An Algorithm for Differentiating Abnormal Heartbeats

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Abstract

The medical field is teeming with new technology and, in many ways, the medical fields' advancements have aided more efficient treatment. Despite this, physicians still rely on old techniques such as stethoscopes to detect heart abnormalities. The main problem with this method is the subjectivity of physicians' opinions. We've automated this process by creating an algorithm for a convolutional neural network which allows AI to differentiate normal heart beat sounds from abnormal sounds. In using this algorithm, we can form a standardized method by which doctors detect and diagnose heart diseases. Future studies should explore the difference in accuracy between algorithms and physicians.

Results

While the algorithm training is ongoing, we can expect with each additional training that its accuracy in differentiation will become more precise. By using existing heart files to create synthetic heart data for training, the algorithm's accuracy with different heart sounds will increase. The results for this algorithm are preliminary and a more detailed report can be concluded after more extensive training.

Methods

Pre-Training

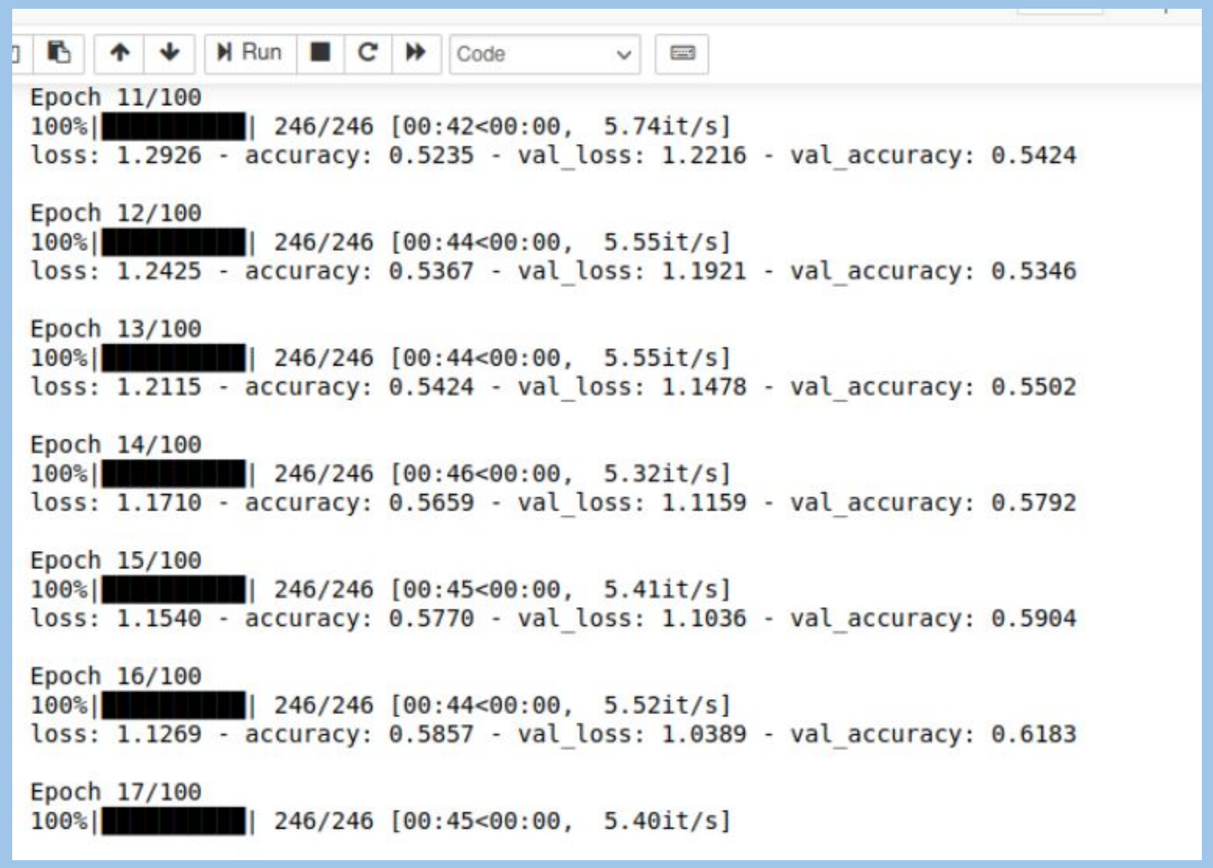
- Initial algorithm pre-trained on a variety of sounds from street sounds to dogs barking
- These sounds were used to train the algorithm to differentiate general noises and use them as a basis for sounds heard in the heart audio files

Training

- We collected 25 samples per class of heartbeat rhythm categorized by type of rhythm
  - Each sample was spliced into a 4-second audio file
- There were 3 iterations of the training cycle
- Algorithm was tasked with differentiating between normal and abnormal heartbeats
- There were 23 classes of abnormal and normal heartbeats used
- In total, 1656 audio files were used for training
- A convolutional neural network was used to create the synthetic heart sounds

Discussion

The standardization of diagnosis methods remains an important advancement needed in the medical field. While the results of our algorithm were preliminary, further tests will yield more accurate results. Future tests should study if the assistance of this algorithm decreases the amount of misdiagnoses by doctors. As the algorithm continues training, it's possible that it could become a tool used to differentiate types of abnormalities. Additional training is required to confirm the algorithms ability to handle more specifications.



References

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