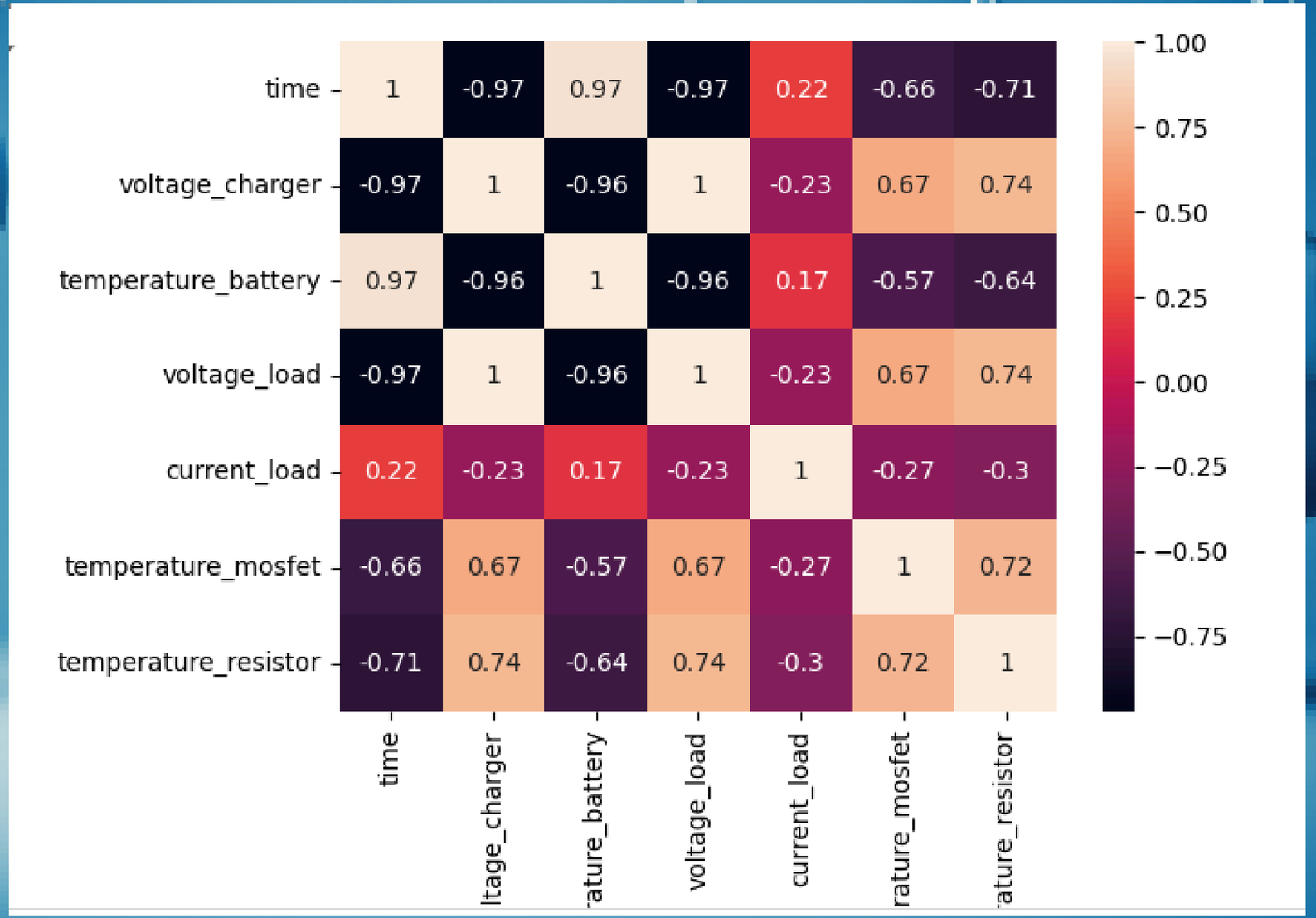
- time - *time taken during discharge*
- voltage load - *voltage drop across the load*
- current load - *current flow*
- voltage charger - *power source voltage*
- battery temperature - *temperature measured at the surface of the electrodes.*

