



# Paroxysmal Atrial Fibrillation Events Detection

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# Introduction

**Motivation:** Atrial fibrillation (AF) is the most frequent arrhythmia, but paroxysmal atrial fibrillation (PAF) often remains unrecognized.

**Objectives and goals:** My goal is to develop an algorithm that search the AF episodes in dynamic ECG records.



# Methodology

## The data I used:

The data is recorded from 12-lead Holter or 3-lead wearable ECG monitoring devices.

The training set consists of 1436 records extracted from the Holter records from 49 AF patients (23 PAF patients) and 56 non-AF patients (usually including other abnormal rhythms).

# Methodology

The data I used:

```
{'record_name': 'data_13_11',  
  
 'sig':  
  array([[4.99201085, 5.28203287],  
         [5.00000754, 5.2850044 ],  
         ...,  
         [5.15999049, 5.63703712]]),
```

```
'sig_len': 45803,
```

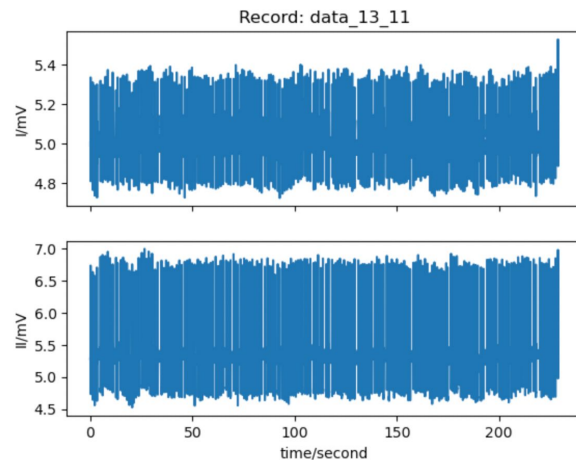
```
'fs': 200,
```

```
'beat_loc': array([ 0, 30, 243, ,  
                  45773, 45802]),
```

```
'af_start_scripts': array([0]),
```

```
'af_end_scripts': array([202]),
```

```
'class_true': 1}
```





# Methodology

## Tools I used:

Python waveform-database package for data analysis

Biosppy for ecg processing

Tensorflow Keras for modeling



# Methodology

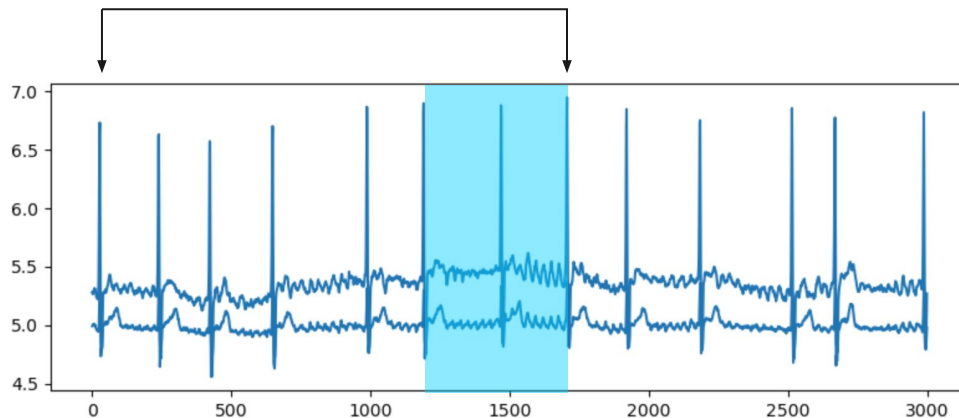
How I used the data:

1. Select record name, signals, fs, beat locations, af start scripts, af end scripts and class true features and save them into a list of dictionaries.
2. Filter the signals and get all r-peaks of the ecg records using Biosppy



# Methodology

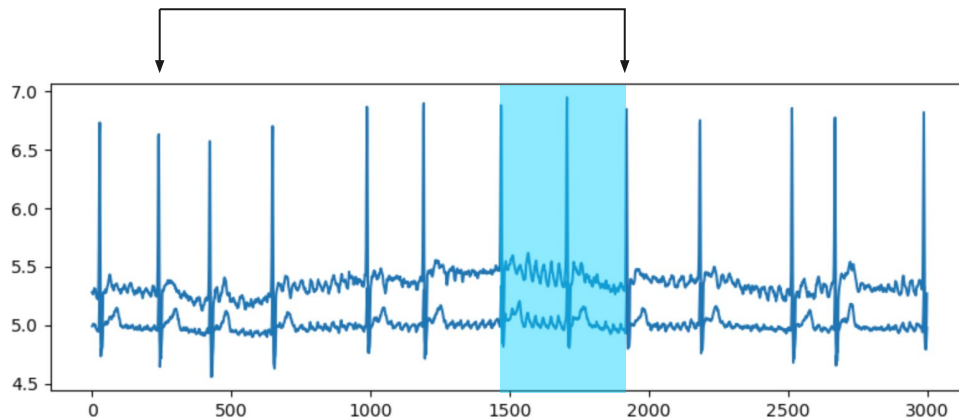
How I used the data:





# Methodology

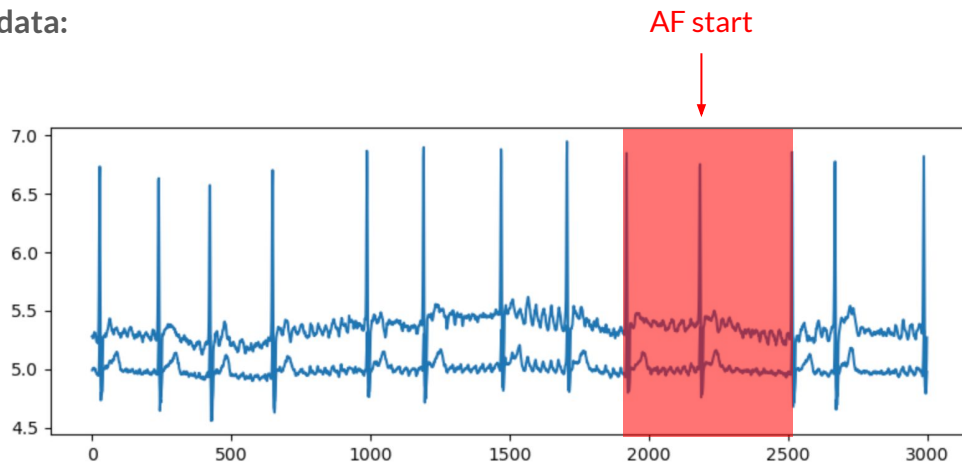
How I used the data:





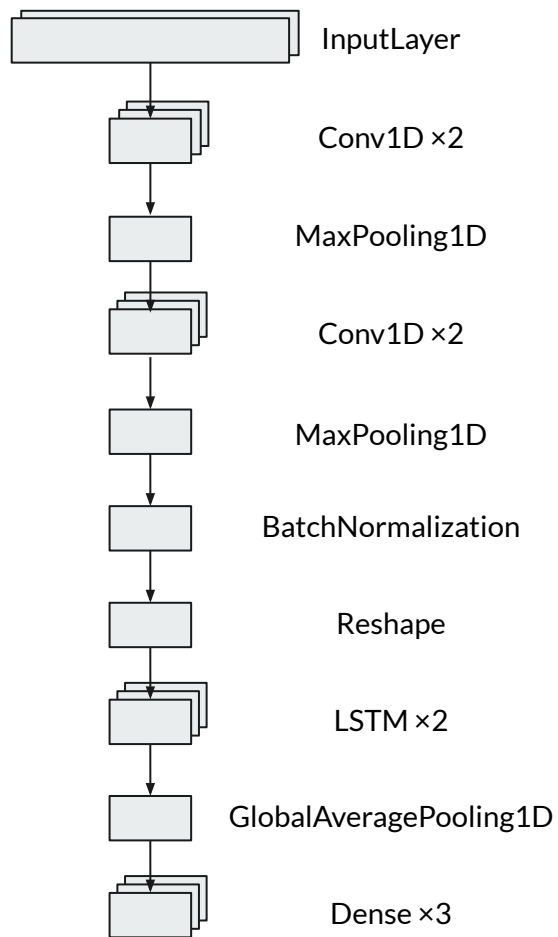
# Methodology

How I used the data:



# Methodology

CRNN model:





# Results

Hyperparameters:

- Batch size: 20
- Epochs: 10
- Loss function: categorical\_crossentropy
- Optimizer: adam
- Metrics: accuracy



# Results

Best result on the 4th epoch:

On validation set:

- Accuracy: 0.953
- Loss: 0.193

On test set:

- Accuracy: 0.953
- Loss: 0.128



## Conclusions

In the past, we would only be able to detect atrial fibrillation. Now we can detect paroxysmal atrial fibrillation period which is of great value for AF surgery options, drug intervention and the diagnosis and treatment of various clinical complications.



## Future Work

1. To expand the dataset and train on more data and epochs.
2. To keep tuning the model to make better predictions.



**Thanks for your attention!**