



A/C Preference Troubleshooting Device AirWise

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Team Introductions



John Bradshaw
Team Leader



Edine Landoure
Design Engineer



Woodley Fevrius
Systems Engineer



Darryl Brooks
Tech Lead



Curtis Rahman
Software Engineer



Manuel Urbina
Programmer Specialist

Edine Landoure

Sponsor



Dr. Devine is the project sponsor, and the Entrepreneur in Residence at the FAMU-FSU College of Engineering.

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Advisors



ME Advisor

Dr. Shayne McConomy



Project Advisor

Dr. Neda Yahgoobian



ECE Advisor

Dr. Jerris Hooker

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Objective

- Design a device that allows for the optimization of individual preferences and integrates itself with the A/C system.

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Past Work : Project Scope

- Optimize environmental conditions
- Design an air conditioning control system
- Satisfy key customer needs while being energy efficient
- Market final design for various real-world applications and uses

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Past Work: Markets

Primary

- Businesses
- Schools
- Hospitals

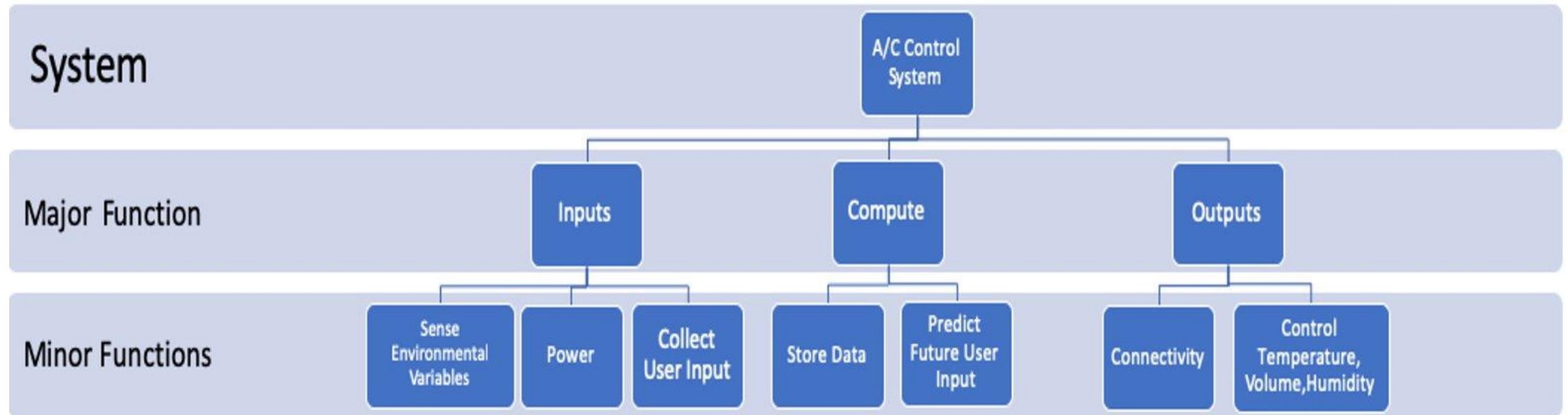
Secondary Markets

- Residential Housing

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Past Work: Functional Decomposition



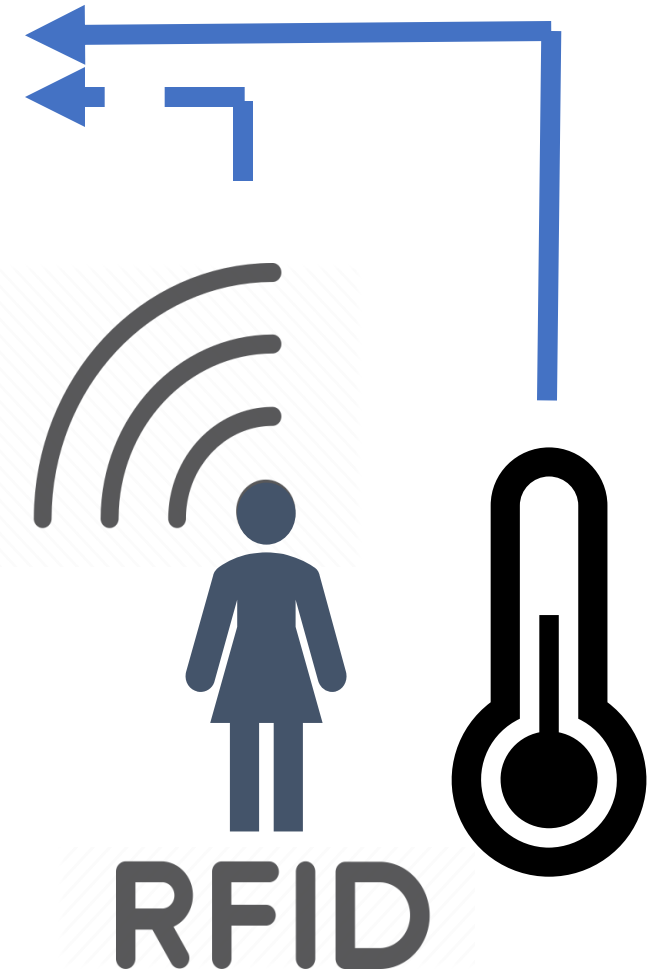
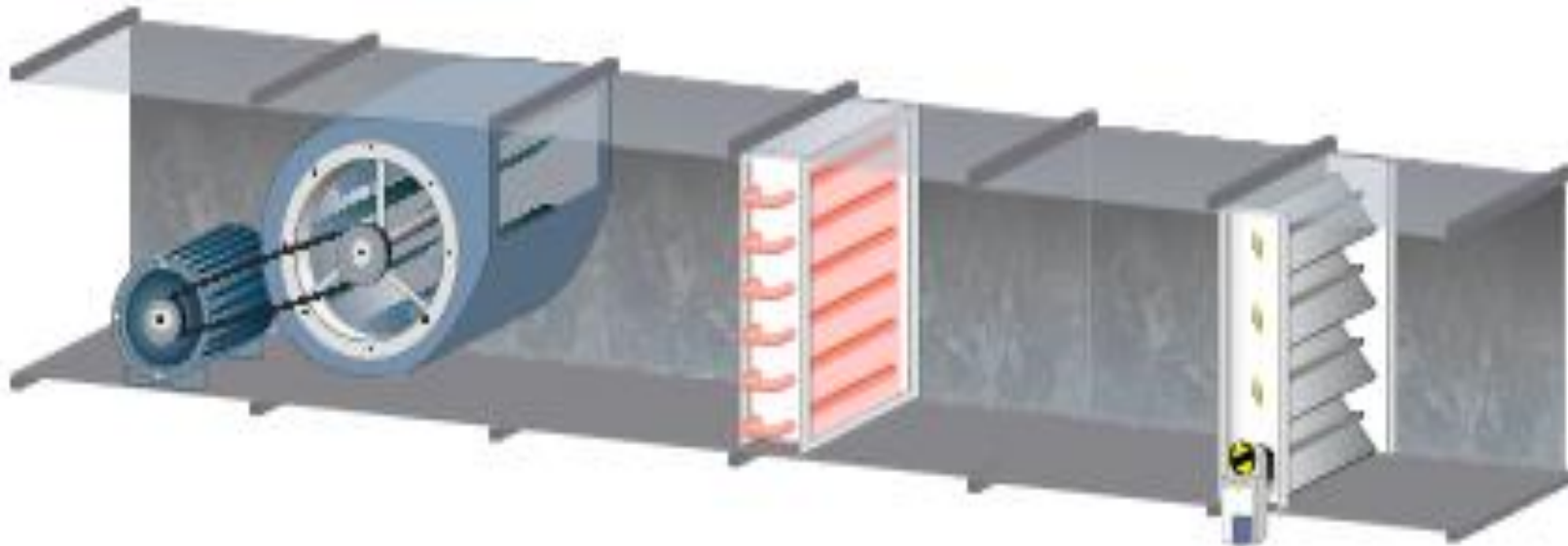
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Concept Generation