METHOD

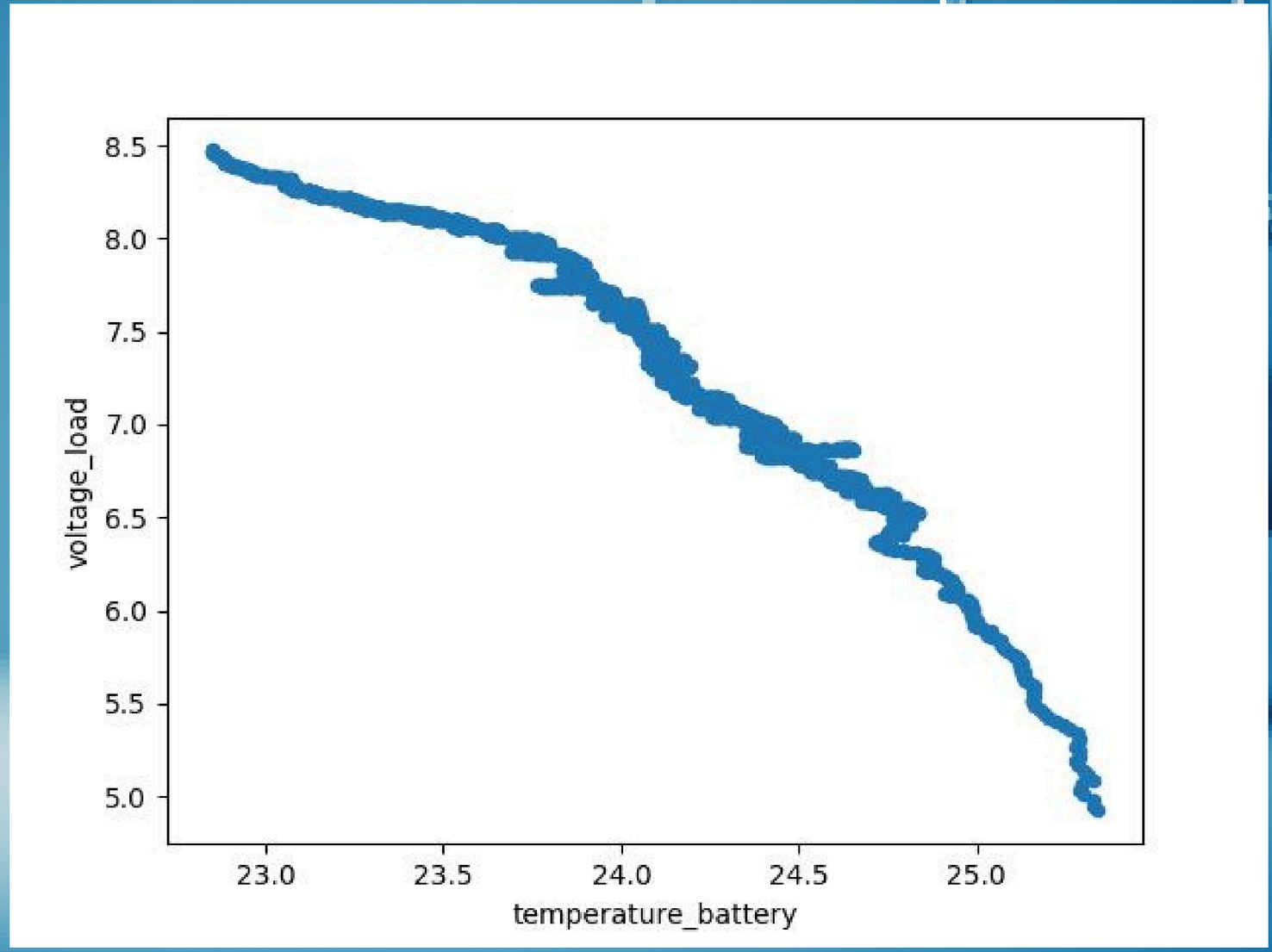
1. Collected and uploaded Data into google colab for cleaning and visualization using python language.
2. Correlation heat map - to show if there is a correlation between the parameters under study.
3. Scatter plot -Further investigate the trends between variables of interest.

