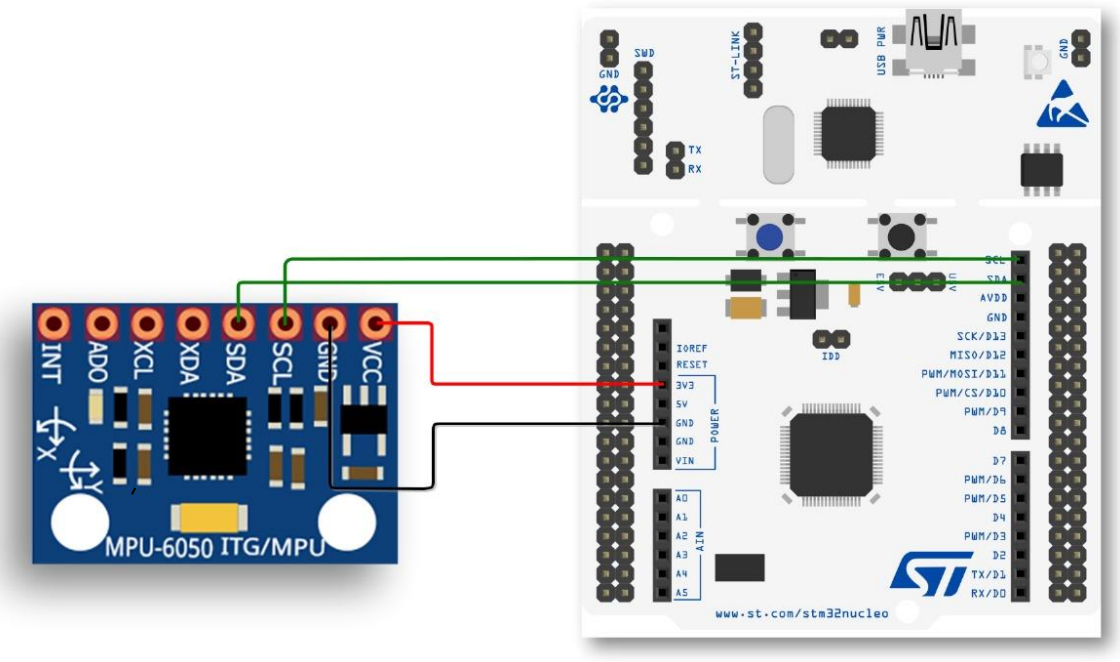
Running a Datalogger and building a Anomaly Detection project in NanoEdge AI Studio.

Experiment Overview:

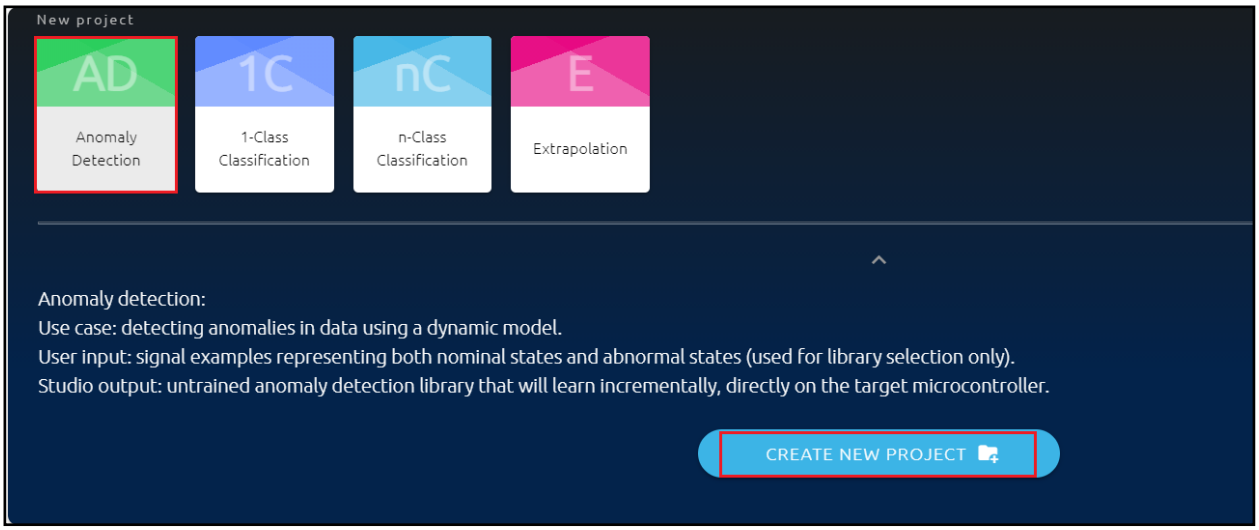
The goal of this experiment is to run a datalogger, so as to build our machine learning model on NanoEdge AI Studio. After uploading our code on the target Microcontroller, we will create a project on NanoEdge AI Studio for detecting the abnormal vibration patterns in machine.

Connection Diagram:

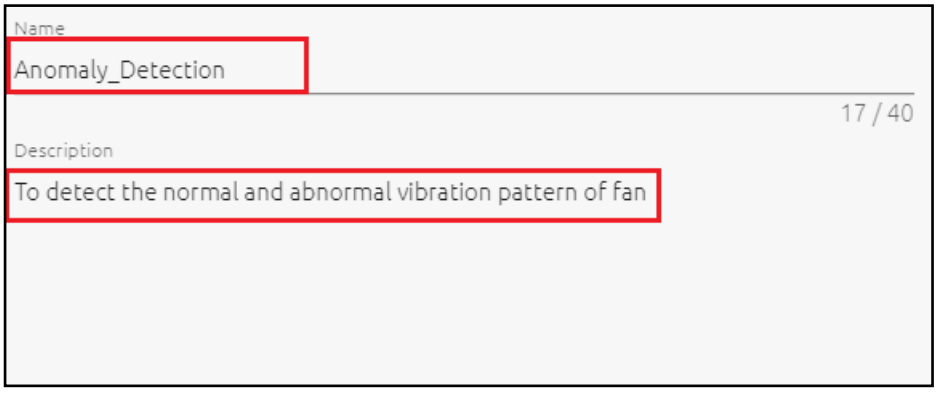


Procedure (NanoEdge AI Studio):

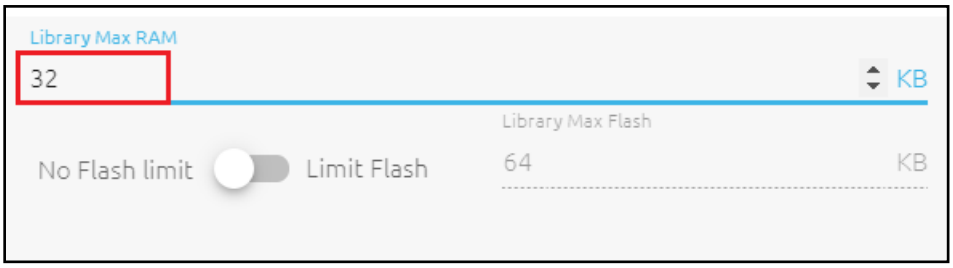
1. Open NanoEdge AI Studio.
2. Select **Anomaly Detection** project type and select **Create New Project**.



