

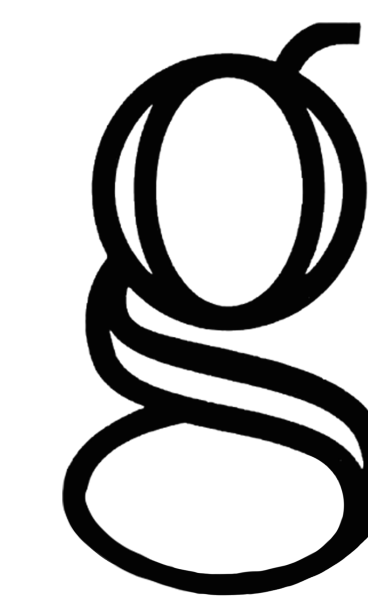


# Exploring the Feasibility and Potential Benefits of Vehicle-to-Vehicle (V2V) Charging for Electric Vehicles

UNIVERSITY OF MARYLAND  
HONORS COLLEGE

CHARGE X GEMSTONE RESEARCH TEAM

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## Research Statement

- Vehicle-to-vehicle (V2V) electric vehicle (EV) charging is a promising solution for limited range and lengthy charging times of current EVs.
- The research aims to explore the feasibility and potential benefits of V2V charging for sharing battery power between EVs while on the road.
- The study investigates the impact of V2V charging on the power grid, battery degradation, and the availability of charging infrastructure.
- The research evaluates the economic and environmental benefits of V2V charging, such as reduced energy costs, improved grid stability, and decreased carbon emissions.

