



# AI (NEURAL NETWORK) BATTERY MANAGEMENT SYSTEM FOR ELECTRIC VEHICLE

Shubhangi M. Gond

Department of Electronics and Telecommunication  
G.H. Rasoni Institute of Engineering and Technology, Wagholi, Pune.  
Savitribai Phule Pune University  
Pune India.

**Abstract:** Engine drives vehicle by generating power. To generate this power engine need fuel. Imagine a vehicle without fuel is nothing but the piece of iron. Today where automotive world reach it was beautiful journey, this journey consists lots of ups and downs. Modern automotive face lots of challenges, out of all big challenge is “limited fuel source” “Fuel prices” etc. fuel prices rapidly increases now a days. So Automotive world is looking for substitute for fuel energy. For example, Solar energy, Battery energy, etc. A battery vehicle also called E-Vehicle. it is successful outputs of Automotive world over a fuel problem. In conventional vehicle it is easy to determine remaining fuel, you can check in fuel meter on dashboard. Also, Time required to Refill fuel in conventional vehicle is several minutes. however, in electric vehicle it is more challenging to monitor remaining energy and compared to conventional vehicle an electric vehicle needs several hours to refill rather than several minutes. Also, safety, operation, and even the life of the passenger depends on the battery system.

Battery management system keep a continue eye on the key operational parameters during charging and discharging for example voltages, currents and the battery internal and ambient temperature. The BMS system would normally estimate and provide inputs to protection devices which would disconnect the battery from the load or charger any of the parameters like SOC, over charge, under charge, high temperature, become out of limits. All parameters are monitor and well manage with using Neural network algorithm will be implemented on MATLAB software for the process.

**Index Terms - Battery, Fuel, charging, Neural Network, Temperature, Automotive, Gasoline, BMS, Sensor.**

## I. INTRODUCTION

As we understand fuel energy is used to drive a vehicle and for e vehicle modern automotive move to other energy source i.e. battery power. So, for continuous growth the battery is the main component in E-vehicle. So, we can conclude that Battery is Hart for E vehicle. Human body working fine unless and until hart is working fine. Now a days we will find so many exercises to keep hart fine and in good condition. However, your brain or your intelligence plays important role to take such decision Similarly, for e vehicle if battery is hart, we need to keep battery fine and in good condition like hart, also we need one more important thing which is brain to take such intelligent decision. Hence, we conclude modern automotive really demands for an intelligent (BMS) battery Management system. No fuel in Vehicle, doesn't matter what fuel we used either gasoline, solar, or battery. Like conventional vehicle it is important to know how much energy is used and how much energy is balance into the battery. In every case doesn't matter gasoline, solar or battery driver needs to know how much distance vehicle can covered with existing resource. The amount of gasoline balance in tank after drive can be easily monitored. You get that information on fuel meter. However, it is big challenge to find out exact amount of energy available in battery without intelligent monitoring system it is difficult to find out. If driver unable to get this information. Then it is a crisis for driver.

## II. PROBLEM STATEMENT

Modern automotive face lots of challenges, out of all big challenge is “global energy prices”. cost of fossil oil increases rapidly. Hence industries demand substitute for gasoline. E vehicle is new successful invention over conventional fuel vehicle. Invention consists lots of small invention and sub systems. Those sub systems also need to improve to become a new big invention. This is we called a journey from good to best. BMS system plays same role in E vehicle. BMS monitor and manage battery parameters that parameters provide forecast. This forecast helpful to avoid major crisis happens in future.

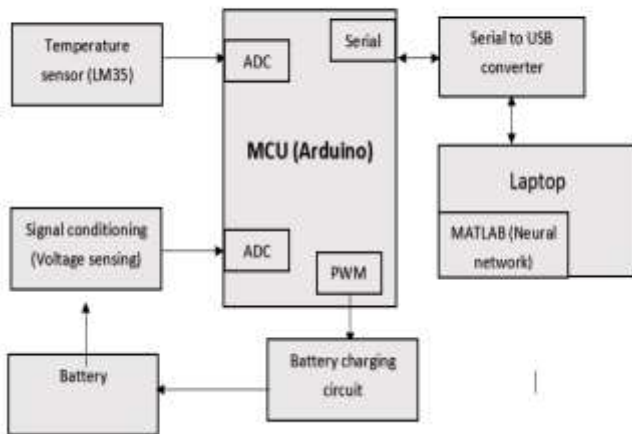
## III. LITERATURE SURVEY

Energy resource for conventional vehicle like gasoline is limited in availability, as we aware limited source with high demand causes high cost. Many studies conclude that reserves of oil, coal and natural gas could be exhausted within the next 200 years. Hence modern automotive research for reusable energy sources like E Vehicle. The second and equal important need for E vehicle and battery management system is CO2 emission form conventional vehicle. The drawback of using conventional vehicle and its emission are not unavoidable which contribute to Global warming. The presence of excess carbon dioxide in the atmosphere has been attributed to a rise in global temperatures, rise in sea levels, negative impacts on natural ecosystems and a rise in catastrophic weather events.