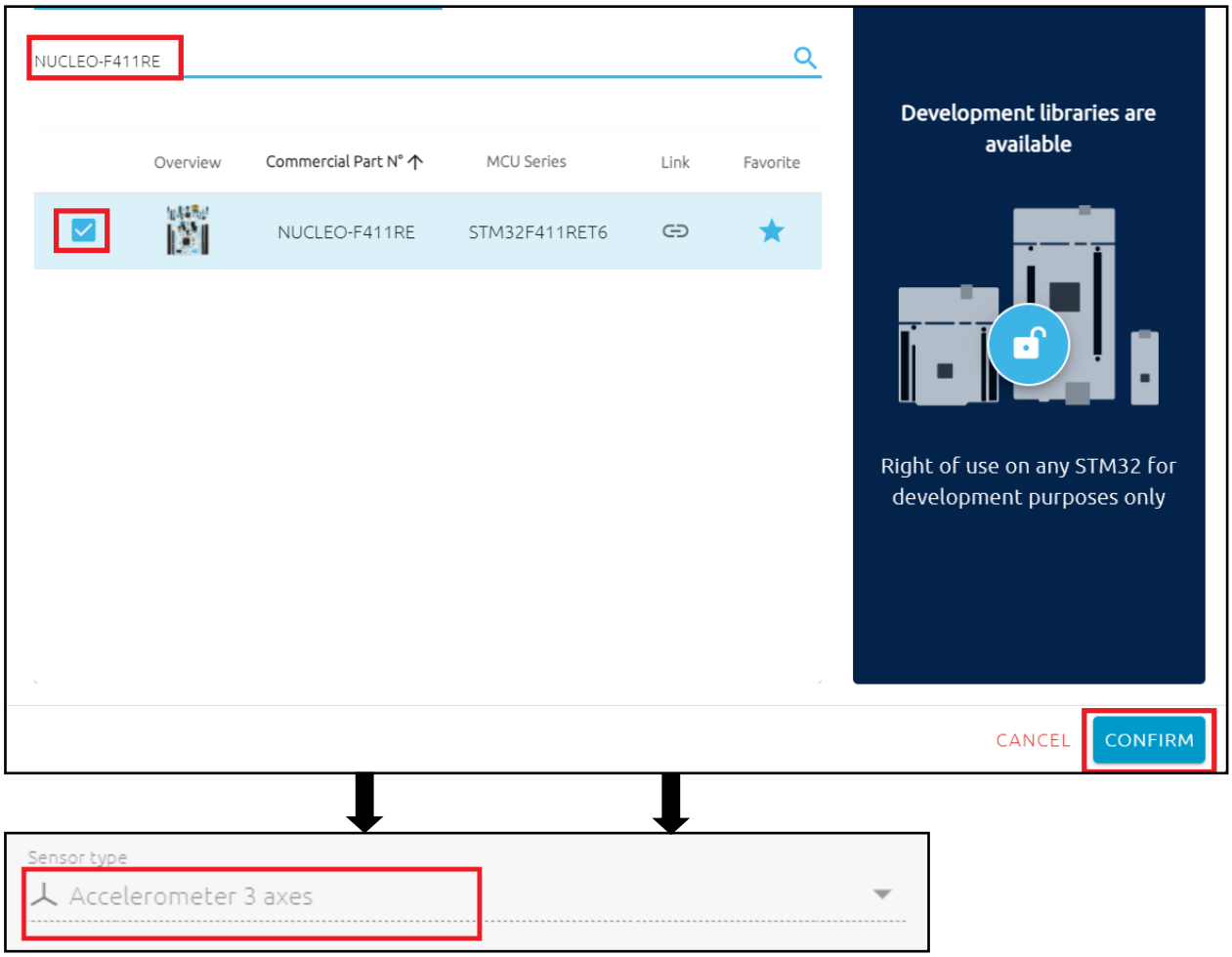
3. A new window will open. On the first step, **Project Settings**, name the project as **Anomaly Detection**. Under **Description** type “To detect the normal and abnormal vibration pattern of fan”.



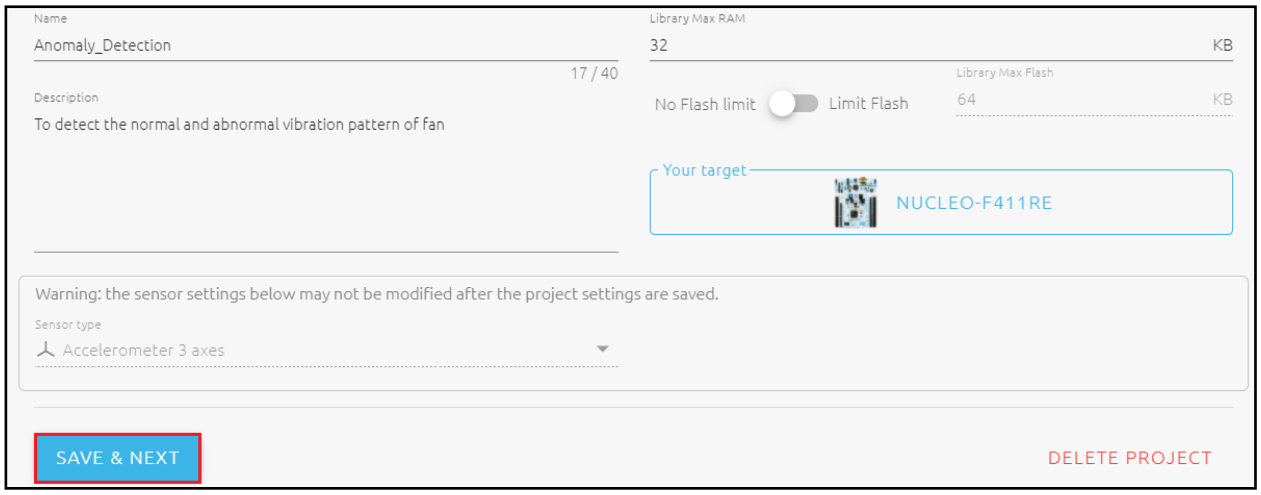
4. Let **Max RAM** and **Max Flash** option remain as default.



