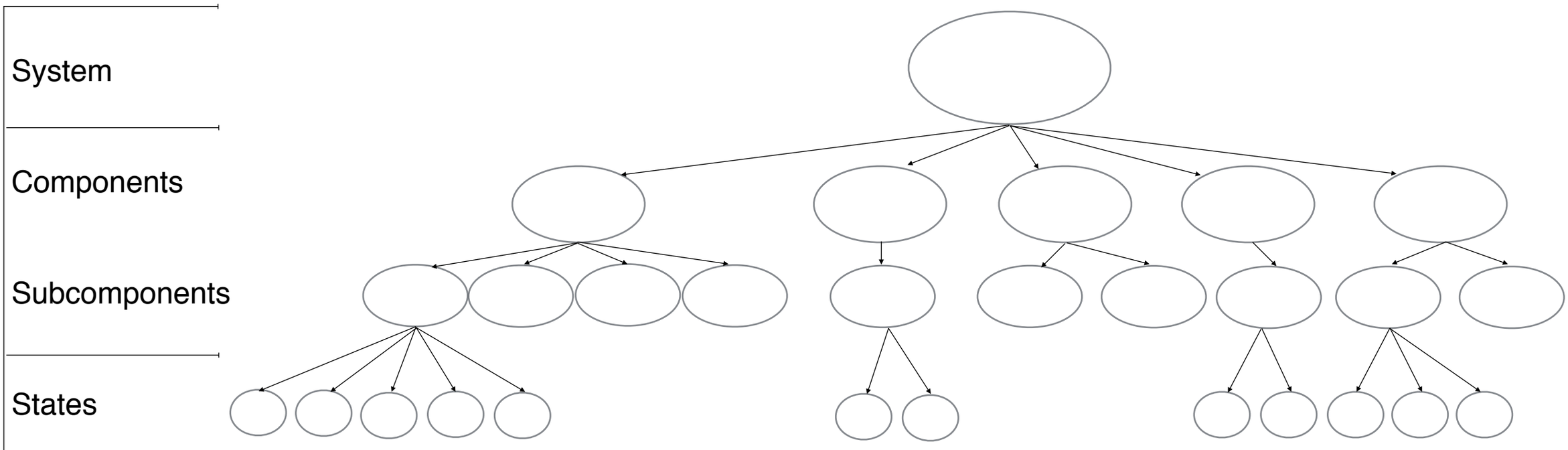
Energy Reporting

TASK 1

Goals

- PC component energy characterizations and methodology
- Energy reporting algorithm and efficacy
- Software and application power consumption variation

