



Attività di ricerca



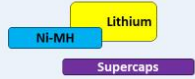
Claudio Scarpelli, PhD

- ☐ **Modellazione e simulazione di sistemi di accumulo a batteria**
- ☐ **Studio di stimatori di invecchiamento per batterie al litio**
- ☐ **Modellazione energetica veicoli elettrici e ibridi**
- ☐ **Ottimizzazione sistemi di ricarica veloce per veicoli elettrici in autostrada**

contact: claudio.scarpelli@unipi.it



Caratterizzazione accumuli elettrochimici

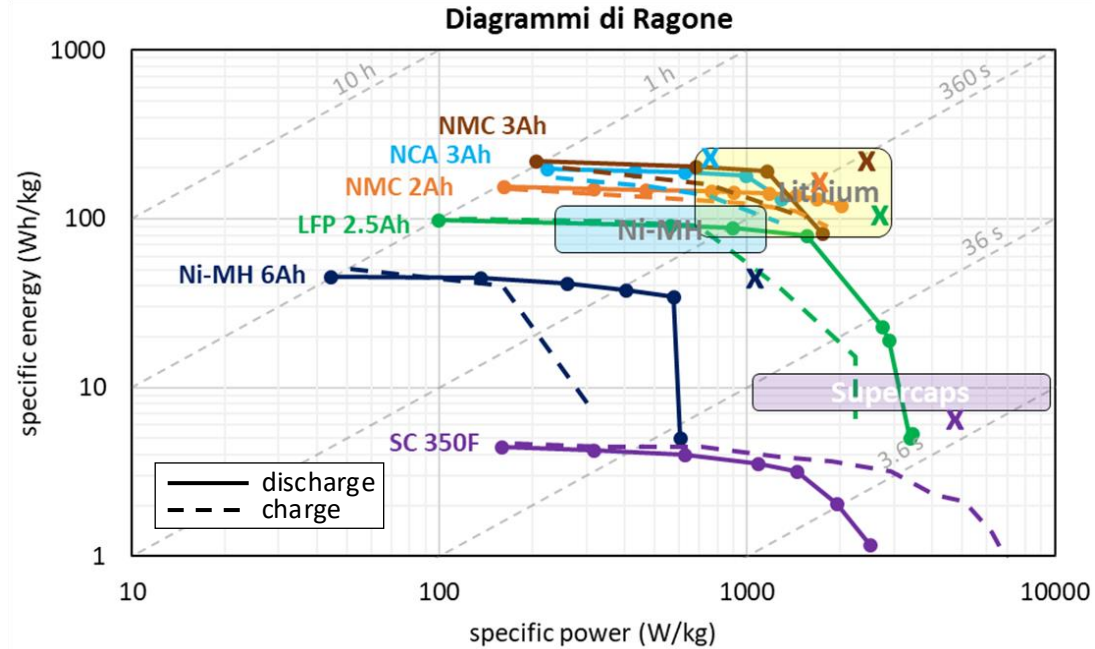
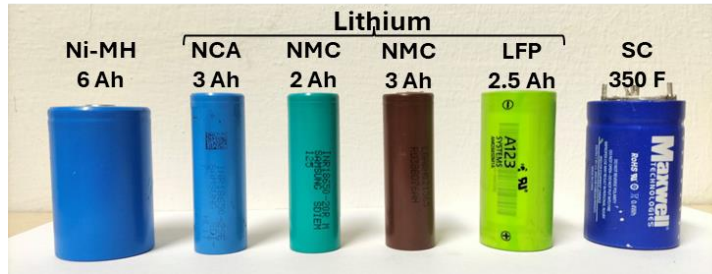


Informazioni provenienti
da letteratura

Informazione da datasheet
del costruttore

X

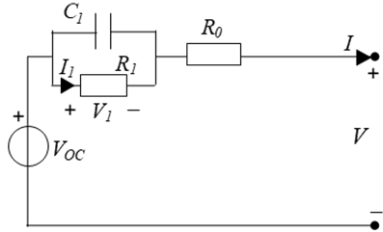
Risultati delle
caratterizzazioni
sperimentali



