

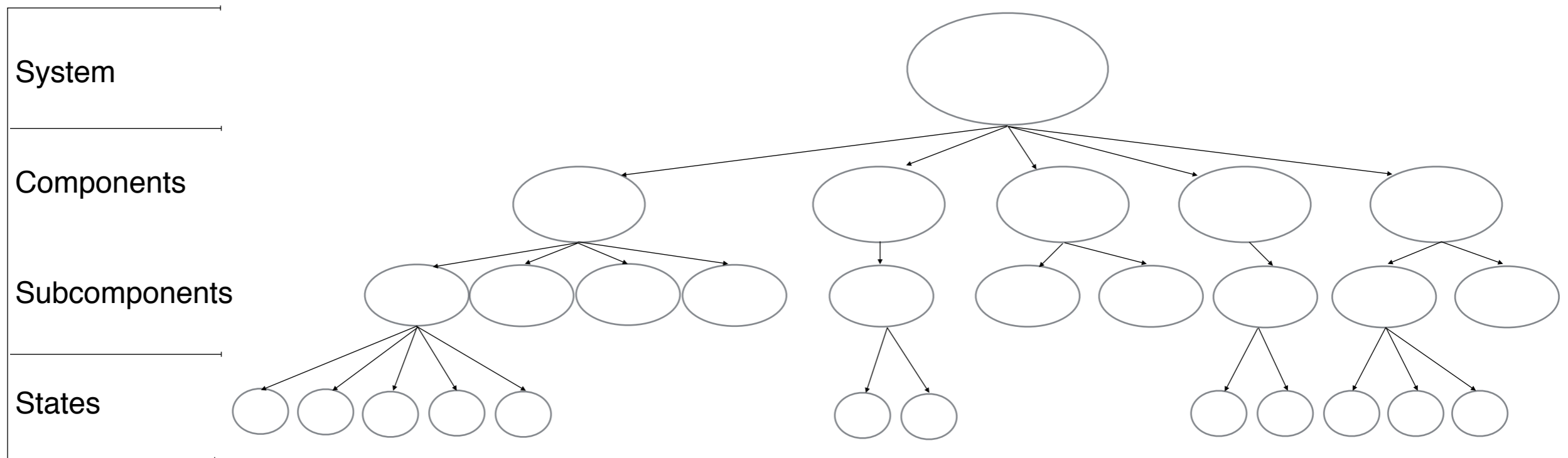
Energy Reporting

TASK 1

Goals

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

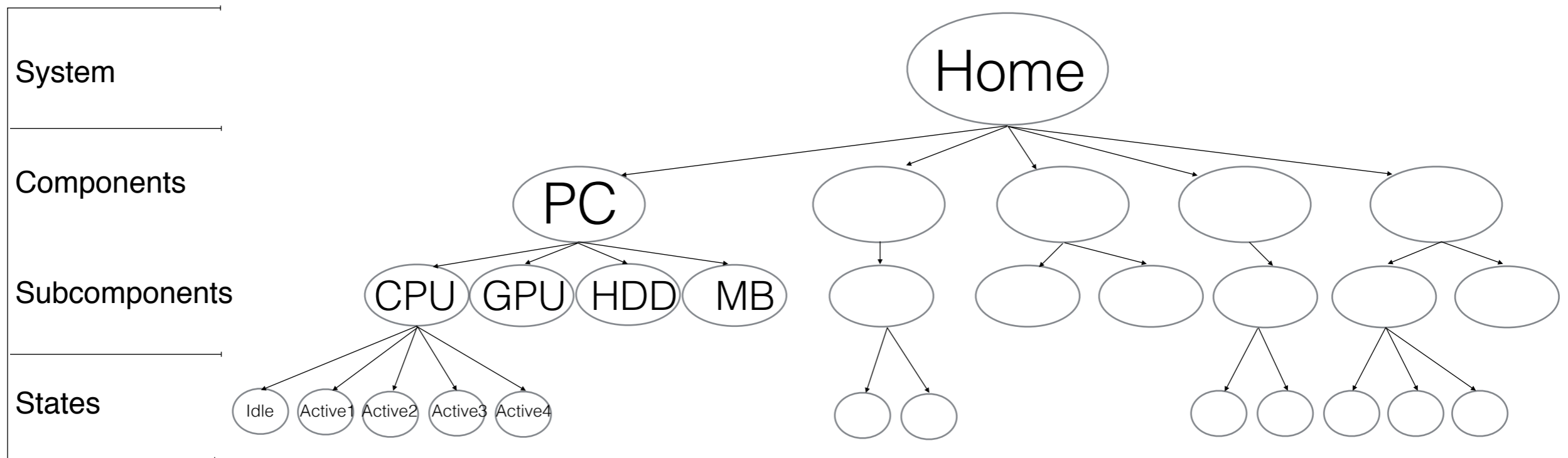
Template



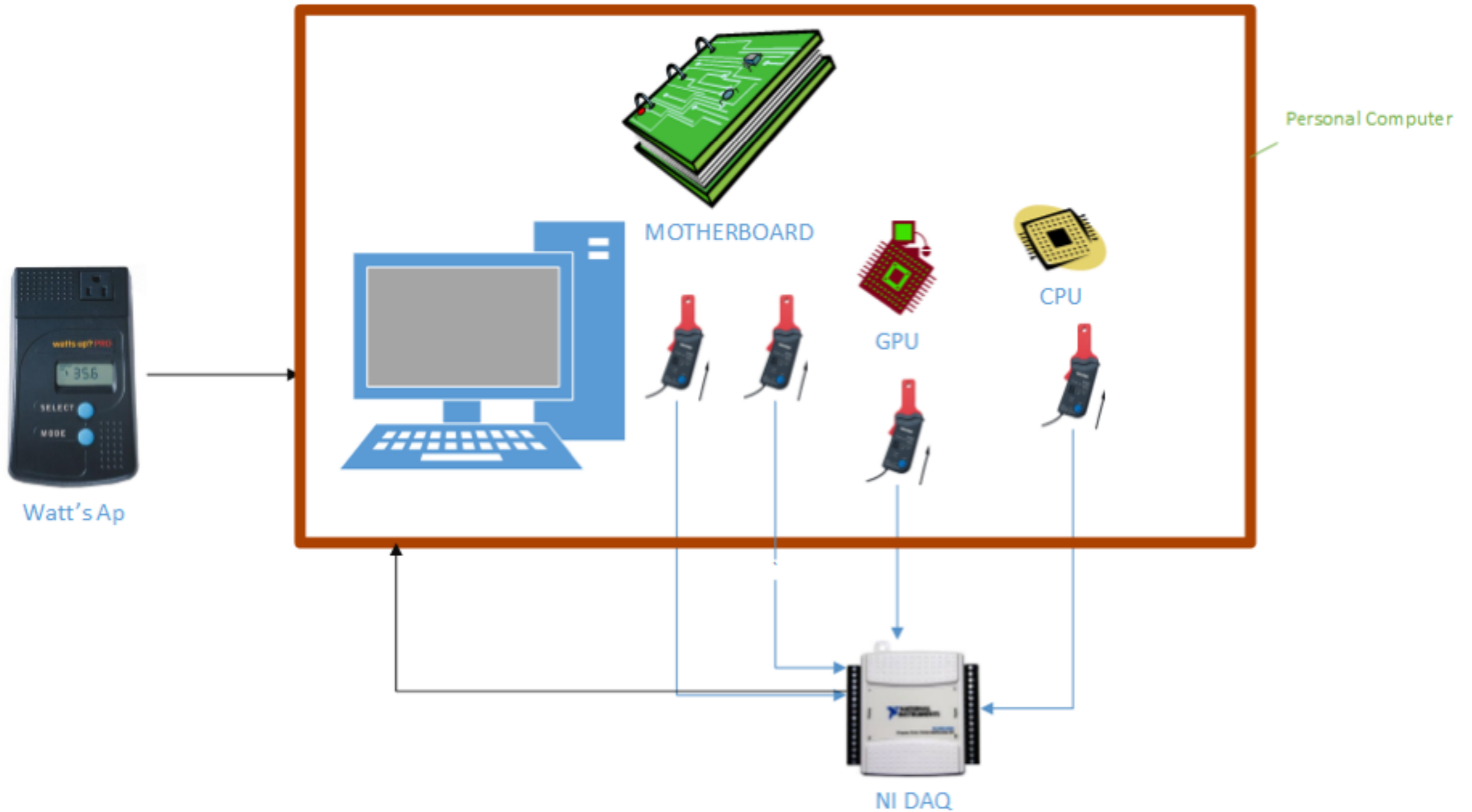
$$\text{Power} = \sum_{i=1}^n E(\text{SbC}_i.\text{PS}) \times C(\text{SbC}_i, S)$$

where S is for the System Configuration, SbC_i is the i -th Subcomponent, $\text{SbC}_i.\text{PS}$ is the current P-State of the Subcomponent, $E(\text{SbC}_i.\text{PS})$ is the estimate of Subcomponent's State, and $C(\text{SbC}_i, S)$ 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

