



Insight Power Smart Outlet

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Problem statement



Benefits of smart outlets

- Allow monitoring of power usage for plugged in devices
- Devices plugged in can be turned on/off remotely
- Enable home automation policies

Problems with smart outlets

- Tedious to set up
- Plugged-in devices are not automatically managed
- Setup friction increases hugely for home-scale installation



Problem statement (Cont.)

Solution

- Simple to setup
- Easy to use interface
- Automatically detects and classifies devices that are plugged in

“Customers often find smart outlets difficult to use. The Insight Smart Power Outlet fixes this by providing customers with an easy and intuitive experience by classifying devices that are plugged into the product.”



System Requirements

- Plug easily into wall outlet, remains firmly in place once plugged in.
- Connect wirelessly to app
- Measures and graphs (via app) power usage in real-time
- Turn device on and off via app
- Continuous analysis of usage data
- Classify devices based on data into different categories (lighting, heating/cooling, etc)
- User-Friendly companion app
- 12cm x 3cm x 3cm (L x W x H)
- Less than 1lb



System Specifications

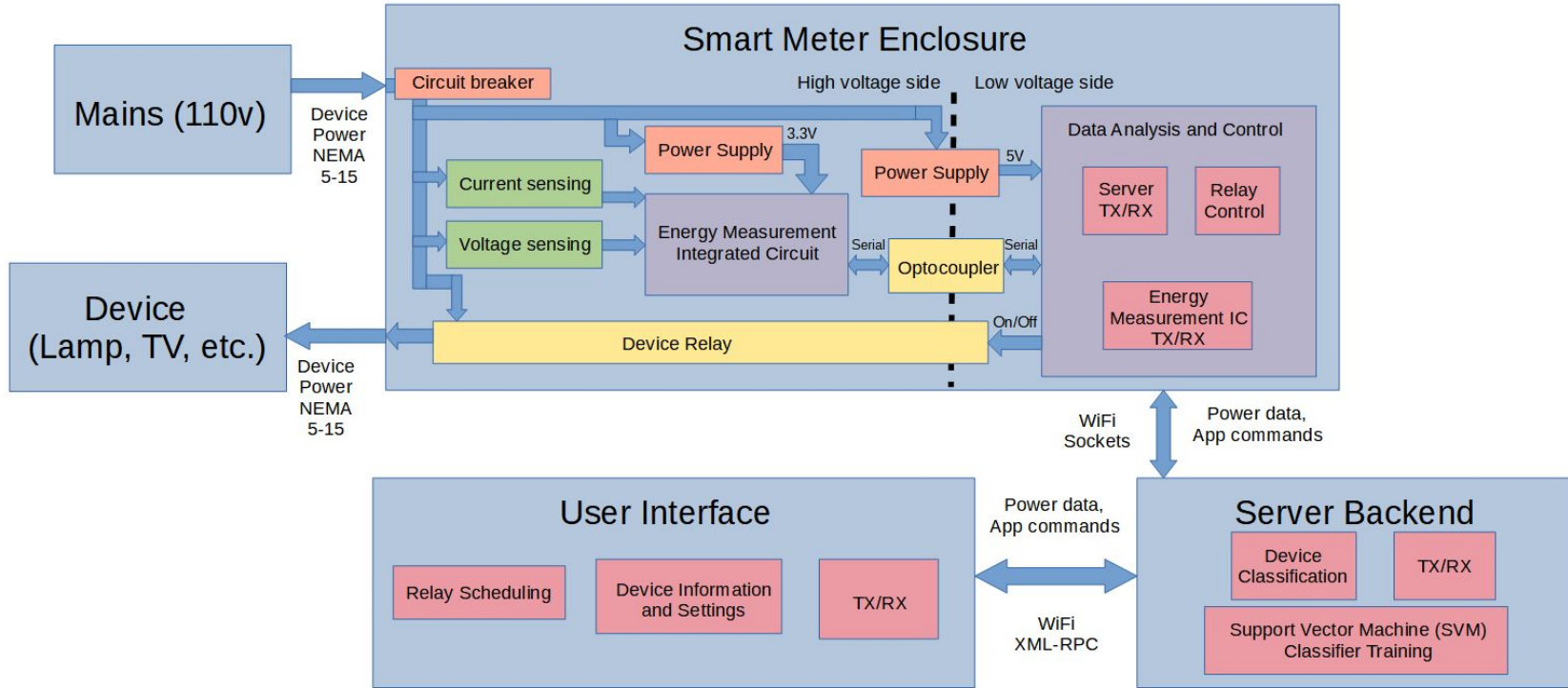
- Measures power usage at least **once per second** within **1%**
- Companion app updates **once per second**
- Communication between app and outlet takes at most **1 second**
- **Ideal Accuracy:**