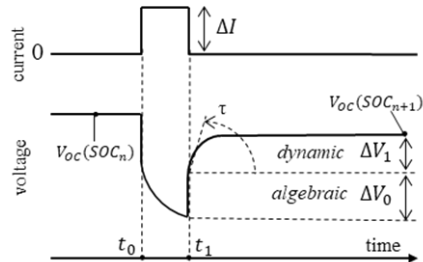


Protocolli di modellazione elettro-termica di batterie

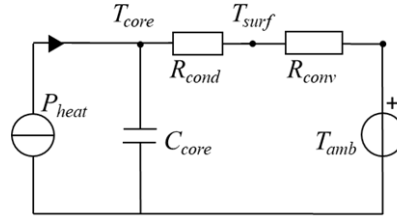
Circuito elettrico equivalente



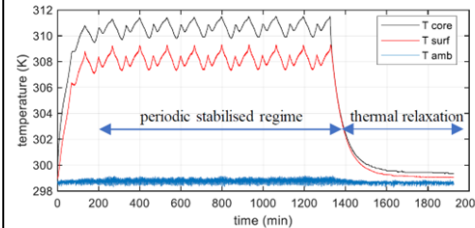
Test sperimentale



Circuito termico equivalente

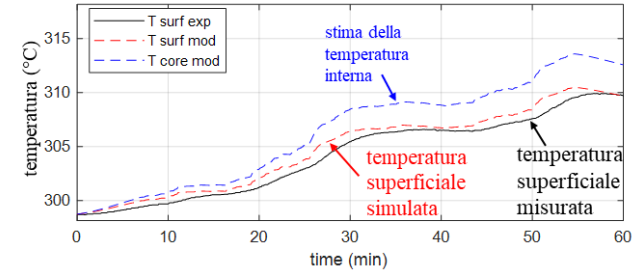
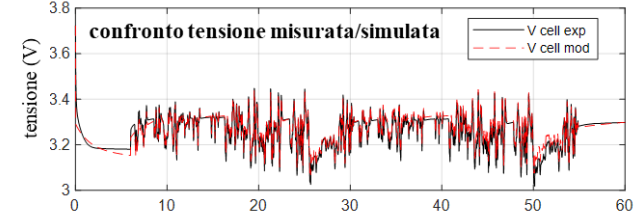
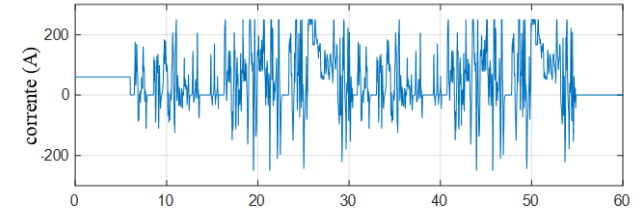


Test sperimentale



Validazione del modello

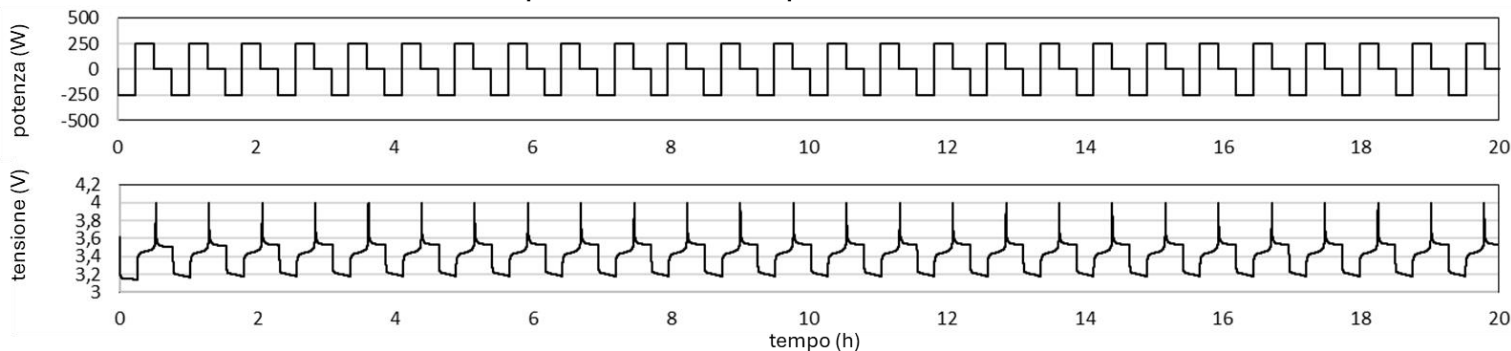
Validazione su profilo dinamico realistico