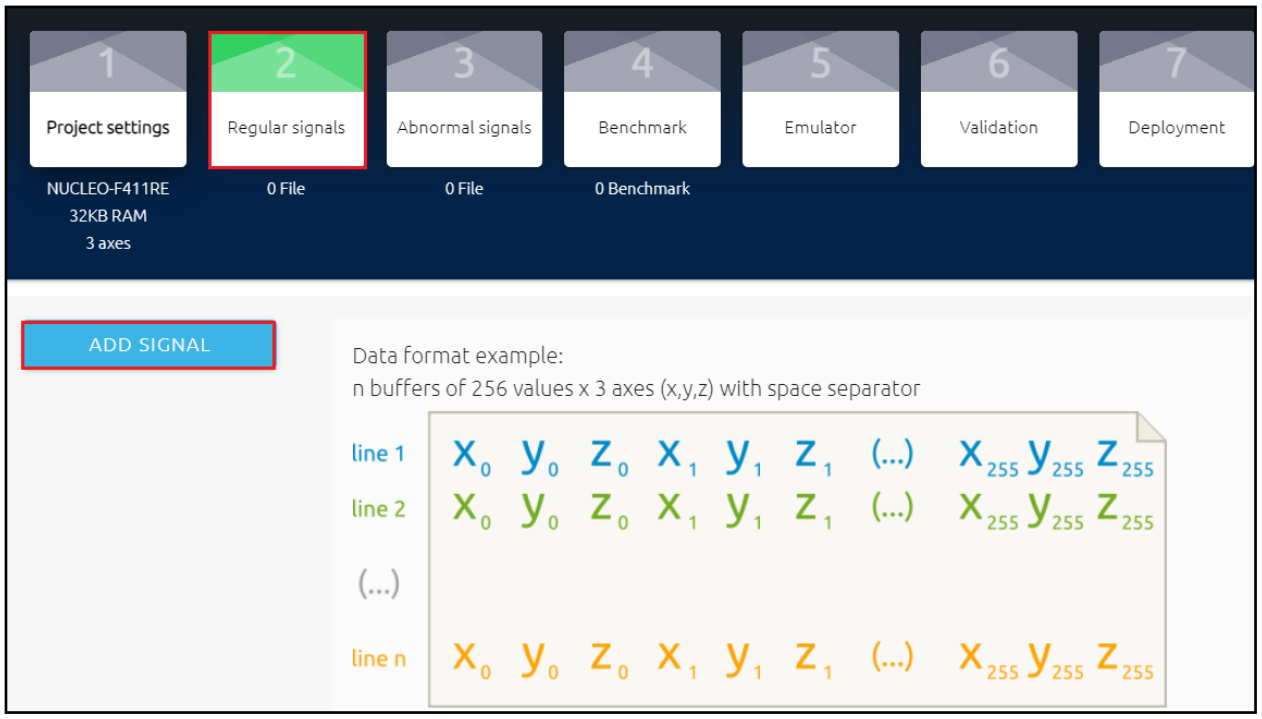
5. In **Target** section, select your proper STM32 Nucleo board. In **Sensor type** section, select the type of sensor you are working with. For this experiment you have to choose **Accelerometer 3-axes.**



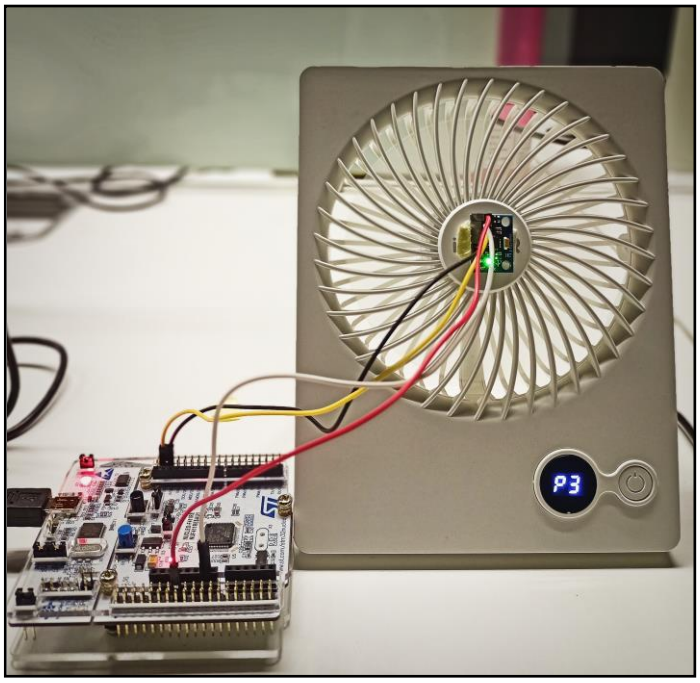
6. Click on **Save & Next** to move onto the next step.



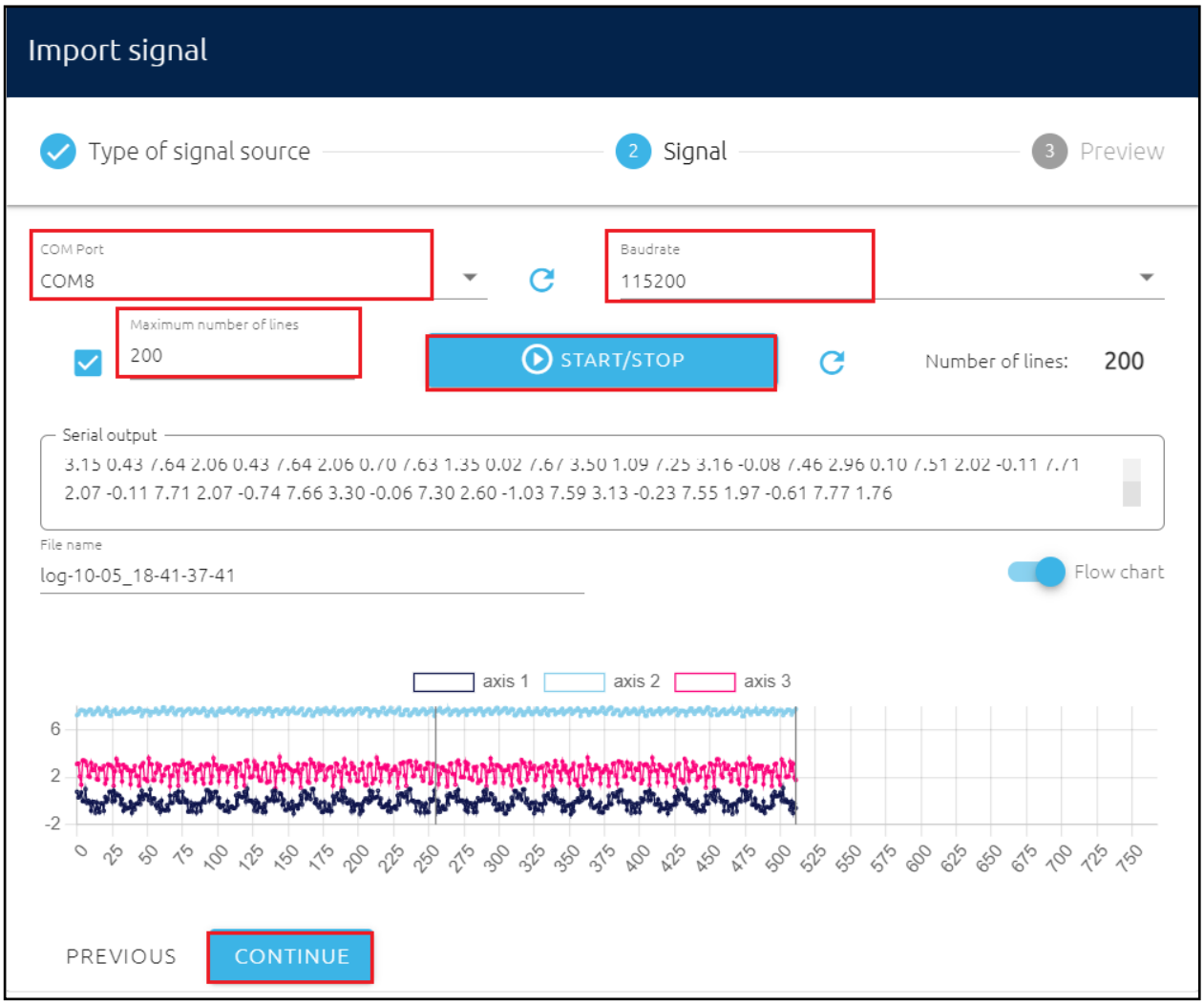
7. In the second step on NanoEdge AI Studio – **Regular Signals**, click on **Add Signals**. A window will open with different source options for you to import signals, select **From Serial (USB)** as we are collecting sensor data connected to microcontroller board, which in turn is connected to your PC through a Serial USB Cable.



