



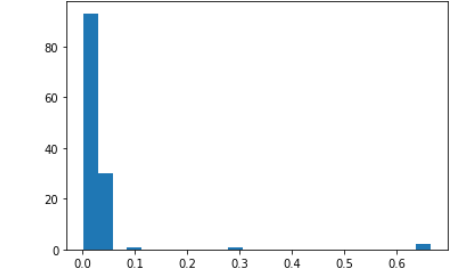
# Laurenz Hundgeburth

## NeuraBeats

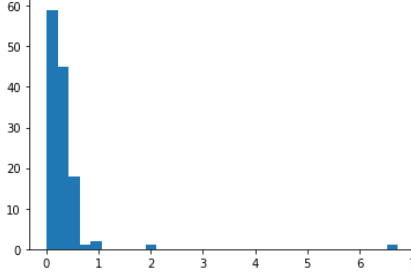
Beat Detection Challenge

2022

coefficient of variation of the distances between beats in the training set

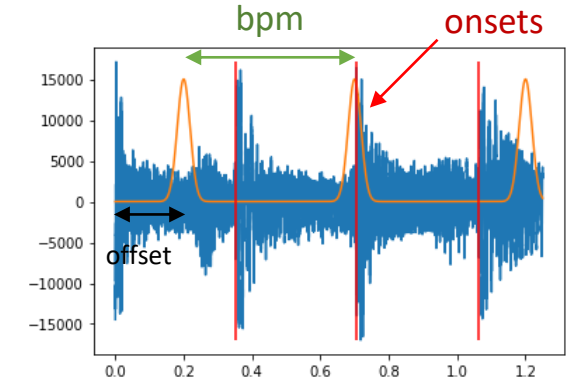


time to first beat



### Plan:

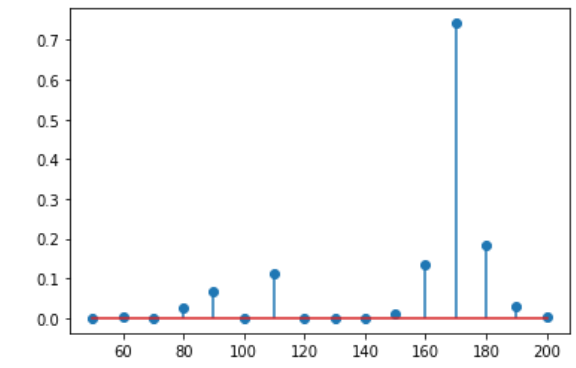
Utilize the onset predictions from the last challenge and distinguish beats from onsets based on a search of the tempo, that delivers the best fit when sampling my proposed signal.



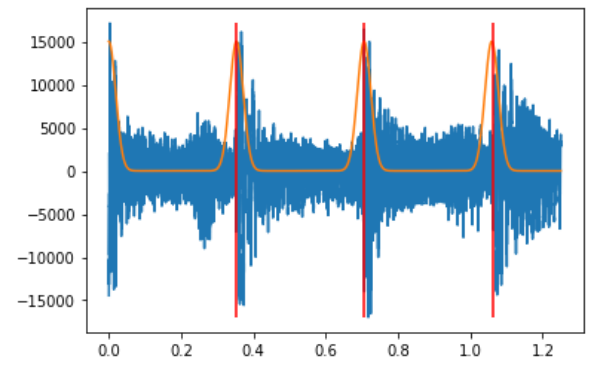
### Concept to measure periodicity while allowing for some deviation:

1. Calculate 4 inter-onset-intervals cluster centers with kmeans
2. Create a pulse **train of gaussian signals** with **bpm** values around the clusters and a range of **offset**
3. Calculate a **score** by sampling this signal with the onsets and divide this number by the number of pulses to get the average score per pulse
4. Find the combination with the highest score
5. Determine which onsets are beats by **discarding onsets** which are to far away from the pulses

Search for the highest scoring bpm value for each track (offset held constant here)



Taking the bpm value leading to the highest score and filtering onsets produces good beat predictions (in this example)



### Cons:

- Horribly slow
- Offline analysis
- Only as good as onset predictions
- Based on constant tempo assumptions

### Results:

Test set beat  
F1 score  
**0.184**