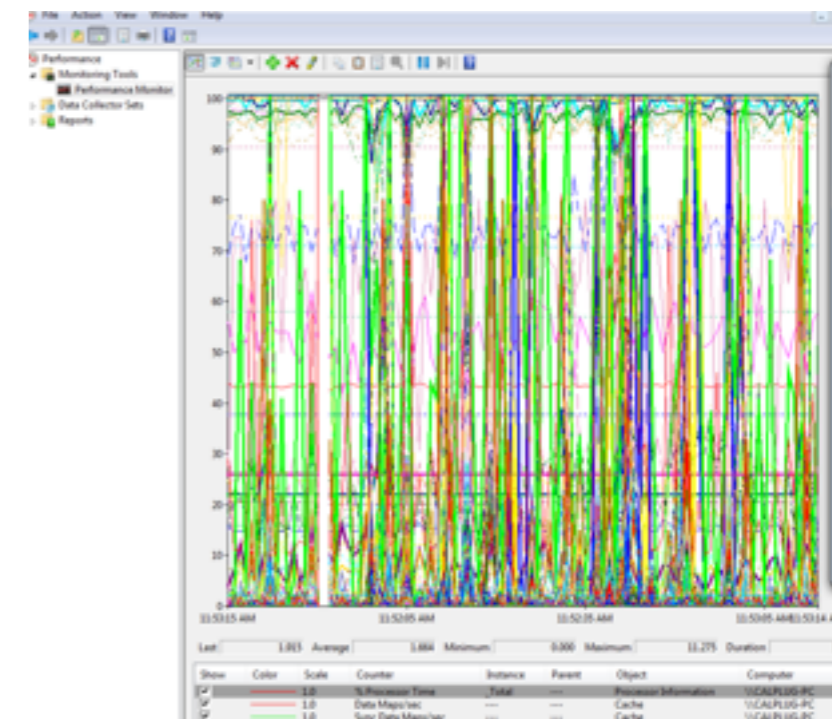
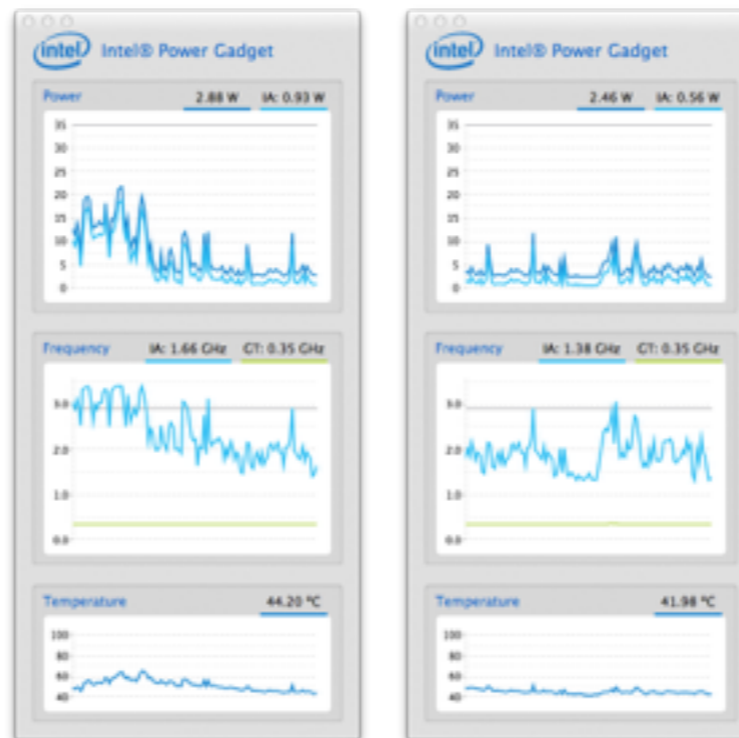
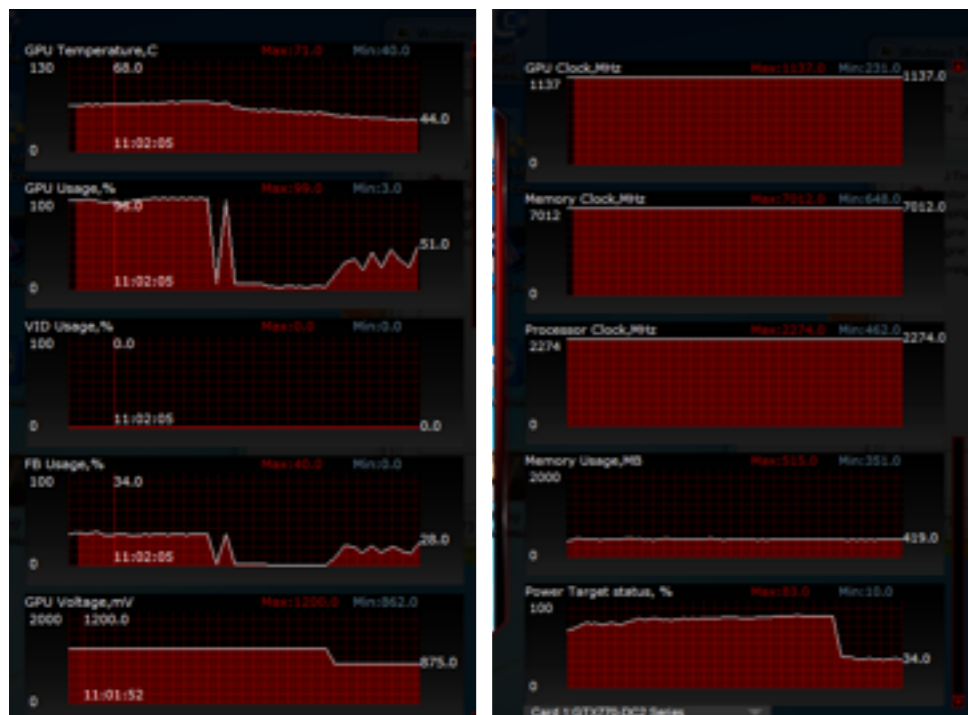