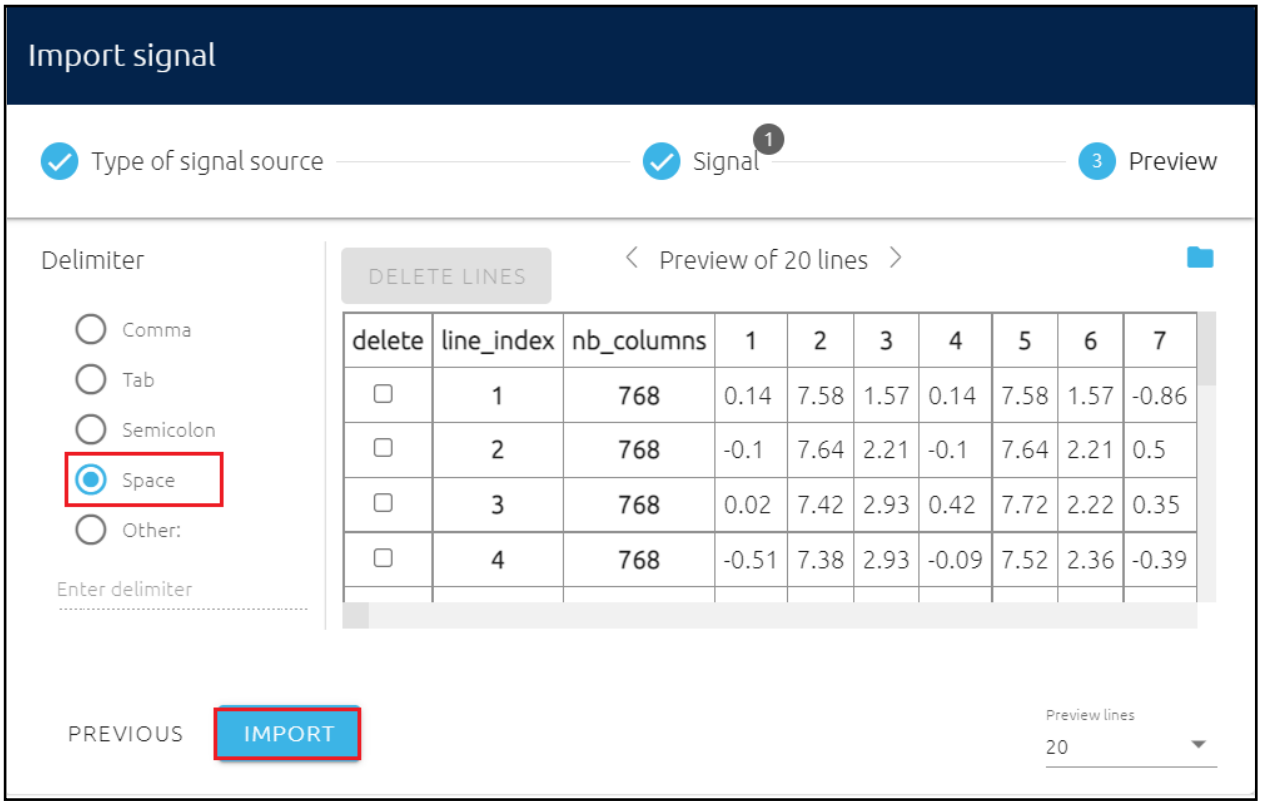
8. Before adding signals, you have to attach your MPU6050 sensor at the middle of the fan for collecting the vibration data from the fan.



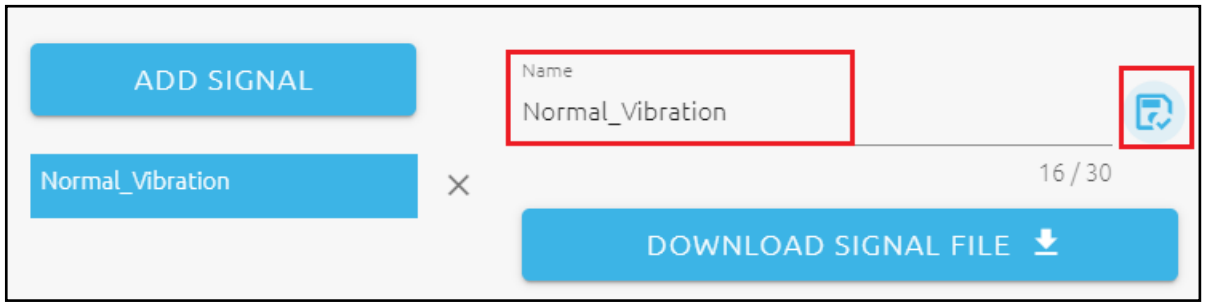
9. Now you can add your signals. In **COM Port** select the correct COM port based on device manager info. Select **Baud rate** as 115200. In **Maximum number of lines** enter the number of lines of data you want to collect. In this case we will collect 200 lines of data. Now turn on the fan and start collecting the vibration data from it.
   Click on **Continue** to move onto importing the vibration samples.



