Record 1 of 1

Title: Online state of health prediction method for lithium-ion batteries, based on gated recurrent unit neural networks

Author(s): Ungurean, L (Ungurean, Lucian); Micea, MV (Micea, Mihai V.); Carstoiu, G (Carstoiu, Gabriel)

Source: INTERNATIONAL JOURNAL OF ENERGY RESEARCH **Volume:** 44 **Issue:** 8 **Pages:** 6767-6777 **DOI:** 10.1002/er.5413 **Early Access Date:** APR 2020 **Published:** JUN 25 2020

Cited Reference Count: 27

Abstract: Online state of health (SOH) prediction of lithium-ion batteries remains a very important problem in assessing the safety and reliability of battery-powered systems. Deep learning techniques based on recurrent neural networks with memory, such as the long short-term memory (LSTM) and gated recurrent unit (GRU), have very promising advantages, when compared to other SOH estimation algorithms. This work addresses the battery SOH prediction based on GRU. A complete BMS is presented along with the internal structure and configuration parameters. The neural network was highly optimized by adaptive moment estimation (Adam) algorithm. Experimental data show very good estimation results for different temperature values, not only at room value. Comparisons performed against other relevant estimation methods highlight the performance of the recursive neural network algorithms such as GRU and LSTM, with the exception of the battery regeneration points. Compared to LSTM, the GRU algorithm gives slightly higher estimation errors, but within similar prediction error range, while needing significantly fewer parameters (about 25% fewer), thus making it a very suitable candidate for embedded implementations.

Accession Number: WOS:000524334200001

Language: English

Document Type: Article

Author Keywords: battery management system; gated recurrent unit; lithium-ion battery; long-short term memory; online state prediction; recurrent neural networks; state of health

KeyWords Plus: USEFUL LIFE ESTIMATION; SHORT-TERM-MEMORY; OF-CHARGE; HYBRID; MODELS

Addresses: [Ungurean, Lucian; Micea, Mihai V.; Carstoiu, Gabriel] Politehn Univ Timisoara, Dept Comp & Informat Technol, Timisoara, Romania.

Corresponding Address: Micea, MV (corresponding author), Politehn Univ Timisoara, Dept Comp & Informat Technol, Timisoara, Romania.

E-mail Addresses: mihai.micea@cs.upt.ro

Author Identifiers:

Author	Web of Science ResearcherID	ORCID Number
Micea, Mihai V.	B-5581-2011	0000-0002-8224-2032

Publisher: WILEY

Publisher Address: 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

Web of Science Categories: Energy & Fuels; Nuclear Science & Technology

Research Areas: Energy & Fuels; Nuclear Science & Technology

IDS Number: LY2MR

ISSN: 0363-907X

eISSN: 1099-114X

29-char Source Abbrev.: INT J ENERG RES

ISO Source Abbrev.: Int. J. Energy Res.

Source Item Page Count: 11

Output Date: 2020-10-18