Many scientists concluded that Battery vehicle produces very less emission compared to conventional gasoline powered Internal combustion engine. Even if we consider electricity which is used to power to battery vehicle is produces from coal. The scientist also concluded the renewable energy resources like wind, solar, Battery etc. are produces approx. zero to no emission. Hence the question raises why the industry is not dominated by battery vehicle.

#### IV. PROPOSED SOLUTION

As stated, the whole implementation would be done using Neural network algorithm which will be implemented on MATLAB software for the process.



To process all this Parameter used Arduino along with other peripherals. like power supply, temperature sensor, battery, signal conditioning circuit, etc. Hence, the solution is basically divided into two parts: first part includes Parameter processing is done using sensor & produce decisions, and second part implements the decision received from first part through MATLAB software using Neural network algorithm.

##### A. ARDUINO UNO (ATMEGA328P)

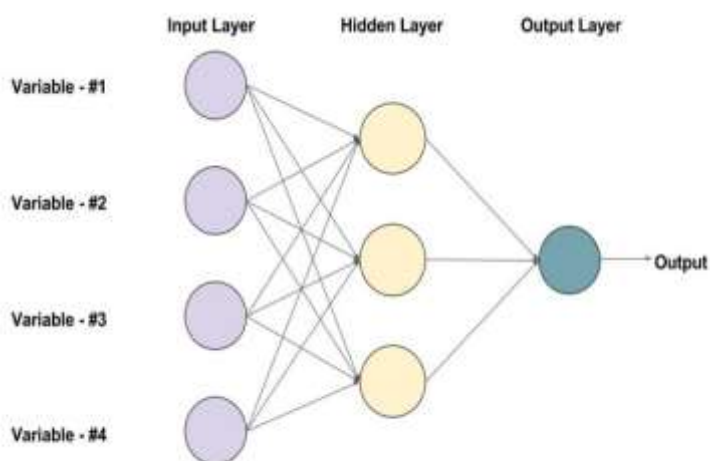


Arduino Uno is a microcontroller board based on the AT mega328processed. The Uno board is the first in a series of USB Arduino boards. Arduino can connect to computer with the help of USB otherwise Arduino can connect with AC-to-DC adapter or Arduino can directly connect battery to getting start. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases.



## B. MATLAB (Neural Network)

To implement real time output MATLAB is used. BMS parameters operating condition identify using Neural network algorithm will be implemented on MATLAB software for the process processors. The neural networks concept is part of intelligence, which is come to light and getting huge demand in the development of systems. Neural network recognize change in input, so network gives best possible result, due to this no need to redesign the output criteria.

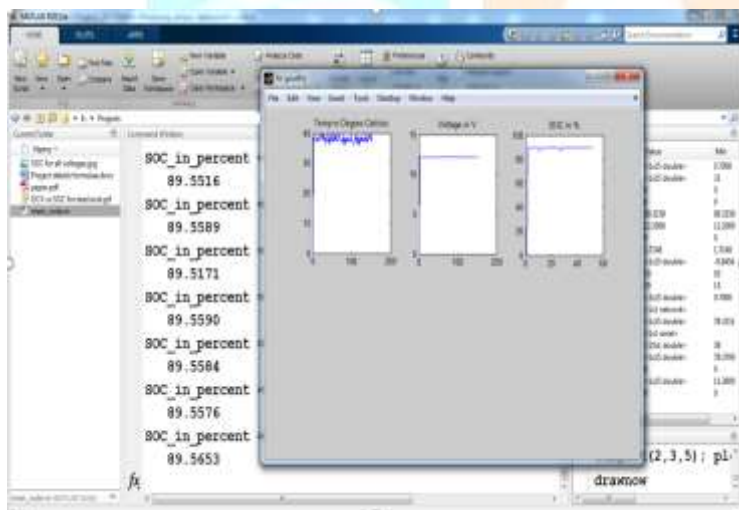


An example of a Feed-forward Neural Network with one hidden layer ( with 3 neurons )

Each neural net accepts knowing “Input “and generate probability forming result weighted associations between the two, get stored data structure of the net within it.

## RESULT

We would be getting real time value of Temperature, voltage & SOC parameter of BMS system.



## CONCLUSION

The paper presented can conclude following points

- ❖ Brief idea about evaluation of E-vehicle.
- ❖ Need of AI (Neural Network) system for E-vehicle.
- ❖ Introduce BMS for value addition result & output.

## REFERENCES

- [1]. W. Taylor, G. Krithivasan, and J. J. Nelson, “System safety and ISO compliance for automotive lithium-ion”
- [2]. David Linden, Thomas B. Reddy. Handbook of Batteries
- [3]. Sandeep Dhameja. Electric Vehicle Battery Systems. Butterworth Heinemann
- [4]. Guo-quan, X. I. N. G. (2007). Temperature Characteristics and Application of LM35 Sensor
- [5]. Pavlov D. (2011) Lead-Acid Batteries: Science and Technology, Elsevier London
- [6]. Chang, W. Y. (2013). The state of charge estimating methods for battery: A review. ISRN Applied Mathematics, 2013
- [7]. Bergveld, H. J. (2013). Battery Management System; Design and Modelling. Eindhoven, Nederlands: Royal Philips Electronics