EDGE COMPUTING

Requirement

Kirana is a retail store looking for more digitalized way of expanding their business. They want to use a more systematic way of checkout system and reduce their human work force at billing counters.

Help Kirana devise a system that allows automatic detection of product using camera. The detection of product must be wrt the size of the product, type of product and automatically take the cost of product to make a bill of materials at checkout. This has to be done in real-time without sending the data to cloud for processing as some of these stores can be in remote areas with intermittent connectivity and Kirana do not want customers to wait due to latency issues for connectivity.

Example: If a toothpaste is placed in front of the camera, it should detect the product, according to the size and weight of toothpaste it must understand what the price of the product is. The details of each product scanned is then presented at the bill of materials for payment.

Please note, Kirana has Edge Servers that are not compute intensive.

Things to do:

- Build a **ML model** for product detection based on the mentioned parameters.
    - ➢ Size of product
      (When a customer keeps a product in front of the camera, it should detect the product by determining the size of product. It should be able to distinguish between the products of same brand, but of different size. Refer the toothpaste example above.)
- Train the ML Model.
- Create a **web** application named '**Kirana Product Billing**' for Product Detection and Billing. Integrate it with the trained ML model and show the details of the bill for products bought by the customer.

Expected Output:

1. Open '**Kirana Product Billing'** web application.
2. Upload image of a product for detection (You can also use desktop/Laptop camera for product detection)
3. Based on the image, perform product detection through the ML model built for detecting product based on size of product.
4. Once product is detected, directly add the corresponding Product ID, Product Name, Quantity and Cost of detected product to the Bill of Materials.
5. Repeat the above steps for atleast 5-6 products. Amongst these products, include 2-3 images of the same product, but in different size. Example: If a customer buys three toothpaste in small, medium and large size each.
6. After images of all products are uploaded, show the final bill of materials. It should display the following details

I. Sr. No.
II. Product ID(This is a unique ID which will be different for all the products regardless of the brand and size
III. Name of Product
IV. Quantity
V. Cost of product
VI. Final Cost of Product(=Quantity*Cost of Product)
VII. Highlight 'Final Cost' by performing addition on the final cost of all the products bought

Sharing an example view of Bill of Materials (You can use your own details for products)

Sr. No	**Product ID**	**Name of Product**	**Quantity**	**Cost of Product**	**Final Cost of Product**	
1	234	XYZ Toothpaste-Small	1	20	20	
2	247	XYZ Toothpaste-Medium	2	30	60	
3	351	XYZ Toothpaste-Large	1	40	40	
4	114	ABC Potato Chips-Small	1	10	10	
5	256	ABC Potato Chips-Large	1	50	50	
					180	Final Cost

In the video, show the following:

- Details of technology and services used in the solution.
- Mention hardware/software utilized in the solution.
- Explain with a **High-level Reference Architecture diagram**, the proposed solution in a **real Retail Store scenario** considering Edge Computing capabilities.
  The Reference Architecture must cover
  - How images from camera will be sent to Edge Server(this can be your desktop/laptop/Raspberry Pi) for processing(any protocols/methods)
  - How Cloud services can be used for model training(mention which Cloud Platform and Cloud service)
  - How Machine Learning Inference can be used in the solution
- Flow chart of the solution
- Show the working demo of "Kirana Product Billing' web application.
- Show the developed ML code and code for web application.

Points to Remember:

- The Edge Server is not compute intensive, plan model training and application deployment accordingly.
- 'Kirana Product Billing' is a **web application** which will run on the **Edge Server(can be your desktop/laptop/Raspberry Pi)**
- You can use Python for development of code. If you are comfortable with any other development language, feel free to use it.

POINTS TO REMEMBER

The below listed will be the upcoming events/ process next week onwards for Inframind Season 3 Round 2:

- For each tower, there will be a webinar session organized with the TCS SMEs to help you further understand the problem statement. the Webinar announcements/links will be shared via emails ,Campus commune channels and text messages.
- For further more details regarding Inframind Season 3, students can visit the "Inframind Season 3 "and "IT Infrastructure Services - Powering IT Infrastructure Globally - Be the Future !" channels on Campus Commune.
- Pls utilize the webinars to help enhance your understanding of the case study; your queries will also be addressed on this platform. Mentors will be assigned to you as required during these Webinars .