Communication Method	Type of Data Manipulation	Environmental Outputs
RFID	SQL	Temperature
		Volume of Air
BlueTooth	Fuzzy Logic	Humidity (Moisture in Air)
		Temperature and Volume
Application	Supervised Learning	Temperature and Humidity
		Air Flow

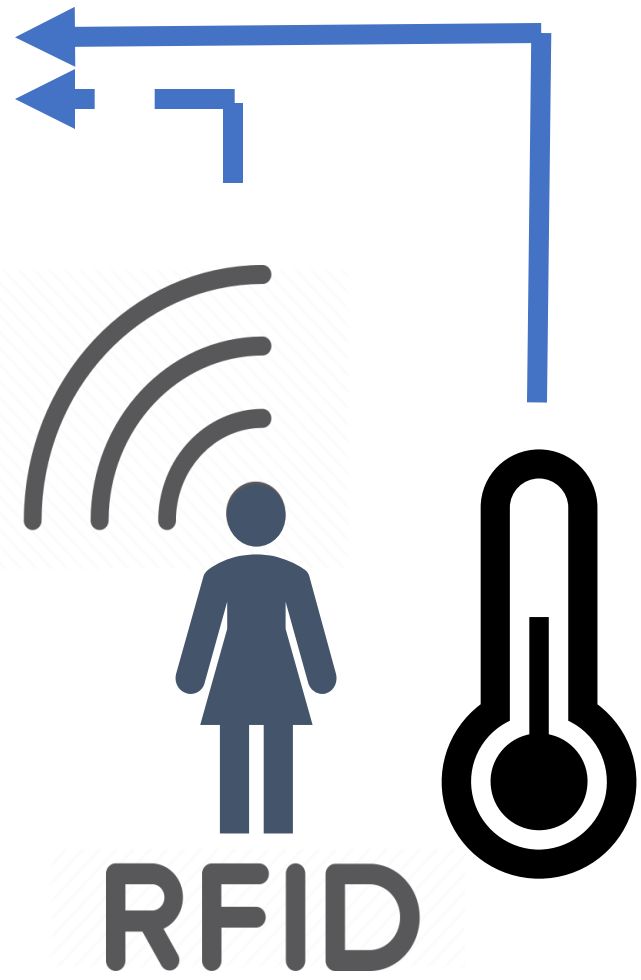
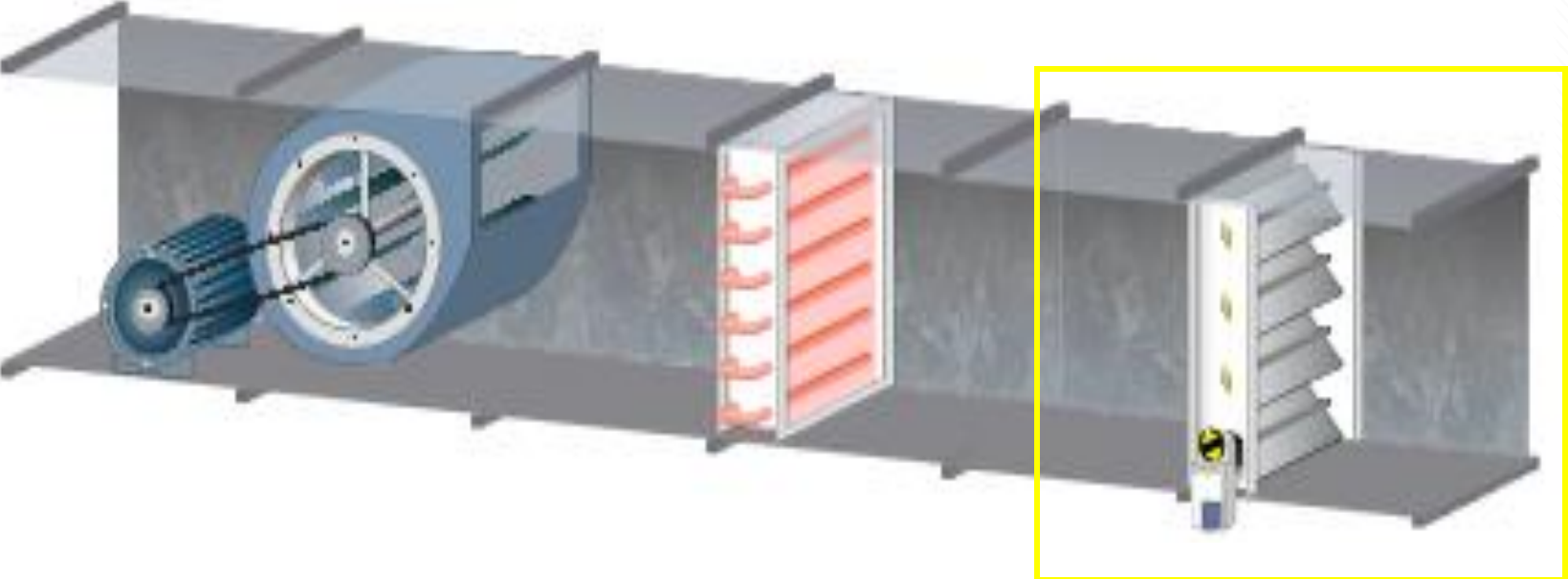
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The Prototype



