Energy Harvesting, Storage and Management for Automated Environment Monitoring in the East African Region

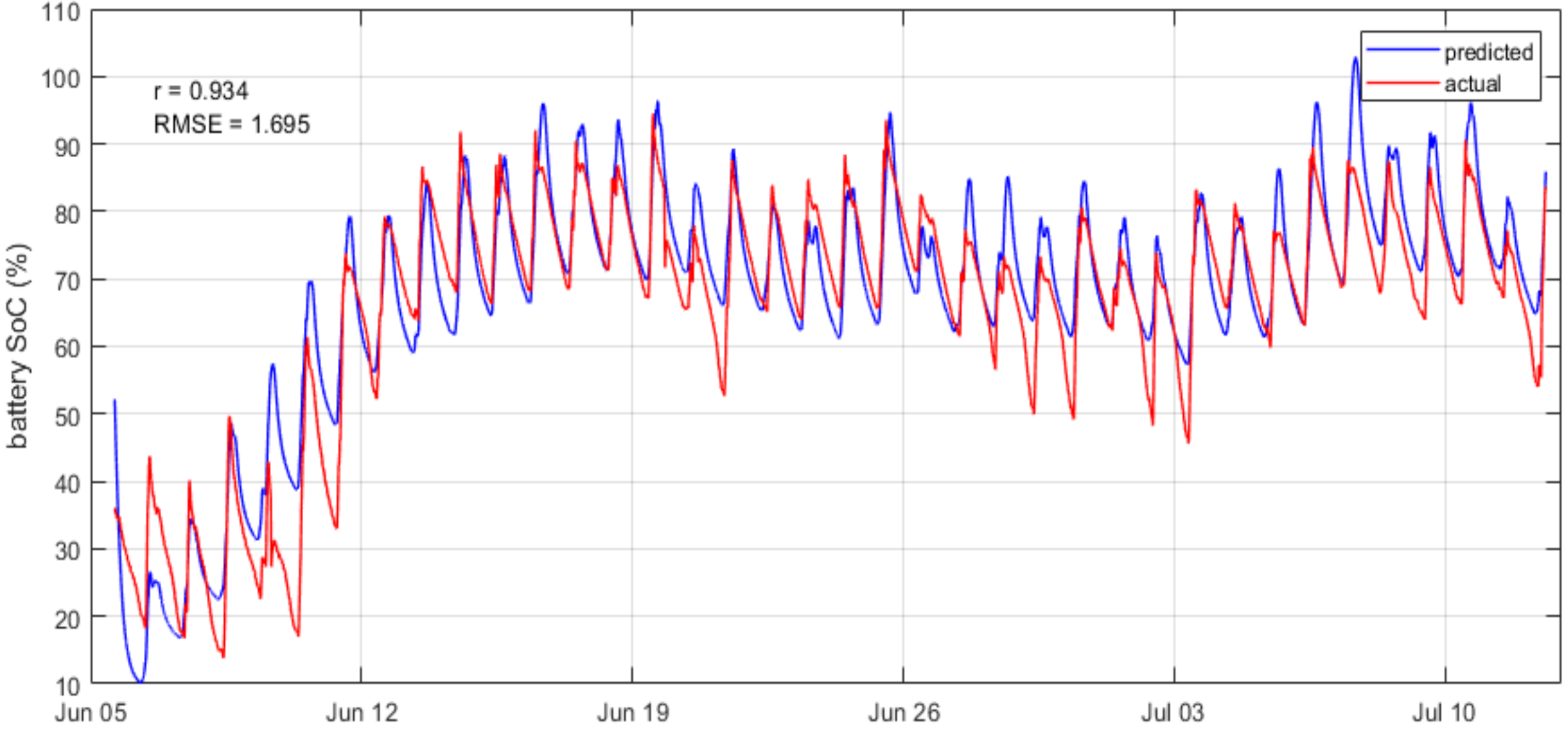
PROGRESS REPORT – JULY

MAXIMUS BYAMUKAMA

June in brief

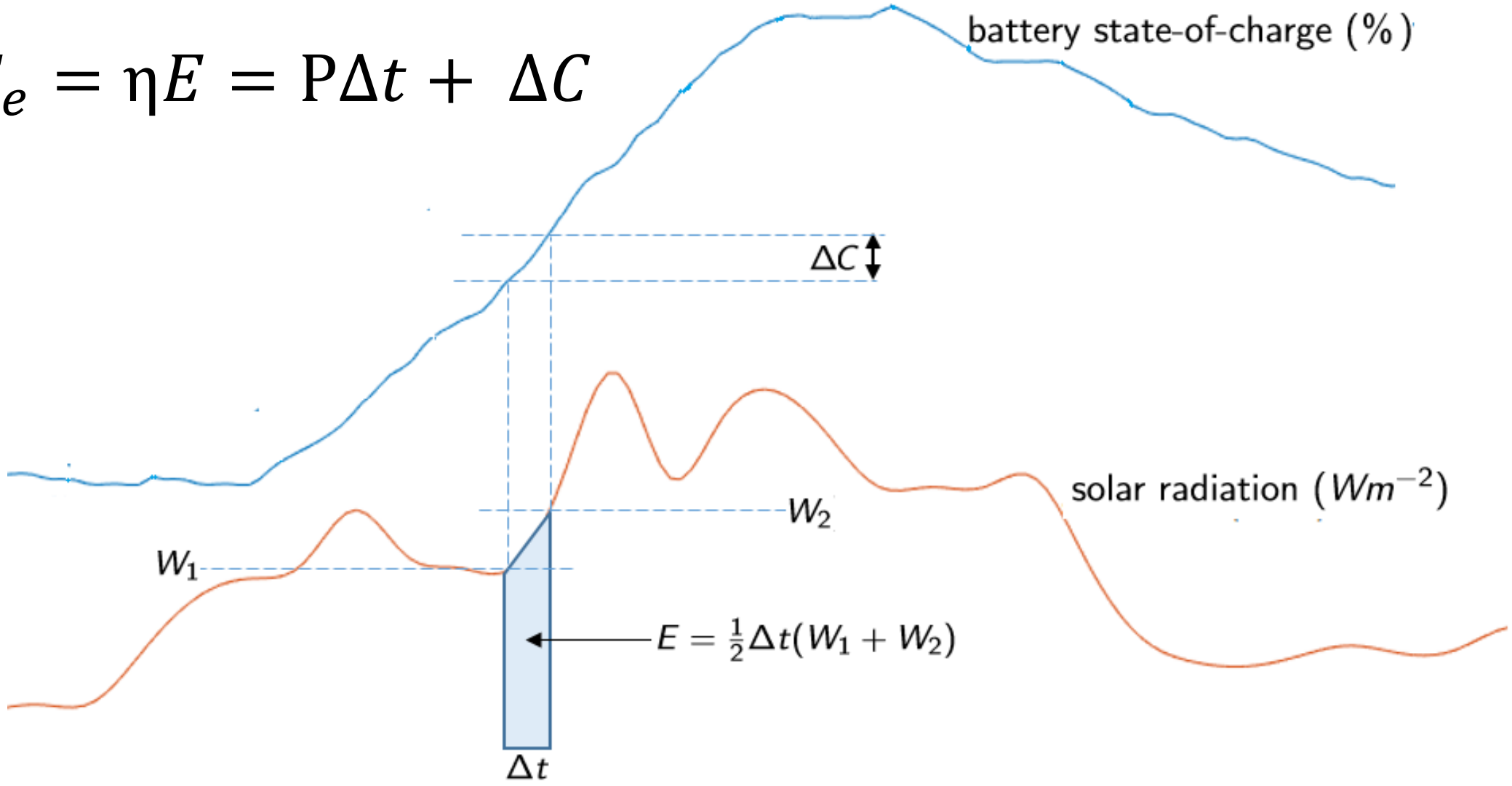
- Submitted LIC Self Discharge Paper to PLOS ONE – under review
- Prepared paper on "**Powering Environment Monitoring WSNs: Lessons from Eastern Africa**" for journal EAI Transactions on IoT in Developing countries – Accepted with minor comments. Published by EUDL.
- Completed testing of 2 new models on Solar panel sizing (Obj 3)
- Finished paper on Objective 3: "**New Techniques for Sizing Solar Photovoltaic Panels in Environment Monitoring Sensor Networks"** MDPI Sensors Journal
- Draft dissertation: **Introduction finished. Paper chapters to attach.**