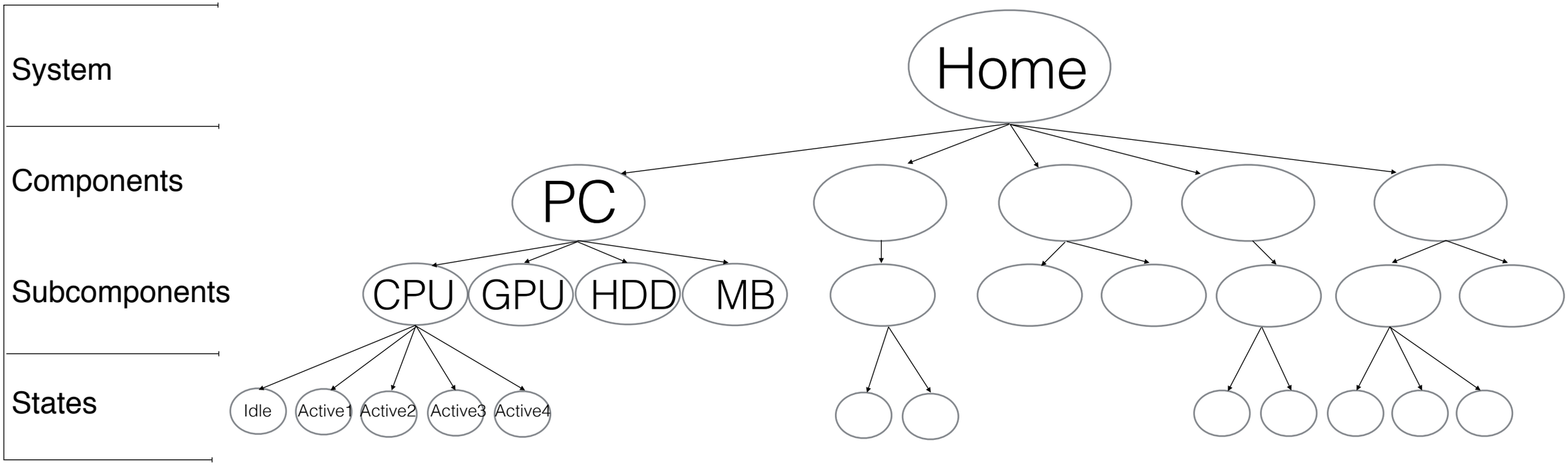
Template



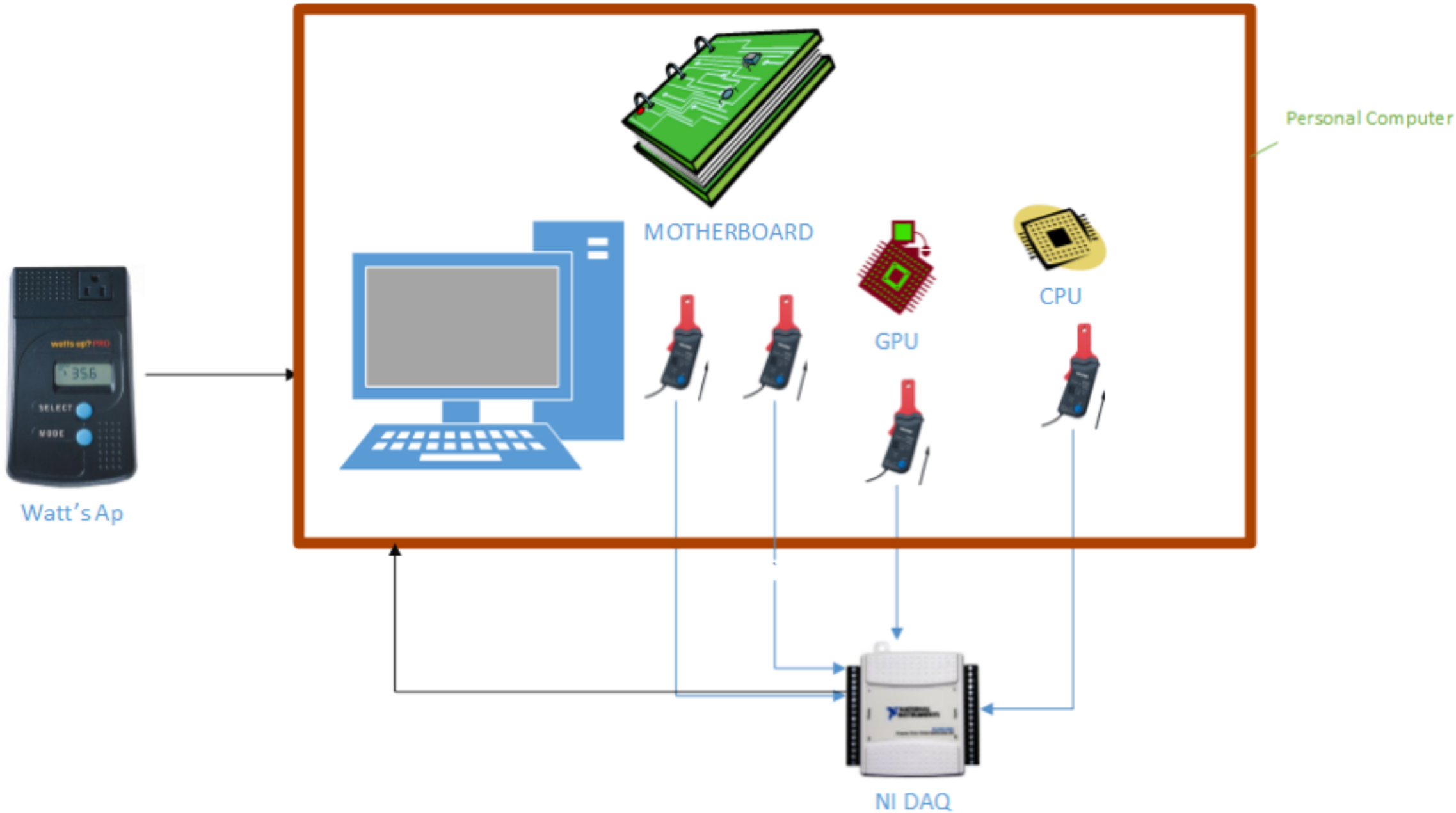
$$\text{Power} = \sum_{i=1}^{n} E(SbC_i.PS) \; x \; C(SbC_i, S)$$

where S is for the System Configuration, SbC_i is the i-th Subcomponent, $SbC_i.PS$ is the current P-State of the Subcomponent, $E(SbC_i.PS)$ is the estimate of Subcomponent's State, and $C(SbC_i, S)$ is a coefficient for the particular component in the current system configuration.