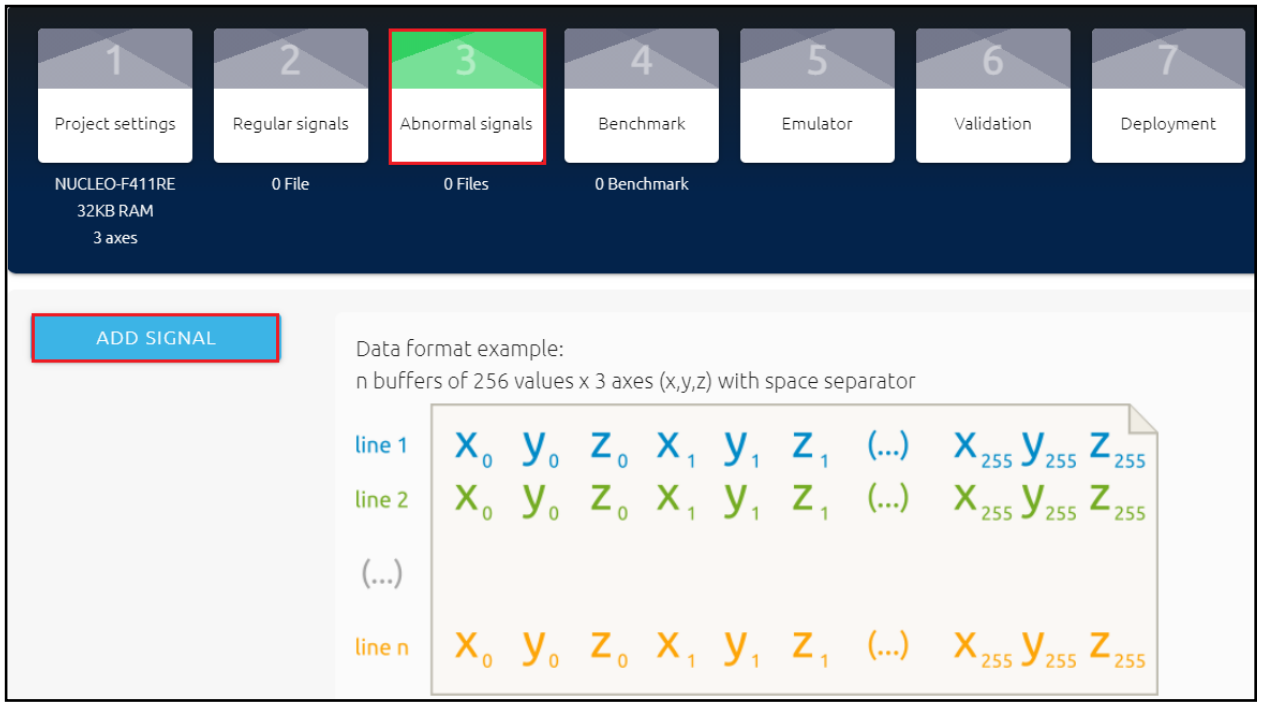
10. In this window, select the **Delimiter** as **Space.** If any line of data has some corrupted values, an error message will be shown under the preview lines. You can select the particular line(s) and delete it. Select **Preview Lines** as 200 to check all the line of data you have collected, and click on **Import**.



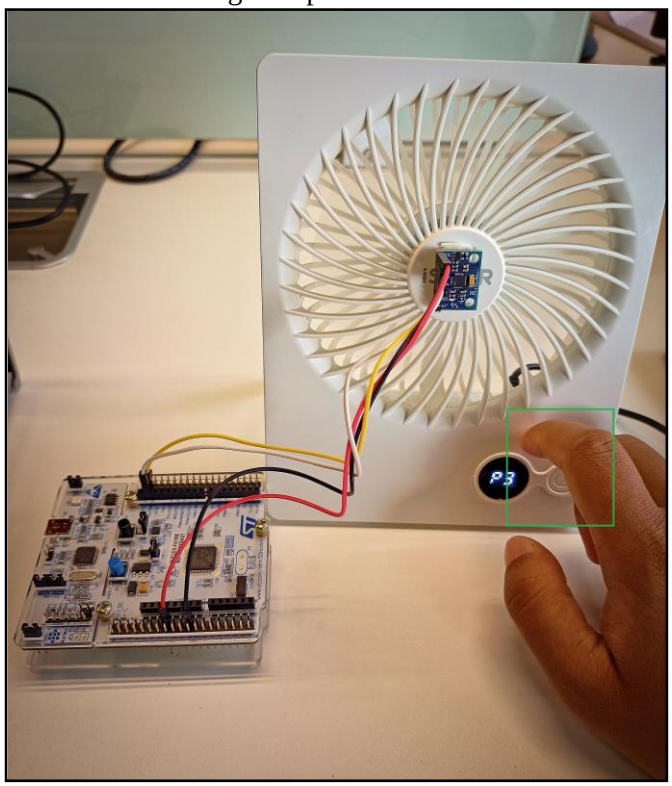
11. In the new window, rename the sample under **Name** as **Normal_Vibration** and click on the **Blue Save Icon** to save the renamed sample.



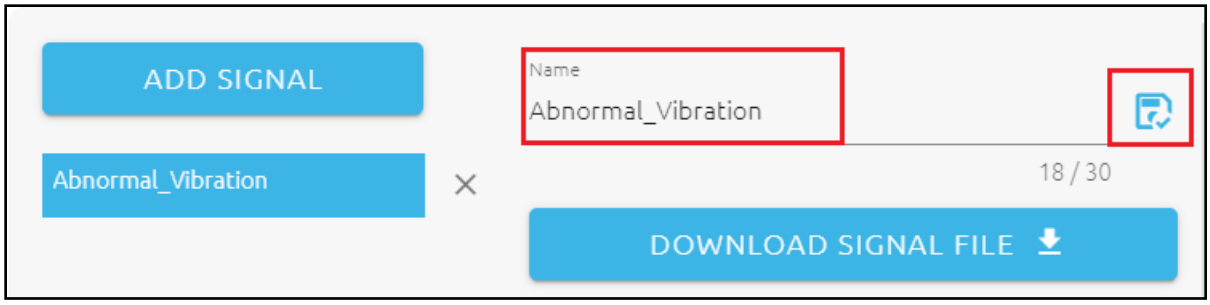
12. Now select **Abnormal Signals** and click on **Add Signal** again.



