



# INTERNET OF THINGS

## FOCUS AREAS

Connected Assets

Connected Ops/Logistics

Connected Services

Connected Experience



Hardware  
Prototyping



Web/Mobile App  
Development



Design &  
Testing



Connectivity  
Management



Cloud  
Integration



AI Services

## OPPORTUNITY

### Consumer



- Smart Home
- Energy Efficiency

### Medical



- Wearable/Implanted Devices
- Hospital Automation
- Real-time Patient Monitoring
- Predictive Diagnoses

### Industrial



- Smart Metering
- Faulty Part Detection
- Predictive Maintenance
- Waste Management

## OUR CLIENTS



# WHAT WE DO



## CUSTOMISE

We provide **custom IoT Solutions** development and services tailored to **fit customer needs**.



## SPECIALISE

We specialise in **Hardware development, Connectivity Management, Cloud deployment and Integration, Mobile & Web App Development**.



## QUALITY

We do not compromise on **Quality** and pay serious attention to **UI/UX** and **Security**.





# OUR End to End IoT Offerings



## Connected Devices

- Embedded Device & Gateway design
- Sensor and Actuator integration
- Hardware and Firmware testing



## API/Cloud Integration

- Microsoft Azure IoT
- Amazon AWS



## Connectivity Management

- Protocol selection assistance
- Development on mesh protocols

















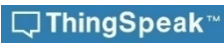








## Assessment Services

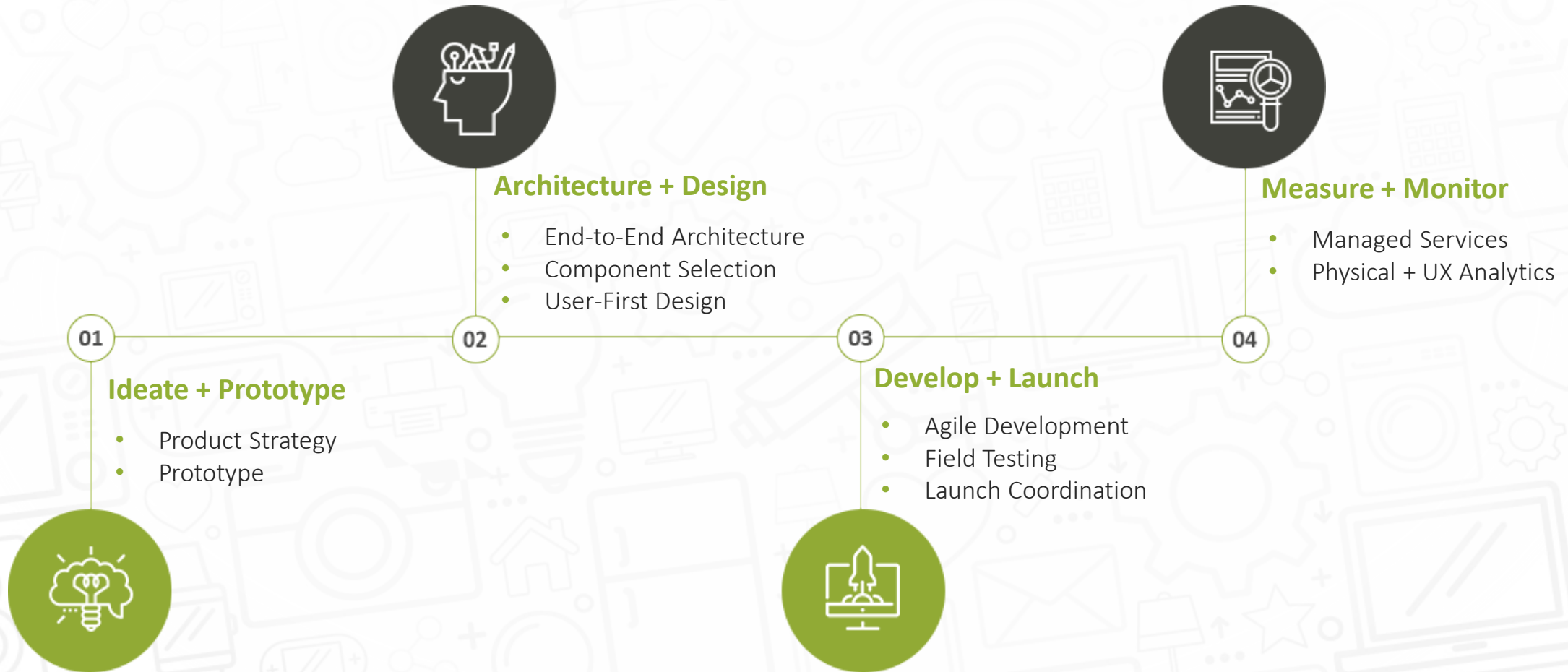
- Requirement and Cost analysis
- Architecture and Blueprint creation

