

list of the required software and libraries to run this contactless heart rate monitoring project:

Core Programming Language:

- **Python:** Version 3.x (The Colab environment typically uses a recent version of Python 3).

Python Libraries:

You'll need to install the following Python libraries using `pip`:

- **mediapipe:** Version 0.10.10 (specifically this version as indicated by the `pip install` command). This library is used for face detection in the video frames.
- **opencv-python (cv2):** Used for video and image processing tasks, such as reading video files, resizing frames, and color space conversions.
- **numpy:** Essential for numerical operations, especially for handling image and video data as multi-dimensional arrays.
- **matplotlib:** Used for creating plots, such as displaying sample faces and visualizing the PPG signals and heart rate waveforms.
- **tensorflow:** A powerful open-source library for numerical computation and large-scale machine learning. This project uses TensorFlow's Keras API to build and train the neural network models (LeNet, Custom CNN, GoogLeNet, UNet).
- **scikit-learn (sklearn):** Provides various machine learning tools, including `train_test_split` for splitting the dataset and metrics like `mean_squared_error` and `mean_absolute_error` for evaluating model performance.
- **graphviz:** A graph visualization software.
- **pydot:** A Python interface to Graphviz, used for visualizing the architecture of the Keras models. You might need to install the Graphviz system software separately in some environments (though Colab usually has it pre-installed).
- **scipy:** A library that provides tools for scientific and technical computing, including signal processing functionalities like `find_peaks` and `butter` (for Butterworth filter).
- **gradio:** A library for quickly creating interactive web interfaces for machine learning models. It's used here to build a simple UI for uploading a video and getting heart rate predictions.

Environment:

- **Google Colaboratory (Colab):** The notebook is designed to run in this cloud-based Python environment, which provides pre-installed versions of many common libraries and access to GPUs or TPUs for faster training.

How to Install (in Colab):

Most of these libraries are likely pre-installed in a standard Google Colab environment. However, the notebook explicitly installs a specific version of `mediapipe` and you might need to install `graphviz` and `pydot` if they are not already available. You can install them by running the following commands in Colab cells:

Python

```
!pip install mediapipe==0.10.10 --no-cache-dir
!pip install graphviz pydot
!pip install scipy
!pip install gradio
```

Make sure to run these cells in your Colab notebook before executing the parts of the code that depend on these libraries.