

# Machine Learning on IoT Data: Predicting Battery Health Status and User Type



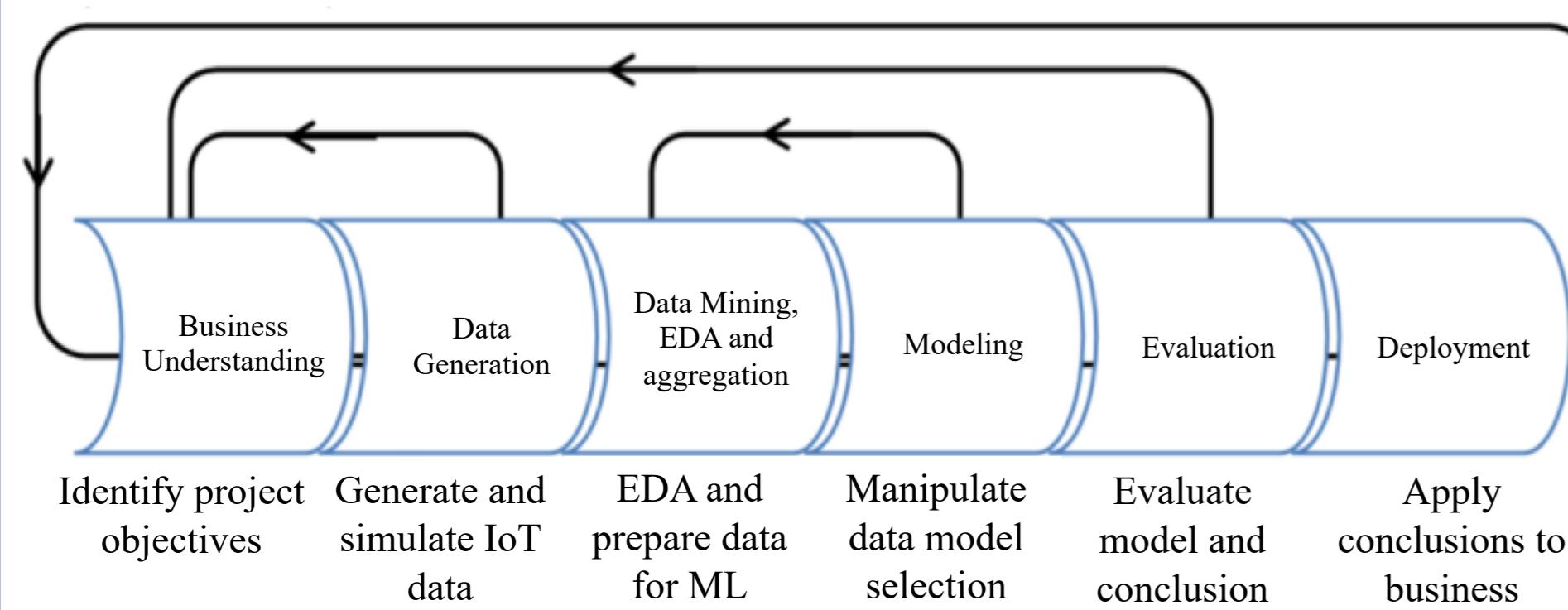
Mehdi Lebdi - Mirza Tauqeer Baig - Mehdi Nikkhah - Junaid Qazi

