- We created multiclass classification models to classify CTG features into the three fetal health states :
  -Normal
  -Suspect
  -Pathological
  - labels= 1-> Normal, 2-> Suspect, 3-> Pathological.

- We chose KNN, SVM, ANN and Random Forest to solve this problem and tested them to see which one would be almost the best to deal with the issue and categorize the CTG features into 3 classes.

- The reasons for our choice these models:

KNN	**SVM**	**ANN**
● The main advantage of KNN over other algorithms is that KNN can be used for multiclass classification. That’s first thing making us think to use KNN. ● Few hyperparameters to tune. ● KNN mainly involves two hyperparameters, K value & distance function.	● SVM take cares of outliers better than KNN. ● SVM is more effective in high dimensional spaces. ● SVM is relatively memory efficient. ● SVM works relatively well when there is a clear margin of separation between classes, so we did standardization, normalization and scaling on data to achieve that and did the same with the others models also to see how this affects.	● These networks can learn from examples and apply them when a similar event arises, making them able to work through real-time events. ● Even if a neuron is not responding or a piece of information is missing, the network can detect the fault and still produce the output. ● They can perform multiple tasks in parallel without affecting the system performance, and this helps when have large data.

- Results:

Models	**Accuracy**			
	Without standardization	**With standardization**	**With normalization**	**With scaling between [1, -1]**
SVM	0.84	0.91	0.925	0.925
ANN	0.798	0.873	0.887	0.915
KNN	0.887	0.887	0.906	0.906

Note :

- KNN is used with n_neighbors=10.
- SVM with decision_function_shape='ovo' built in method for making it multiclass classification.
- ANN with 3 hidden layers, they have the same number of nodes= 8, and solver='adam' for weight optimization with max_iterations=1000 & activation function= 'relu'.
- We applied standardization, normalization and scaling gradually to see their influence together.