Transfer function estimation Model

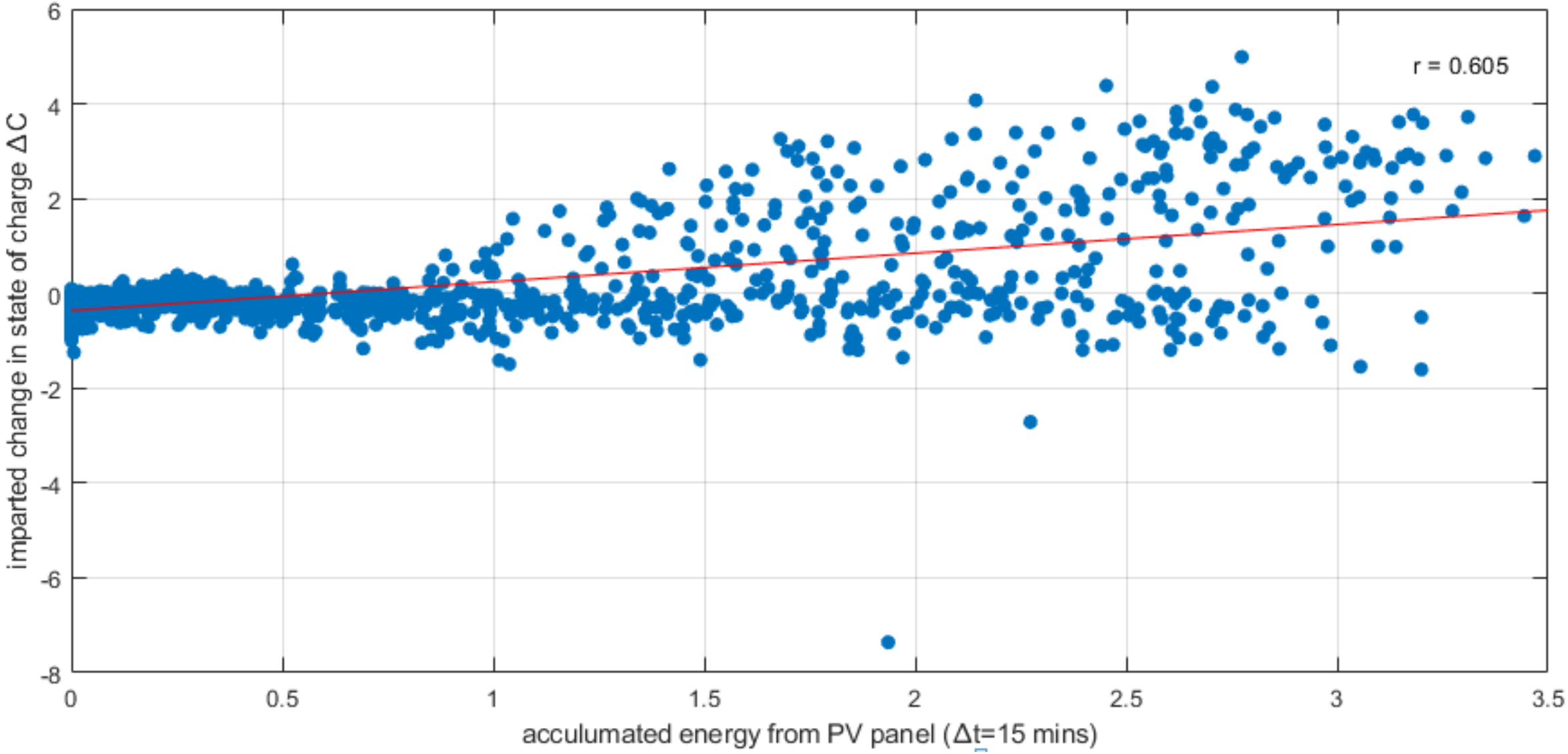


Discrete Calculus Model - Theory

