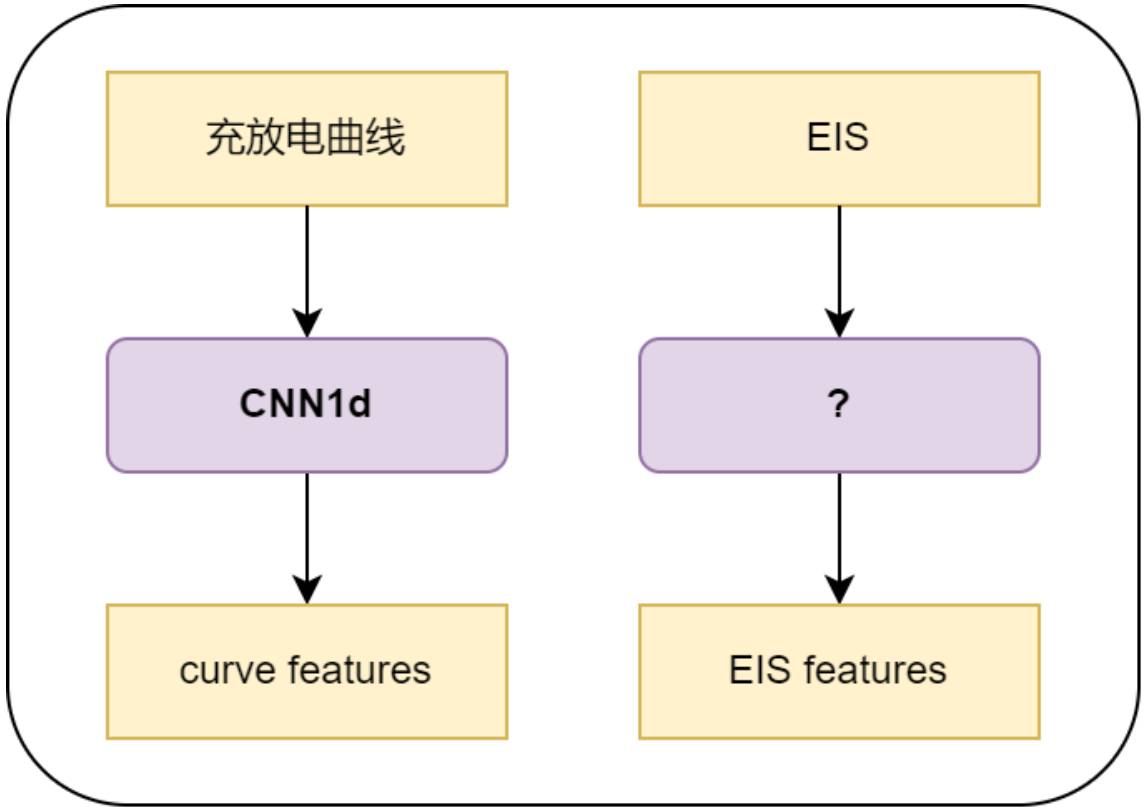
2024-2-29

Model

Step1：



充放电曲线（以电压的充放电曲线为例）：

+ 1维的
+ 预设采样电压区间
+ 预设步长

CNN1d:

三层的一维卷积网络，只含有卷积区域，无全连接区域，见下页

提取EIS特征:

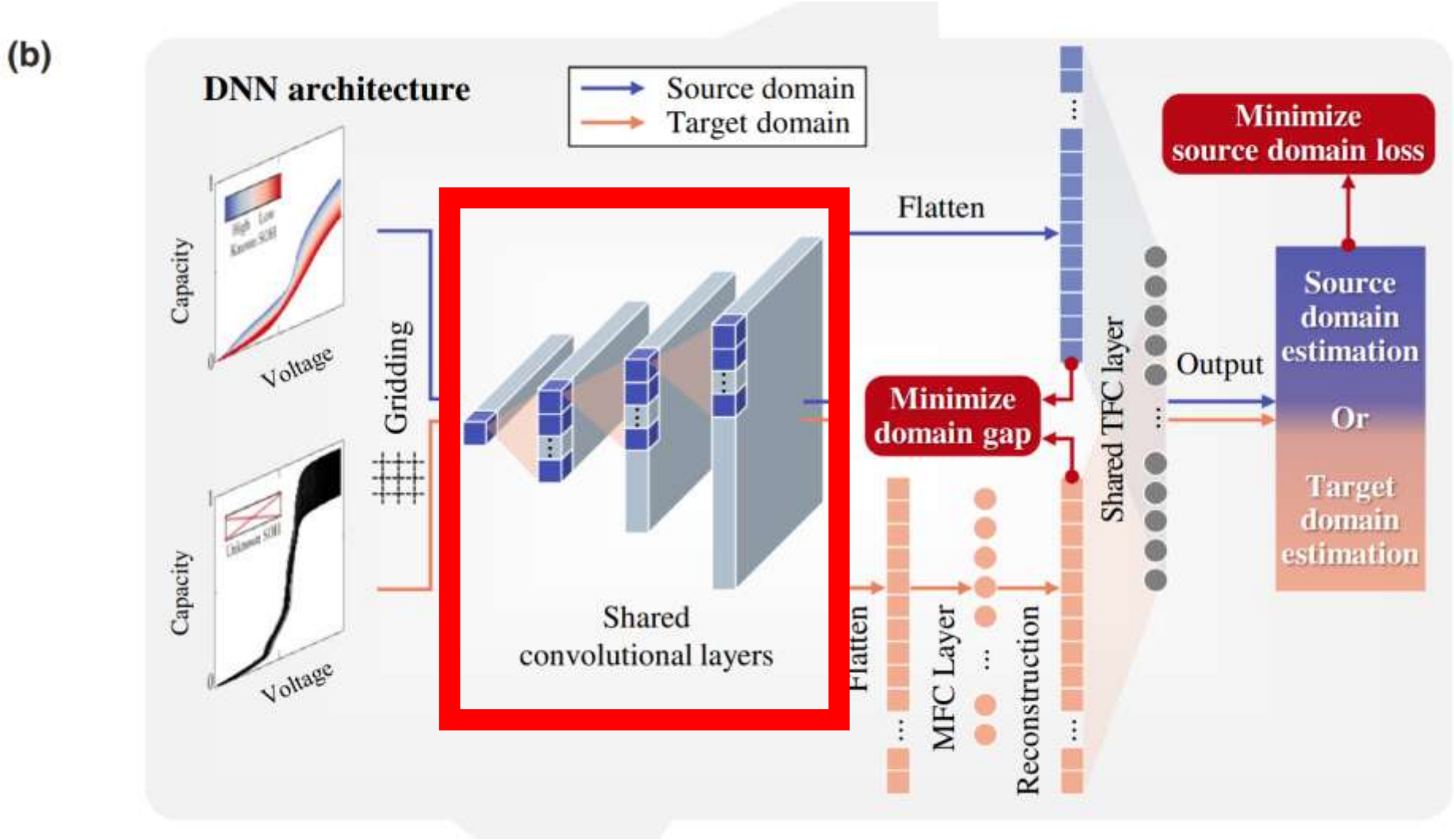
模型待定

EIS问题点:

该工作流下，EIS需要每个充放电周期都存在；
解决办法：直接删除EIS特征

CNN1d模型 Ref: Deep learning to estimate lithium-ion battery state of health without additional degradation experiments