Consumer System



Test Bench Diagram



PC Configuration

CPU — Intel I7 4770K

GPU — ASUS GTX 770

Motherboard — MSI Z87-GD65

Hardware Utilities

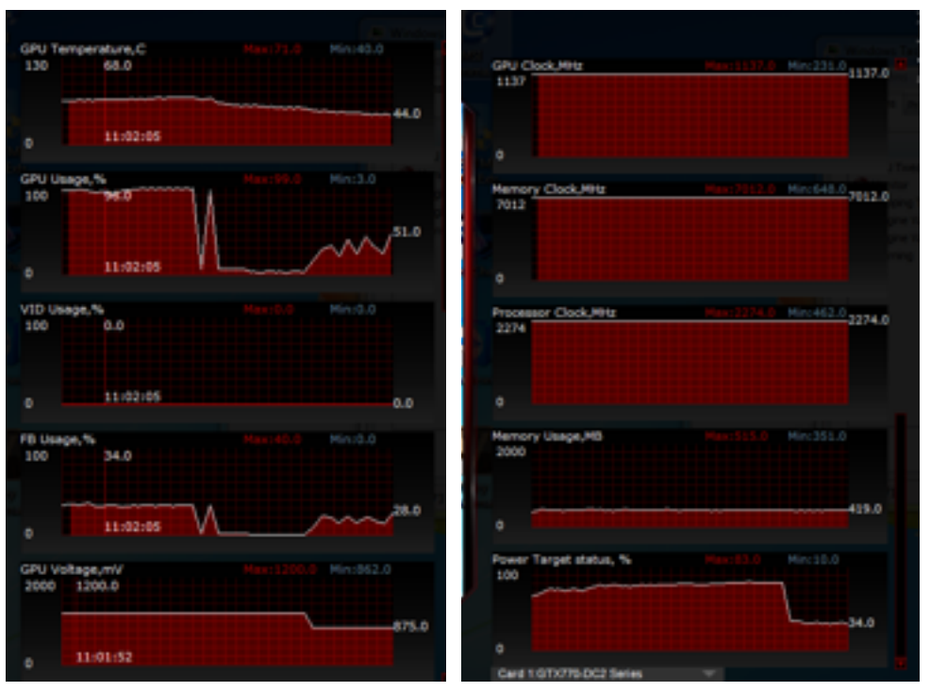
PICO TA018 Current Clamp

NI USB-6009

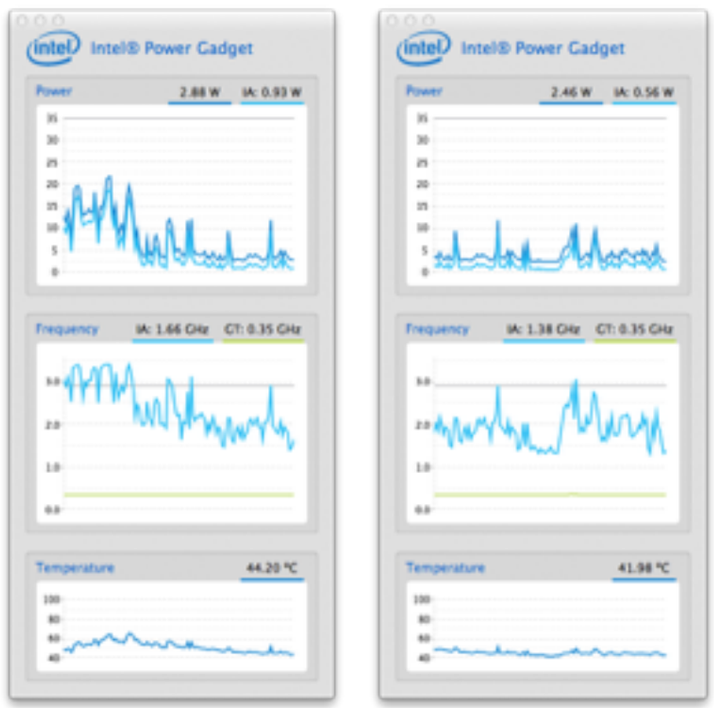
”Watts Up? Pro” Meter

Software Utilities

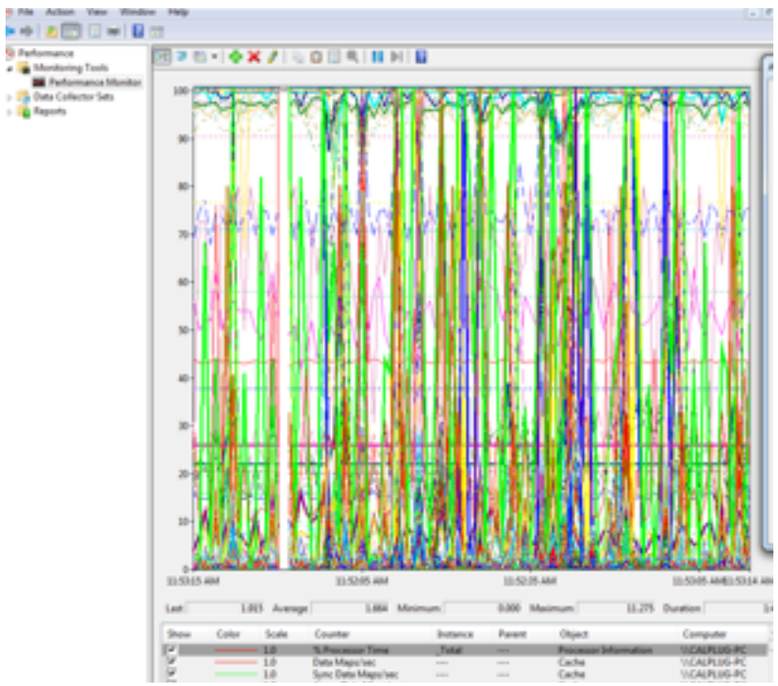
ASUS GPU Tweak



Intel Power Gadget



