## Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

Classification of Arrhythmia by Using Deep Learning with 2-D ECG Spectral Image Representation.

The electrocardiogram (ECG) is one of the most extensively employed signals used in the diagnosis and prediction of cardiovascular diseases (CVDs). The ECG signals can capture the heart's rhythmic irregularities, commonly known as arrhythmias. A careful study of ECG signals is crucial for precise diagnoses of patients' acute and chronic heart conditions. In this study, we propose a two-dimensional (2-D) convolutional neural network (CNN) model for the classification of ECG signals into eight classes; namely, normal beat, premature ventricular contraction beat, paced beat, right bundle branch block beat, left bundle branch block beat, atrial premature contraction beat, ventricular flutter wave beat, and ventricular escape beat. The one-dimensional ECG time series signals are transformed into 2-D spectrograms through short-time Fourier transform. The 2-D CNN model consisting of four convolutional layers and four pooling layers is designed for extracting robust features from the input spectrograms. Our proposed methodology is evaluated on a publicly available MIT-BIH arrhythmia dataset. We achieved a state-of-the-art average classification accuracy of 99.11%, which is better than those of recently reported results in classifying similar types of arrhythmias. The performance is significant in other indices as well, including

sensitivity and specificity, which indicates the success of the

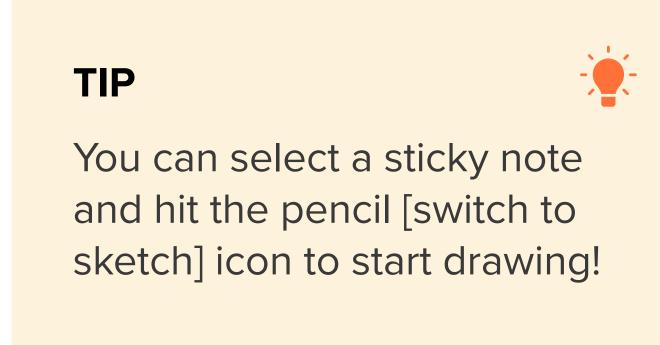
proposed method.



## Brainstorm

Write down any ideas that come to mind that address your problem statement.





Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

① 20 minutes

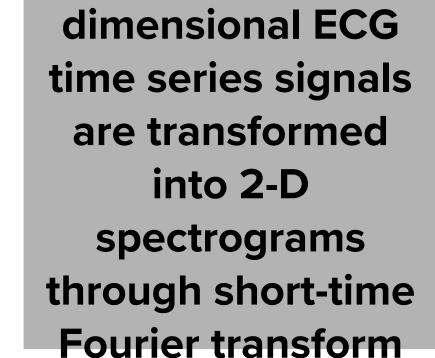
Group ideas

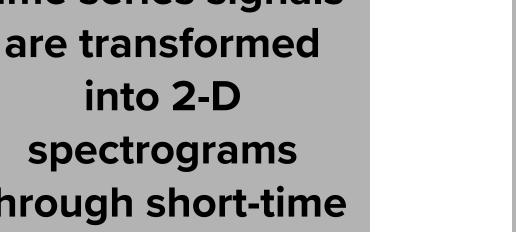
### **KARTHIKA T**

In this study, we

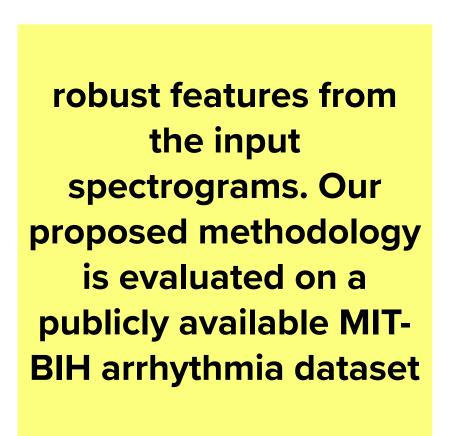
ARCHANA P

atrial premature





# HARI JYOTHIKAA J P



**KEERTHANA P** 

We achieved a state-of-the-art accuracy of 99.11%, which is better

in other indices as

well, including

model are the batch size of the data

the best accuracy in the

. An arrhythmia does not necessarily mean that the heart is beating too fast or slow, it indicates that the heart is following an irregular beating pattern

According to the **World Heart** fourths of the total CVD deaths are among the middle and low-income segments of the society

> A classification mode to identify CVDs at their early stage could effectively reduce the mortality

the heartbeat known as

. It could mean

that the heart is

beating too

fast—tachycardia

(more than 100

beats per minute

over 17 million people

known to lose their

## Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

① 20 minutes