**End to End  
IoT**

# OUR CAPABILITIES IN IOT LANDSCAPE

	Technology	Capability
Devices & Sensors	     	<ul style="list-style-type: none"> <li>• Bare metal embedded firmware development</li> <li>• RTOS</li> <li>• 8, 16, 32 Bit Micro Controllers</li> <li>• GNU GCC Toolchain</li> <li>• Keil, Mbed, Arduino</li> </ul>
Connectivity & Gateway	     	<ul style="list-style-type: none"> <li>• Connectivity Management</li> <li>• Protocol Integration</li> <li>• Protocol Translation</li> <li>• Hybrid Connectivity Gateway development</li> <li>• OTA/FOTA</li> </ul>
Platform & Middleware	    	<ul style="list-style-type: none"> <li>• Device management</li> <li>• Device Twins</li> <li>• Stream Ingestion &amp; Processing</li> <li>• Data Storage</li> <li>• SQL/No SQL Databases</li> </ul>
Applications & Analytics	     	<ul style="list-style-type: none"> <li>• API Development &amp; Integration (Rest)</li> <li>• Mobile &amp; Web Apps</li> <li>• Business Intelligence</li> <li>• Machine Learning</li> <li>• Custom Backend Development</li> </ul>

# DEVELOPMENT CYCLE



# OUR PROJECTS

Temperature sensor



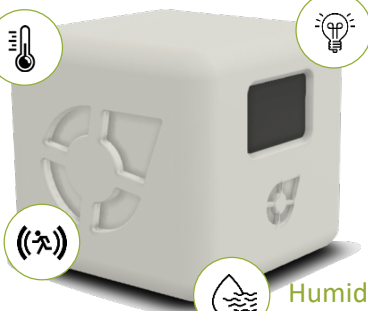
Light sensor



Motion sensor



Humidity sensor



## AAPNA Multi-Sensor

Our custom designed multi-sensor provides real-time availability and occupancy of meeting rooms along with Ambient lighting condition, Temperature and Humidity and Air Quality index on a unified dashboard on Power BI using data from Azure IoT HUB. Users can see this status both on Web and Mobile App.

## Streaming Camera Gateway

A retrofit solution that can connect to any IP Camera that acts as an intermediary arrangement, translates RTSP protocol to RTMP protocol, connect to internet and send live feed to Customers Server.

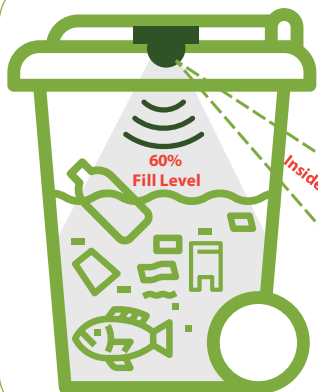
This Integrated H.264 RTSP to RTMP stream transcoder and pusher.



