**Timeline and planning for revising the paper**

**April 22 – May 10**

1. I have put the paper on the overleaf platform again because it is a common site that everyone can use to modify the paper, without changing the IEEE formatting.
2. I revisited journal papers explaining the 8 machine learning models, and I am in the process of rewriting the discussion and conclusion. I could have explained differences between the models in a more precise manner. For example, the terminology that I used for comparing the models is confusing from a modeling perspective. I choose 'optimization based-model' vs 'decision-tree model' because l wanted to focus on the structure of the algorithms not considering the estimated parameters. But, the estimated parameters of all the models are estimated using optimization (gradient descent), so I can see why reviewer 1 says the work is 'Partially' technically sound and comprehensive.
3. I have identified two deep learning models used for time-series data, LSTM and Transformer Attention models. I used a simplistic deep learning 2-layer model because I wanted to compare model architecture with respect to features, but this appears to no-longer be interesting in top Data Science research journals. Many newer papers implement a more complex Deep learning model architectures of existing models. LSTM/ Transformer Attention will also tell us about the time-delay needed to respond, we can modify a memory parameter in the model and it tells us how much past information is needed for the prediction. 1D CNN has been used in many papers, therefore perhaps it maybe less interesting to implement for our dataset and we would not learn about timing information.

**May 11 – 20**

* Email the group and tell them about the planning and timeline, and ask for their advice. If they quickly want to participate in the literature review for feature and model selection.
* Finish reading the journal papers to find the best fequency features, because the frequency features that we use are too simplistic. Below are paper that I have found that will help me to select a reasonable feature.

1. Human Activity Recognition using Continuous Wavelet Transform and Convolutional Neural Networks – Nedorubova\_2021\_CWT\_CNN\_HumanActivity

2. Human Activity Recognition on Smartphones Using a Multiclass Hardware-Friendly Support Vector Machine : Anguita\_2012\_HumanActivity (frequency components - SVM)

3. Novel Approaches to Activity Recognition Based on Vector Autoregression and Wavelet Transforms : AbduAguye\_2018\_Wavelet (autoregression coefficients, Discrete Wavelet Transform – RF, CCA, Deep Forsts (gcForest), nearest-neighbor (ProtoNN) )

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* Finish reading the journal papers to identify the most current Deep Learning models for human movement data

1. LSTM-CNN Architecture for Human Activity Recognition – Xia\_2020\_LSTMCNN.pdf

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* Finish reading the journal papers recommended by reviewer 2

1. An, Sizhe, et al. "Mgait: Model-based gait analysis using wearable bend and inertial sensors."

ACM Transactions on Internet of Things 3.1 (2021): 1-24.

2. Von Marcard, Timo, et al. "Sparse inertial poser: Automatic 3d human pose estimation from

sparse imus." Computer Graphics Forum. Vol. 36. No. 2. 2017.

3. Xiao, Fanyi, et al. "A deep learning method for complex human activity recognition using virtual

wearable

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At the moment, below are Internet search keywords that I used to find the above papers. If you have any advise on keywords to search that would be useful to find papers that could help us learn about feature/marker selction and deep learning modeling for human movement data, please feel free to let me know.

Models:

1. lstm activity detection

2. transformer attention activity detection

Features:

1. wavelet frequency machine learning features

2. mel frequency machine learning features

**May 21 – June 4**

1. Select a better feature for representing frequency than constant categorical features. I realized that these types of features add false positives to the results, and the accuracy results are higher than they should be. I am looking at wavelets or some frequency features used for audio processing, like mel frequency. If these frequency features do not help with prediction accuracy, I will create an unsupervised feature from the time series joystick data using kmeans; this feature should contain both time and frequency information.  
  
2. Re-run at least 2 models (decision-tree versus non-decision tree). I am targeting a comparison between decision-tree and non-decision tree models because they use feature/parameter space differently; decision-tree models partition feature space in subsections and non-decision tree models use the entire feature space to make predictions. The functioning of the two types of models what I wanted to compare with different classical human movement control features. As I tried to explain in the paper, decision tree models predict based on signal amplitude associations but non decision tree models predict based on a combination of amplitude and temporal associations (since it uses all of feature space).  
  
3. Implement LSTM and RNN Attention on our dataset, I already have executed these models before with other datasets. Since we need to present a more complex and current deep learning model, LSTM, RNN, and Multi-head Attention models are currently used to account for temporal causality in either text or time-series data.  
  
4. Report modeling results of only 3-4 models (decision tree, non-decision tree, and deep learning)

**June 5 – June 12**

- Round 1 of revisions on Overleaf.com – everyone modify the document on overleaf.com or email their opinions to me and I modify the draft on overleaf.com

**June 13 – June 19**

Final discussion and final Round of revisions

**June 20**

Resubmit the paper to IEEE