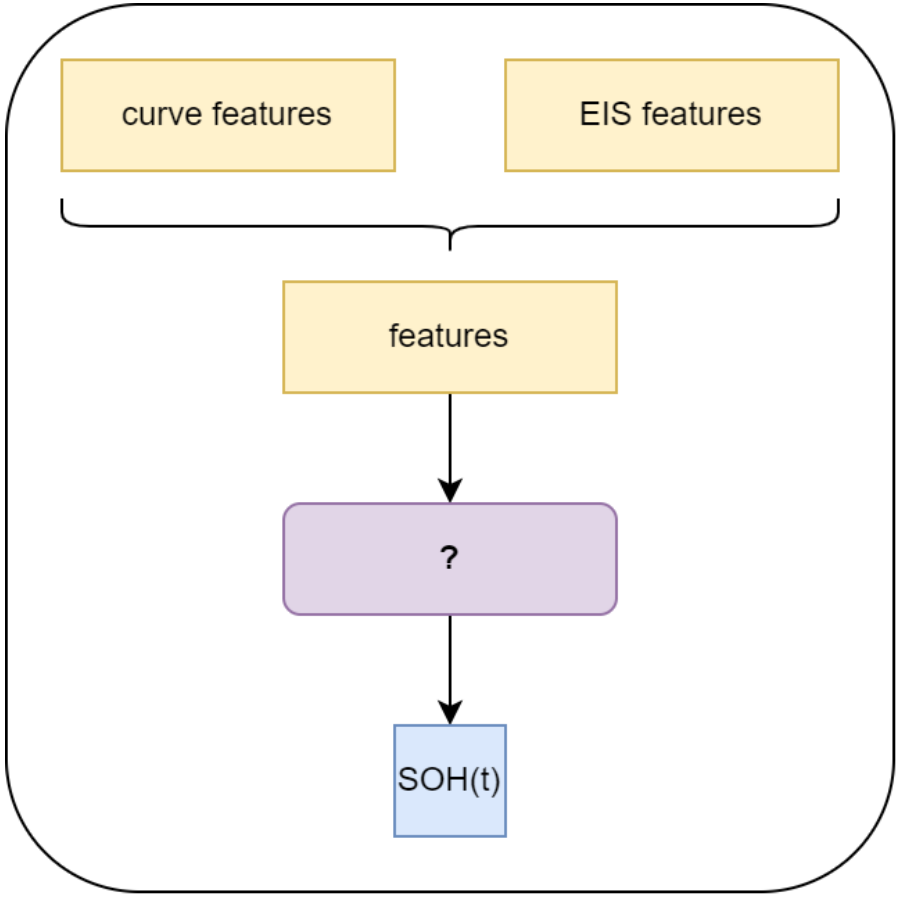
Proposed Method



CNN1d模型 Ref: Deep learning to estimate lithium-ion battery state of health without additional degradation experiments

Model

Step2：



特征 Features：

将curve features和EIS features直接连接，作为一个新的vector

Model ? ：

模型待定

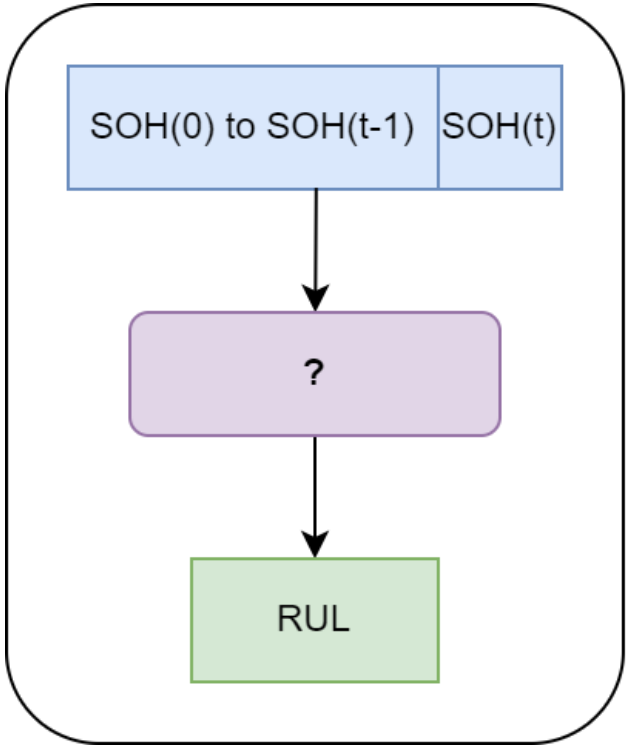
Output: Capacity -> SOH:

最终输出为一个实数，为capacity(t)

SOH(t) = capacity(t)/capacity(0)

Model

Step3：



Input：SOH 序列

将历史SOH和新计算的SOH(t)直接连接，形成一个向量

Model？：

模型待定

+ 可以使用简单的多项式模型，见下；
+ 问题点：容量再生现象，见下。
+ 考虑该问题需使用更复杂的模型

Get Regression Function:

+ 自变量：充放电周期 t
+ 因变量：SOH
+ RUL = arg[t] SOH(t) < 0.8

（三次）多项式模型

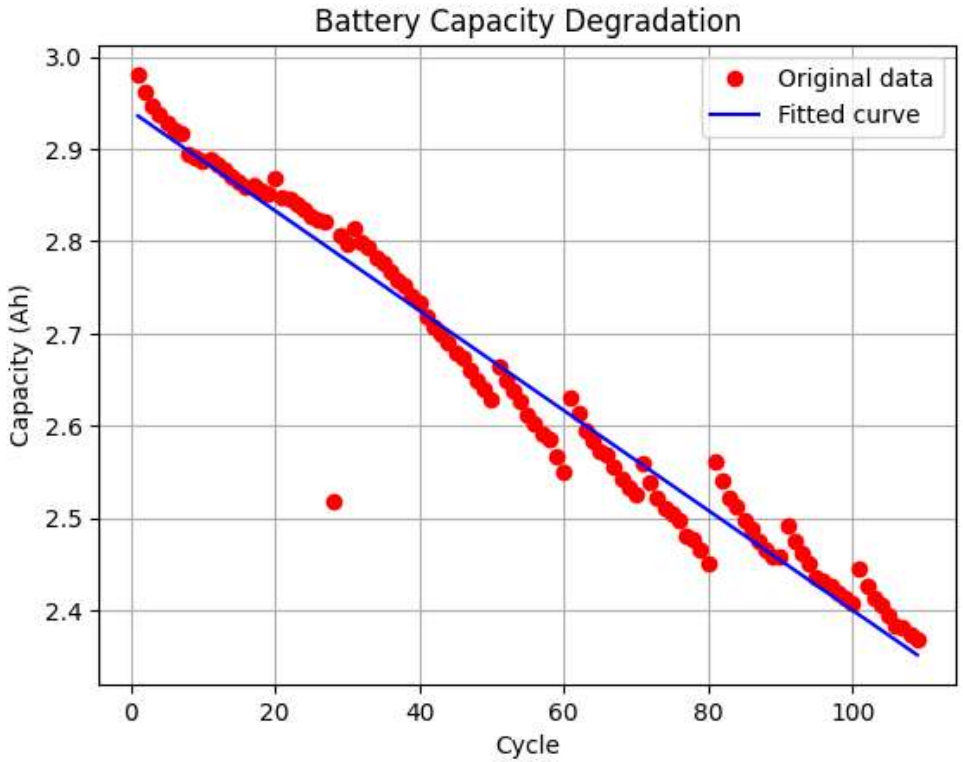
ABSTRACT

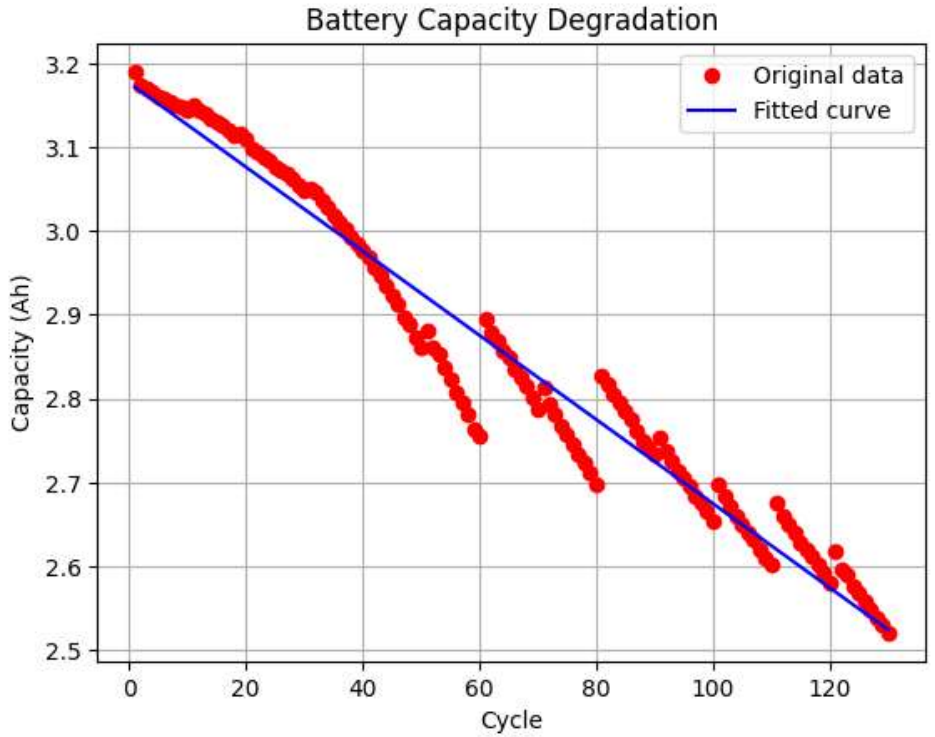
State of health estimation and remaining useful life prediction of lithium-ion batteries is challenging due to various health indicators characterizing battery degradation. This paper develops an integrated health indicator to predict remaining useful life by incorporating capacitance, resistance, and constant current charge time with the help of a beta distribution function, based on the correlation analysis between parameter variations and aging mechanisms. A three-order polynomial model is employed to fit the battery health degradation process, remaining useful life is predicted using a particle filter algorithm, and the probability density function for the battery remaining useful life is then provided. A case study is conducted to validate the health degradation model and battery remaining useful life prediction. The results show that the constant voltage charge time is not a good health indicator, and a threshold of 0.85 is recommended as the end-of-life criterion based on the integrated health indicator. The developed method provides a reference for battery remaining useful life prediction when sufficient energy and power are required.

