Temperature Prediction Model for a Prototype in a Smart Home Environment

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Abstract

Cyber Physical Systems (CPSs) are systems which integrate computational and physical processes with communication capabilities to interact with the physical world [1]. The idea of a CPS combined with a smart home may be beneficial towards energy consumption and lowering economical costs. However, not much is known about using deep learning algorithms, while modeling a smart home as CPS.

Therefore, we developed a prototype for a smart home that uses deep learning algorithms to predict temperature in order to make proper adjustments to smart home sensors and actuators.

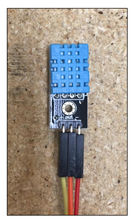
Prototype

- Controlled using Raspberry Pi
- Consists of four rooms
- Room A: Continuous open window and controllable door
- Room B: Controllable door and window
- Room C: Controllable window and no doors
- Room D: No windows or doors

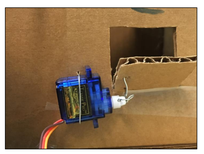
Sensor Usage

Micro Servo SG90 – Used to control doors and windows

DHT11 – Used to measure temperature and humidity



SRD-05VDC-SL-C Relay – Used to control heating lamp and fan

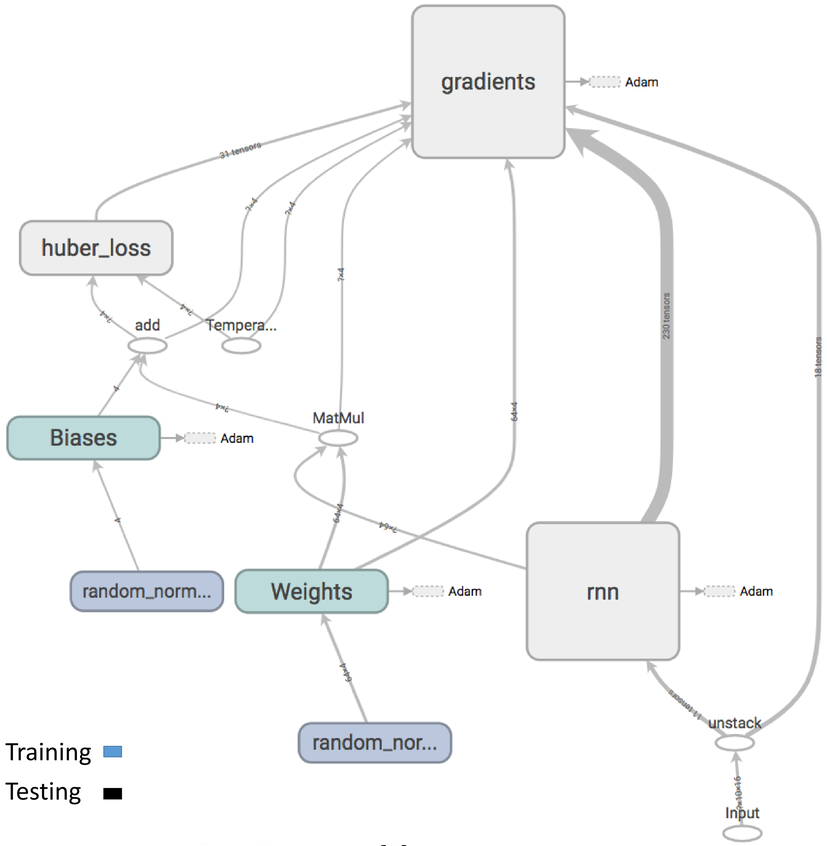


Future Work

- Predict smart home actuator actions based on energy cost
- Expand on prediction model to all low dimensional aspects of a smart home

Methods

Computational Graph Created with *TensorBoard*



UMassTraceRepository [2]

Smart Home Prototype

Acknowledgements

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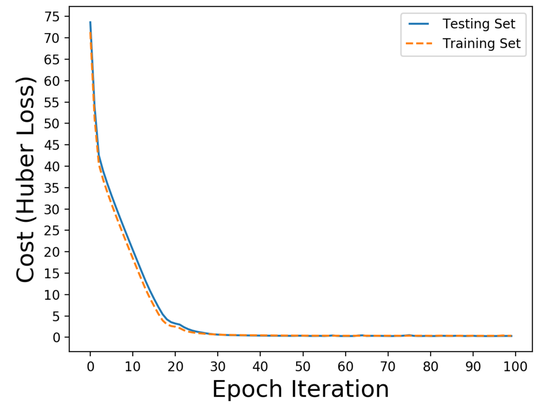
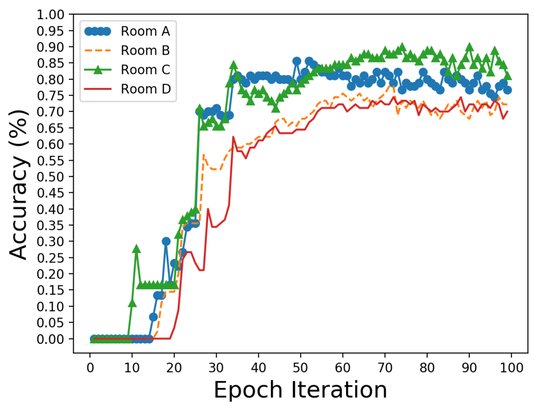
Results

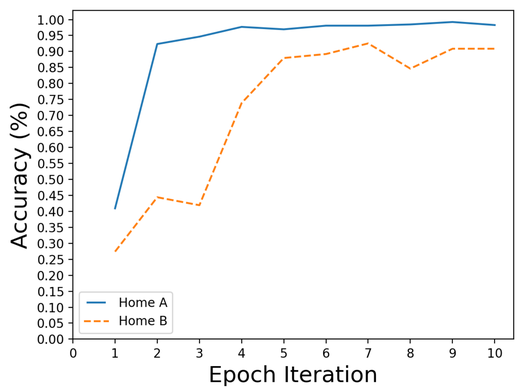
Iteration vs Cost (Prototype)



Iteration vs Testing Accuracy (Prototype)



Iteration vs Testing Accuracy (UMassTraceRepo)



References:

[1] T. Sanislav and L. Miclea, "Cyber-physical systems - concept, challenges and research areas," vol. 14, pp. 28–33, 01 2012

[2] S. Barker, A. Mishra, D. Irwin, E. Cecchet, P. Shenoy, and J. Albrecht, "Smart*: An open data set and tools for enabling research in sustainable homes."