

# STUDENTS' ANNUAL ACTIVITY REPORT

## CYCLE XXXIV YEAR 2019/2020

- Name and Surname **Ethelbert EZEMOBI**
- Dottorato in **INGEGNERIA MECCANICA**
- Department **DIMEAS**
- Coordinator **Prof. Luca GOGGIO**
- Tutor **Prof. Andrea TONOLI**

- Macroarea  
**Artificial intelligence Automotive**

- Short description of research activity (maximum 20 lines)

Many Hybrid and Electric vehicle academic and industrial researches focus on reaching the set targets on battery energy reliability, energy conservation and pollution reduction. This research work exploits the benefits of Artificial Intelligence and other relevant engineering tools to estimate the battery State of Charge (SOC) and State of Health (SOH), and to model the thermal behaviour of the battery.

Over the period covered by this report, the project has been concentrated on:

- Understanding and defining the reliable battery operating criteria based of SOC, SOH and Temperature for safe and conservative battery operation in hybrid automotive applications.
- Experimental data extraction to analyze battery thermal behaviour and aging subject for different current profiles.
- Experimental characterization and modelling of Lithium ion battery for State of Charge (SOC), State of Health (SOH) and Remaining useful life estimation using Artificial Neural network, and for thermal model validation.

- Training activities carried out during the year (courses, seminars, etc.); for each activity specify the nature, duration, and location

**Conferences:**

ASME IDETC 2020: Energy saving from Electrification of cooling system

**Courses:**

01LCPRV Experimental modeling

01UOFRV LabView-based programming toolchains for Power Electronics control applications

- Possible participation in further research activities during the year (research projects and agreements)

**Implementation of State of Charge and thermal models for powertrain control**

- Collaborations with companies during the year
  - **Dayco (for model implementation)**

- List of accepted papers
  - **State of Charge Estimation of Lithium Batteries for Automotive application with Artificial Neural Network:** *2019 Aeit International Conference of Electrical and Electronic Technologies for Automotive (Aeit Automotive)* - published July 2019
  - **Energy saving from Electrification of cooling system:** *2020 IDETC-CIE International Design Engineering Technical Conferences & Computers and Information in Engineering Conference* – accepted for publication August 2020

Date, 18/092020



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Signature of Tutor



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Signature of the Phd student

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The Coordinator