IP Camera



Wi-fi Gateway



Inside view



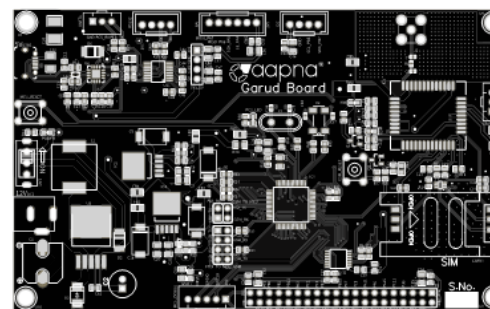
Ultrasonic Sensor

## TrashCan Monitoring Device

This device can automatically measure the level of garbage at regular intervals by the Ultrasonic sensor and send the readings to the cloud using GSM/cellular technology, This data is processed and displayed on the dashboard. Also, This device works on a battery and sends an alert when it is critically low.

## GSM Logger

Our GSM logger is a developer board packed with a Quectel M66 2G Quad-Band GSM module for cloud/call connectivity with a SIM card connector and the possibility of switching power supply from 5v Micro USB or 9V to 12V DC-DC power jack. The SWD connector for programming and debugging 36 Dedicated GPIO's, RS232, UART, I2C, and SPI for communication.





# SMART OFFICE/MEETING ROOM – AAPNA MULTISENSOR

## • Challenge



Idea was to device an IoT based solution to capture Realtime information about the occupancy of a Meeting Room.

## • Solution



Our solution creates a unified dashboard on Power BI using data from Azure IoT HUB. Users can see this status both on Web and Mobile App.

This data provides real-time occupancy of office/meeting rooms along with Temperature, Humidity, Light and Presence Detection using Multi-Sensors.

## • Multi-Sensor



Our custom designed multi-sensor provides real-time availability and occupancy of meeting rooms along with Ambient lighting condition, Temperature and Humidity and Air Quality index.



Motion Sensor



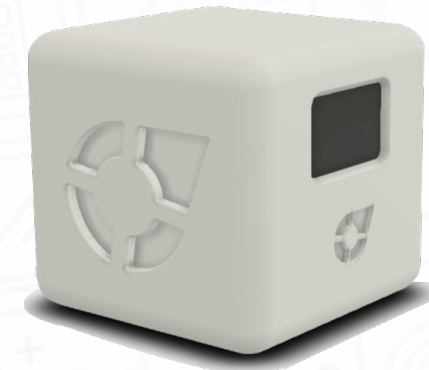
Light Sensor



Humidity Sensor



Temperature Sensor





# CUSTOM ENDPOINT STREAMING CAMERA – SOLUTION INTEGRATION

## Challenge



CCTV companies provide restricted cloud connectivity, web and mobile applications. These cameras can't stream to third party applications/services thereby limiting functionality. Our customer wanted to use their own website instead of manufacturer website or app for streaming and playback.