Windows PerfMon



List of Benchmarks

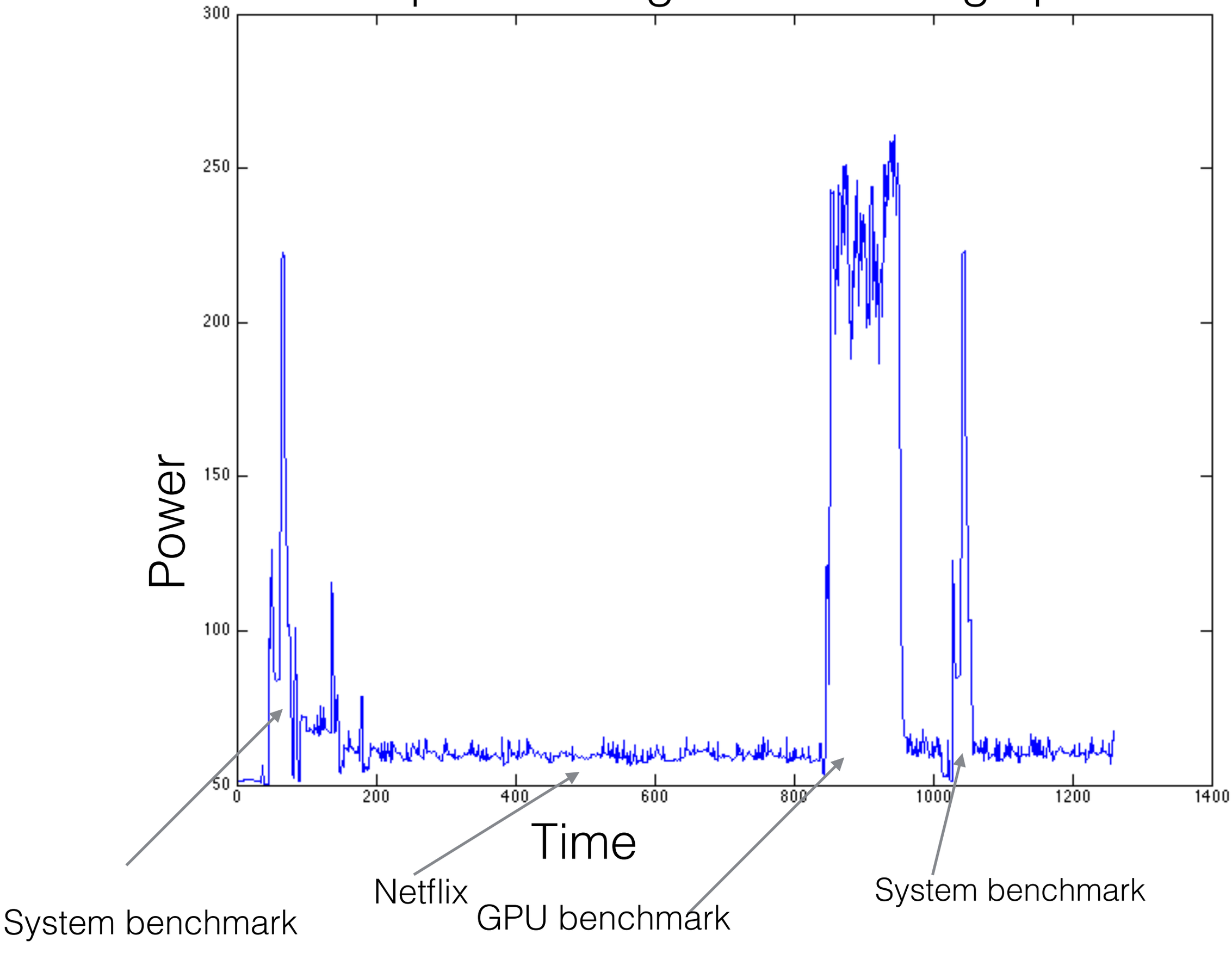
Performance Benchmarks

- Intel Extreme Tuning Utility
- PC-Mark 7
- Unigine Valley Benchmark
- Unigine Heaven Benchmark
- SiSoftware Sandra

Programs as Benchmarks:

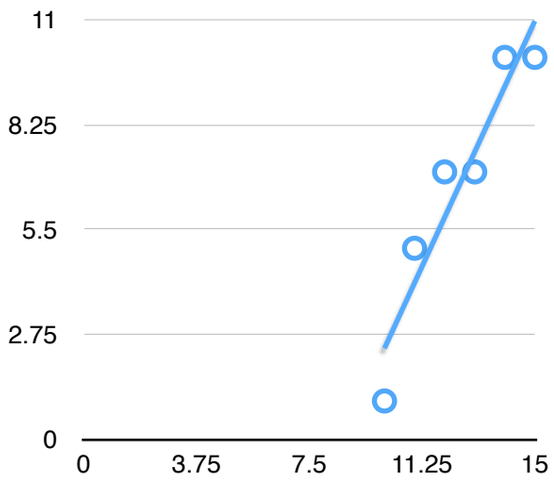
- OpenOffice
- Netflix streaming
- Amazon Instant streaming
- Microsoft Visual Studio
- Eclipse IDE