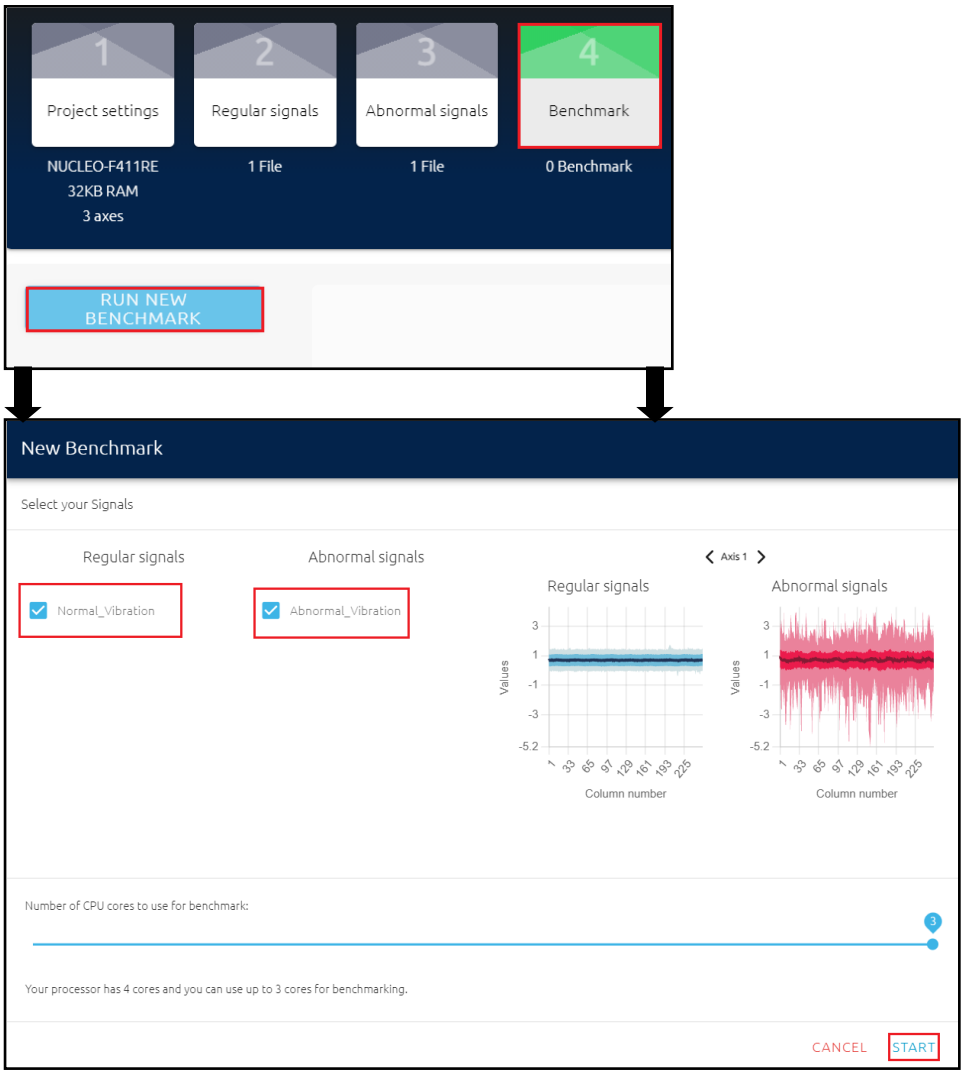
13. Turn on the fan, give some disturbances by your finger and start collecting data for the abnormal vibration. Collecting data process will be same as above.



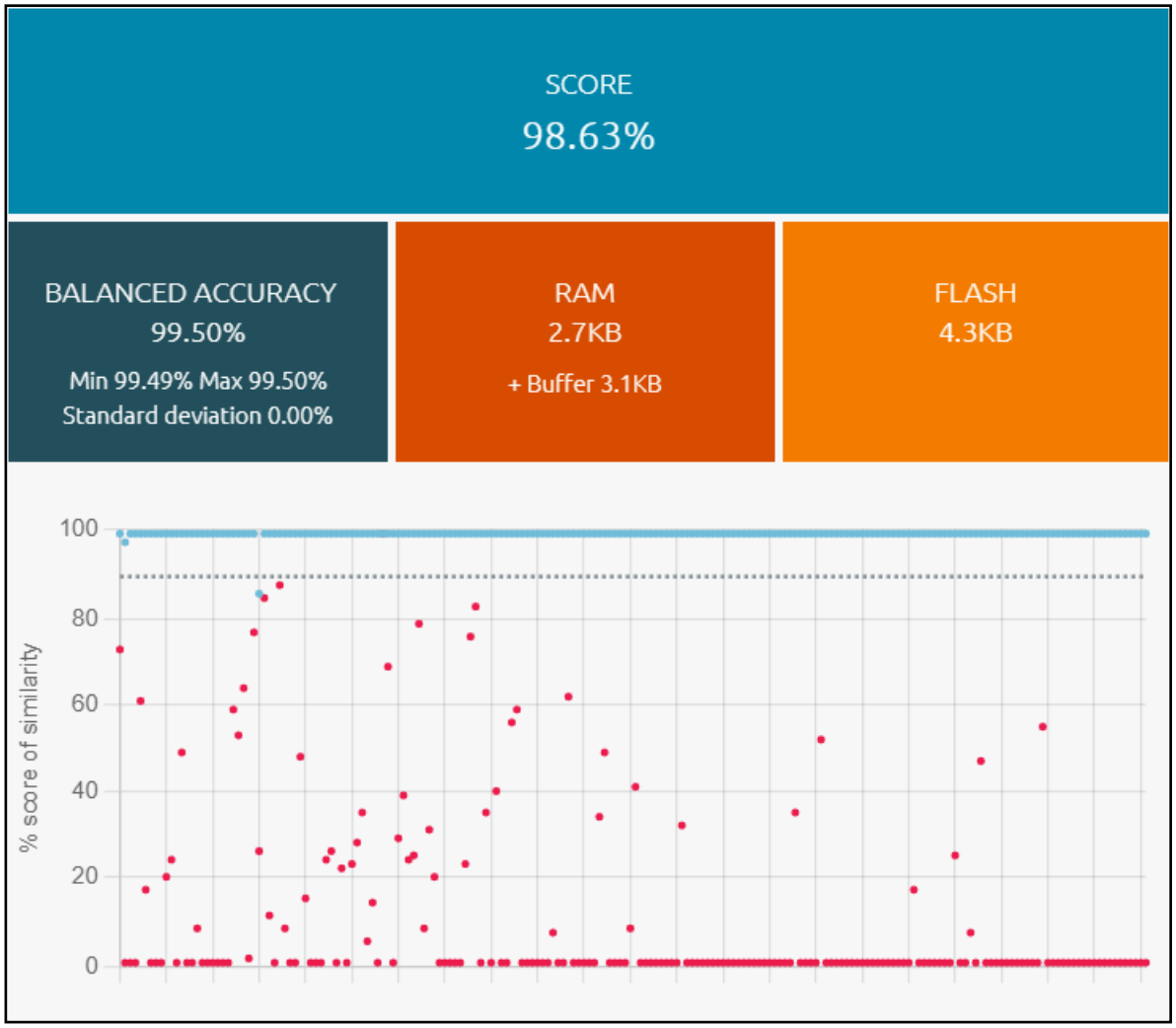
14. Now turn off the fan and name the file as **Abnormal Vibration**.