## Solution

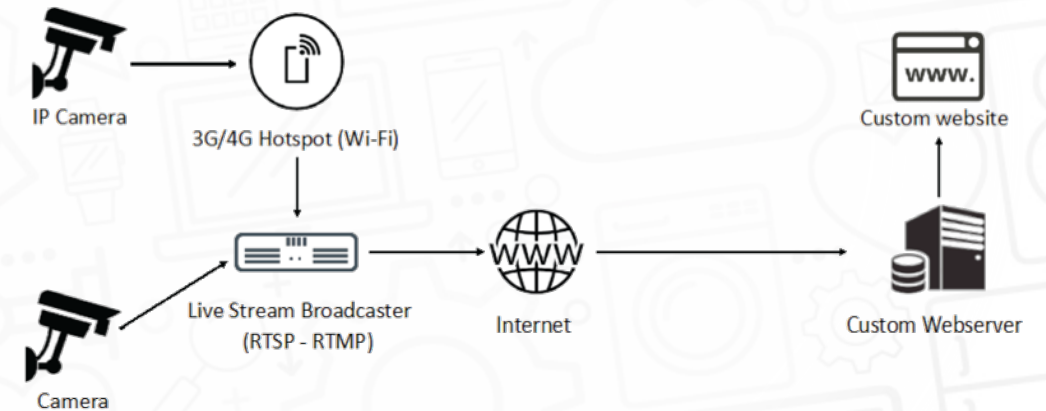


A retrofit solution that can connect to any IP Camera that acts as an intermediary arrangement, translates RTSP protocol to RTMP protocol, connect to internet and send live feed to Customers Server.

## Live Streaming Camera



Integrated H.264 RTSP to RTMP stream transcoder and pusher. This transcoder can connect up to 16 cameras and can stream directly to RTMP Server deployed on Customer Website.



Custom Endpoint Streaming Camera Architecture

# SMART TRASH CAN MONITORING DEVICE

## • Challenge



We were given the challenge to create a device that can measure the level of garbage every six hours and send the readings to the cloud using GSM/cellular technology where this data is processed and displayed in a dashboard. Also, the device should run on batteries and should alert when it gets critically low.

## • Solution

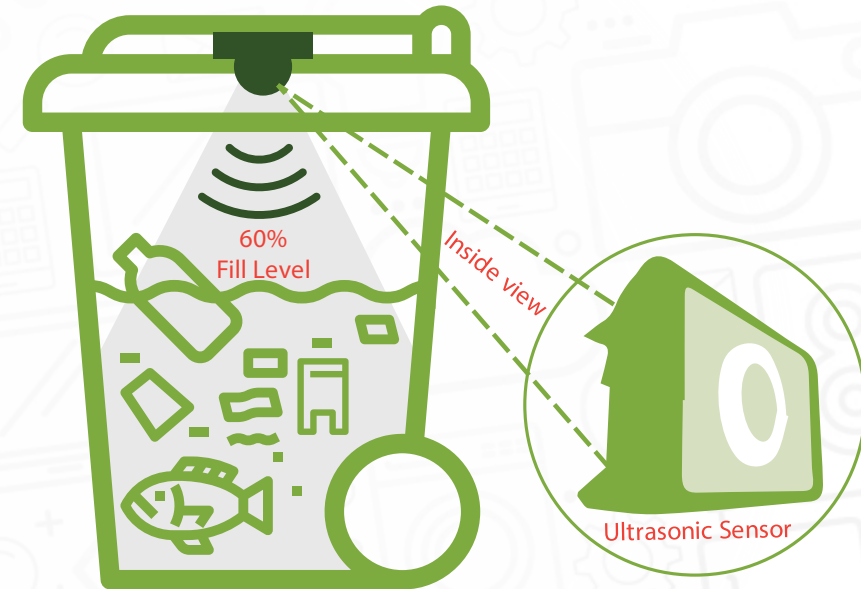


A custom-designed smart trash can monitoring device is created that automatically detects levels of garbage at regular intervals by the Ultrasonic sensor.

## • Transformation



The data gathered by our IoT solution will enable cities to deploy garbage collectors effectively. Due to resources being expended appropriately with data, not only will our IoT product help cities get cleaner, it will save labour costs, time and fuel – resulting in a cleaner, smarter and more comfortable life.



# AAPNA GSM LOGGER- DEVELOPMENT BOARD

## • Challenge



Most of the trackers used today are closed designs, cannot be configurable to other servers and There is no possibility of getting them repaired.