Power consumption during different usage patterns

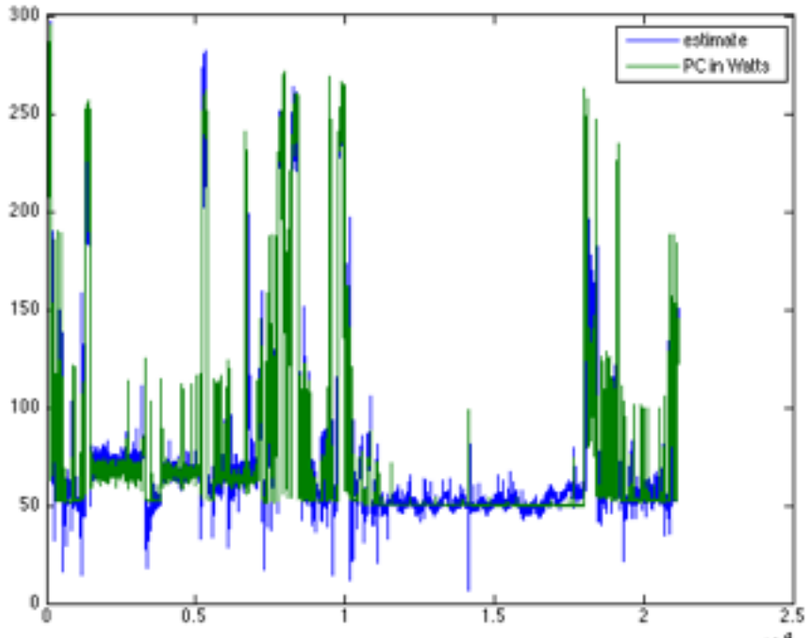


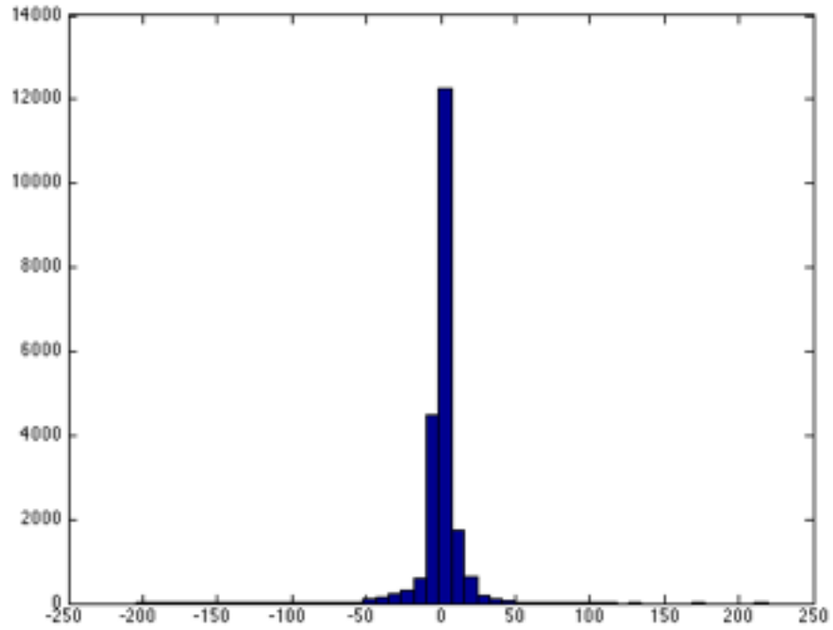
PC Energy Estimates and Error

Regression

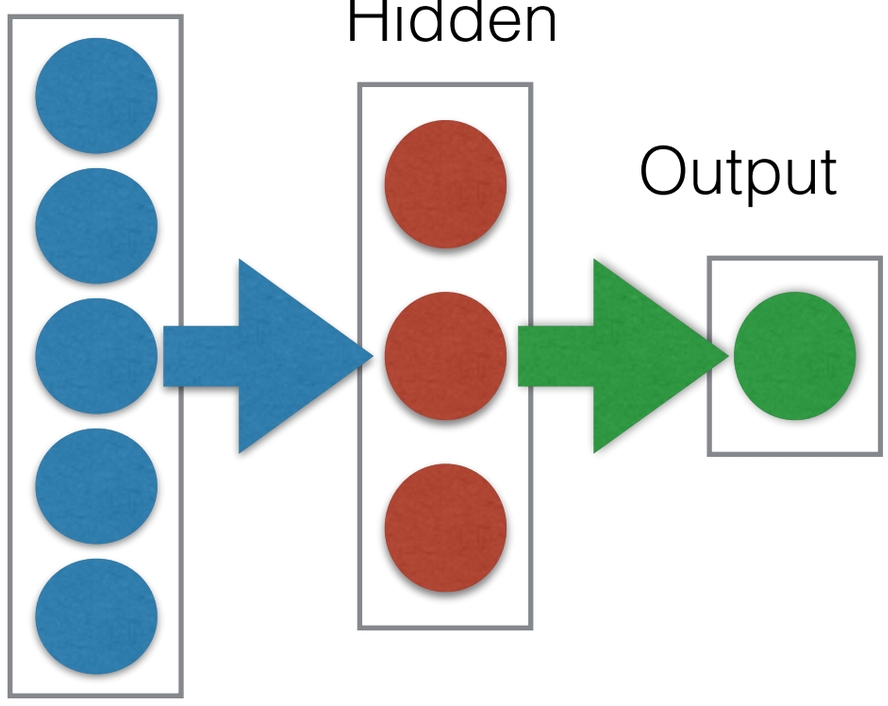


