Date	19 September 2022
Team ID	PNT2022TMID12576
Project Name	Project - Deep Learning Fundus Image Analysis for Early Detection of Diabetic Retinopathy

Solution Architecture:

Diabetic Retinopathy is a condition which affects the human eye, causing partial loss of vision and eventually the complete loss of vision. And the other downside of this condition is that the loss of vision can't be cured rather only prevented from getting worse. So it is necessary for us to detect the condition in a patient early on.

- The existing solution forces the customers to rely on professionals, clinics and hospitals. And the entire process for the customer to understand his or her problem and find the actual condition of his or her situation is not really feasible and heavily dependent on non-technological solutions. Which are prominently based on a professional diagnosing the condition using a fundus image of the patient through their naked eye. Which can be completely adapted with a technological solution. But it can't be rushed with a solution as it involves a very crucial human condition, so it is necessary to come up with the best possible and the most effective solution.

- To come up with the best possible solution, we need to understand the problem first. Since Diabetic Retinopathy is a condition which can't be treated rather than only prevented from getting worse, it is extremely vital for us to detect this condition as early as possible. So when the patient is experiencing early symptoms, it is necessary for them to visit the nearest testing center which has a scanner with which we will be able to get the fundus image of the patient's eye. And that image can be uploaded to the cloud where computer intelligence techniques like deep learning can be implemented for image processing to diagnose the presence of the condition diabetic retinopathy. And the report generated from the processing can be sent to the testing center or to a doctor or the patient himself. And accordingly they can make their decisions.

- The key features of the computational advancement in this field is to remove the dependence on the professionals and make this entire process more feasible for the patients. This way they can more efficiently derive their diagnoses and not rely on one available solution. And a deep learning network built out of a huge database of images can be more precise than a professionals' naked eye, making it more important to detect it early on.

  The development phases include pre-processing of the fundus image so we can more effectively handle the image processing. The next part would come-up with a deep learning model which would compute the necessary attributes to eventually diagnose the existence of DR. And the database of images plays an important role to train the model in our hands. And once we are ready with a model which can compute the presence of diabteic retinopathy, we need to develop the frontend should play a middleman role of

gathering the patient information and fundus image and inreturn feed the generated report on their diagnoses.

- Some of the specifications according to which the solution's framework will be decided are:
    - core functionality of the product, which includes computer intelligence. In this case deep learning.
    - other use cases based on interactions from the user: a frontend application that would middleman between the user and cloud which provides the computational overhead.
    - user requirements: availability of the product
    - feasibility of the solution: it should not take too much computational overhead, rather it should be more efficient and productive. This reduces the hardware stress and generates the necessary reports soon.