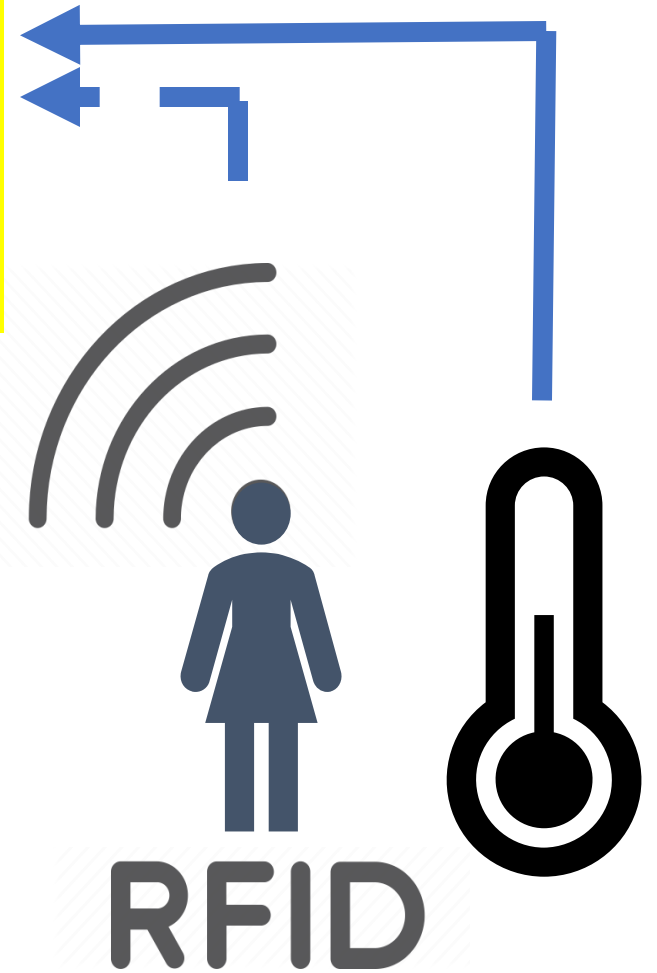
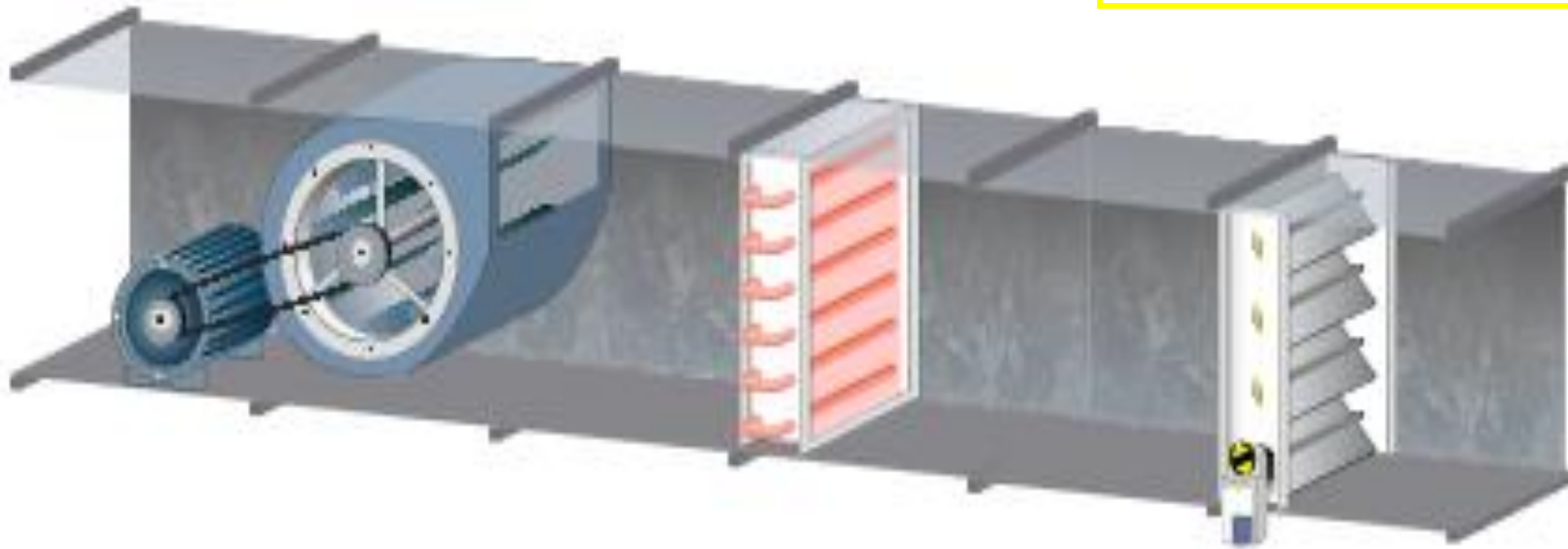
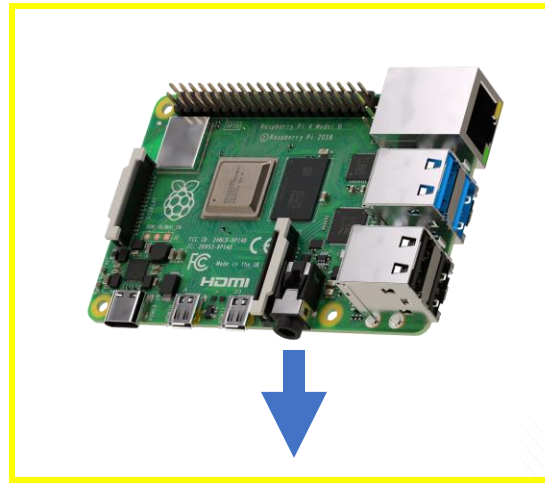
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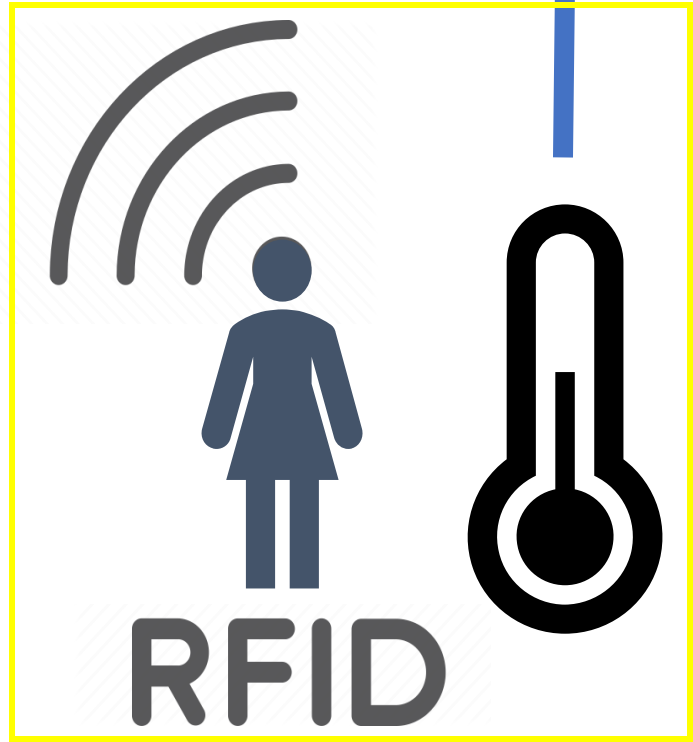
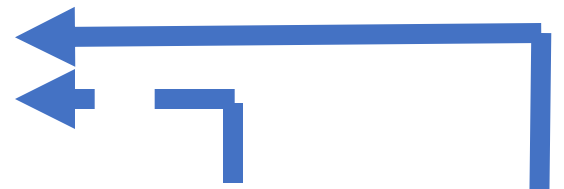
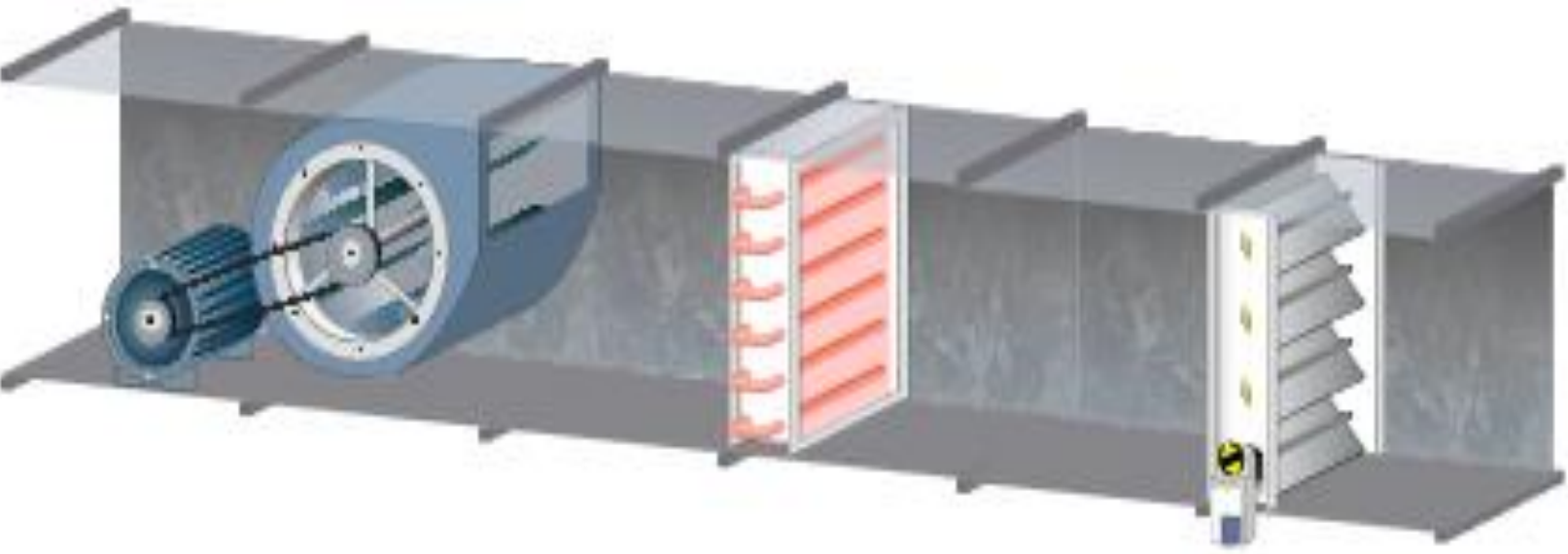
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The Prototype