Minimize for Least Square Error

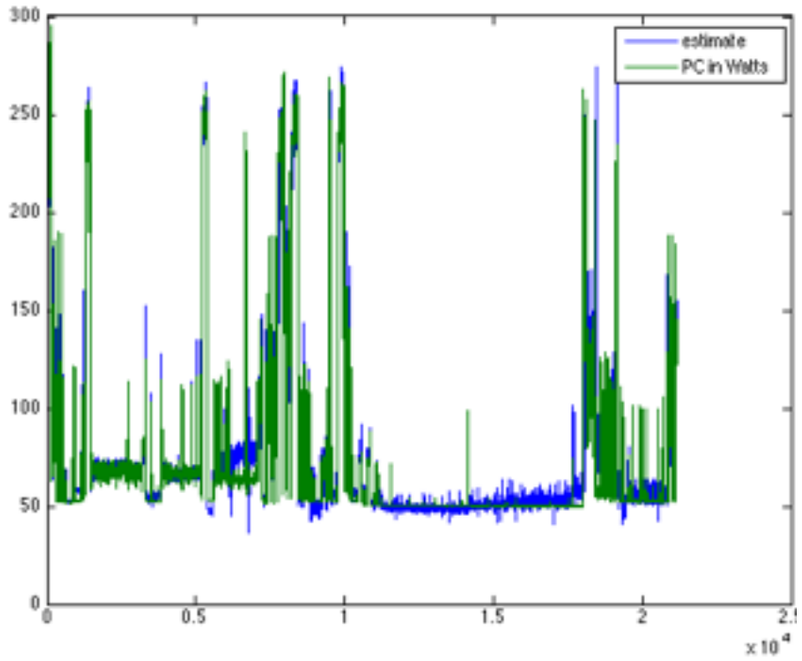


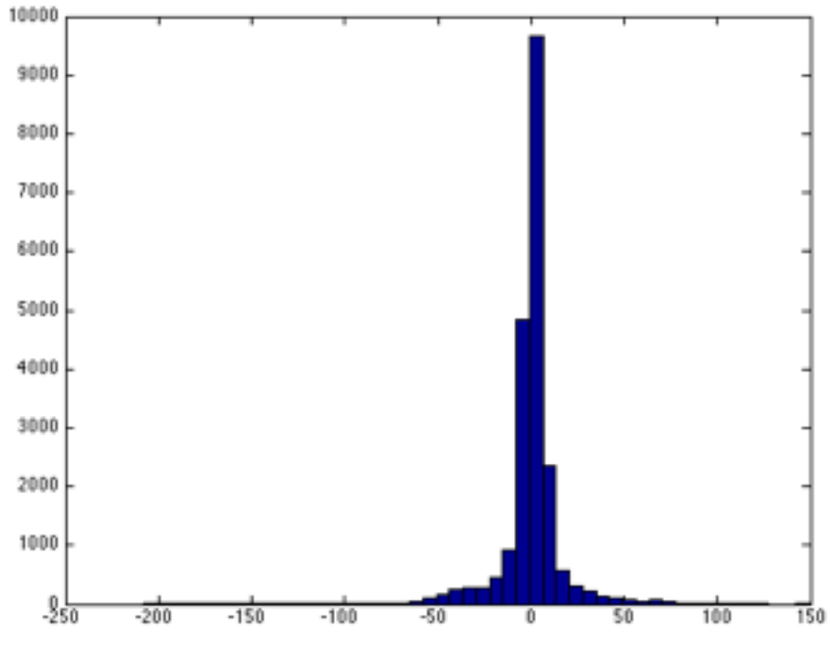


Neural Networks

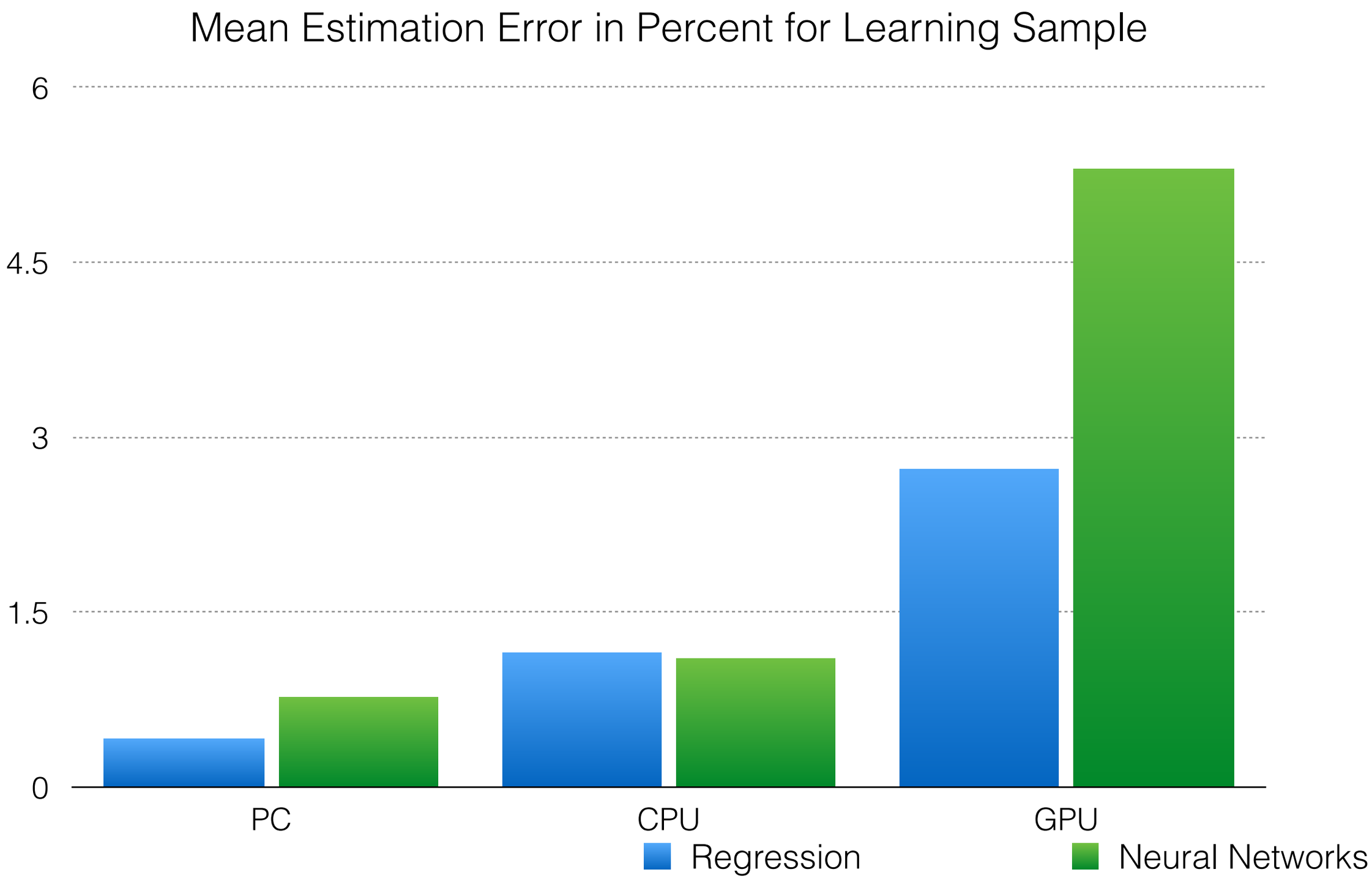


BLUE — Estimate
GREEN — Measured

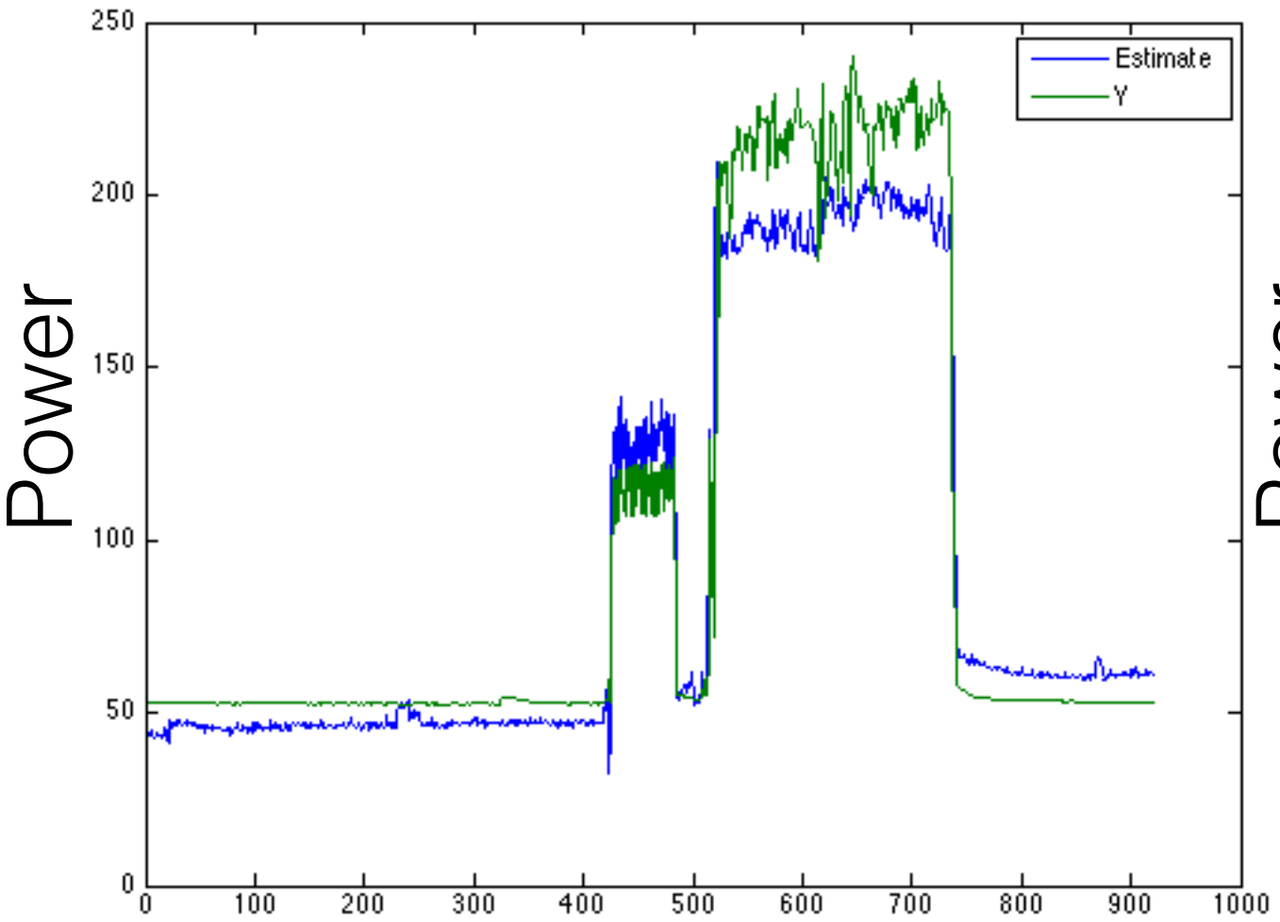