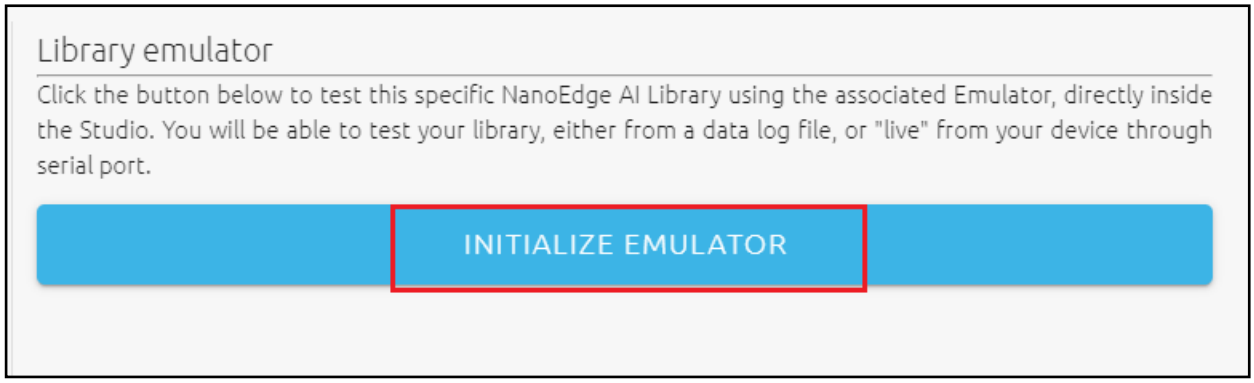
16. In the fourth step of the NanoEdge AI Studio- **Benchmark**, click on **Run Benchmark**. Next select **Regular Signals** and **Abnormal Signals** and click on **Start**.



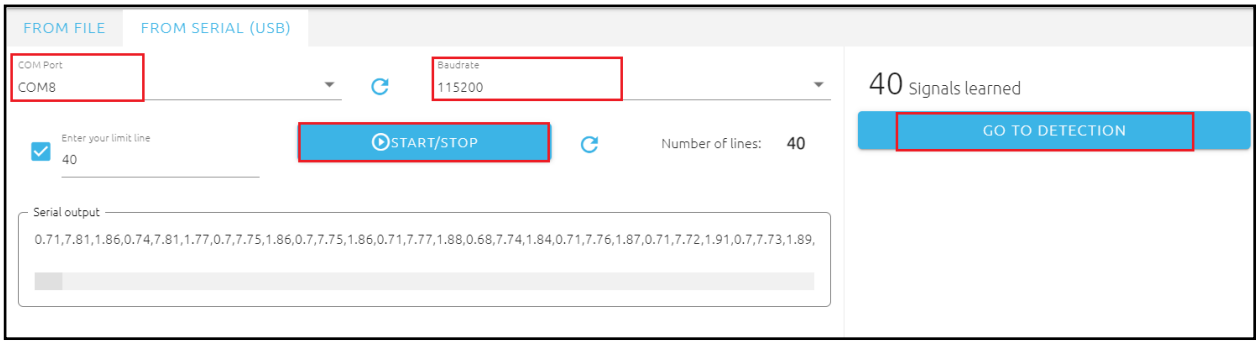
17. After the Benchmark has reached a **Score** of above 95% stop the benchmark process.



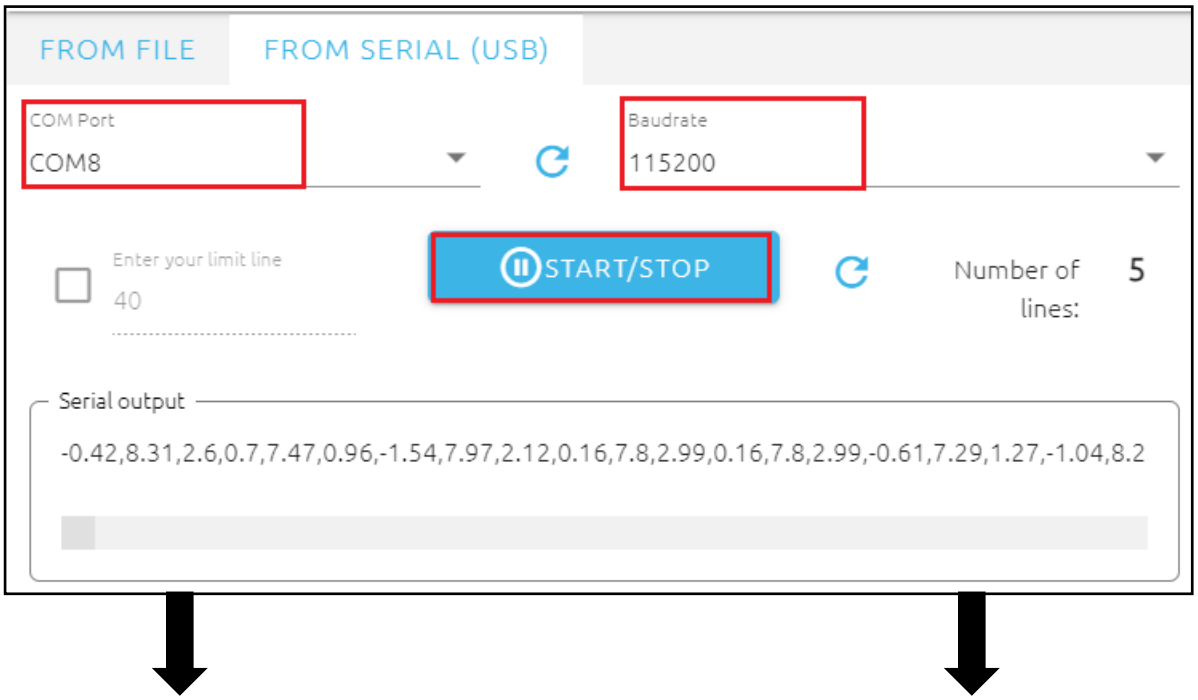
18. After the benchmark process is done, go to the fifth stage, **Emulator**. Click on **Initialize Emulator** to move on to test the library you have selected on the NanoEdge AI Studio.

