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# Cognitive electronic unit for assisted ultrasound: preliminary results and future perspectives

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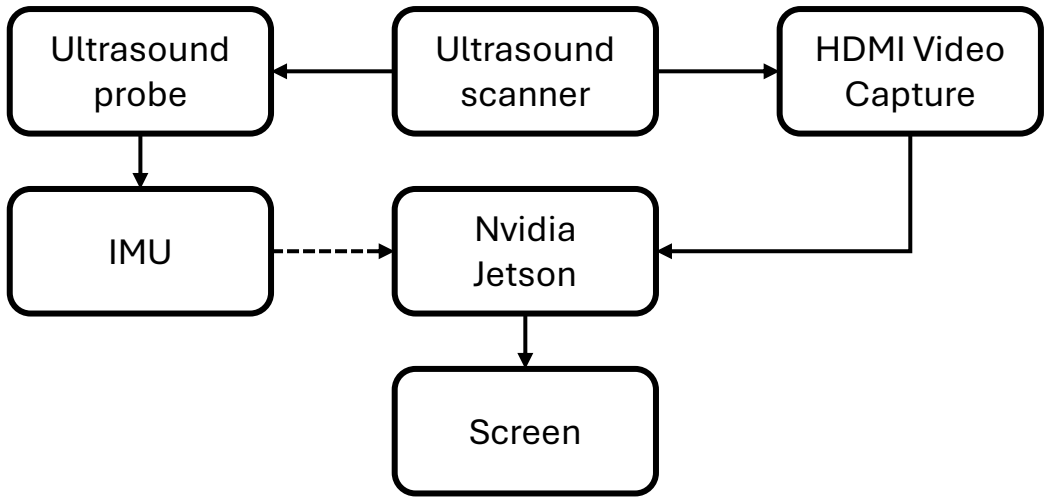
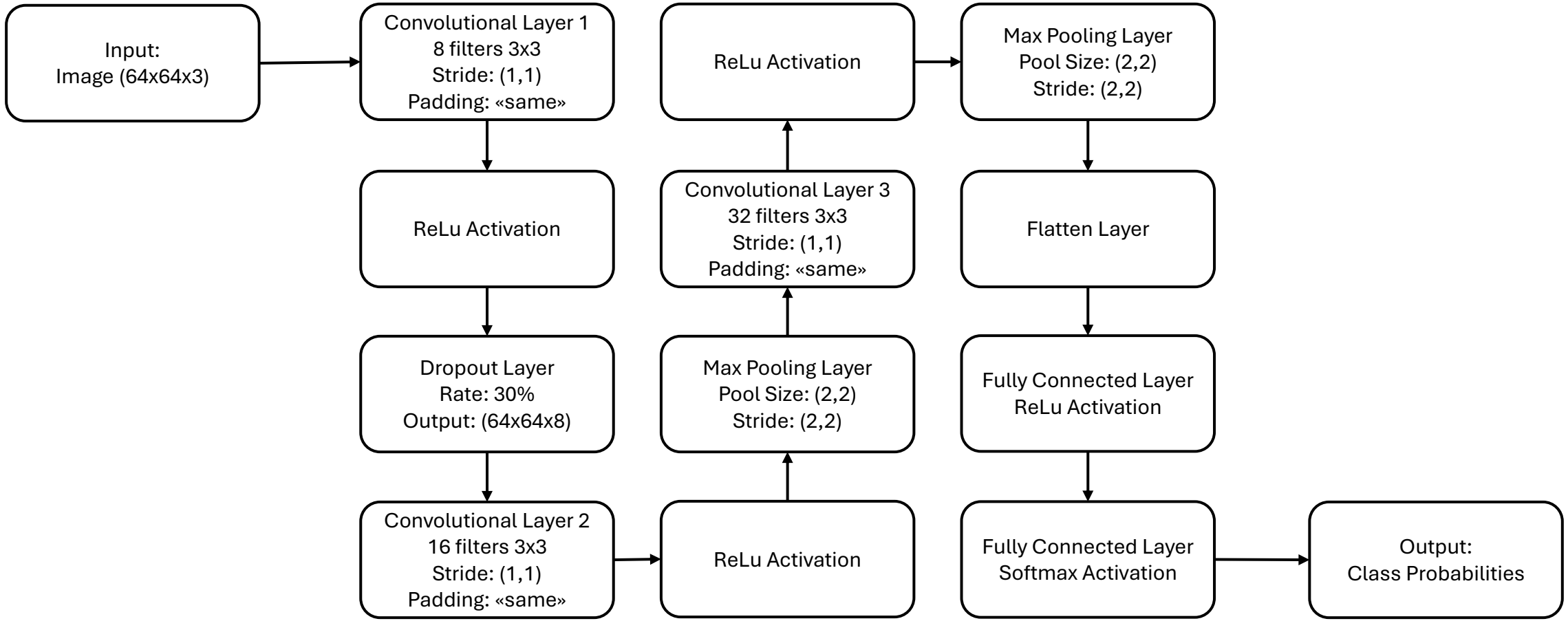
# Hardware setup and Neural Network model

To develop a cognitive electronic unit for assisted **echocardiography**. It must provide real-time information on image quality, probe movement and cardiac view/projection.




The **convolutional neural network**, trained on a public dataset, classifies automatically and in real time echocardiographic images into 'Apical projection with 2 chamber view (**2CH**)', 'Apical projection with 4-chamber view (**4CH**)', and '**Unknown**', with the latter including all non-classifiable images.

# Neural Network model



# Preliminary results and conclusions

The neural network has been tested on 1040 images.

| | Precision | Recall | F1 score |
|---|---|---|---|
| 2CH | 0.86 | 0.79 | 0.82 |
| 4CH | 0.81 | 0.88 | 0.85 |
| Unknown | 1.00 | 0.97 | 0.99 |
| Accuracy | | 0.85 | |

To verify the performance on the embedded hardware, the **ultrasound video stream has been acquired** during an echocardiography performed on a volunteer. The cardiac view contained in each frame in real time has been classified in real time.
During the test, the **CPU** and its temperature has remained stable around **55.5 °C**, and the **RAM** usage has been approximately **70 %**. The **average inference time** for a single frame has been measured at **13.74 ± 2.48 ms**

The next essential step involves the comprehensive collection of a **dataset** and collaboration with sonographers for accurate frame **labelling**.

# Thank you for your attention!