Software Utilities

ASUS GPU Tweak

Intel Power Gadget

Windows PerfMon



List of Benchmarks

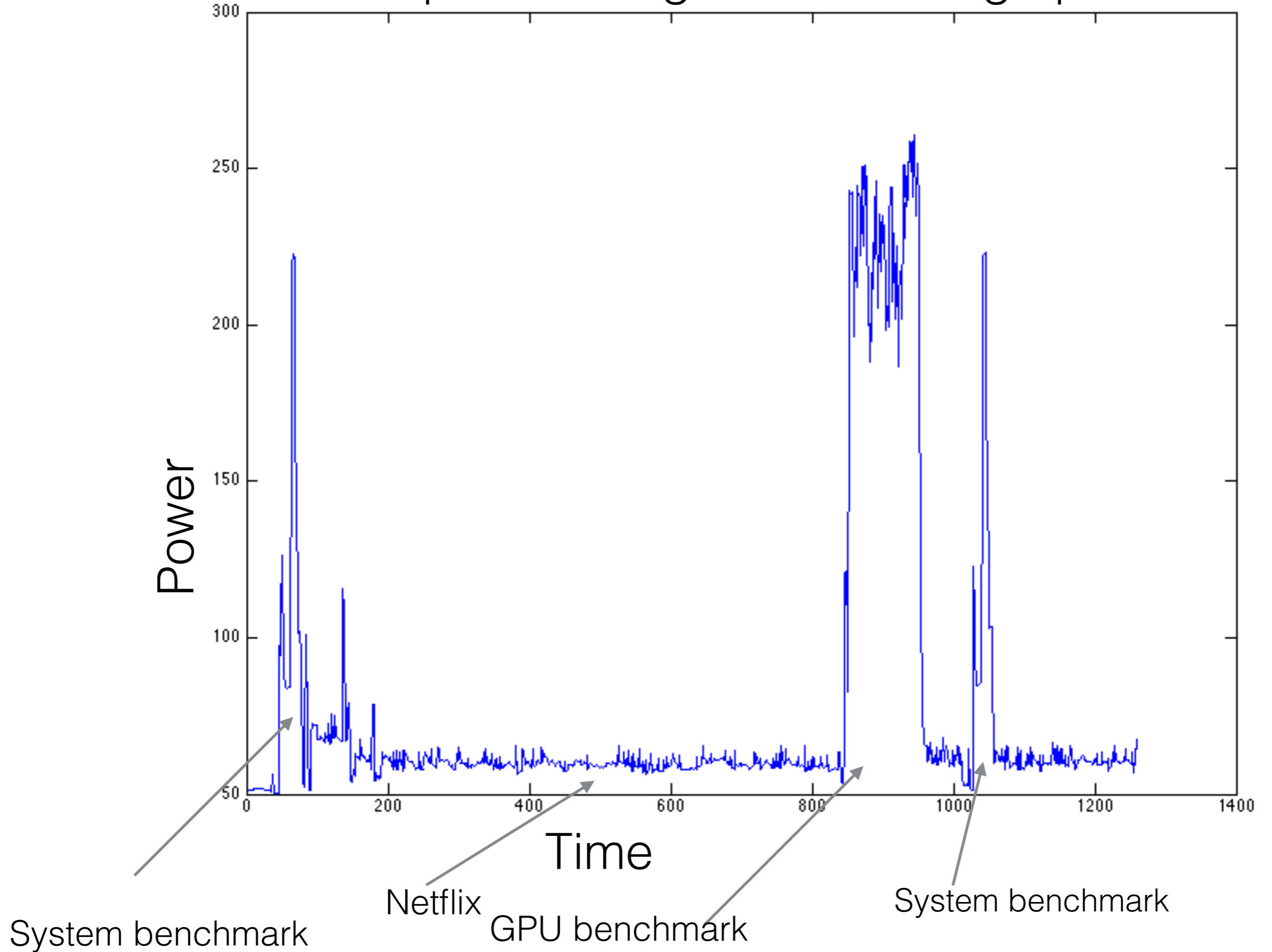
Performance Benchmarks

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

Programs as Benchmarks:

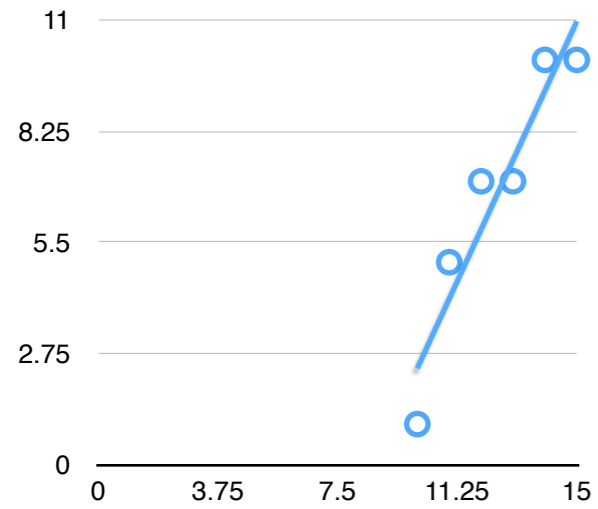
- OpenOffice
- Netflix streaming
- Amazon Instant streaming
- Microsoft Visual Studio
- Eclipse IDE

Power consumption during different usage patterns

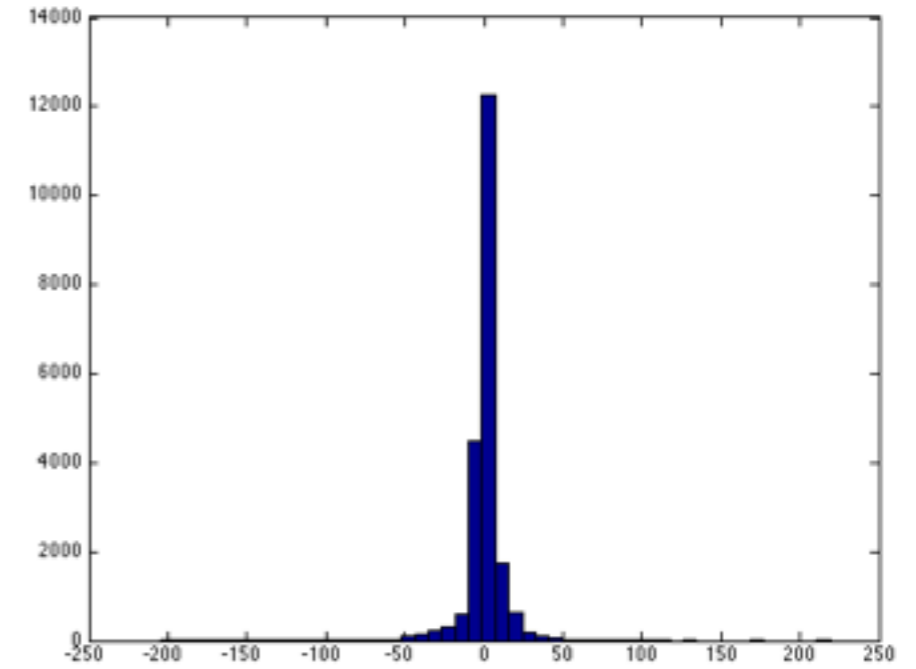
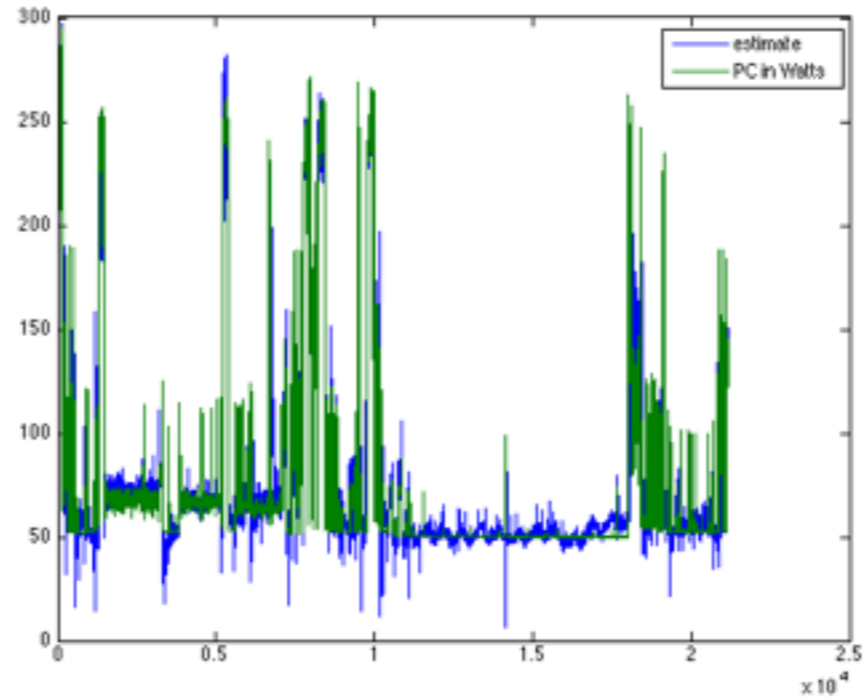