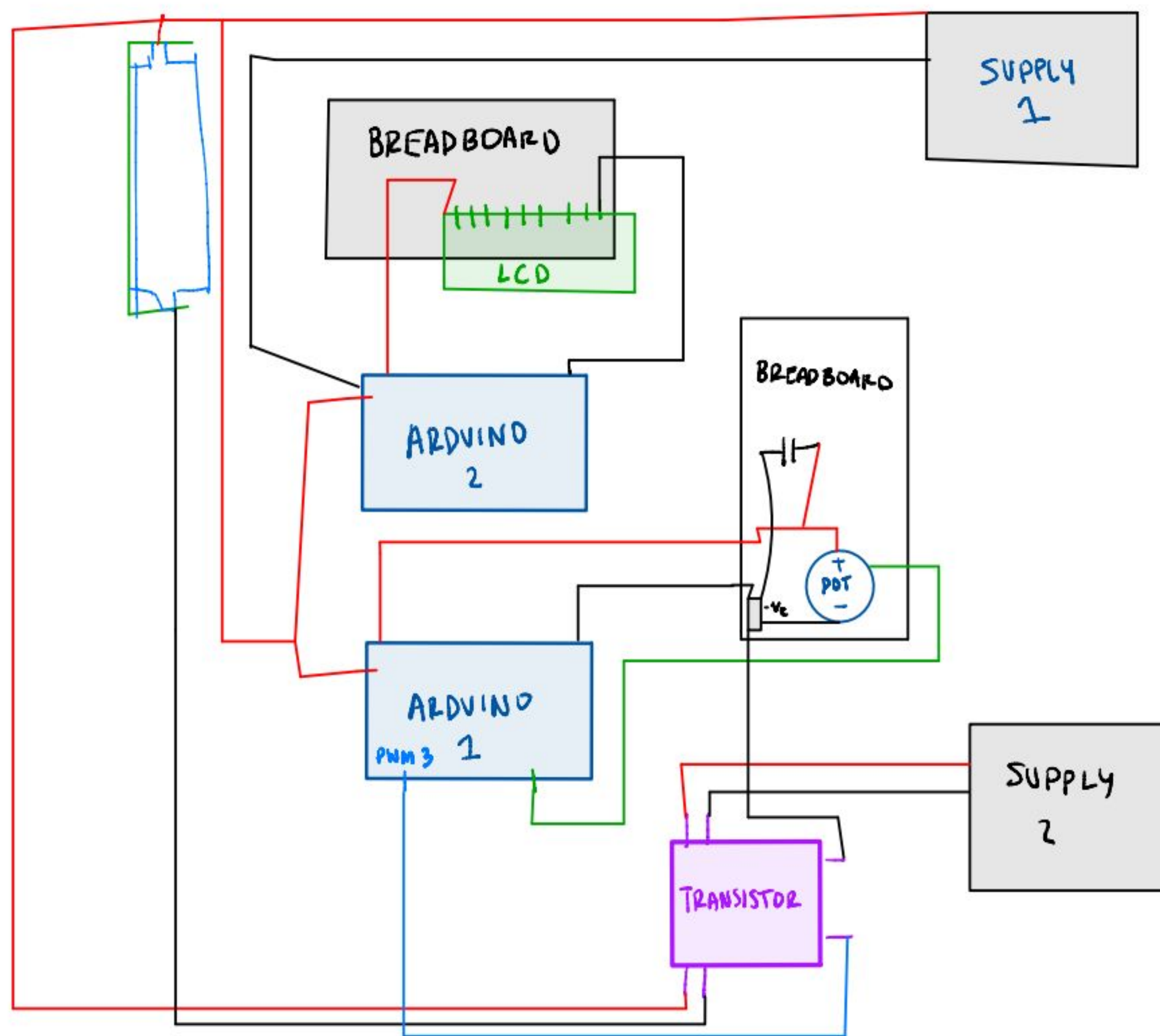
## Research Question and Hypothesis

- What are the technical requirements and challenges for implementing V2V charging for electric vehicles, and how can these challenges be addressed?
- What are the economic and environmental benefits of V2V charging, and how do these compare to other forms of EV charging, such as public charging stations or home charging?
- What are the social and behavioral factors that influence the adoption and usage of V2V charging, and how can these factors be leveraged to encourage wider adoption?
- How can V2V charging be integrated into existing transportation infrastructure and systems, and what are the potential barriers to integration?

## Projects

- RC Filter for converting Arduino UNO R3 PWM output to analog output
- Created a battery voltage sensor with help of secondary Arduino Uno R3 with LCD displaying live battery voltage in real time
- Added transistor and external power supply to power the circuit and charge the cell.

## Circuit Schematic



## Initial Goals

- The initial research goal was to explore the feasibility of using one electric vehicle (EV) to jump-start another EV on the road through Vehicle-to-Vehicle (V2V) charging.
- The idea was to enable EV drivers to share battery power with each other when one vehicle runs out of charge, without requiring a fixed charging station.
- The research aimed to investigate the technical and economic feasibility of V2V charging for EVs and the potential benefits for drivers, including increased range and reduced charging time.
- The research team also sought to address potential issues such as safety concerns, battery degradation, and the impact on the power grid.
- While the research goal of using V2V charging to jump-start EVs has potential, it may face challenges in terms of standardization, compatibility, and scalability for widespread adoption.