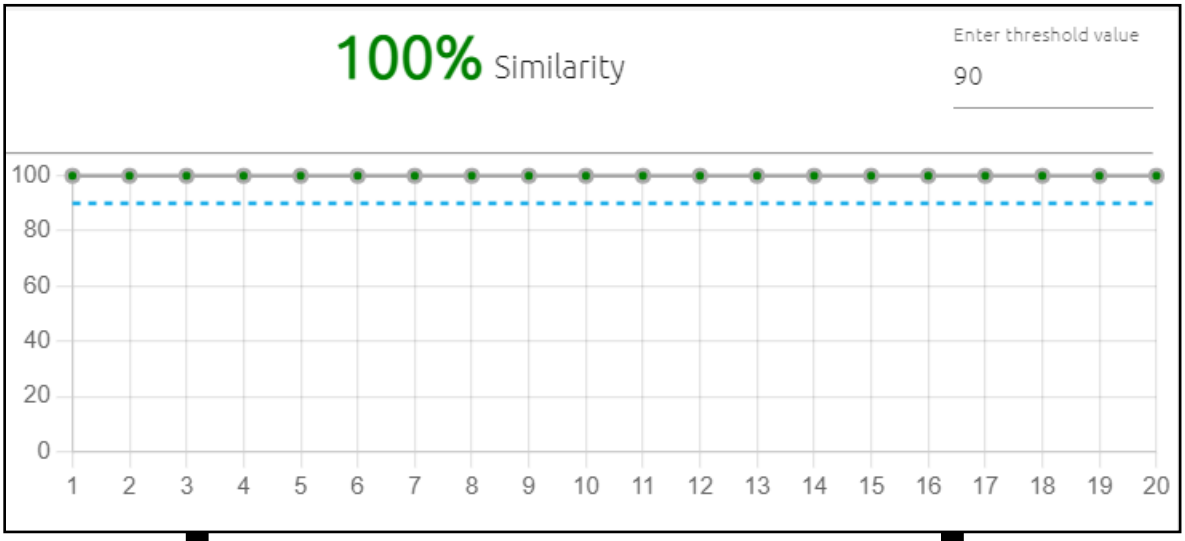


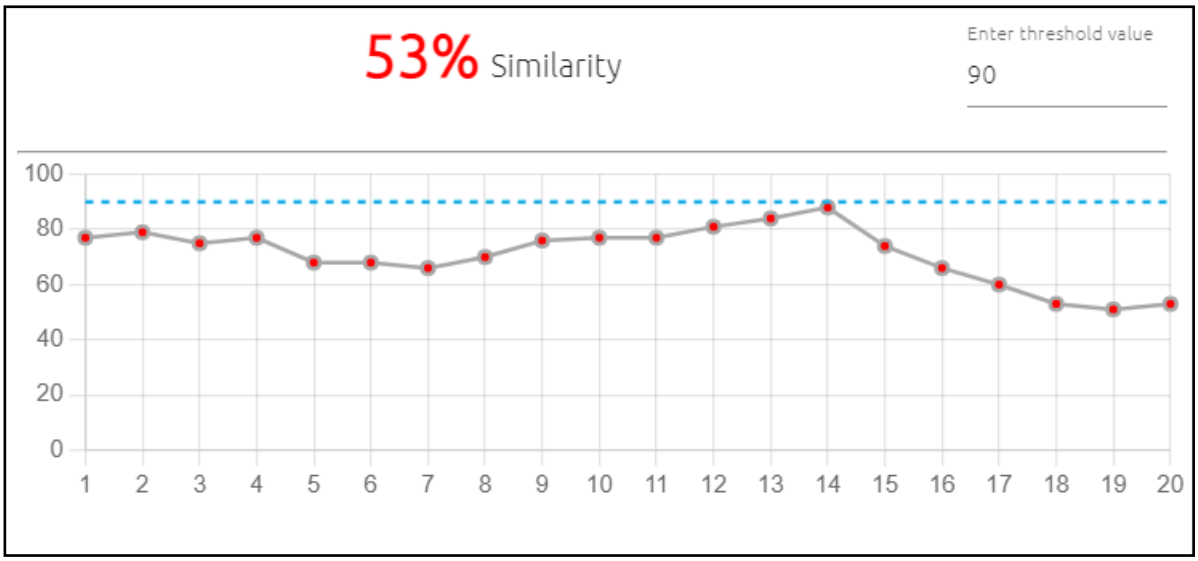
19. In the new window, select **From Serial (USB)**. Select **COM Port** according to info from Device Manager. Select Baud rate as 115200. Keep **the Maximum number of lines** as 40. Start the fan and let the ML Model learn the fan normal vibration for 40 cycles.
Now select **GO TO DETECTION**.



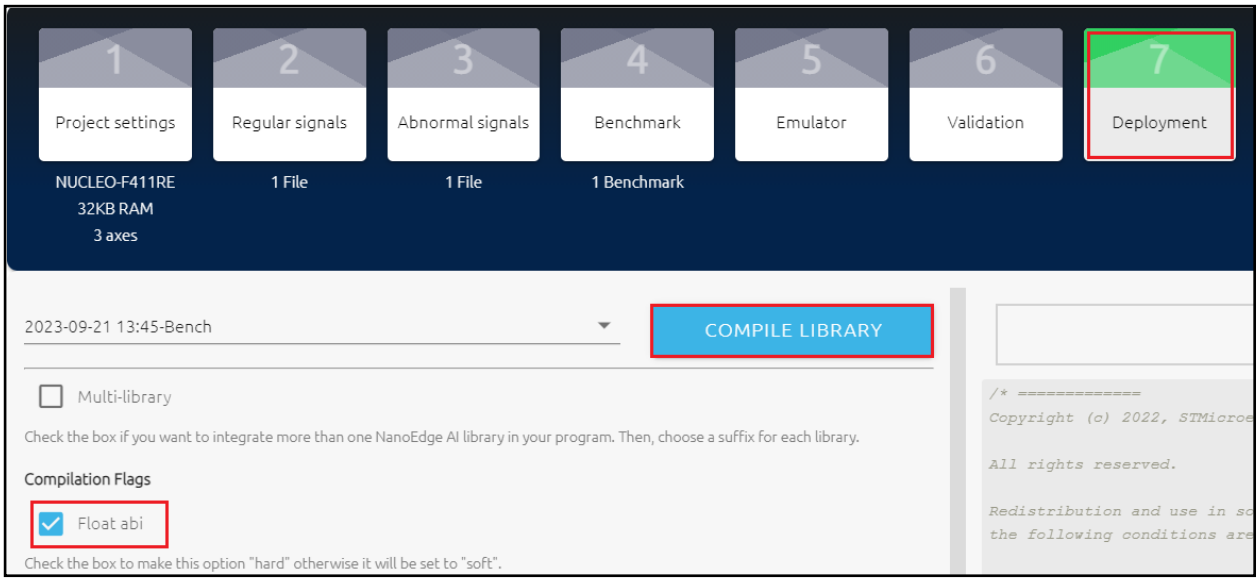
20. In the Detection part, select From Serial (USB). Select COM Port according to info from Device Manager. Select **Baud rate** as 115200. Click on **START/STOP.** So for normal vibration it will show **100% Similarity** and when there is some disturbances on the fan, the similarity score drops down.




100% Similarity
Enter threshold value
90
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20


53% Similarity
Enter threshold value
90
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

21. Finally go to **Deployment** stage, select **Float abi** and click on **Compile Library**. Click on **Get Library**, and save your library on the PC.



Note: All important steps and parts are highlighted with a red colour box for the proper understanding of the user. This document is meant for the use of education purpose only.