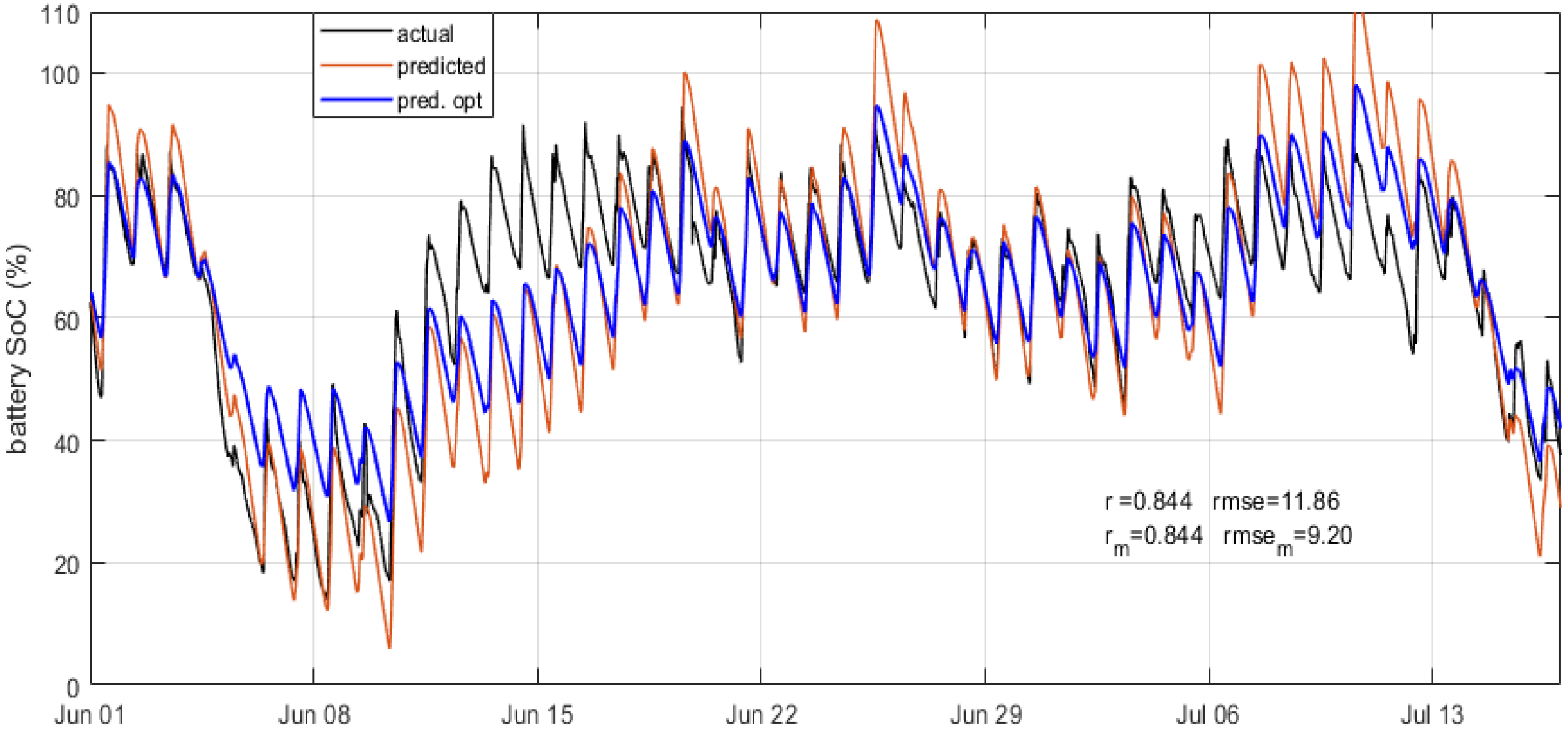
$$E_e = \eta E = \mathrm{P}\Delta t + \Delta C$$