PC Energy Estimates and Error

Regression

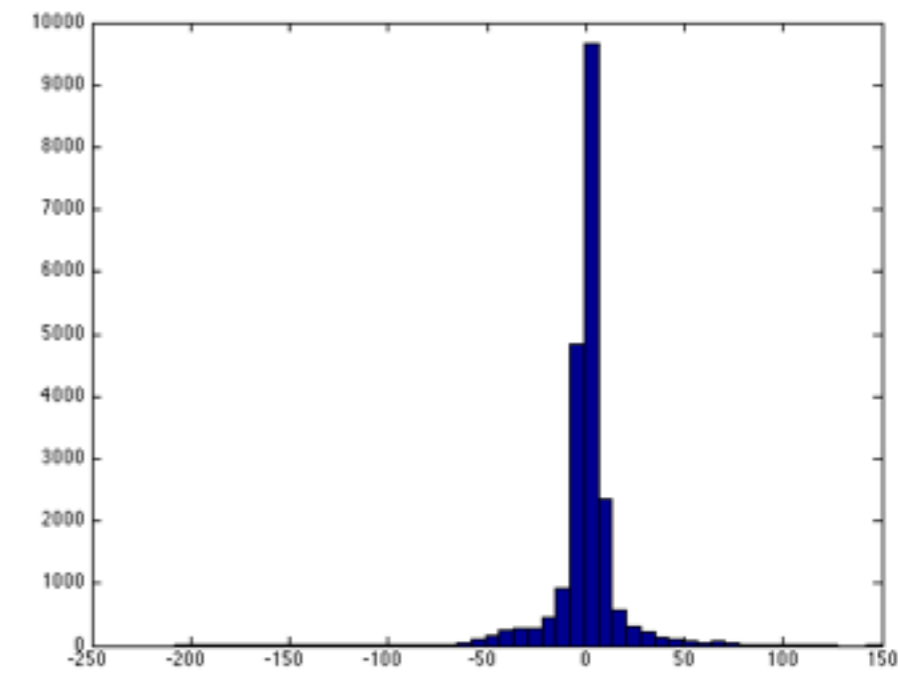
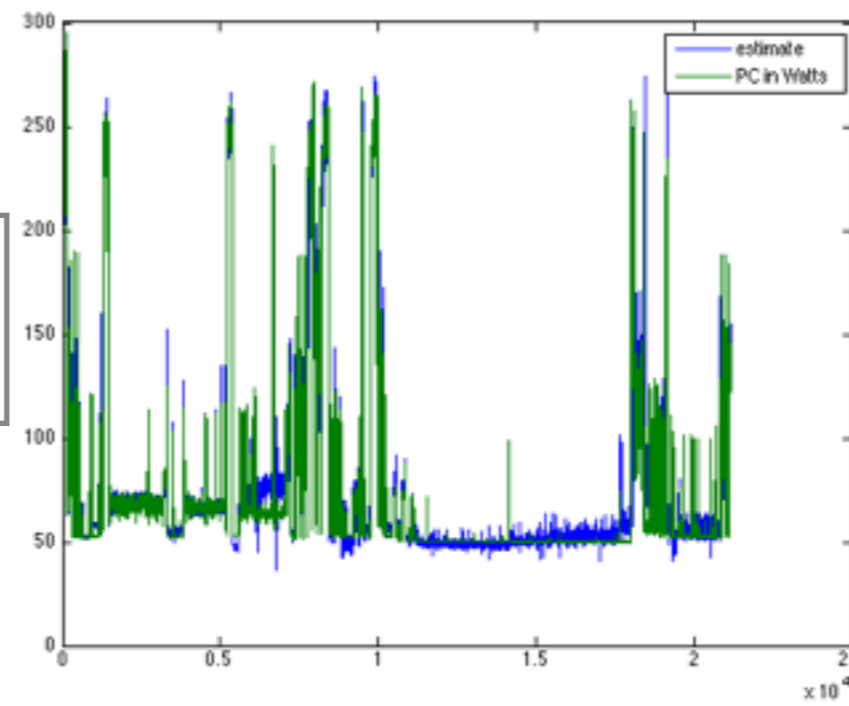
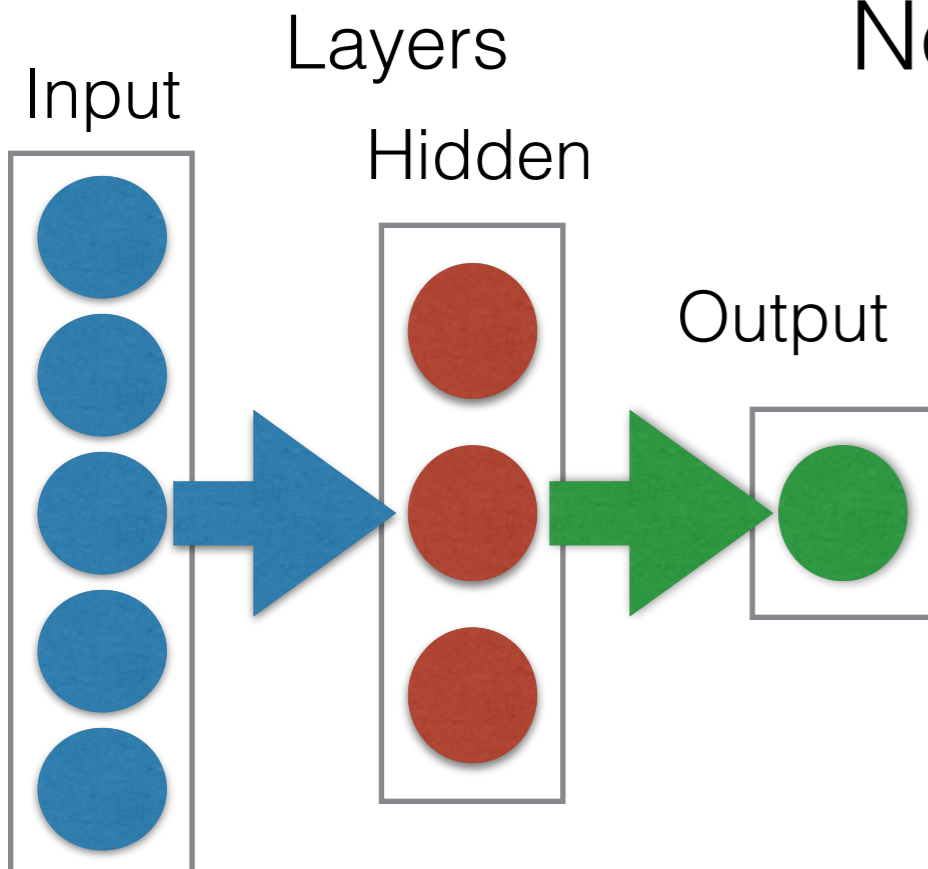