True Positive 50%	True Negative 50%
False Positive 0%	False Negative 0%

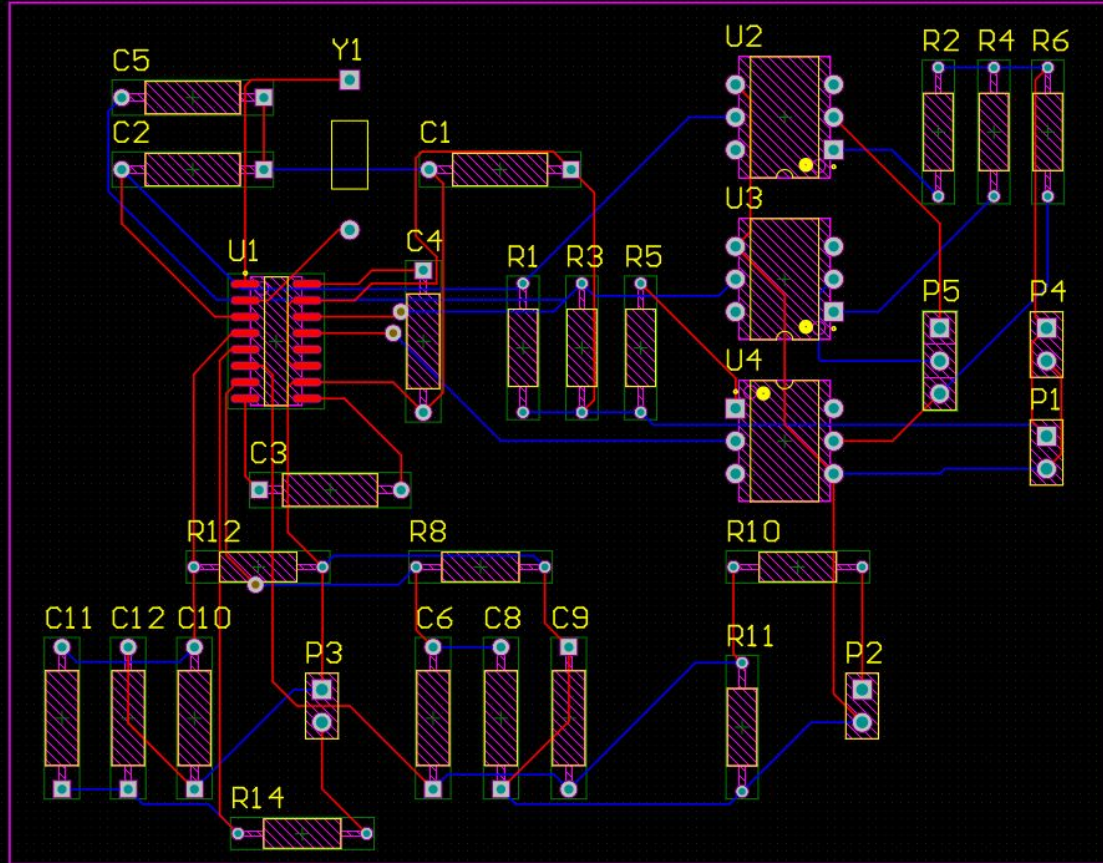
Target Accuracy:

True Positive 40%	True Negative 40%
False Positive <1%	False Negative 19-20%

Block Diagram



PCB Layout





Proposed CDR Deliverables

1. Measure power at full voltage AC **within 1%** of device power usage specifications.
2. Classification able to distinguish between **at least 3 types** of devices (ex. Lamp, Fan, & computer).
3. Classification of powered on devices is instantaneous (**<1 second**).
4. Prototype PCB Designed and Manufactured, but not yet integrated into system.
5. Companion App capable of simultaneous communication with **at least 3** outlets.



Achieved CDR Deliverables

1. Measure power at full voltage AC within 1% of device power usage specifications. (around 5-10% currently)
2. Classification able to distinguish between at least 3 types of devices (ex. Lamp, Fan, & computer).
3. Classification of powered on devices is instantaneous (<1 second). (2-3 seconds currently)
4. Prototype PCB Designed and Manufactured, but not yet integrated into system.
5. Companion App capable of simultaneous communication with at least 3 outlets.



FPR Deliverables

1. Working classification that is implemented on SVMs rather than a Decision Tree. (Mark and Garrett)
2. At least 3 working outlets, all able to classify and read power under required specifications. (ALL)
 - a. Measures power usage at least **once per second** within **5%**
 - b. Achieve classification accuracy of **80%** with false positive **<1%**
3. Smaller design for all outlets. (Kriss)
4. Companion App and GUI refinement. (Brendon)
 - a. Implement only light/lamp toggling on the App.



DEMO!!!



Thank you