The Quest for Non-Functional Property Optimisation in Heterogeneous and Fragmented Ecosystems: a Distributed Approach

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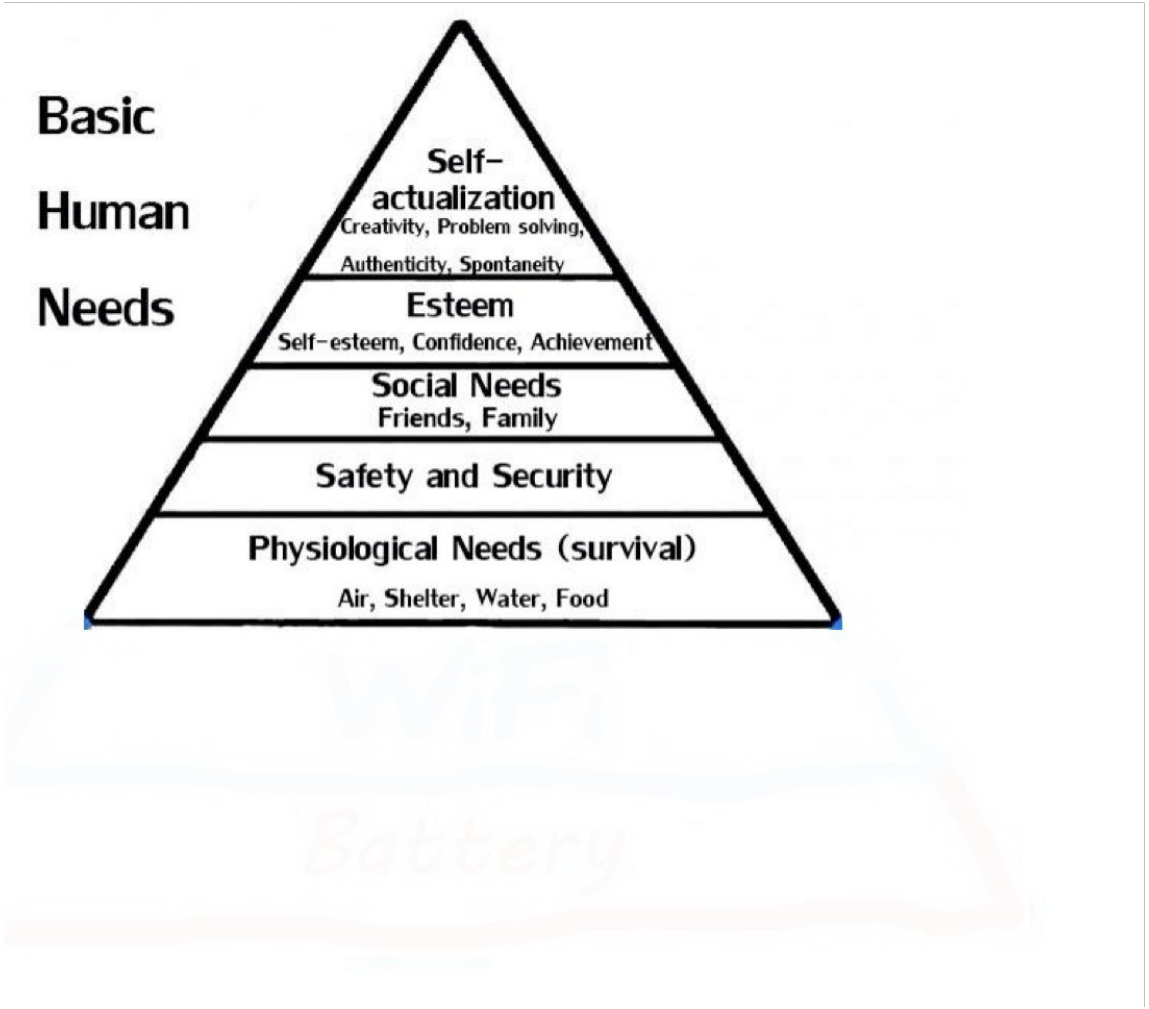
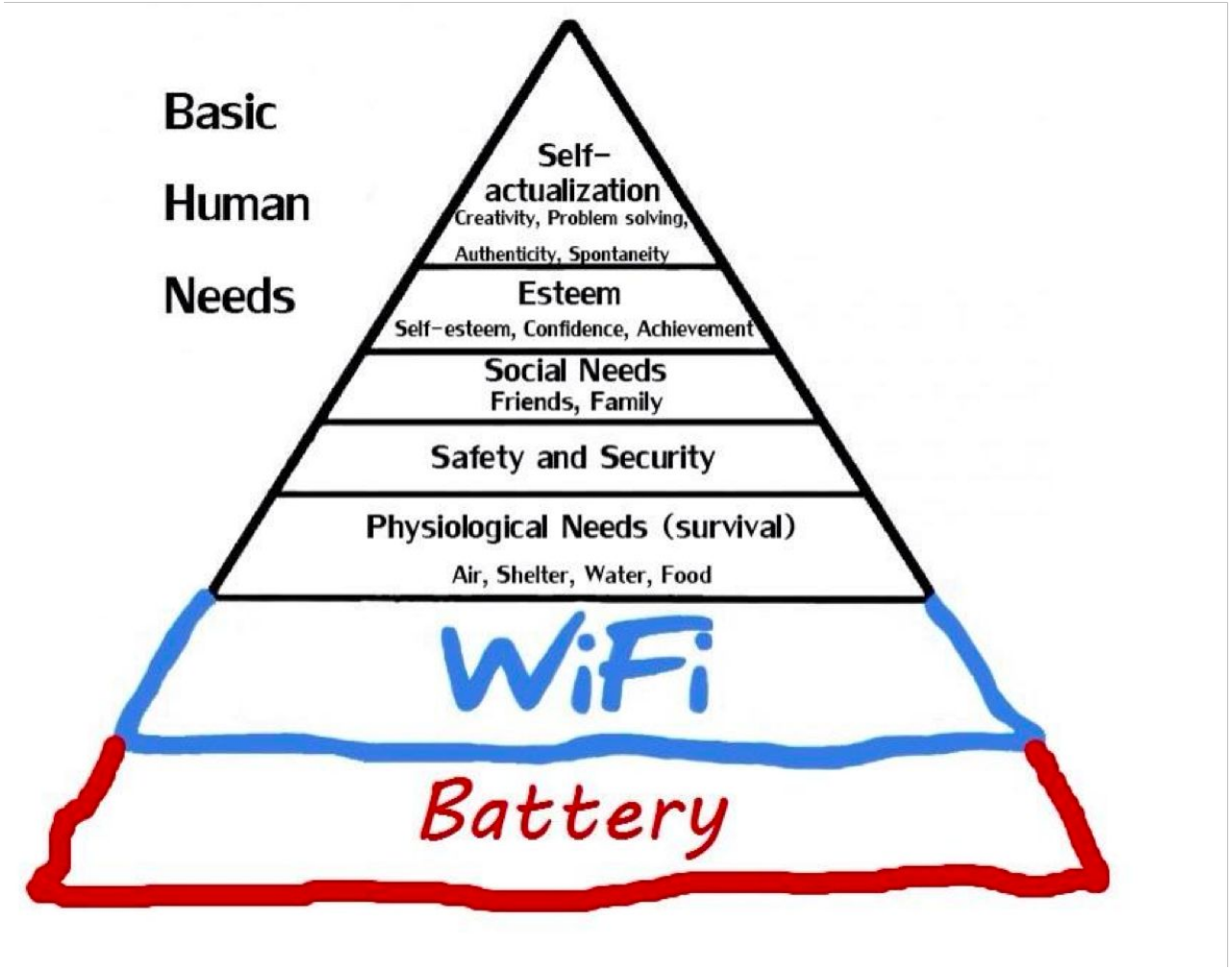
Maslow's hierarchy of needs