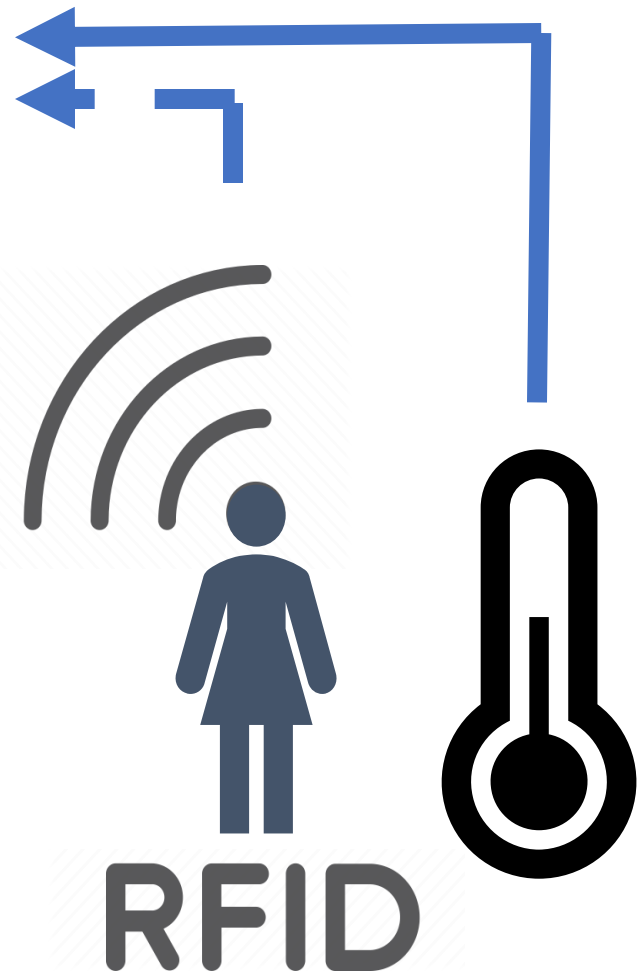
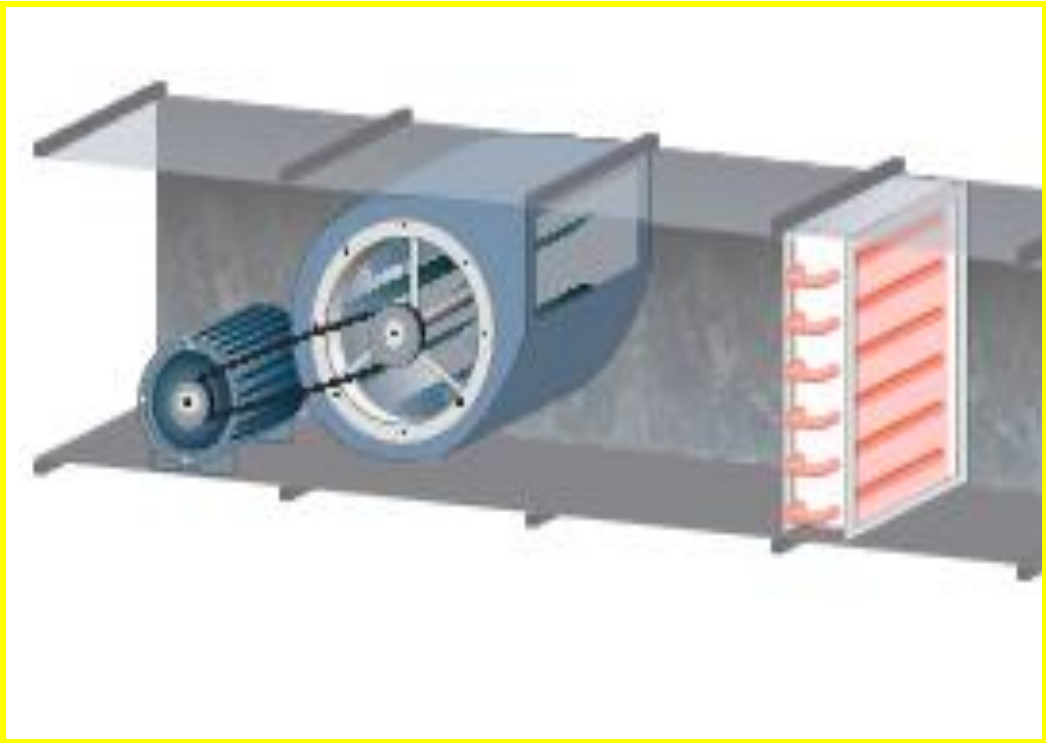
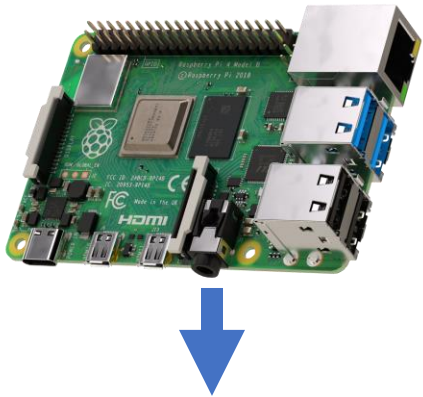
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The Prototype