Minimize for Least Square Error



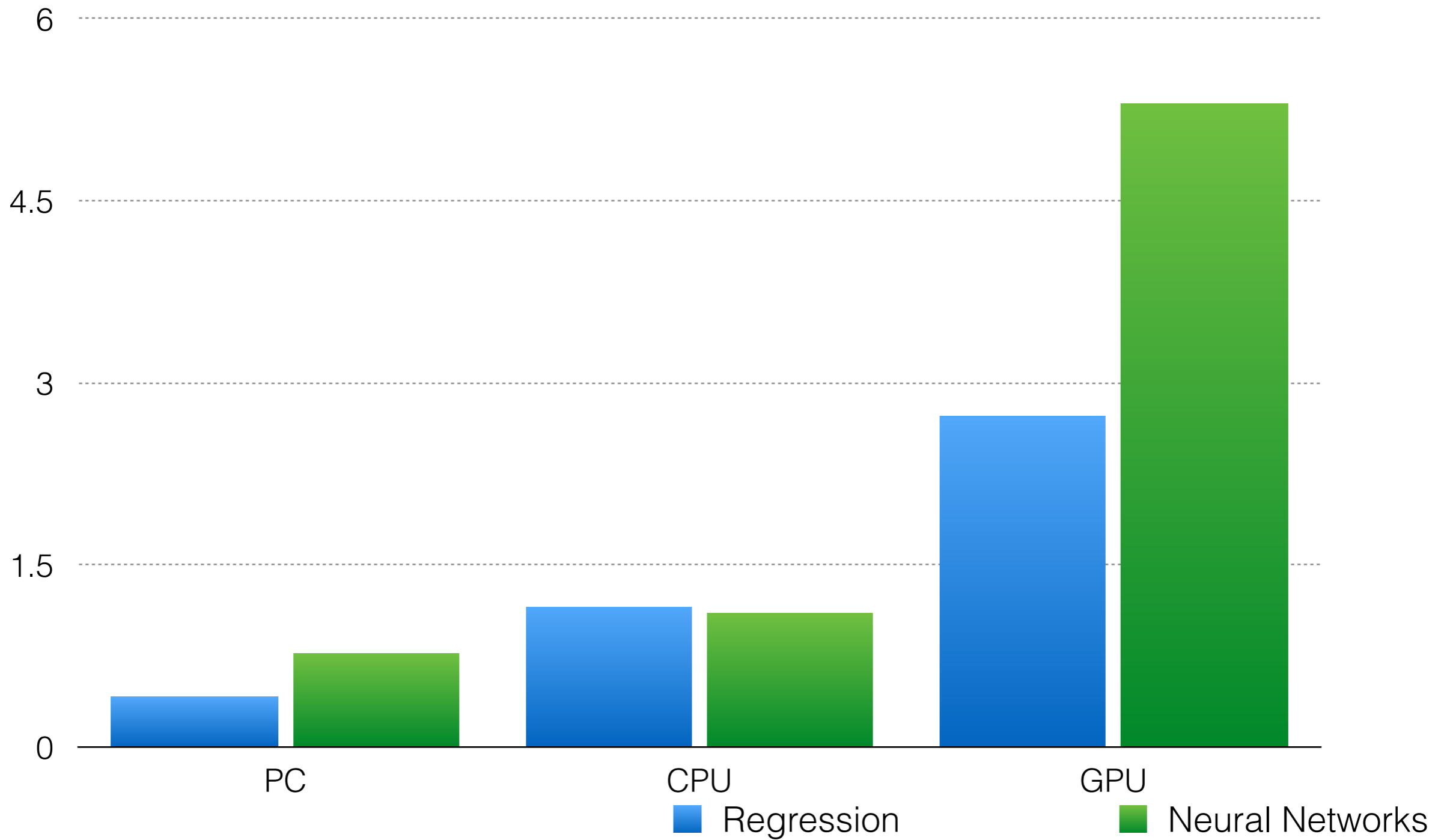
BLUE — Estimate
GREEN — Measured

Neural Networks

