

Introduction:

SmartCycle is a smart waste management system which uses computer vision to detect waste objects. It sorts them into two classes, Recycling or Compost. Using servo motors, the bin is opened based on what class is detected. To ensure my bin is user friendly, I have added an infrared sensor which lets the user know if the bin is full. While the addition of my DHT11 temperature and humidity sensor ensure that optimal composting conditions are taking place. All data is containerised via Docker, saved in my TinyDB database and displayed in a web page. This presents the real time data on the waste collected and the compost readings.

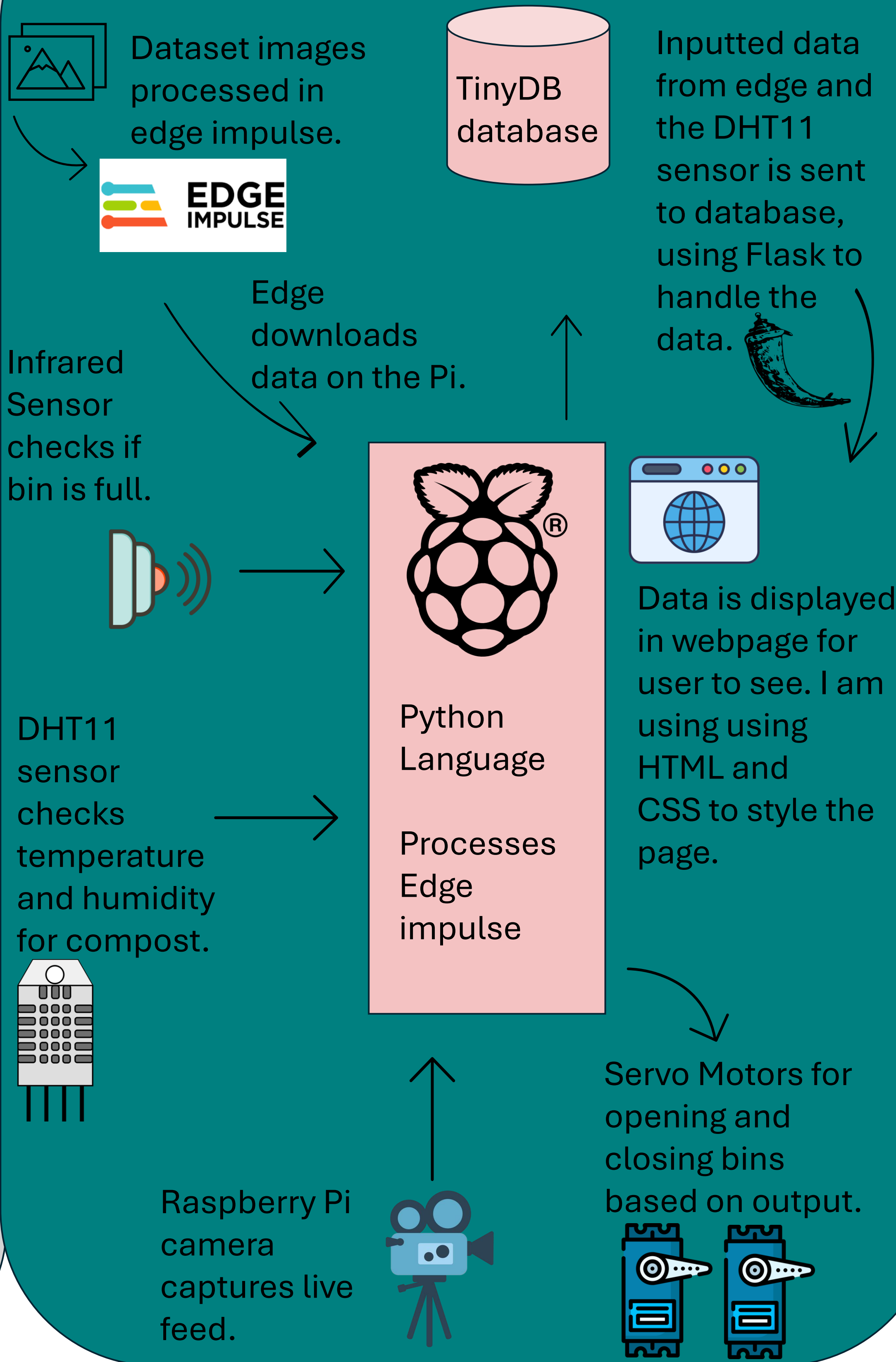
Hardware:

- Raspberry Pi – Microcontroller
- DHT11 – Temperature and humidity sensor for composting.
- Infrared Senor – Checks if bin is full.

Software:

- Edge Impulse – Generates my machine learning model.
- Python – Controls servo motors, sensor and processes data.
- TinyDB – NoSQL database which stores data in JSON.
- HTML and CSS: Structuring and designing the webpage.

Diagram:



Results:

This was the output score from edge impulse. It received an overall F1 score of 72.4%, with Compost being accurately identified at 89.5% and Recycling at 75%.

F1 SCORE ②
72.4%

Confusion matrix (validation set)

	BACKGROUND	COMPOST	RECYCLING
BACKGROUND	100.0%	0.0%	0.0%
COMPOST	10.5%	89.5%	0%
RECYCLING	25%	0%	75%
F1 SCORE	1.00	0.82	0.69

These are the live images which show the accuracy classification labels.

Recycling (0.77)

Compost (0.95) ost (0.95)

Recycling = 0.77

Compost = 0.95