RESULTS

CORRELATION HEAT MAP

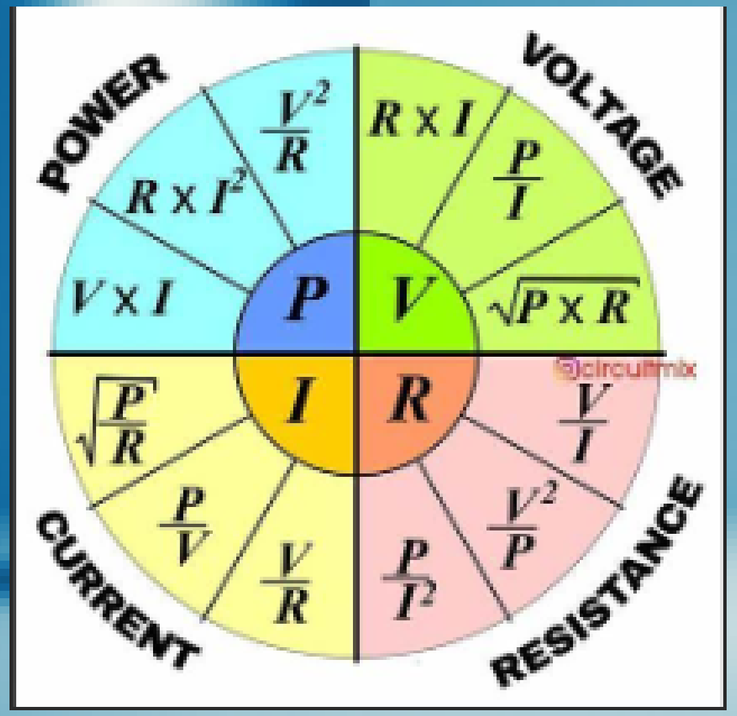


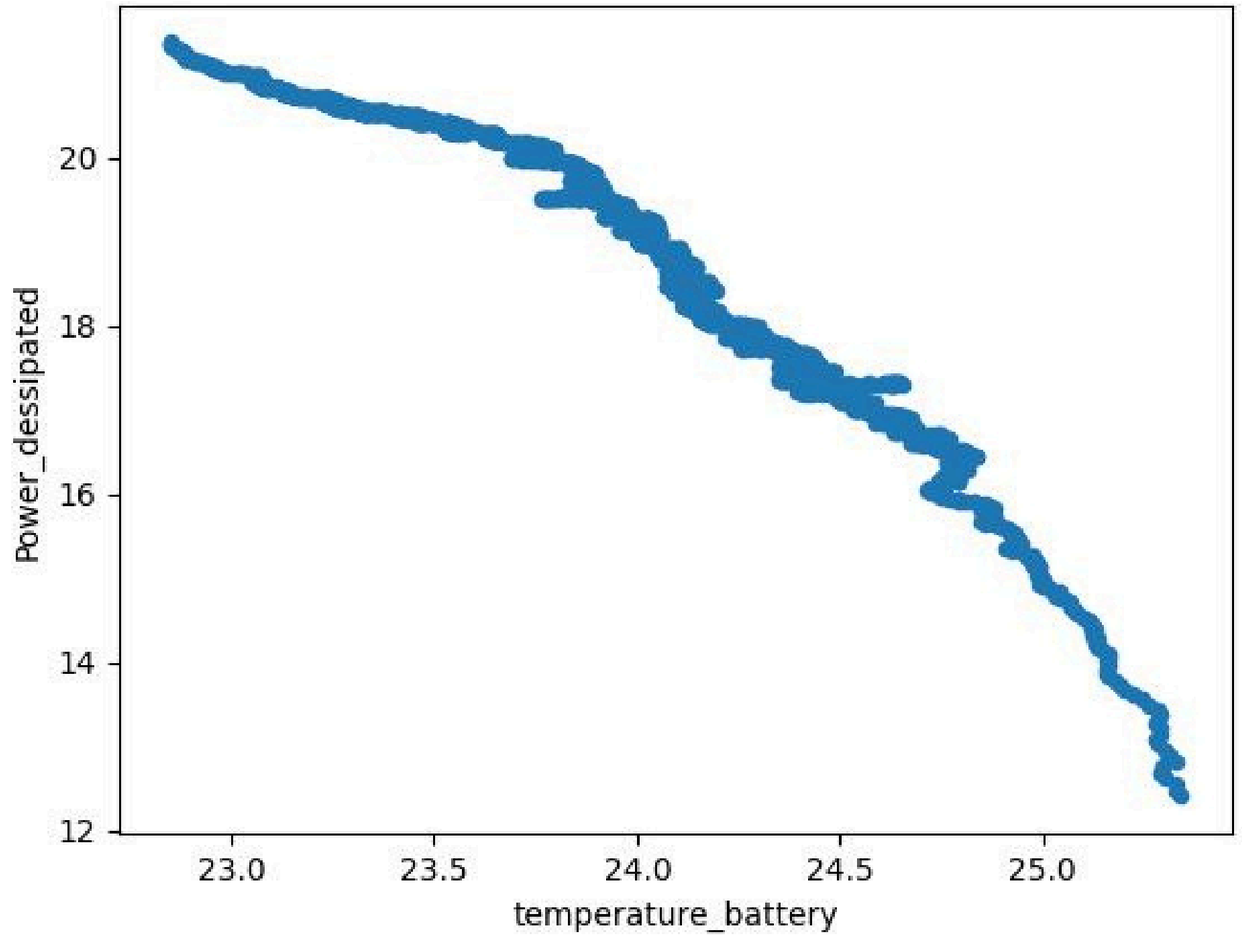
SCATTER PLOT FOR VOLTAGE LOAD VS TEMPERATURE BATTERY



SCATTER PLOT FOR POWER DESSIPATED VS TEMPERATURE BATTERY

formulaes of interest





CONCLUSION

In conclusion, my hypothesis was supported as all the statistical methods used clearly displayed the information inline with my assumption.

References

Ma, S., Jiang, M., Tao, P., Song, C., Wu, J., Wang, J., ... & Shang, W. (2018). Temperature effect and thermal impact in lithium-ion batteries: A review. Progress in Natural Science: Materials International, 28(6), 653-666.

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Thank you!