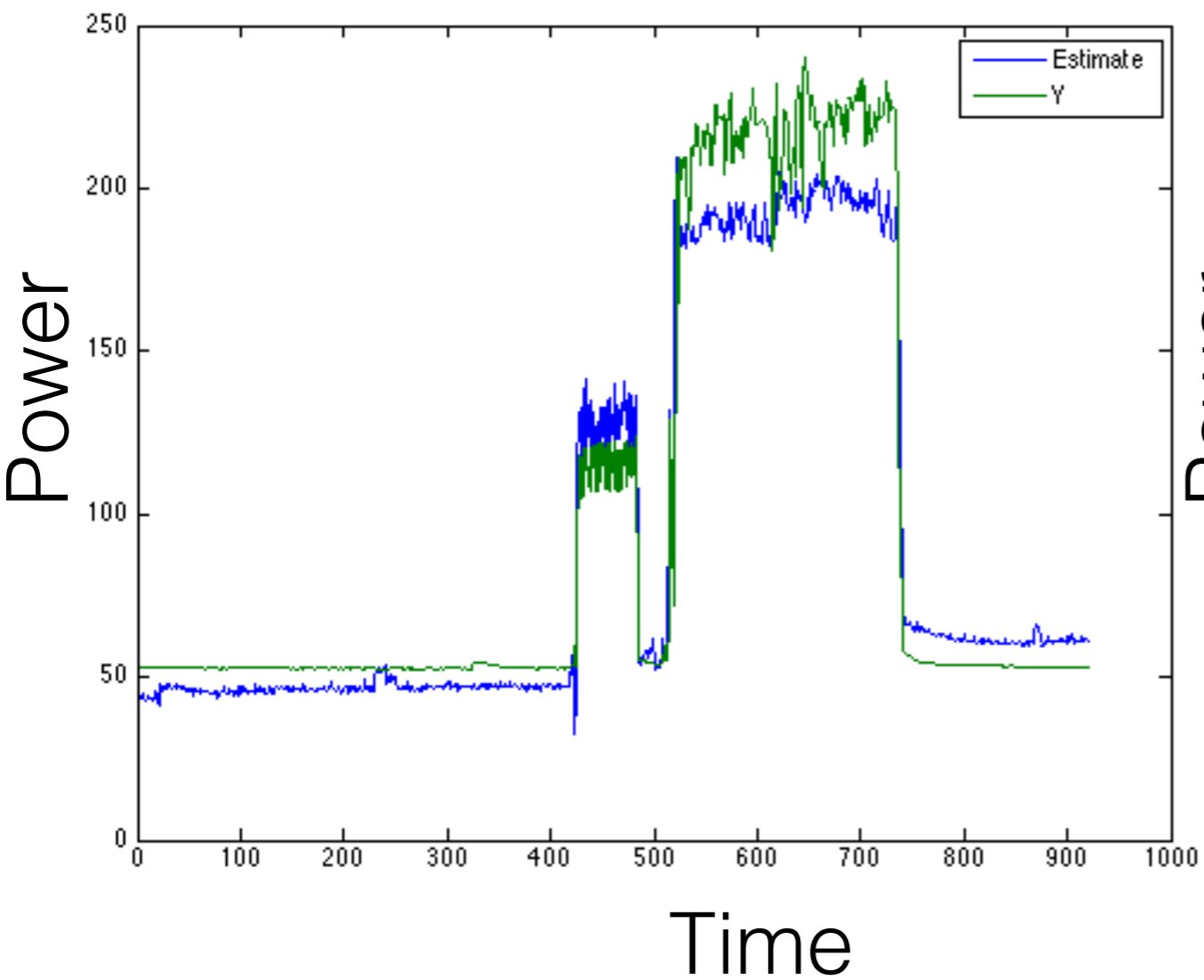


Statistics

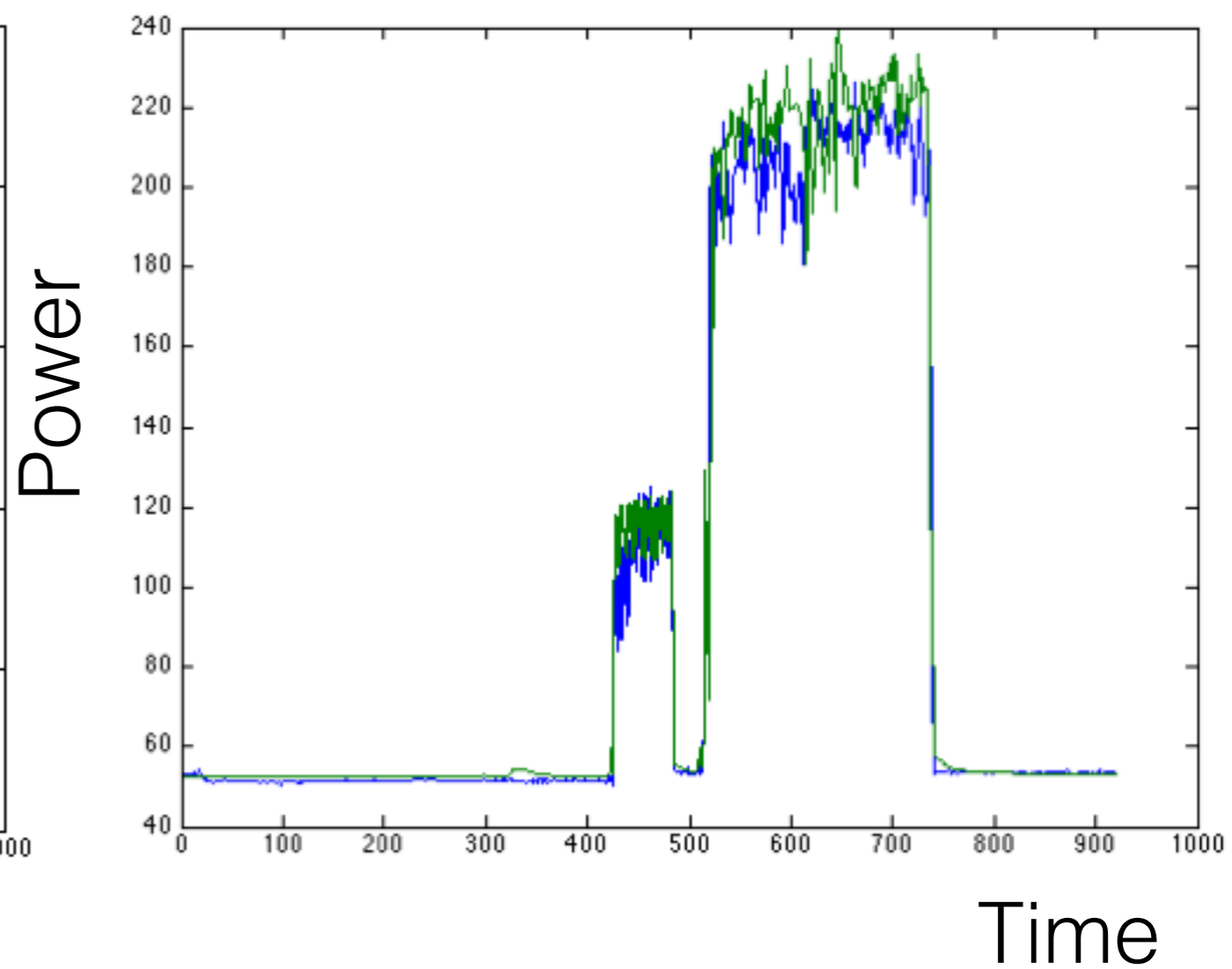
Mean Estimation Error in Percent for Learning Sample



