

Introduction

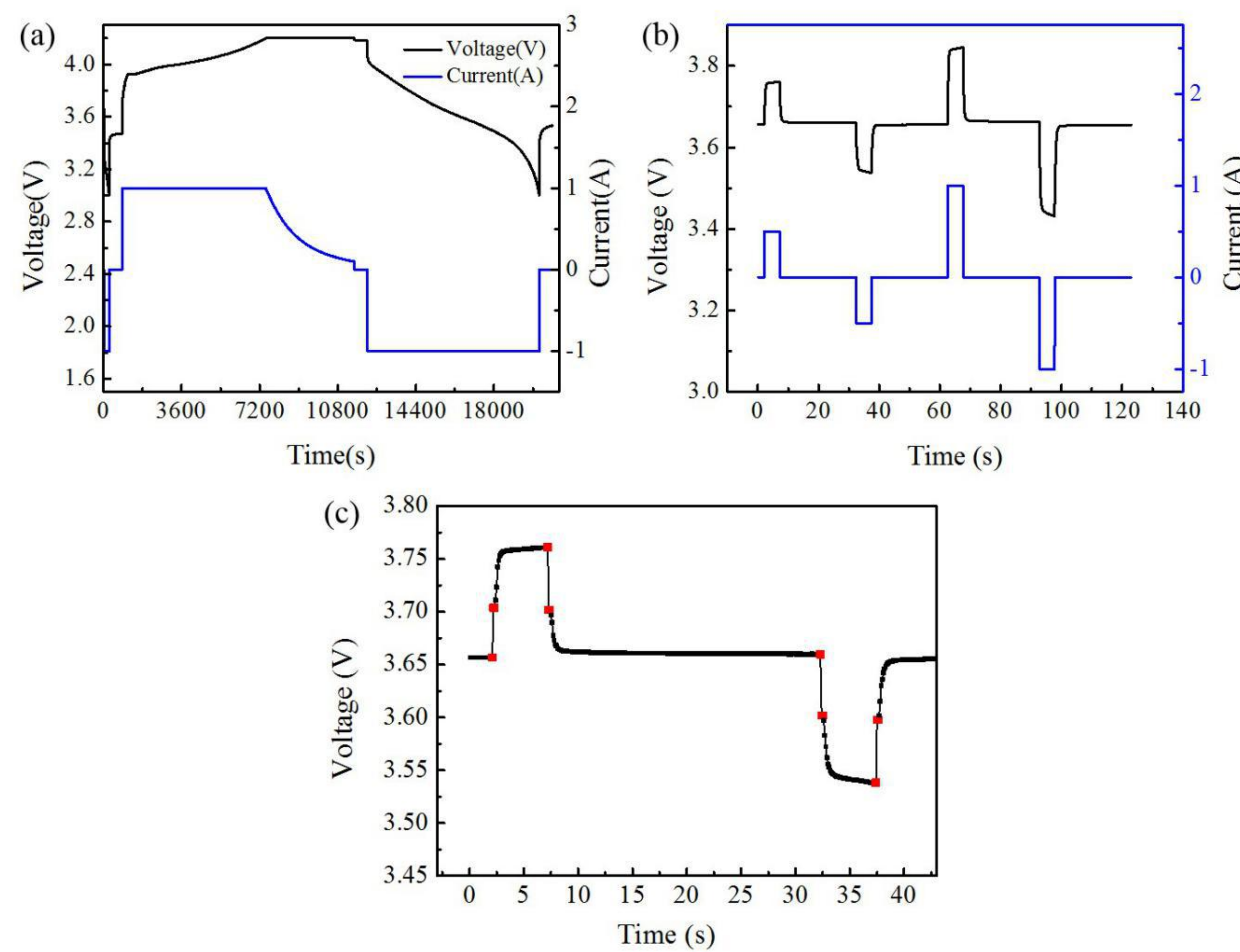
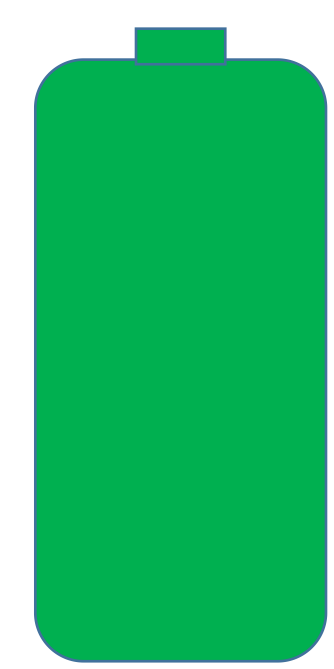
Background/Motivation:

1. A large proportion of power batteries retired from EVs still have about 80% of their initial capacity.
2. Traditional screening methods are too time-consuming to meet reality requirements
3. Retired power batteries can be used in applications which have relatively low energy requirements:
 - low-speed electric vehicle;
 - commercial/home energy storage;

Capacity Fading

100%

80%



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TBSI

Data-driven Fast Clustering of Second-life Lithium-ion Battery: Mechanism and Algorithm



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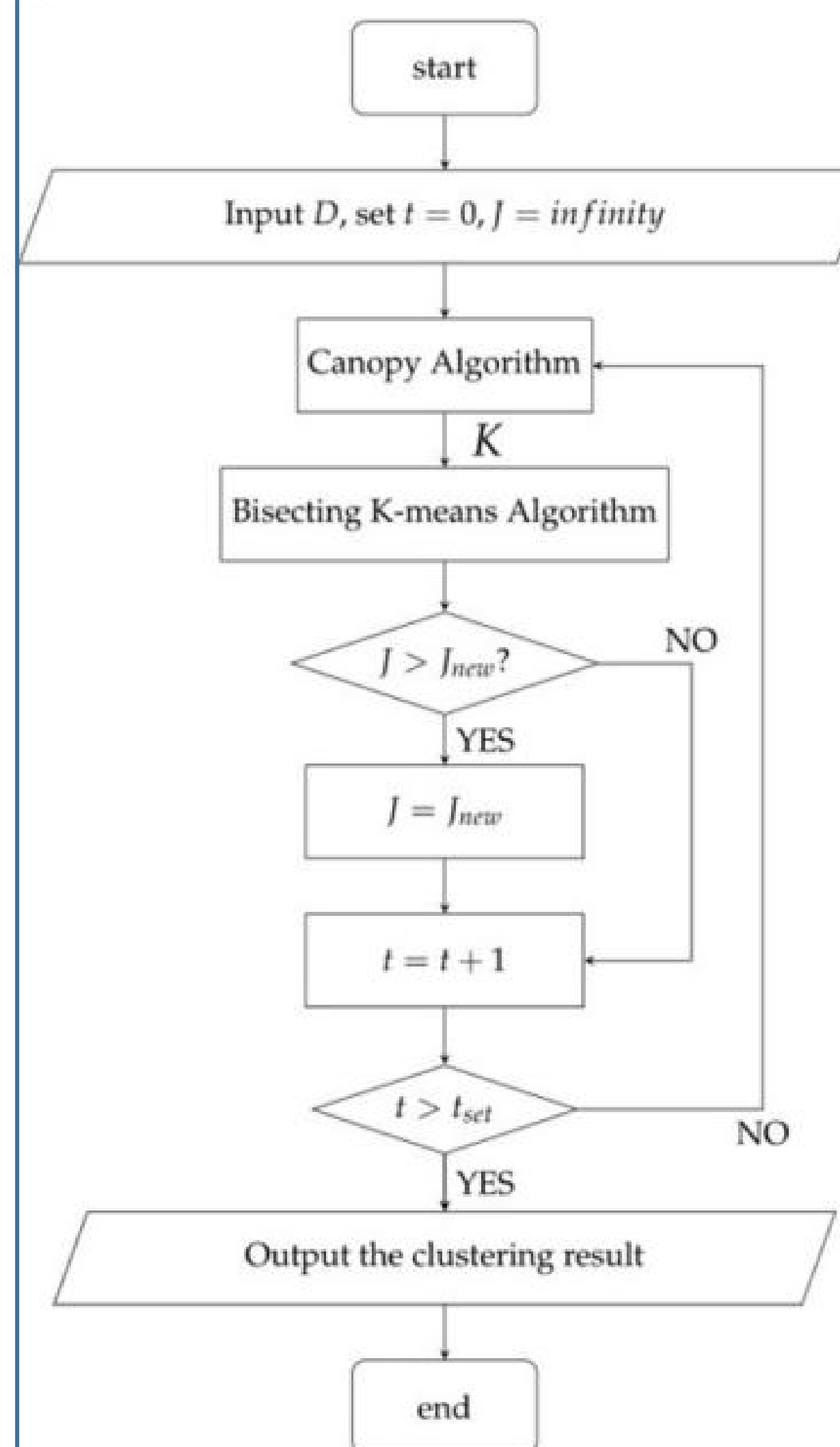
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Abstract