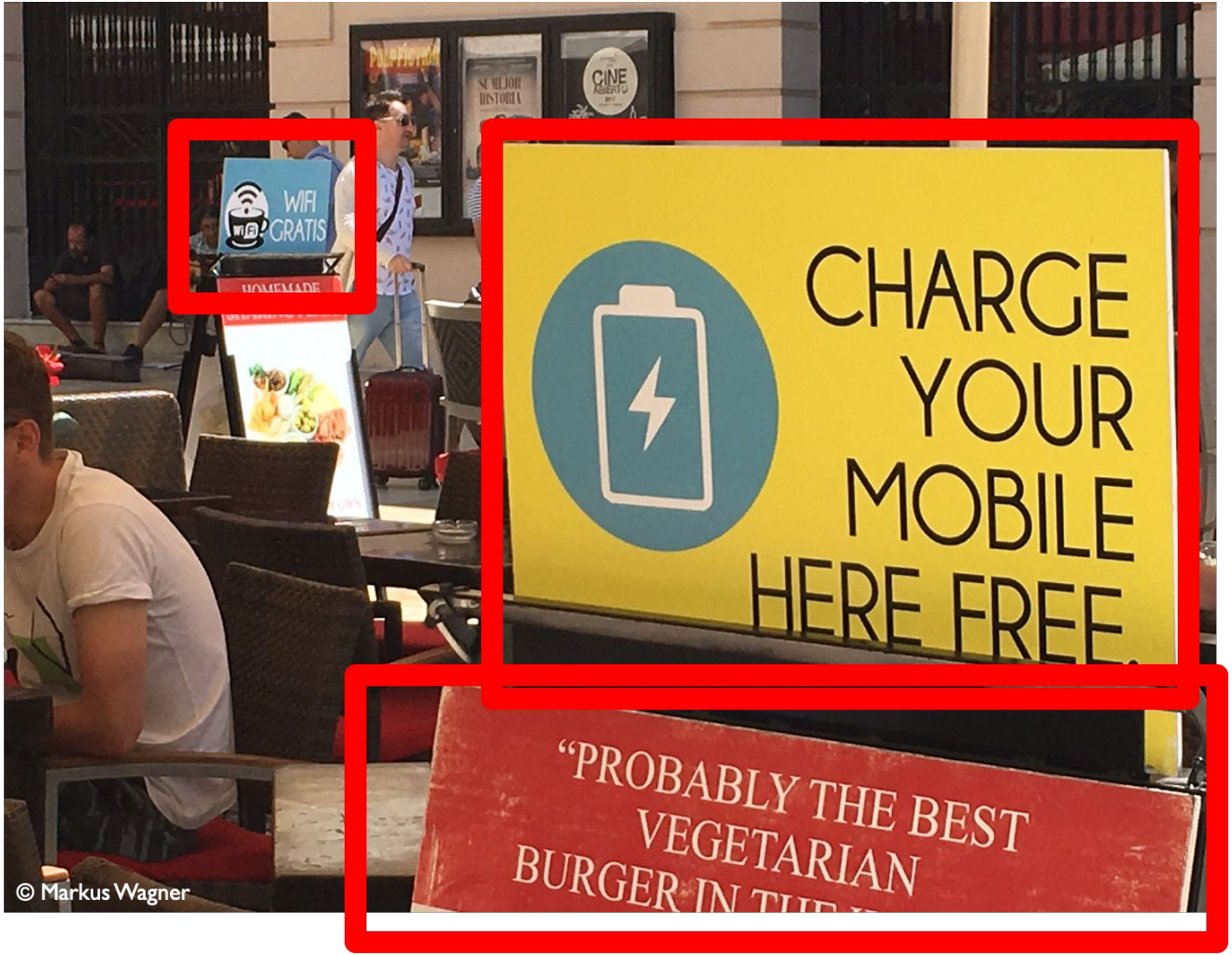


Maslow's hierarchy of needs 2.0

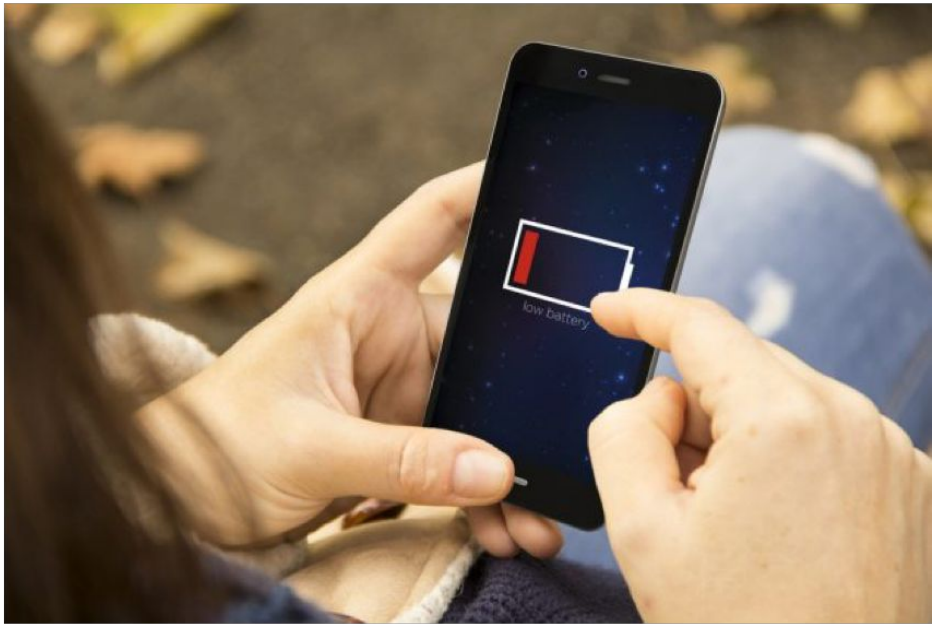


Maslow's hierarchy of needs

Photo taken in Malaga, July 2017



as soon as this appears



shock

anger

denial

the need to get power

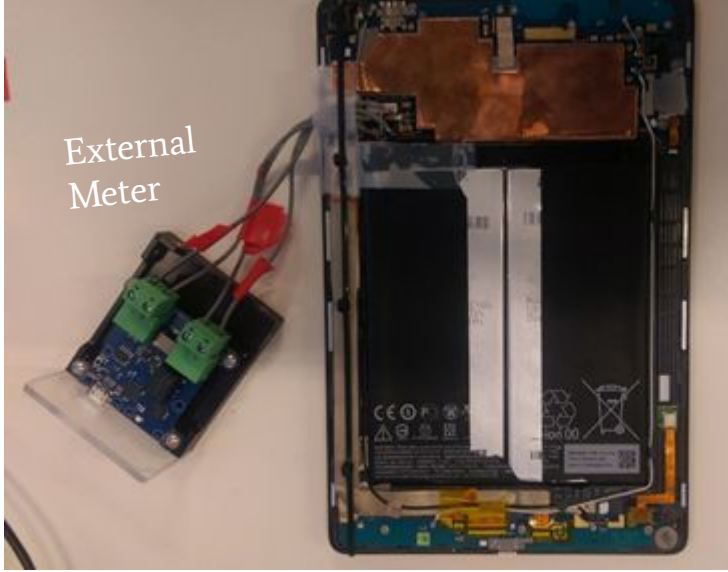
there is a simple solution

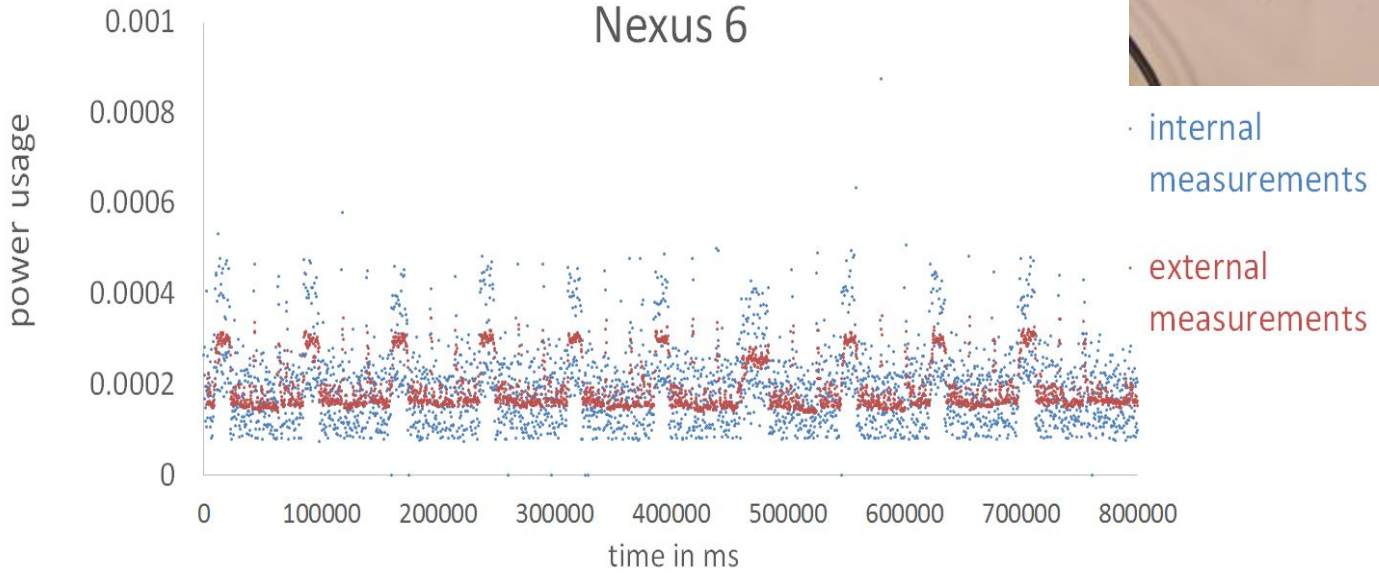
Genetic Improvement

there is a ~~simple~~ solution

