Experiment setup:

For our local experiments, our setup consists of a laptop equipped with Intel i7-6700@3.4 GHz CPU, 16 GB of memory running Ubuntu 16.04 on. For the mobile phone, we have used LG Fortune equipped with 8 MP camera, 1.4 GHz Quad-core processor, and running Android 7.1.2 (Nougat) OS, with 4G compatibility.

We have used the Flask server to set up the connection between both the Android phone and the computer. Flask server [ref] is a web framework that has the capability of supporting multiple frameworks communications within the same server, flask makes it possible to set up and client-server between any computer and mobile device with few lines of code. We have come up with two sets of experiments to test our CNN accuracy level and speed using local client-server setup and cloud client-server setup. In both experiments, we focused on two important metrics, the CNN prediction time, and the CNN prediction accuracy using 5 images from our dataset.

Experiment 1: Local client-server setup.

In this experiment, we implemented a Flex server on the server laptop, and flex client on the Android device. The Flex server is responsible for receiving the desired image that needs to be classified from the client end (Android device), process it using the already installed CNN, and return to which category the image belongs. The connection between the client and the server is direct, and thus we expect a very short latency between both ends. We have embedded Flex server with our CNN implementation, when Flex server is up and running it waits for an image, whenever the image gets received from the client-side it triggers the CNN network. The utility function that we have implemented slows to translate the received image from the android device with any format into the ppm format to run with our CNN. When the image is translated into the desired type, the CNN processes it and returns the category of the image as a message and enqueue. Finally, the Flex server sends back the data into the client-side and dequeues the data form the communication channels.

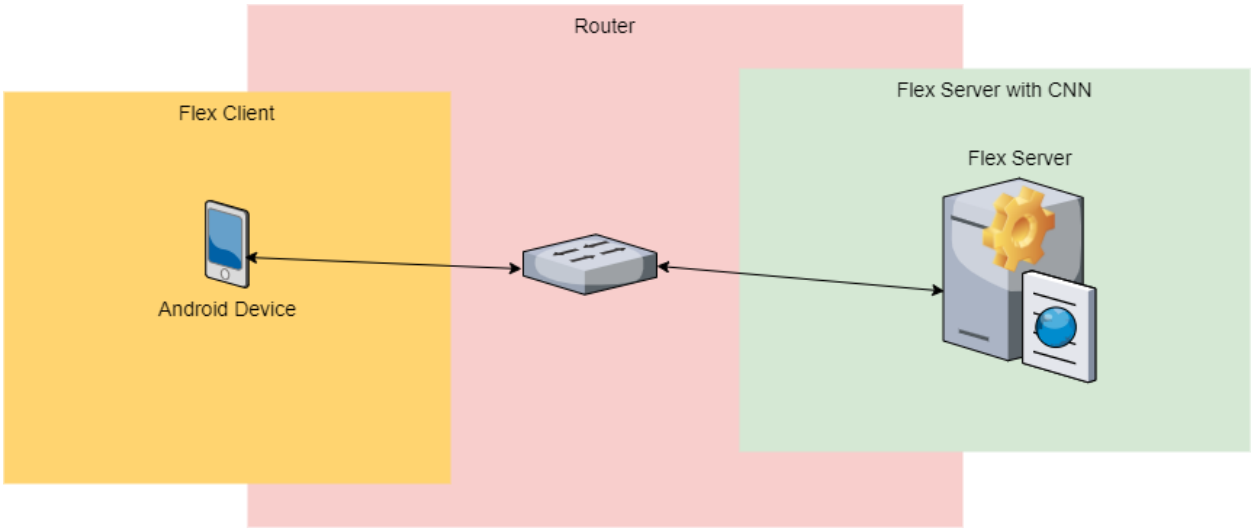

Figure 1. local client-server setup

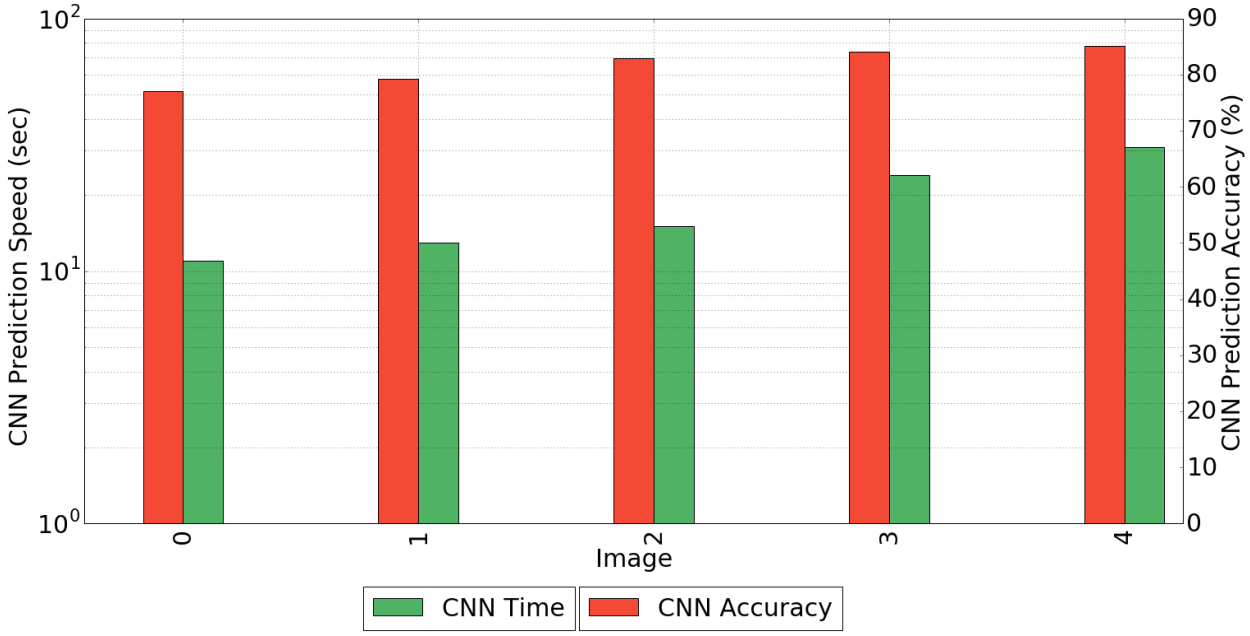

Figure 2. CNN prediction time (green) and accuracy level(red)

The plot in figure 2 presents the prediction time of the CNN added to it the server-client communication overheads. We have formulated the CNN time in a simple equation:

$$CNN\ Time = CNN\ processing_{time} + Flex\ server\ response_{time}$$

(1) Where $CNN\ processing_{time}$ is the amount of time taken to process the image by CNN.
(2) Where $Flex\ server\ response_{time}$ is the amount of time taken to send an image, receive back the data from the CNN, and send the data to the client (cell phone).

Our experiments show that our CNN can achieve up to 85.07% with $CNN\ Time$ of 30 seconds. [Jamal add whatever you want here]