Information Maximizing Generative Adversarial Networks for Capacity Estimation Using Impedance of Lithium-Ion Batteries

Seongyoon KIM, Yun Young CHOI and Jung-II CHOI

School of Mathematics and Computing (Computational Science and Engineering), Yonsei University, Seoul 03722, KOREA

Corresponding Author: Jung-II CHOI, jic@yonsei.ac.kr

ABSTRACT

This study proposes the use of information maximizing generative adversarial networks for the reliable extraction of latent variables representing the characteristics of lithium-ion batteries (LIBs) from electrochemical impedance spectroscopy (EIS) data in a fully unsupervised manner. Meaningful representations were obtained from EIS data measured with direct current and without relaxation, which are difficult to analyze when using equivalent circuit models. The extracted latent variables were investigated as capacity degradation progressed and were used to estimate the discharge capacity of the batteries using Gaussian process regression. We demonstrate that the extracted latent variables from EIS data measured with direct current and without relaxation reliably represent the degradation characteristics of LIBs.