## • Solution



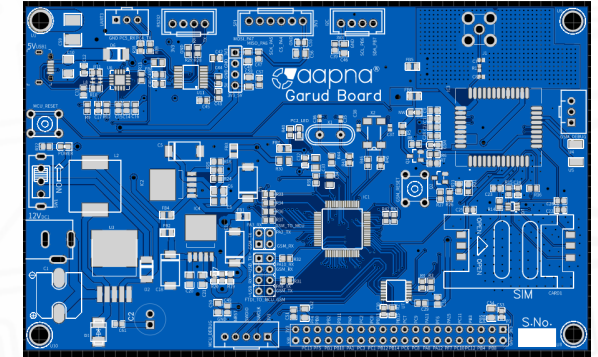
- Quectel M66 2G Quad-Band GSM module for cloud/call connectivity with SIM card connector.
- External Whip Antenna with right-angle SMA connector.
- STM32 ARM Cortex M0 MCU with built-in RTC.
- Switching power supply to take inputs from 5v Micro USB or 9V to 12V DC-DC power jack for power input.
- SWD connector for programming and debugging 36 Dedicated GPIO's, RS232, UART, I2C, and SPI for communication.

## • Next Steps

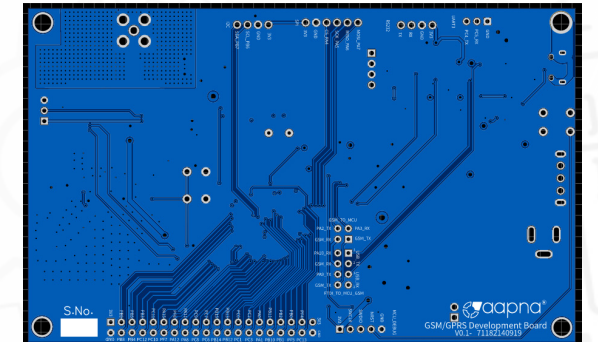


Further, we are working to integrate this to different cloud platforms like AWS IOT, Google Cloud, Azure, etc. From the connectivity standpoint, we are working to integrate LoRa and 4G/NB-IoT in our next release.