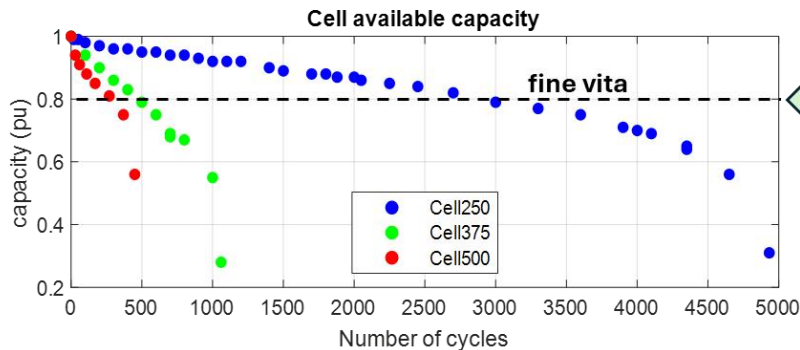
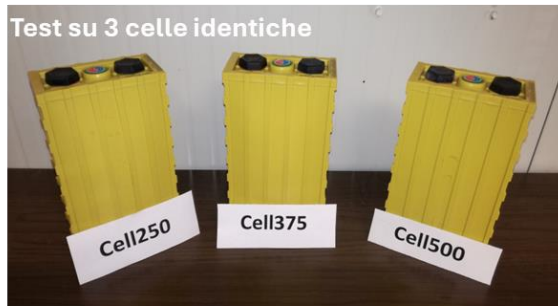


Test di invecchiamento su batterie al litio

Esempio 20 h di cicli a 250 W: potenza e tensione di cella



Test su 3 celle identiche



Raddoppiando la potenza di carica e scarica la vita attesa si riduce di 10 volte

Potenza (W)	Numero di cicli di fine vita
250	3000
375	500
500	300



Simulatore di veicoli elettrici in autostrada

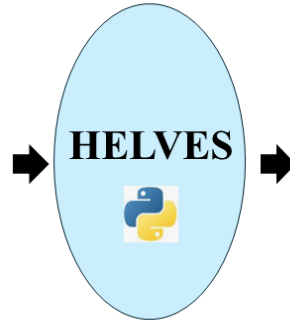
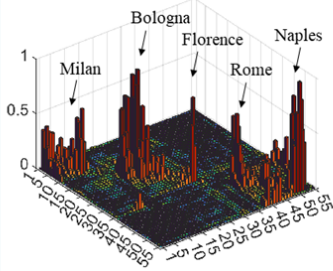
❑ HELVES: Highway ELectric VEHicles Simulator

INPUT

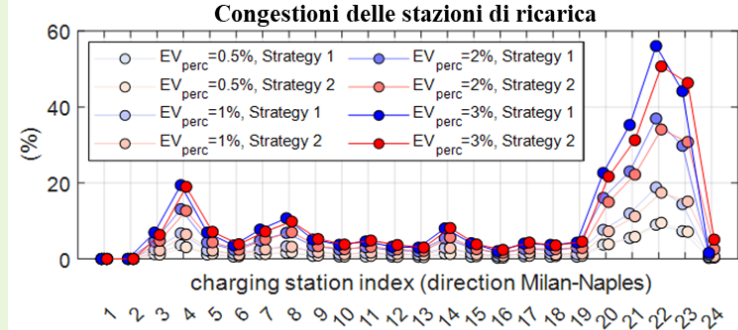
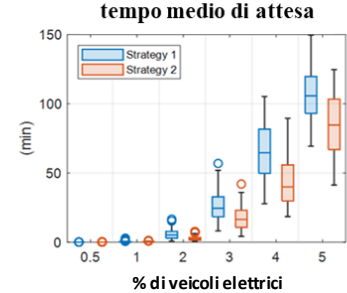
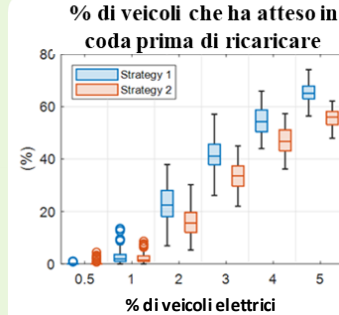
- Struttura dell'autostrada
- Infrastruttura di ricarica

Matrice
Origine/Destinazione

- Flotta di veicoli elettrici
- Strategia di ricarica



OUTPUT (caso studio: A1 Milano-Napoli)



HELVES github link: <https://github.com/SoftwareImpacts/SIMPAC-2024-90>