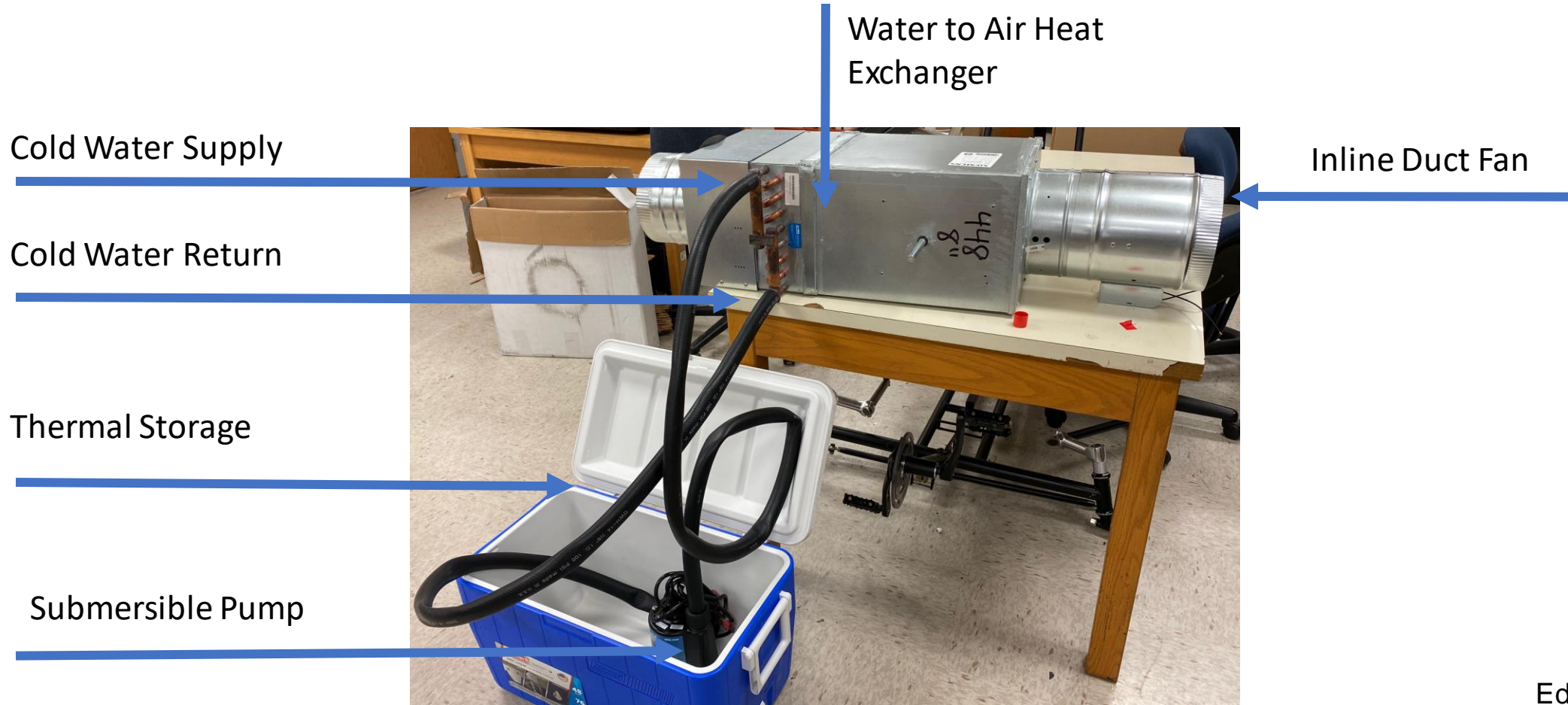
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The Prototype