Genetic Improvement

Internal vs External Meter





Models

Utilisation-based models.

Event-based models.

LOC/APIs based models.

In-vivo and offline optimisation of energy use in the presence of small energy signals – A case study on a popular Android library

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Fragmented Ecosystems

Mind the gap – a distributed framework for enabling energy optimisation on modern smart-phones in the presence of noise, drift, and statistical insignificance

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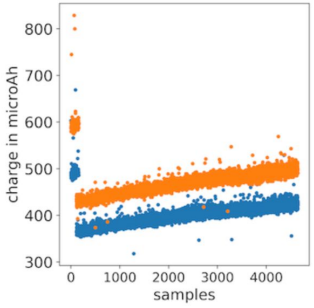
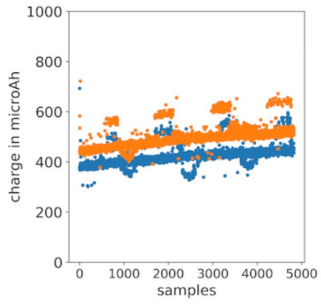
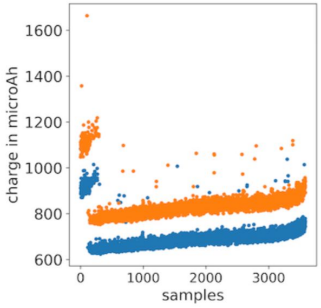
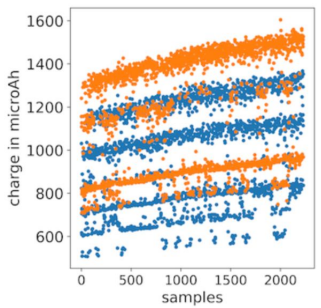
Below: four different phone-OS combinations, orange/blue are two different test loads (but identical across all samples):



