

# Yalan (Christina) Bi

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## SUMMARY

Experience with lithium-ion battery electrochemical and equivalent circuit modeling, optimal charging strategy design, and online SOC/SOH estimation. Complete multiple projects in the past 5 years with hands on experience of large experimental data set processing and battery-in-the-loop testing.

## EDUCATION

## **Auburn University, Auburn, AL**

- Doctor of Philosophy in Mechanical Engineering May 2015 – May 2020
  - GPA: 3.93 / 4.00
  - Thesis: Online state and parameter estimation of lithium-ion batteries based on a reduced-order electrochemical life model
- Master of Science in Mechanical Engineering Aug 2014 – Aug 2018
  - GPA: 3.93 / 4.00

**Jilin University, Changchun, Jilin, China**

- Bachelor of Science in Automobile Engineering Sep 2010 – Jul 2014
  - GPA: 3.38 / 4.00

## EXPERIENCE

## **Graduate Research Assistant, Auburn University**

Collaborated with companies (GM, LG Chem, Hyundai, etc.) on multiple projects. Responsible for meeting arrangement and progress report development

- *Online SOH Estimation Using Nonlinear Filters and ML Methods* Aug 2018 – May 2020
  - Estimated SOH and parameters using particle filter via a physics-based aging model
  - Analyzed sensitivity of terminal voltage and SOC analytically with respect to aging parameters
  - Applied machine learning methods with aging models for parameter and SOH estimation
  - Collaborated with materials-majored students on conducting postmortem analysis of battery cells
- *Characterization of Heat Generation in Large-Format Pouch Cells* Oct 2018 – Oct 2019
  - Designed a calorimeter with Kalman filter for heat generation rate measurement
  - Developed a cell surface temperature control algorithm working simultaneously with the calorimeter
  - Worked closely with team members and provided guidance to control/estimation-related problems
- *Development of an Ultra-fast Charging Algorithm for a High Power Battery* May 2017 – Feb 2019
  - Developed a ROM considered the SEI layer formation and lithium plating/stripping
  - Validated model using data of a large-format NMC622 cell and achieved 22 mV maximum error
  - Evaluated sensitivity of electrochemical parameters and procedure for parameter estimation
  - Designed an adaptive SPKF with equality constraints for SOC estimation with 2% maximum error
  - Applied pulse charging to promote lithium stripping to reduce both charging time and aging rate
  - Led a team of 3 graduate students; planned and organized monthly meetings with sponsors and completed project 3 months in advance
- *Development of a ROM and Online Monitoring Algorithm for an LFP Cell* May 2015 – Dec 2017
  - Developed and validated a ROM for an LFP cell with modeling of side reactions
  - Designed an EKF for SOC estimation with 3% maximum error and tested it in a BIL system
  - Conducted tests on self-constructed test-stations controlled by LabVIEW; conducted EIS tests to evaluate changes in aging parameters of ECM
  - Collected and processed a large amount of data collected at different operation conditions

Graduate Teaching Assistant Auburn University

- Guided and trained new graduate assistants
- Created and graded assignments, projects, and exams
- Instructed students with Mechatronics laboratory exercises and software training

## SKILLS

- Matlab/Simulink (+5 years), Python (+4 years), LabVIEW (+4 years), Git, L<sup>A</sup>T<sub>E</sub>X, Mathematica
- Applied machine learning and deep learning with Scikit-learn and Keras
- Ability to communicate effectively both as a leader and a team member

**PUBLICATIONS  
(SELECTED)**

- [1] Y. Bi, and S-Y. Choe, “An adaptive sigma-point Kalman filter with state equality constraints for online state-of-charge estimation of a Li(NiMnCo)O<sub>2</sub>/Carbon battery using a reduced-order electrochemical model,” *Applied Energy*, Jan 2020.
- [2] Y. Bi, X. Zhao, and S-Y. Choe, “A hybrid state of charge estimation method of a LiFePO<sub>4</sub>/graphite cell using a reduced order model with an extended Kalman filter,” in *2019 American Control Conference (ACC)*, Philadelphia, PA, Sep 2019
- [3] Y. Bi, and S-Y. Choe, “Automatic estimation of parameters of a reduced order electrochemical model for lithium-ion batteries at the beginning-of-life,” in *2018 IEEE Vehicle Power and Propulsion Conference (VPPC)*, Chicago, IL, Aug 2018
- [4] X. Zhao, Y. Bi, and S-Y. Choe, “An integrated reduced order model considering degradation effects for LiFePO<sub>4</sub>/graphite cells,” in *Electrochimica Acta*, 280, pp.41-54, Aug 2018

**AWARDS &  
SCHOLARSHIPS**

- Graduate Research Assistantship, Auburn University May 2015 – May 2020
- Graduate Teaching Assistantship, Auburn University May 2018 – May 2020
- Second Prize Scholarship (top 10%), Jilin University Aug 2013 – May 2014
- Third Prize Scholarship (top 15%), Jilin University Aug 2010 – May 2013

**LANGUAGES**

- Chinese: Native
- English: Proficient