Front View



Rear View

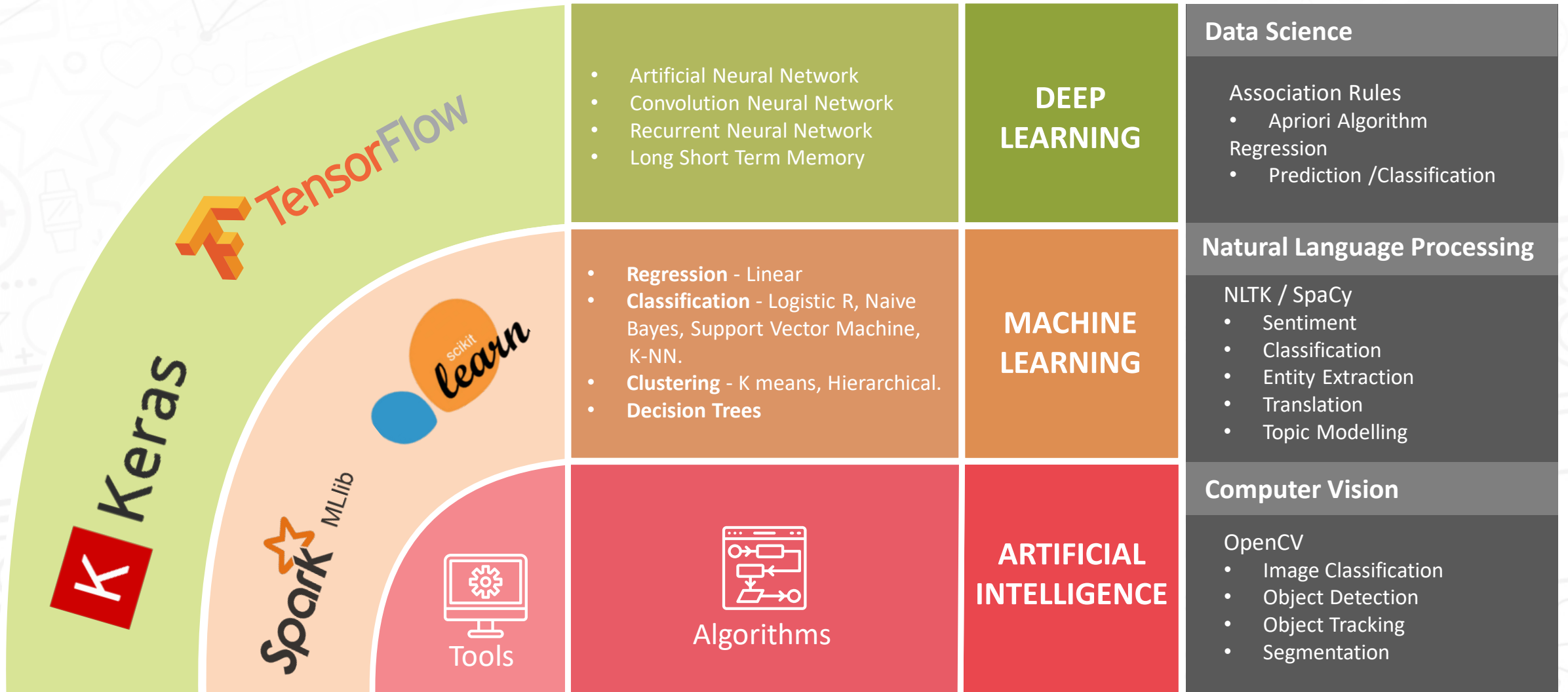




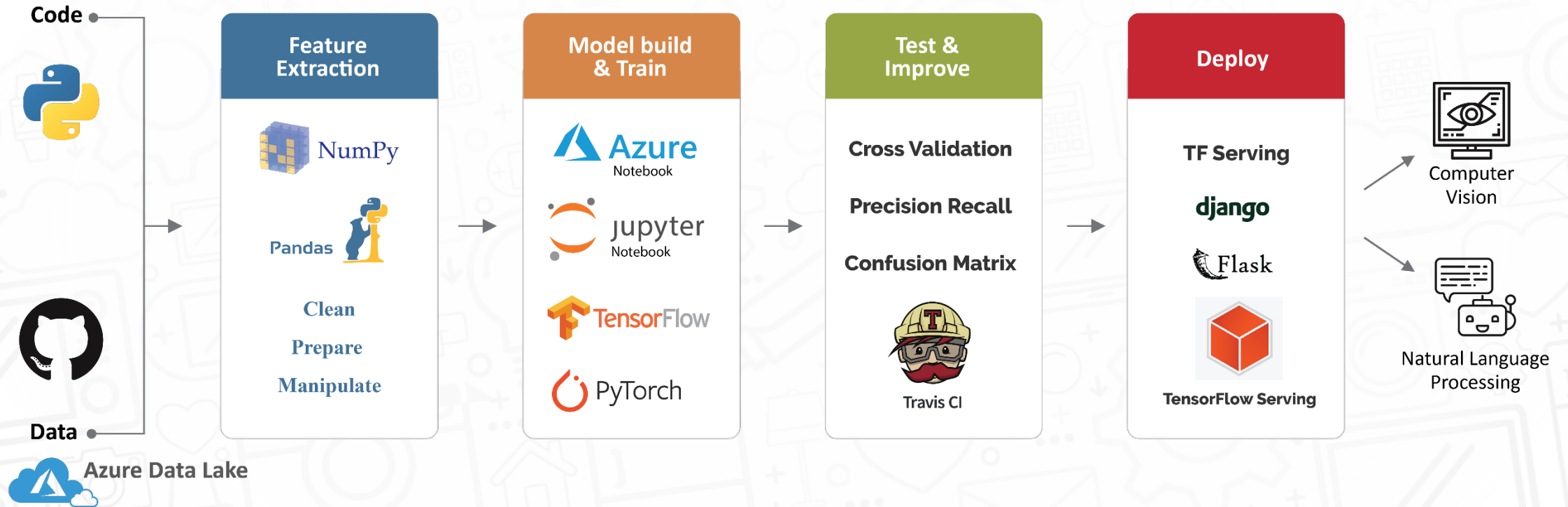


**ARTIFICIAL INTELLIGENCE**

# TECHNOLOGY



# DEVELOPMENT CYCLE





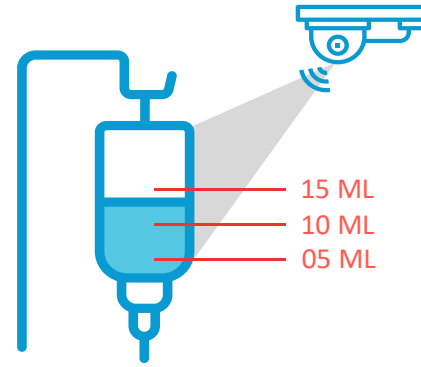
# OUR PROJECTS



## Most Likely Disease prediction. NLP

Diagnose your disease with an ease of chatting with the bot describing your symptoms.

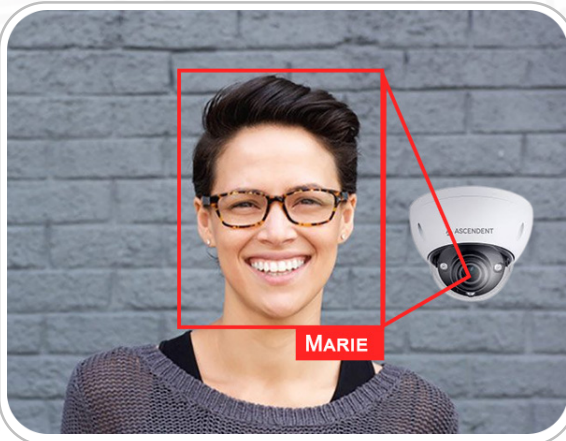
- Azure Bot Framework



## Transparent Liquid Amount Detection

Drips containing Intravenous (IV) fluid, The number of patient in India is large w.r.t the Nurses, The drips are not refilled timely and their refilling time calculations often fail due to some factors. We automatically detect the level and alerts when it gets critically low and needs a refill.

- Canny Edge Detection



## Facial Attendance System

The attendance will be marked based on facial recognition of the person automatically when he/she enters the office.

- Linear Binary Pattern Histogram (LPH)



## AI Waste Monitoring

Classifies the waste images into multiple categories, further also identify as a biodegradable or non-biodegradable waste.

- Image Classification & Segmentation
- Object Detection

# FACIAL RECOGNITION BASED ATTENDANCE MONITORING SYSTEM

- **Challenge** Authentication is a significant issue in system control in computer-based communication. Human face recognition is an important branch of biometric verification and has been widely used in many applications, such as human-computer interaction, and door control system and network security. Idea was to create an autonomous attendance monitoring system that can harness the power of machine vision and AI to provide a seamless solution.



