ECG BEAT CLASSIFICATION BASED ON 1-D CONVOLUTIONAL NEURAL NETWORKS

Lahcen EL bouny, Mohammed Khalil, Abdellah Adib

Laboratoire d'Informatique de Mohammedia, FSTM-Université Hassan II -Casablanca, Maroc

INTRODUCTION

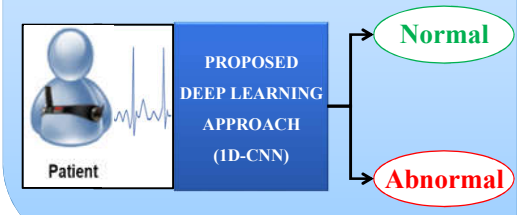
ECG processing is a non-invasive technique that is frequently used for diagnosis of various cardiac diseases. In this work, we propose a new method for ECG beat classification based on Deep learning approach using specially the One Dimensional Convolutional Neural Network (1-D CNN). In our scheme, 1-D CNN was used in order to classify four types of heartbeats, which are Normal (N), Premature Ventricular Contraction (PVC), Left Bundle Branch Block (LBBB), and Right Bundle Branch Block (RBBB). The experimental results obtained on MIT-BIH Arrhythmia database (MITDB), show that the proposed system yields very acceptable performances.

MOTIVATION & OBJECTIVE

✓Cardiovascular Diseases are the first cause of death in the world;

✓ 17.3 millions deaths per an (OMS).

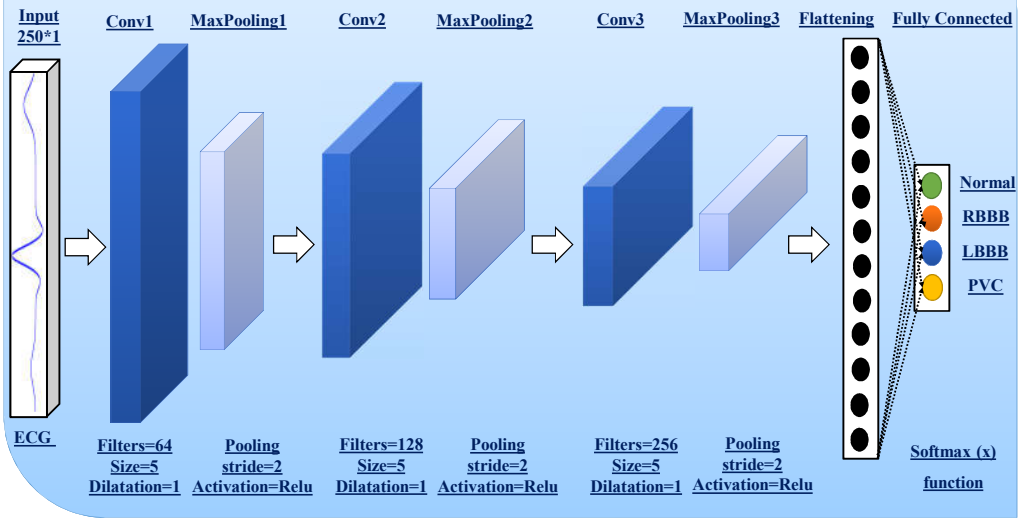
→ **Automatic diagnosis of Heart Diseases.**



DATASET & DEVELOPMENT ENVIRONMENT

- **ECG database : MIT-BIH Arrhythmia database [http://www.physionet.org].**
- 17000 Normal ECG records.
- 20000 Abnormal ECG records : 5000 PVC, 7000 RBBB, 8000 LBBB.
- Programmation language : Python.
- Environment : Tensorflow, Keras.

DEEP LEARNING APPROACH



RESULTS

❑ **Parameters Setting :**

Model	Parameters	Training data	Testing data
1D-CNN	Number_Epoches=**10** , Batch_size=**32** , Metric=**'Accuracy'**, Loss_function= '**categorical_crossentropy**', Optimizer='**Adam**' , Learning_rate=**0.0001**	80 %	20 %

❑ **Model performances :**

Model	Training_Accuracy (70% of training data)	Validation_Accurcay (30 % of training data)	Testing Accuracy (Testing data)
1D-CNN	98.20 %	99.40 %	99.51 %

❑ **Our experimental results demonstrate high classification performances**

CONCLUSION & PERSPECTIVES

- An ECG classification method based on **deep learning (CNN)** paradigm is presented;
- The proposed approach yields **very promising performances**;
- **In a future work**, our aim is to test the 1D-CNN for other heartbeats classes.

REFERENCES

[1] O. Faust, Y. Hagiwara, T. Jen Hong, O. Shu Lih, and U. R. Acharya, "Deep learning for healthcare applications based on physiological signals: A review," *Comput. Methods Prog. Biomed.*, vol. 161, pp. 1–13, 2018.