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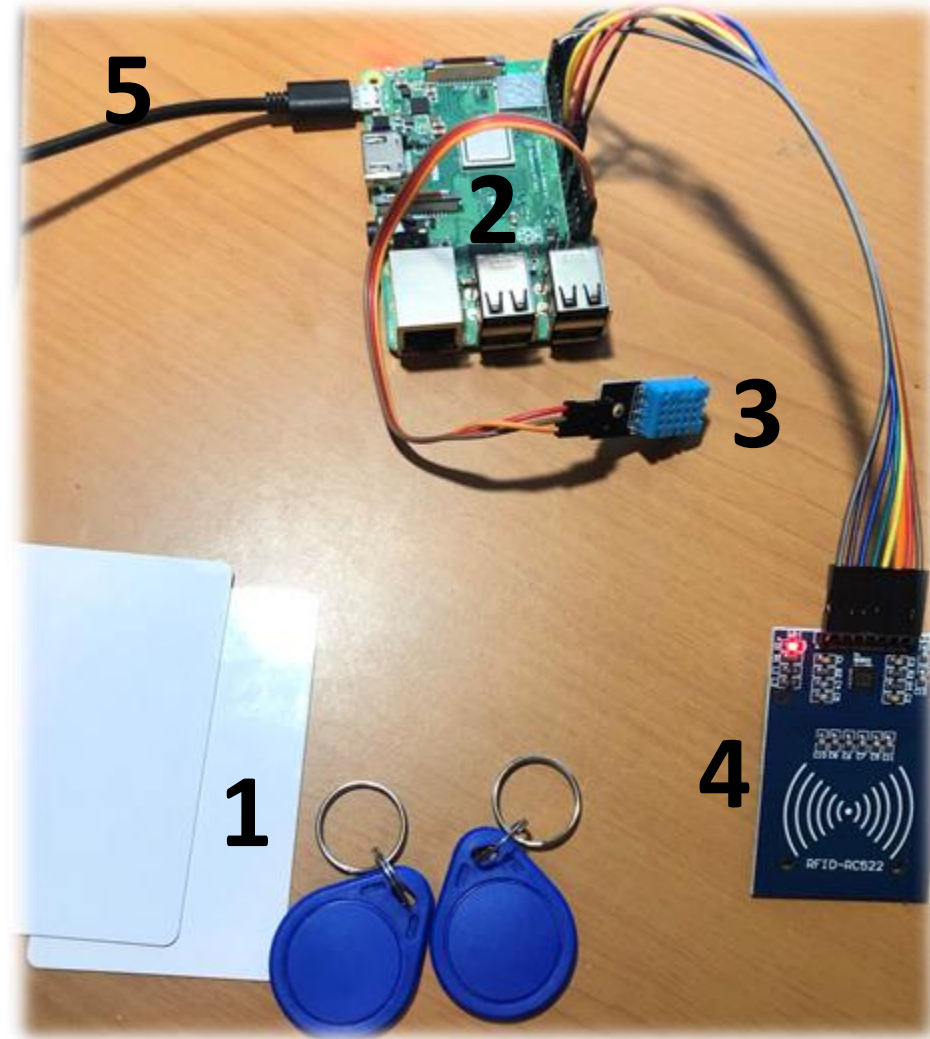
Test Verification Assembly