Test Sample on Regression

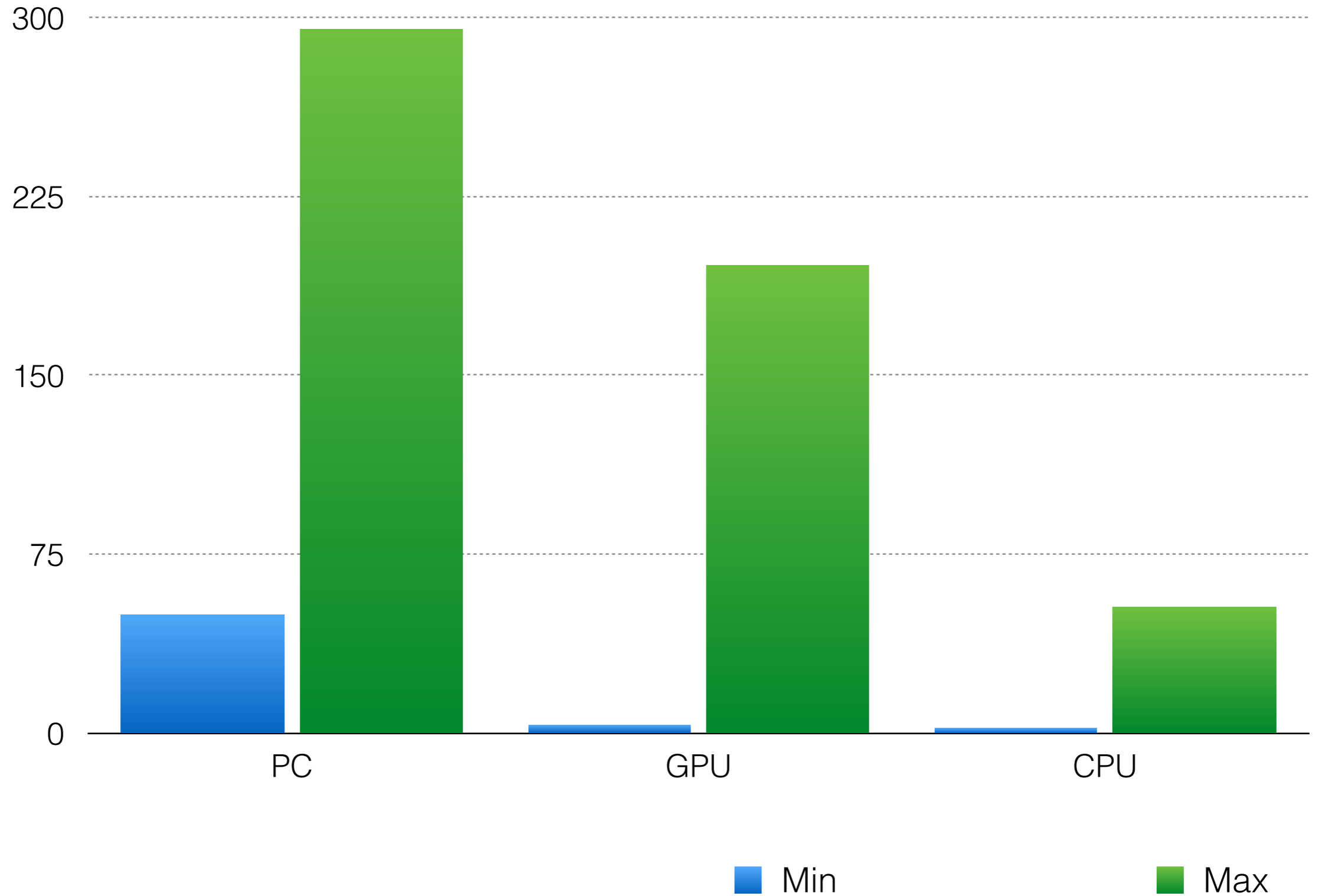


Test Sample on Neural Net.



BLUE — Estimate
GREEN — Measured

Power and Energy Variation



Task 1

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