To achieve fast retired battery screening, a pulse clustering model embedded with improved bisecting K-means algorithm has been developed to effectively sort out retired batteries with life cycles ranging from new to the end-of-life states. The relevance of selected variables is rigorously validated, reaching the accuracy as high as 88% compared with the traditional full charge-discharge test. To note, the test time has largely reduced from hours to minutes.

Method

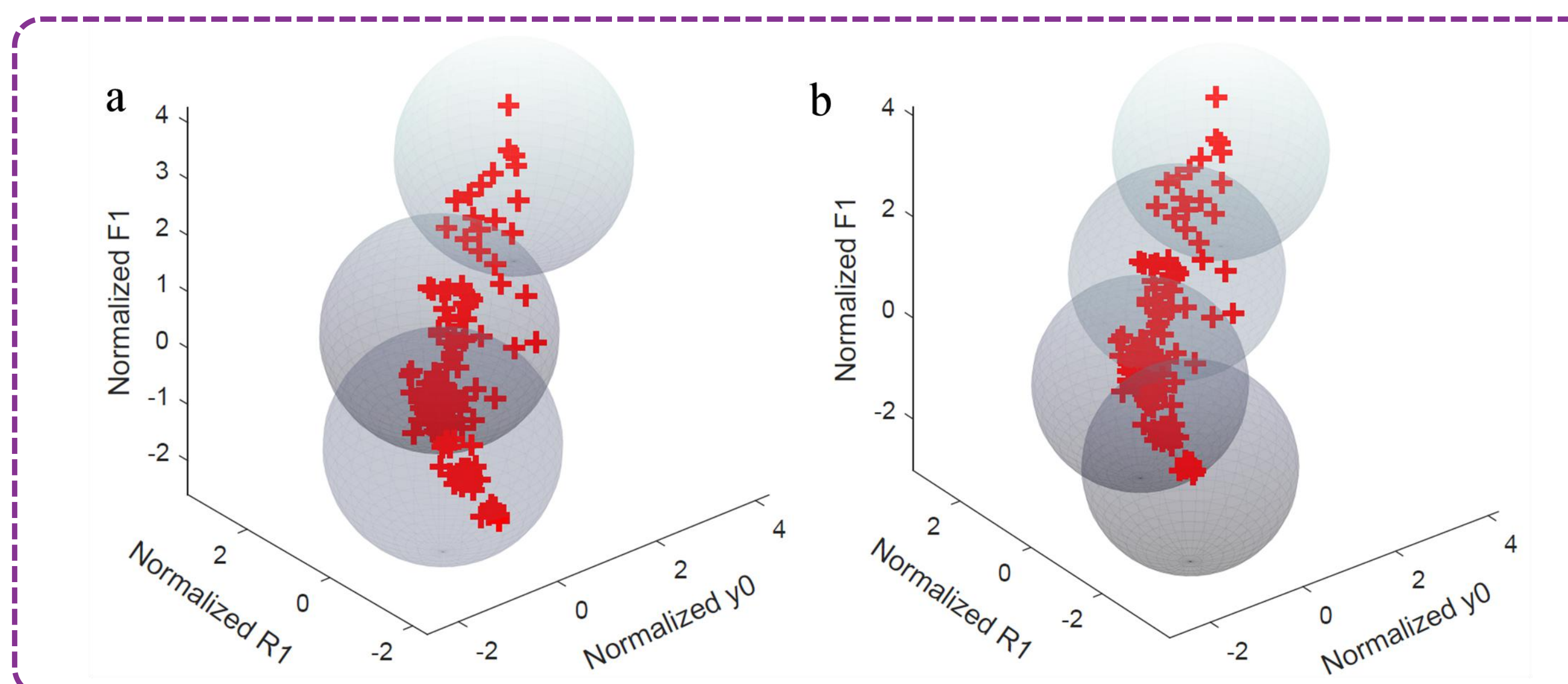
Framework:



➤ Through the canopy algorithm to establish a reasonable cluster K, through the bisectioning K-means algorithm to determine the cluster center.

➤ . Repeat the program until the most reasonable clustering.

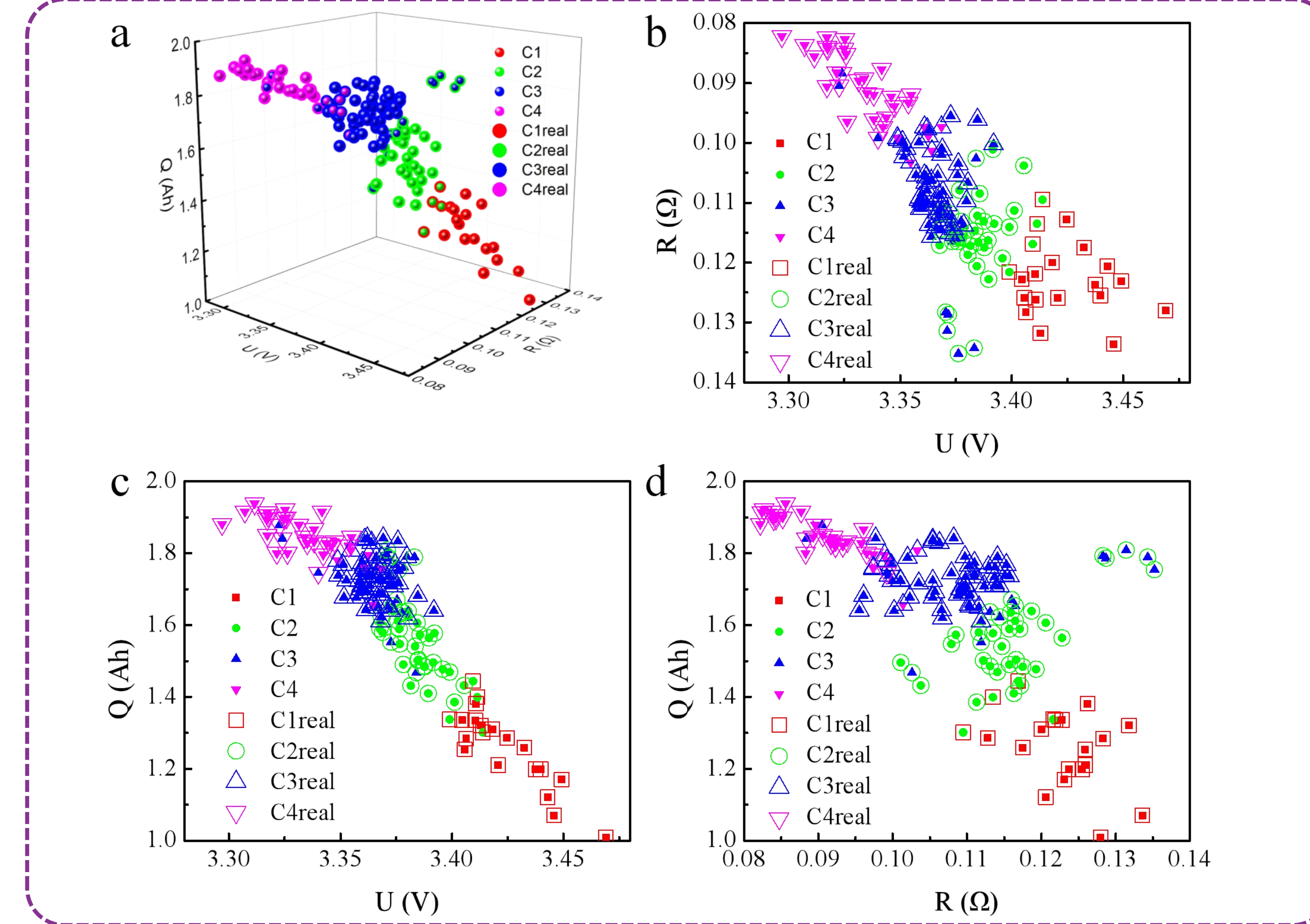
Parameter Determination:



CH(Calinski-Harabaz) index for K=3 is 204.86 while K=4 is 269.63. Therefore, K=3 is used for later clustering

Result

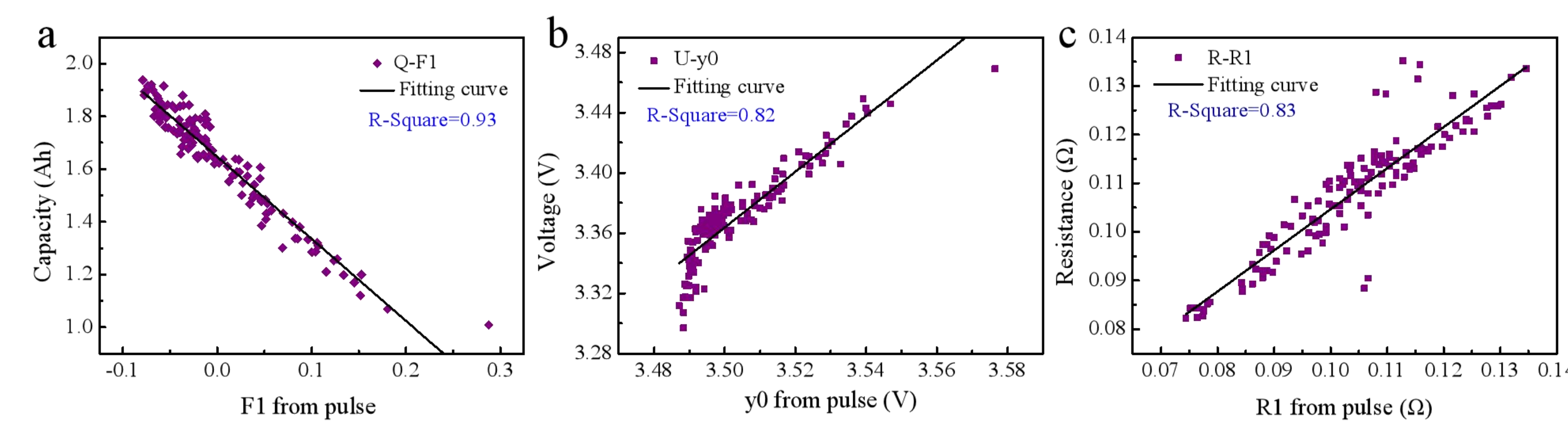
Clustering results:



The proposed method has the following achievements:

➤ **Clustering Accuracy: 88%.**

➤ **Screening Time: 5 hours --> 120 seconds**



The pulse features' highly linear relationship to traditional features U/R/Q