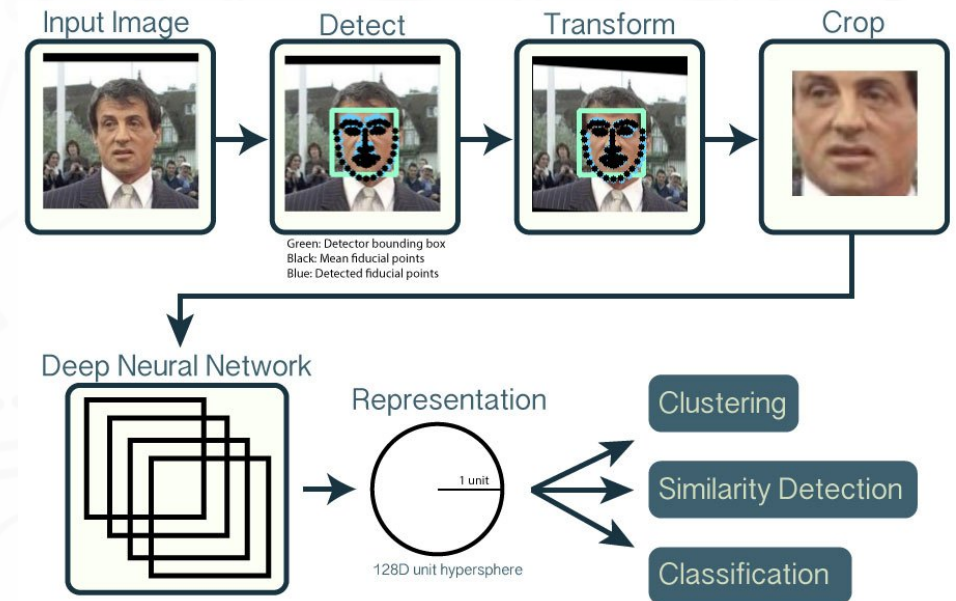
- **Solution** This Solution integrates with the face recognition technology using Linear Binary Pattern Histogram (LPH) algorithm and Haar Cascade classifier for Employee's Attendance System. The attendance will be marked based on facial recognition of the person automatically when he/she enters the office.



- **Smart Attendance Monitoring System**



Brief working of the system is to recognize real time human faces. The detected faces are matched against the reference faces in the dataset and marked the attendance for the employees with a greeting message said aloud through voice conversion system. Finally, the attendance is stored in binary as well as csv file for further user-friendly operations.





# AI WASTE MONITORING

## Challenge



Waste management is a crucial concern in India.

There is no automated waste segregation strategy at day to day household as well as Industry employs semi-automated machines for segregation. Hand-operated segregation of waste is deleterious to labor's health, Therefore an adequately automated, low cost and user-friendly segregation system is need of an hour.

## Solution



Our proposed solution consists of using Artificial Intelligence's Deep learning algorithm. The image is acquired from a camera with object detection and fed into CNN for prediction and classification into multi-class categories such as biodegradable and non-biodegradable. Further, worked on colour segmentation for the counting of segregated bags, and litter cig-butt segmentation.

## Segregating enough



The modern Deep learning Algorithms are based on a methodology known as Transfer learning/ Inductive transfer which concentrates on storing knowledge gained while solving one problem and applying it to a distinct but related problem. Similarly, We have used Microsoft ResNet pre-trained model to recognize our waste data-set to deliver greater precision.

## Image Classification

Maximum Probability: 0.9998971  
Classified: Non-Biodegradable,Plastic

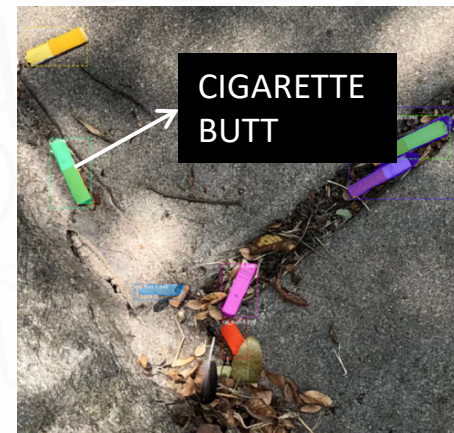


## Colour Segmentation

trashbags\color\_segment.py  
3 blue counts  
2 red counts  
1 yellow count  
1 green count  
1 white count



## Litter Segmentation



## Object Detection







# THANK YOU

For further details please contact us



[aroy@aapnainfotech.com](mailto:aroy@aapnainfotech.com)



[sales@aapnainfotech.com](mailto:sales@aapnainfotech.com)



[+91 729 199 9667](tel:+917291999667)

[www.aapnainfotech.com](http://www.aapnainfotech.com)