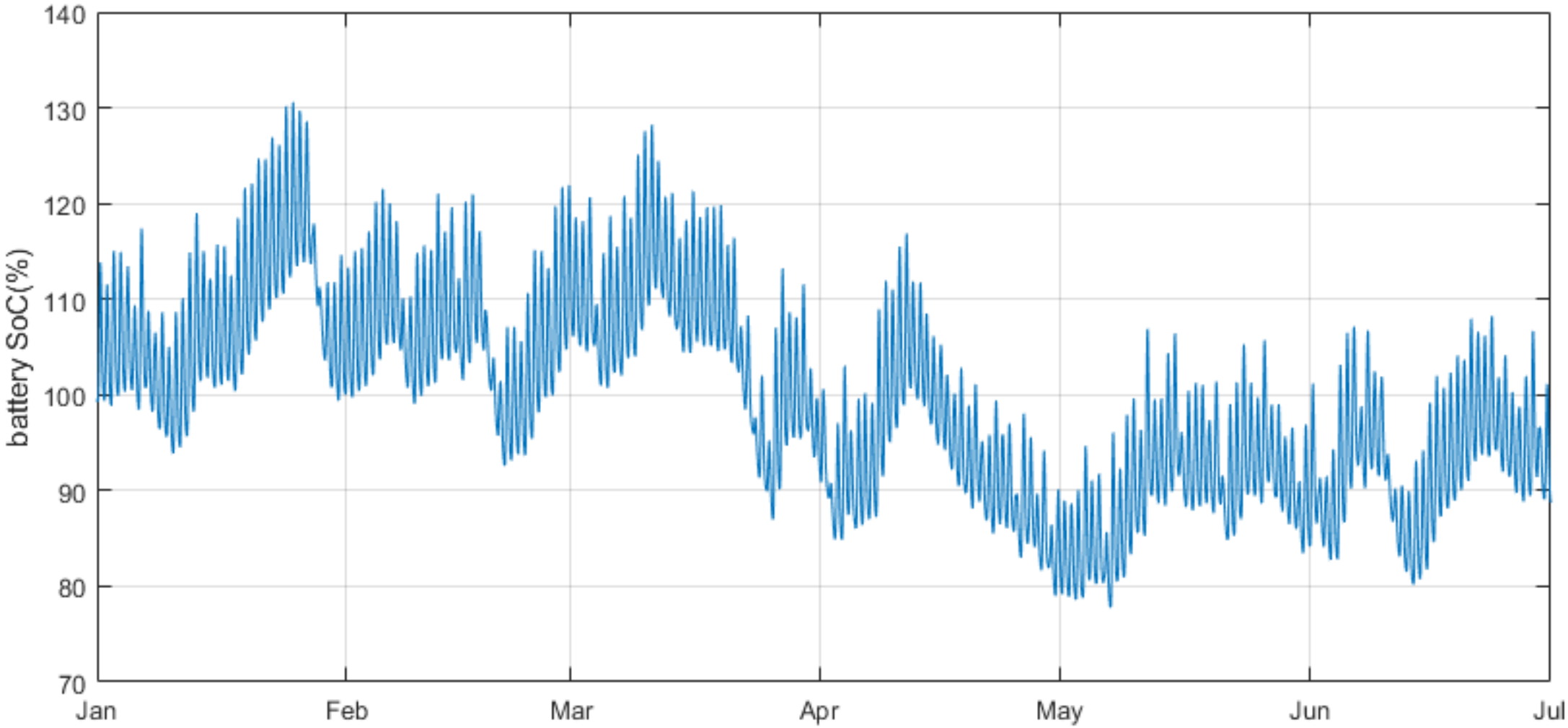
Discrete Calculus Model - results



Discrete Calculus Model - results



Sizing


140
130
120
110
100
90
80
70
battery SoC(%)
Jan
Feb
Mar
Apr
May
Jun
Jul

August Plans

- Submit objective 3 paper to MDPI sensors
- Hand in Draft Thesis – **ETA=August 7**
- Submit **Notice of Intention to Submit**
- Put project work into 2nd gear
- Minor change in objectives

Suggested objectives

1. to review the design and operational challenges of wireless sensor networks in the region
2. design a low-power gateway for environment monitoring WSNs
3. propose optimal electrochemical energy storage technologies for different deployment scenarios of WSNs
4. investigate alternative techniques of sizing solar energy harvesting units for WSNs
5. ~~evaluate the cost effectiveness of using these approaches for subsequent adoption by local stakeholders~~