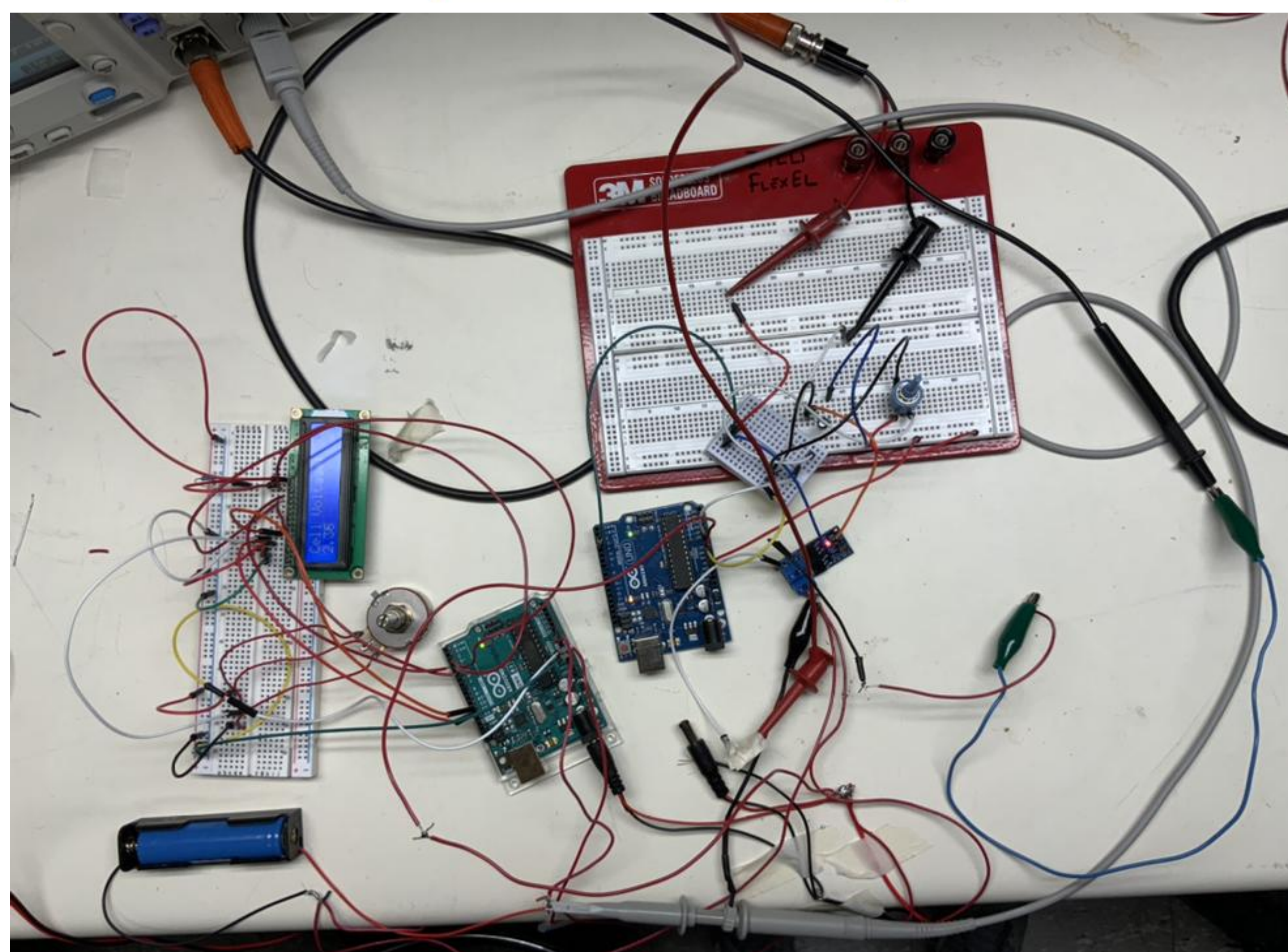
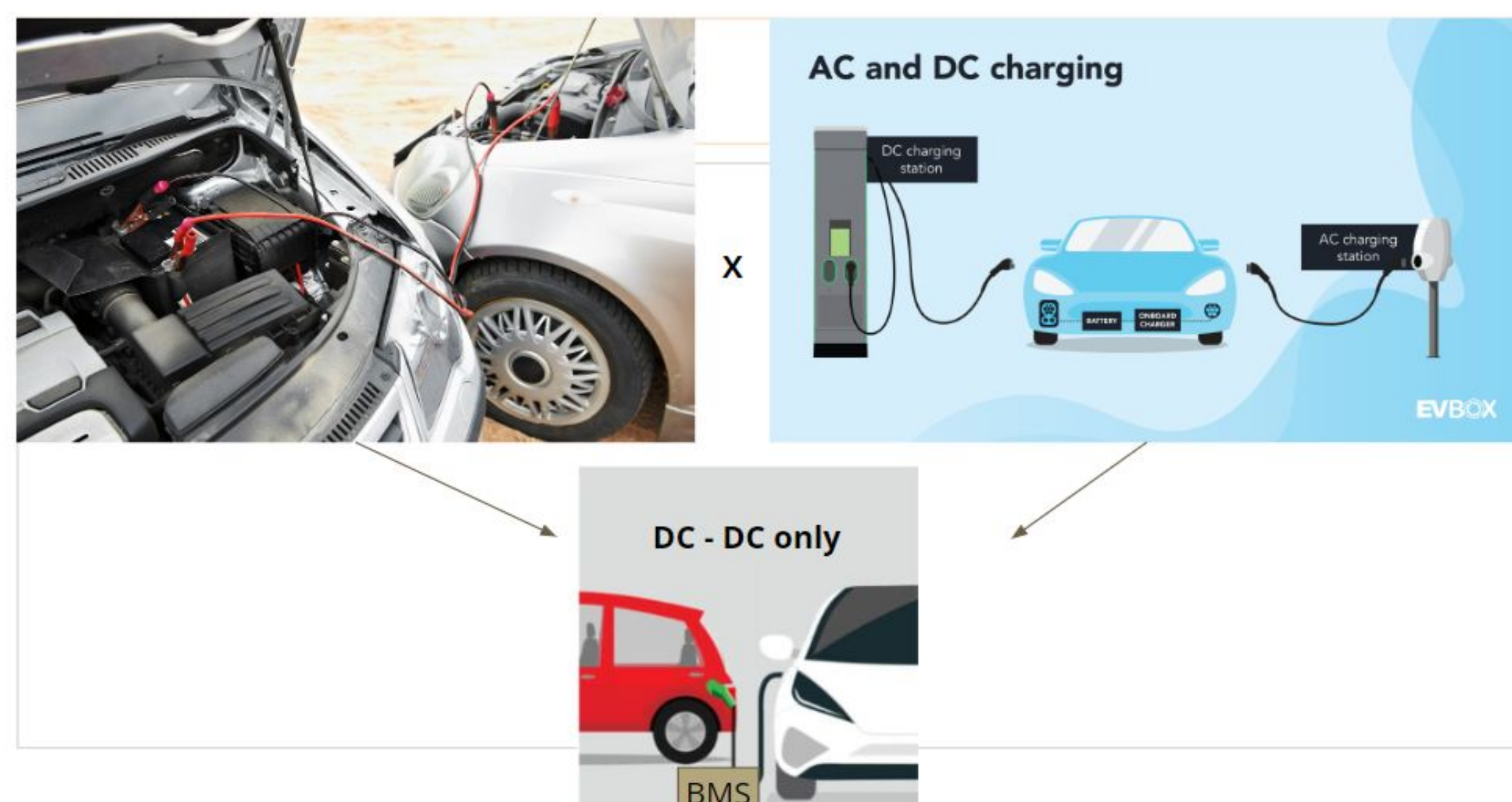
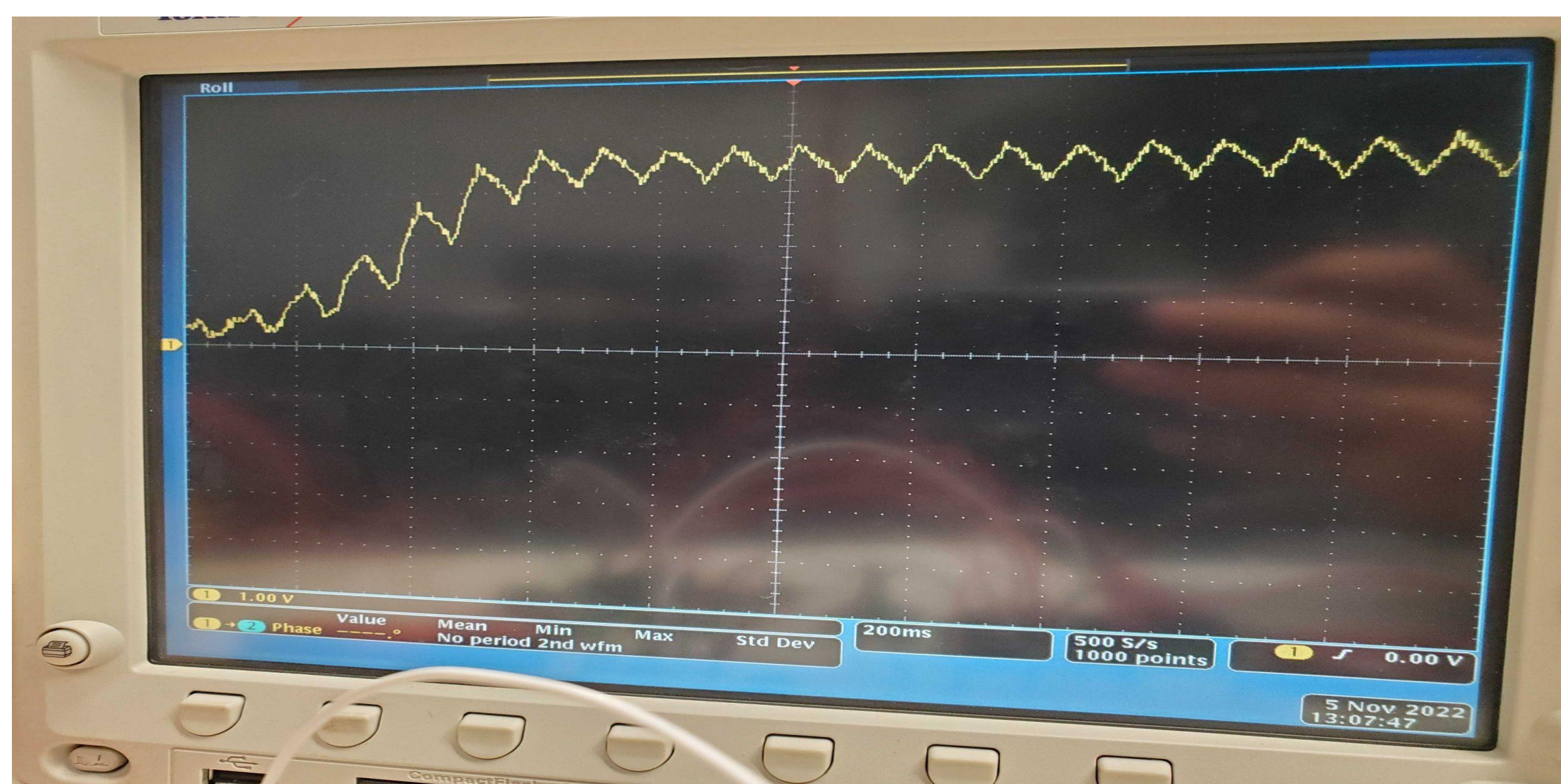
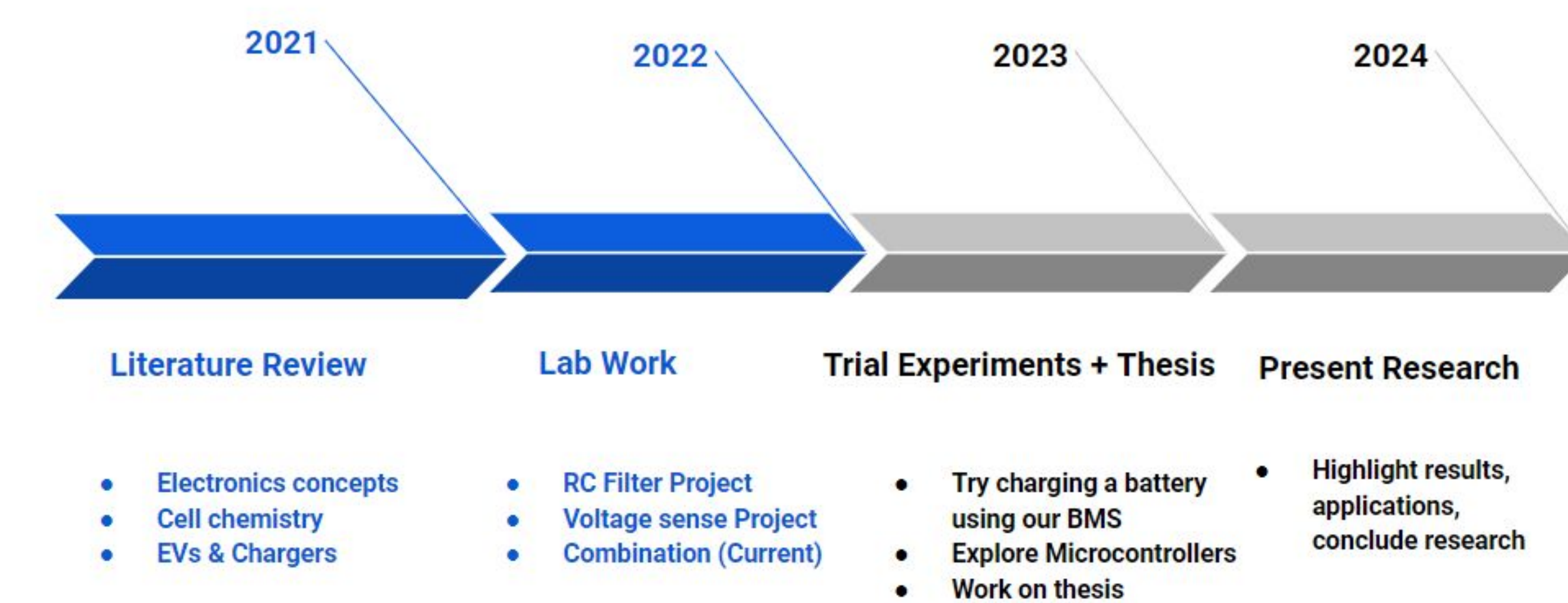
## Challenges

- Overheating when the battery doesn't stop charging.
- The circuitry comprises a multitude of soldered wires, which collectively yield a disorderly and erratic configuration, consequently contributing to intermittent operational failures.

## Future Research Goals

- One area of future research is electric boats and their charging systems.
- Smaller boats can experience the same benefits as electric vehicles and are more applicable to day-to-day users such as fishermen or leisurely boat owners.
- More needs to be done to popularize electric boats in the boat community, such as increasing charging rates and ease of access.

## Timeline



## Acknowledgement

- We express our sincere gratitude to our mentor, Dr. Brian Beaudoin, whose guidance, insights, and encouragement have been invaluable throughout the course of this research project. He has provided us with a wealth of knowledge, expertise, and support, and has been instrumental in helping us navigate through various challenges and obstacles.
- We also extend our thanks to Gemstone Honors College faculty for providing us with the necessary resources and opportunity to conduct this research.

## References