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Raspberry Pi Hardware

1. RFID Card/Keychains
2. Raspberry Pi
3. Temperature Reader
4. RFID Reader
5. 5V power source (DC)



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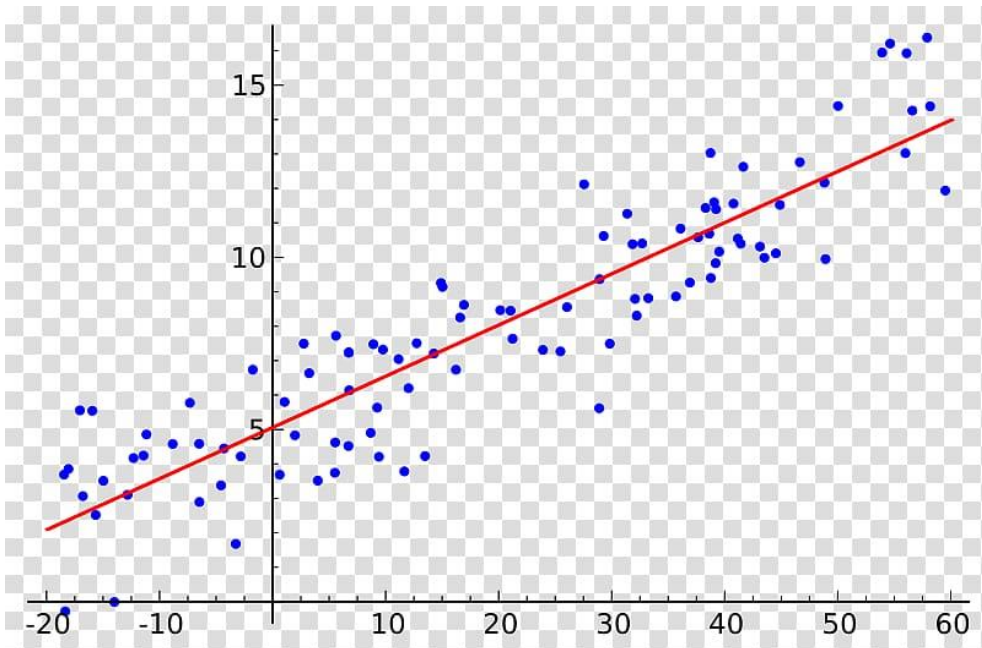
Software

- The software uses previous inputs to predict preferences.
- Right now it performs a simple average so it can acquire the output temperature require.
- For the moment, a simple database is run locally on the device.