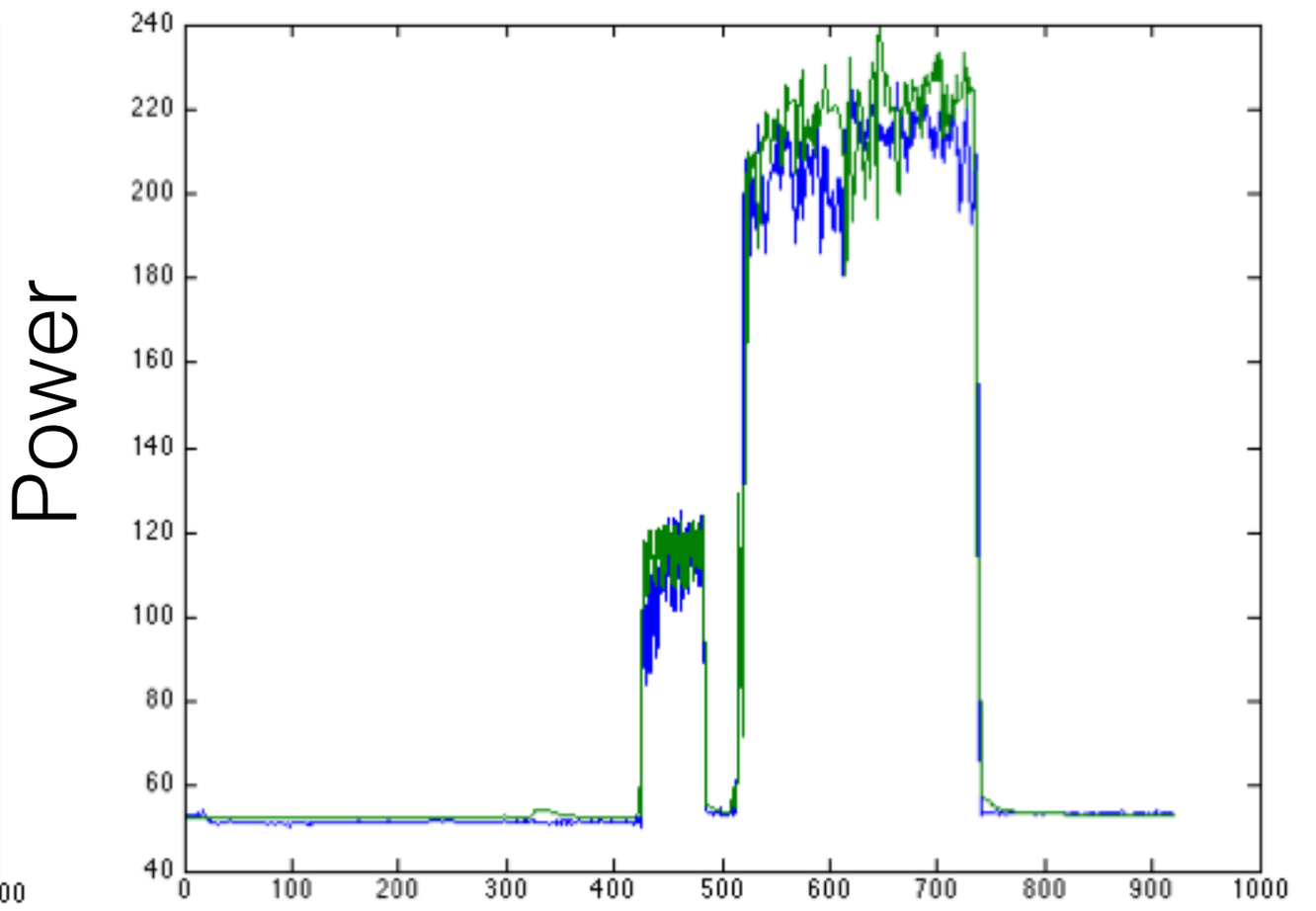
Statistics


Mean Estimation Error in Percent for Learning Sample
6
4.5
3
1.5
0
PC
CPU
GPU
Regression
Neural Networks

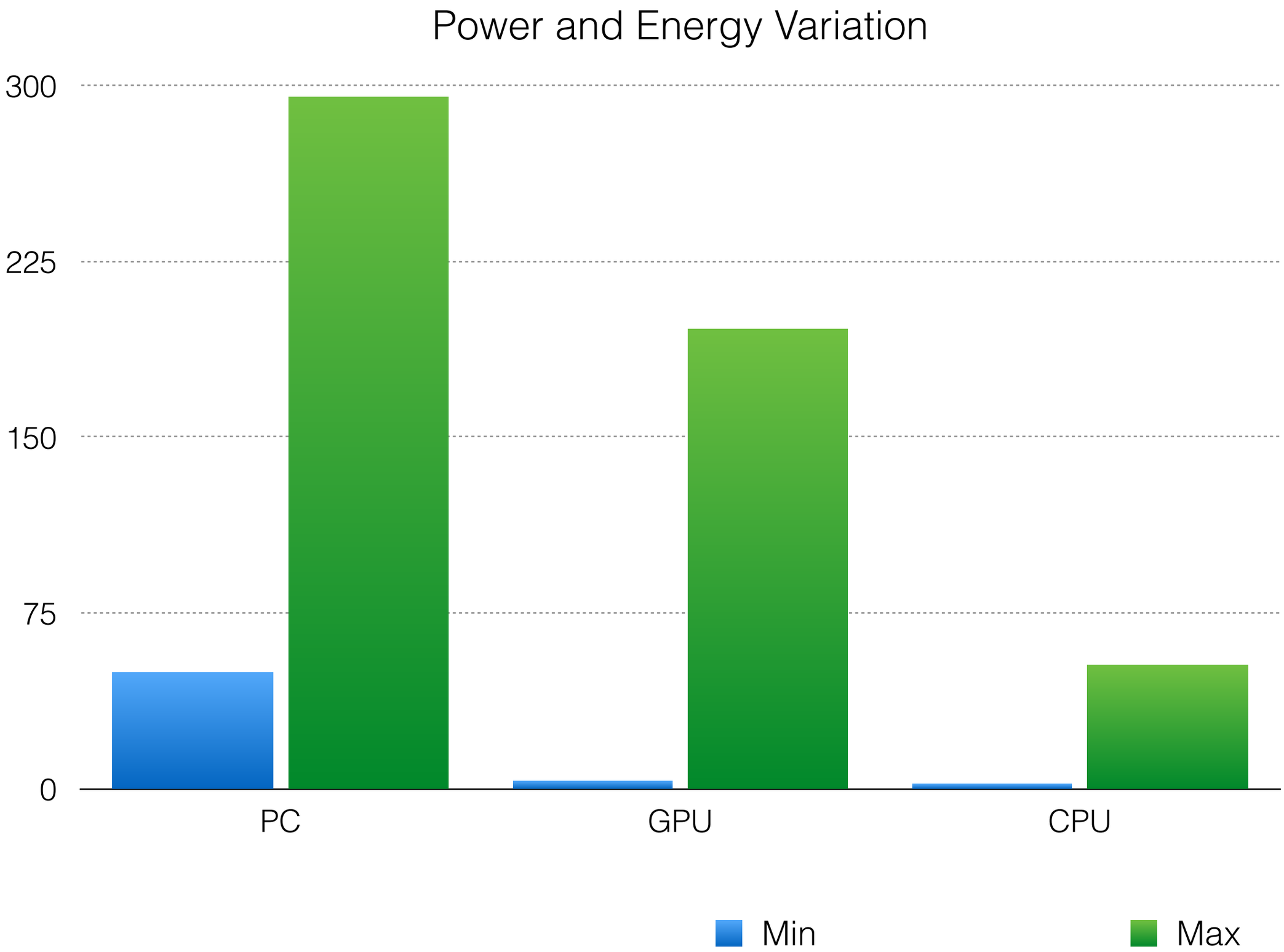
Test Sample on Regression



Test Sample on Neural Net.



BLUE — Estimate
GREEN — Measured


Power and Energy Variation
300
225
150
75
0
PC
GPU
CPU
Min
Max

Task 1
Modeling based on Performance Counters and Data Passing to Task 2 for Graphical visualization