简单多项式模型 Ref: Remaining useful life prediction for lithium-ion batteries based on an integrated health indicator

容量再生现象

容量再生现象 capacity regeneration (CR)

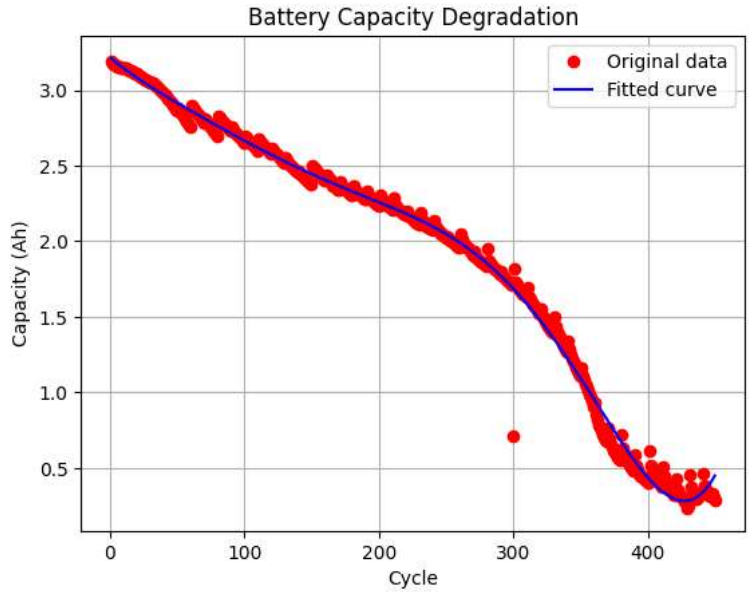




容量再生现象 capacity regeneration (CR)

Ref: Remaining useful life prediction of lithium battery based on capacityregeneration point detection

其他



电池容量随着充放电次数的数据：

数据量看似比较多

```
key: PANA2.5A, cnt: 440
key: PANA3.0A, cnt: 200
key: SANYO2.5A, cnt: 450
key: SANYO3.0A, cnt: 480
```

但是我们研究的范围只在SOH：1 -> 0.8之内
因此数据量会被砍掉3/4

```
key: PANA2.5A, initial_capacity: 2.9806, cnt: 109
key: PANA3.0A, initial_capacity: 2.8413, cnt: 40
key: SANYO2.5A, initial_capacity: 3.1898, cnt: 130
key: SANYO3.0A, initial_capacity: 3.1097, cnt: 50
```

THANK YOU!

现有论文

类别：

+ curve -> RUL

+ curve -> SOH

+ EIS -> SOH

+ review