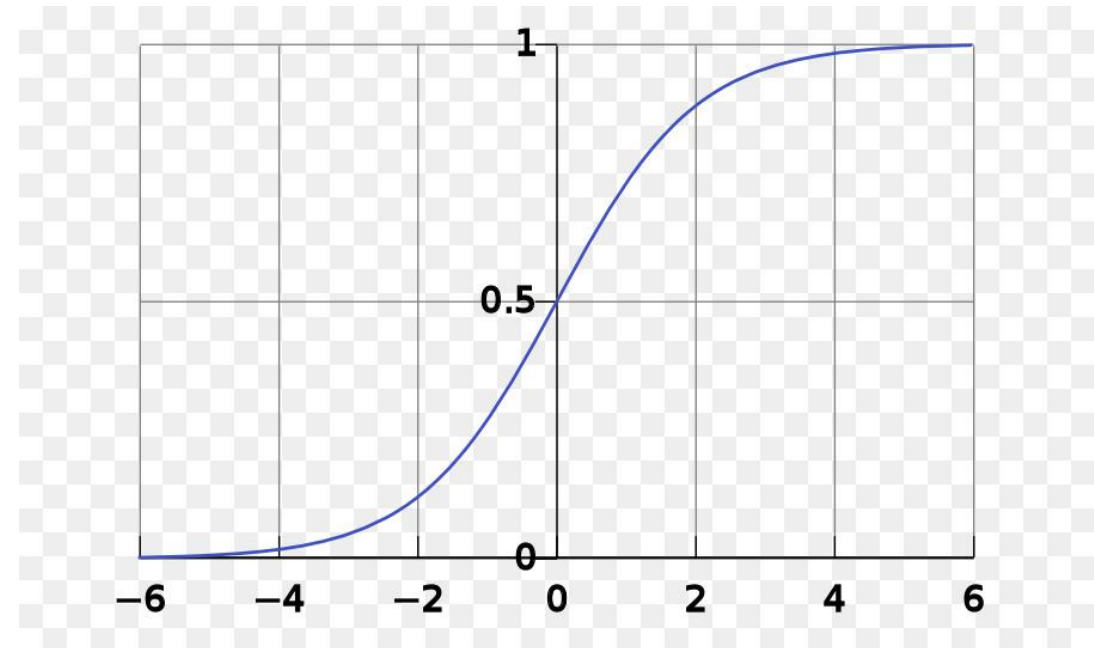


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Training Model



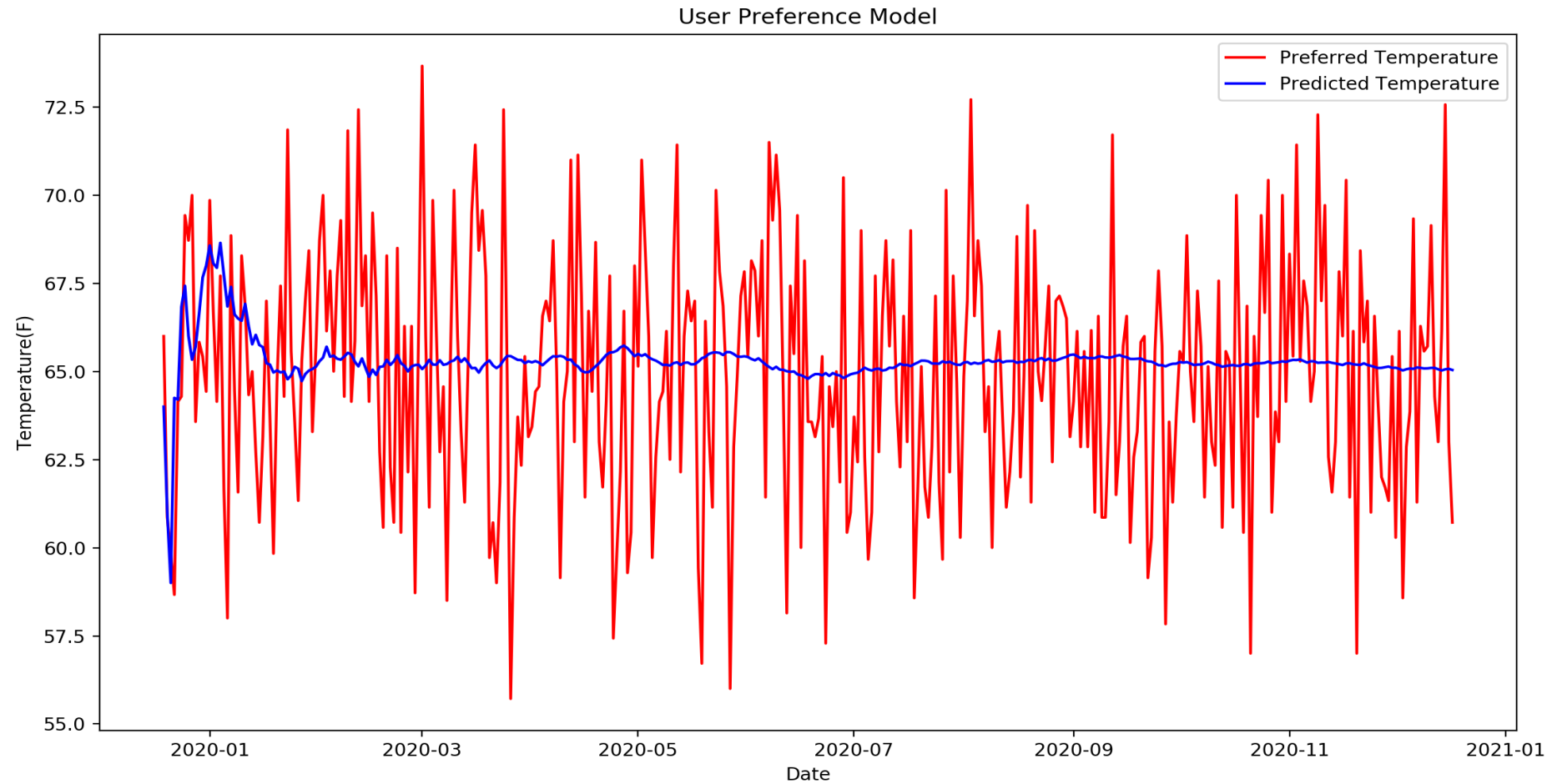
Linear Regression



Logistic Regression

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Baseline



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Training Data

- Tracking the human-building interactions within air-conditioned offices
- Year worth of data recorded in 15min intervals
- 115 Columns
- 3 main features for model training
 - Time
 - Indoor Temperature
 - Personal Preference

Time	Occupant Number	Occupancy 1	Occupancy 2	Survey Time	INDOOR Ambient Temp.
735080	1	0	0	NaN	24.584695
735080.0104	1	0	0	NaN	24.584695
735080.0208	1	0	0	NaN	24.584695
735080.0313	1	0	0	NaN	24.584695
735080.0417	1	0	0	NaN	24.498384
735080.0521	1	0	0	NaN	24.671003
735080.0625	1	0	0	NaN	24.584695
735080.0729	1	0	0	NaN	24.671003
735080.0833	1	0	0	NaN	24.671003
735080.0938	1	0	0	NaN	24.671003

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RFID Data Abstraction

- Unique ID attached to each user via RFID (radio frequency identification) passive chip
- Determine ID upon entry of room
- Gather data and attach to each user's "pool" in the database
- Log user, date, time, temperature



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Big Data Handling

- Ability to handle larger pools of data (thousands of users with thousands of data inputs).
- Intel Edison and Arduino Uno allow a bigger handling of data.
- Possible cloud storages: Amazon Web services, Microsoft Azure and Google Cloud Platform.
- Keeping all user's information secure.



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Budget

Item Number	Quantity	Part Number	Description	Vender	Price	Total Cost
1	1	5C964	Galvanized Steel Axial Duct Booster, 8 ", 120 V	Grainger	\$66.15	\$66.15
2	1	cb-8-10.5-12.5-BRACKETS	Square to Round Ceiling Box Transition	HVAC Quick	\$56.00	\$56.00
3	1	91250	Superior Pump 91250 1/4 HP Thermoplastic Utility Pump	Amazon	\$46.49	\$46.49
4	2	PP855-71	Plumb Pak PP855-71 Dishwasher Discharge Hose with (2) Clamps, 7/8 in X 6 ft, Rubber	Amazon	\$20.70	\$41.40
5	1	3000000152NP	Coleman 48-quart performance Cooler	Amazon	\$24.24	\$24.24
6	1	ABCD2X2	Accord Ventilation ABCD2X2 Ceiling Diffuser, 24" x 24" , white	Amazon	\$85.86	\$85.86
7	2	3775	Raspberry Pi 3B+ - Microcomputer	Adafruit	\$40.00	\$80.00
8	1	RC522	RFID Module/Card Readers	Amazon	\$20.00	\$20.00
9	1	DHT11	Temperature/Humidity Sensor	Amazon	\$10.49	\$10.49
					Total	\$430.63

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Future Works and Improvements

- Give Final Pitch at InNOLEvation (Win it)
- Begin Engineering Shark Tank Competition
- Integrate Mechanical System with Raspberry Pi Hardware/Software
- Validation Techniques/Results
- Website Development



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Setbacks

- The prototype will only handle small amounts of data.
- The database is locally run; it may run out space before a certain time duration.
- Mimicking real-life user data to train and test algorithm.
- RFID Limitations

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