## ABSTRACT

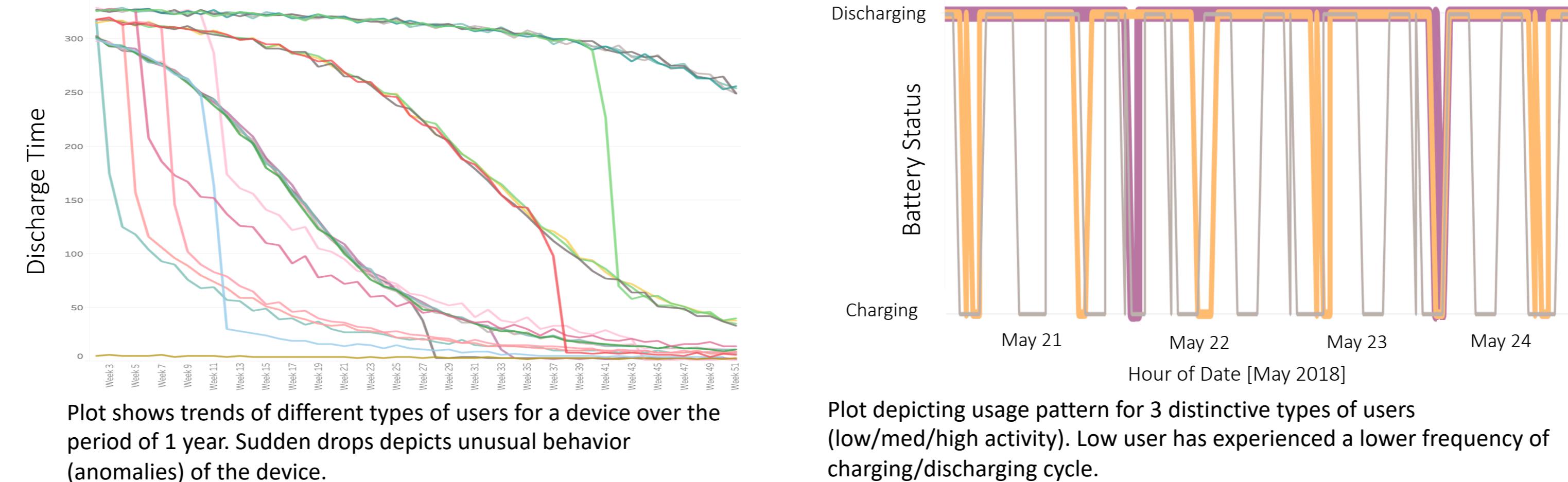
With the rise of IoT devices in the market, the cost incurred on maintenance will be consequential and vast. The models are applied to a case study where the main goal is to predict battery health status and the user type based on its usage behavior. The unsupervised and supervised ML methods, such as **K-Means Clustering**, and **K-Nearest Neighbors (KNN)** are implemented and results are presented in this study.

**Objective:** Can we build a predictive model that can warn us of those initial glitches or anomalies that would help a company detect a complication before it turns into a costly liability?