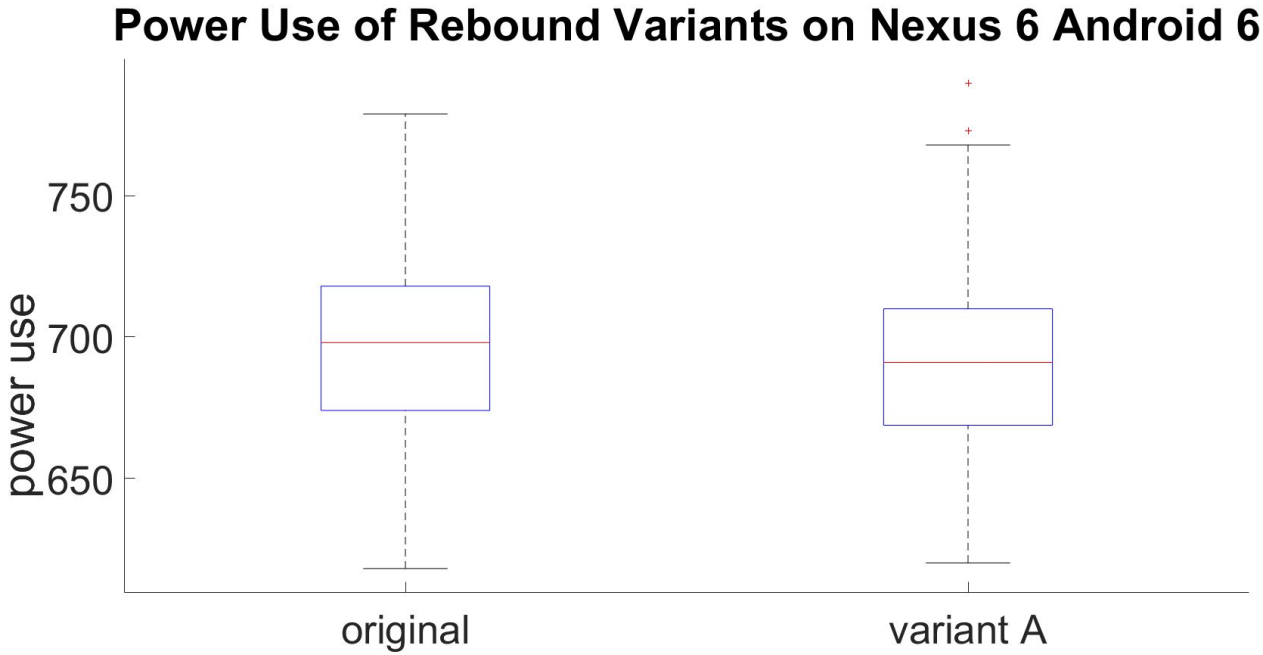






Case Study

Validation on different platform.



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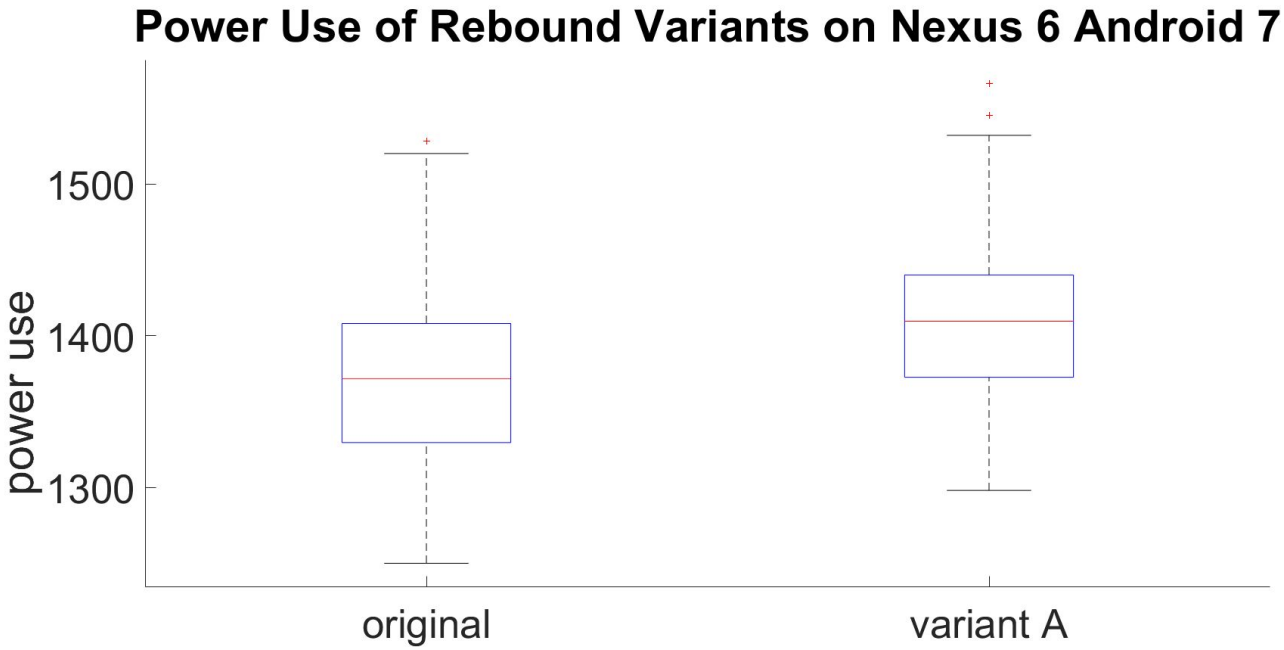

Proposed Framework

Phone farm:

- Asynchronous islands (independent EAs)
- Tournaments to compare program variants
- “Average” behaviour optimisation

Future Work

How effective and efficient is the proposed framework?

How robust are the generated solutions?

How can the scalability of the framework be improved?

How can the framework be used in multi-objective optimisation?

And: solving lots of software challenges, such as, random reboots, communication issues, OS resets, ...