ACEIoT

UNIVERSITY of RWANDA

College of Science and Technology

Africa Center of Excellence in Internet of Things (ACEIoT)

Research Seminar

Edge AI-based Respiratory Disease Recognition from Exhaled Breath Signatures

Samson Otieno Ooko
Msc in IoT-WiseNet
Email: ookosoft@gmail.com

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10:00 am to 11:00

Abstract:

Every year, about 4 million people die from respiratory diseases. While early prediction would reduce this mortality rate, till now diagnosis is only done at hospitals involving costly diagnosis resources and scarce healthcare professionals. Ideally, regular noninvasive breath analysis check-ups at home would allow us to anticipate medical consultation. Considering developing country's contexts, existing commercial portable diagnosis kits under proprietary licenses are expensive and require internet connectivity to work.

Thanks to recent advances in open source edge AI frameworks, this study presents a prototyping design of an offline STM32 based portable kit locally embedding a tiny Machine Learning (TinyML) trained model to predict respiratory disease. Evaluated on an open dataset of Chronic Obstructive Pulmonary Disease (COPD), the resulting real-time requirements of our edge AI model is 15.9 Kb of ROM and 1.5 Kb RAM and performs the inference in 1 ms. Results also show that the accuracy and peak memory for the model are affected by preprocessing, type of sensors and the number of sensors.

In addition to early detection of respiratory diseases, the proposed solution will be of great value in the process of mass collection of exhaled breath data to enable the training of efficient AI models for respiratory diseases.