## Data-science Pipeline



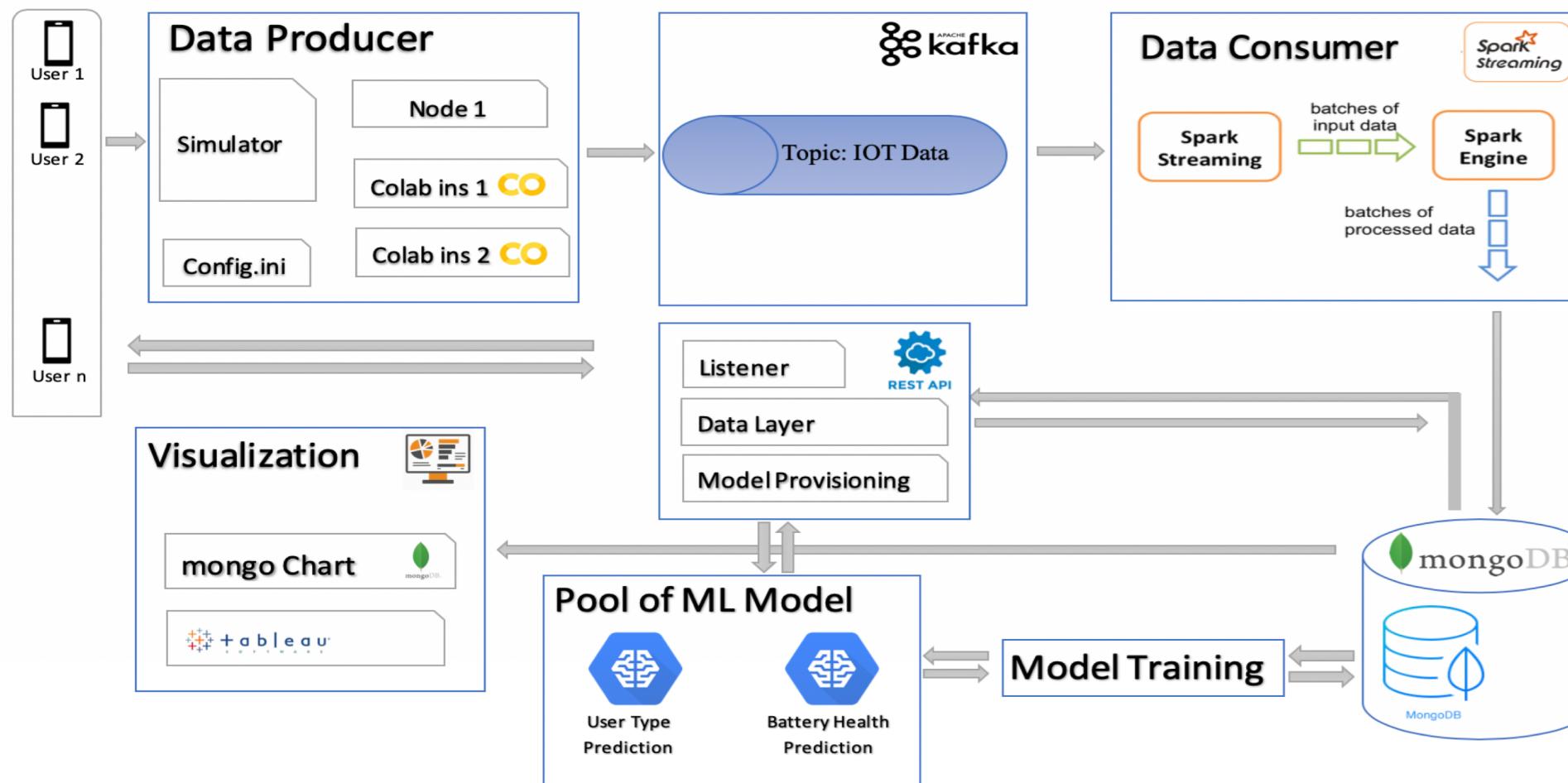
## Exploratory data analysis



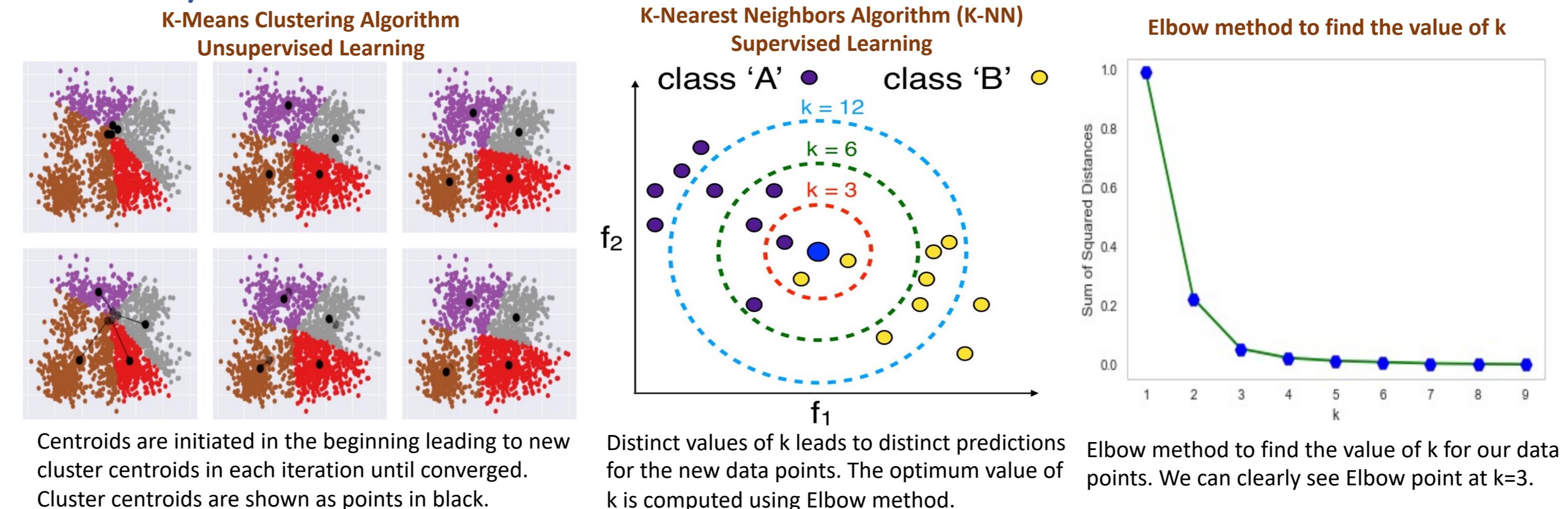
## Conclusion

- ❖ IoT data can be used to avoid costly liabilities such as device failure that could result into bad reputation.
- ❖ Targeted marketing strategies can be successfully planned.
- ❖ Available ML models are good candidates in future planning and business intelligence in this competitive environment for companies.

## Data-science Architecture



## Methods / Models Formulation



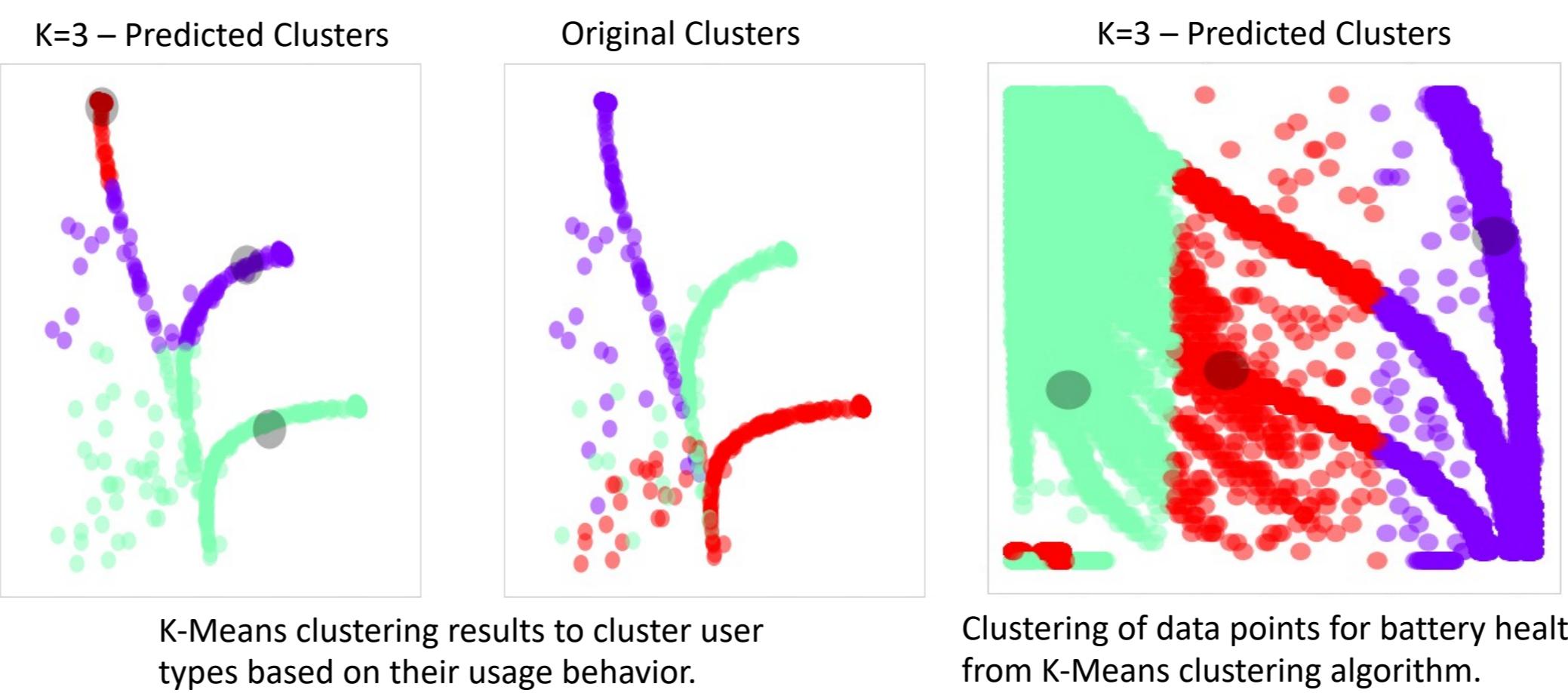
## Future Work

- ❑ Explore other ML models for predicting Remaining Useful Life (RUL) of batteries.
- ❑ Explore IoT data from other devices such as electric cars, home appliances, etc. to optimize their performance.
- ❑ Provide device recommendation to users depending on their daily device usage.

## Experiments & Outcomes

### Confusion Matrix

	Poor	Intermediate	Healthy
Battery Health	5197	91	6
	66	5203	74
User Type	3	104	5348
Low	83	4	2
Medium	0	97	6
High	2	3	103



## Acknowledgments

Thanks to **Bandep Singh** (Data Scientist, Samsung Electronics Canada) for guidance on the project.

Thanks to the instructors **Jiannan Wang, Steven Bergner**  
**References**

1. *Exploring Big Data Clustering Algorithms for Internet of Things Applications*. Hind Bangui et. al. Proceedings of the 3rd International Conference on Internet of Things, Big Data and Security (IoTBDS 2018), pages 269-276.
2. *Machine learning for Internet of Things data analysis: A survey*. Mohammad et. al. Digital Communications and Networks (2017).