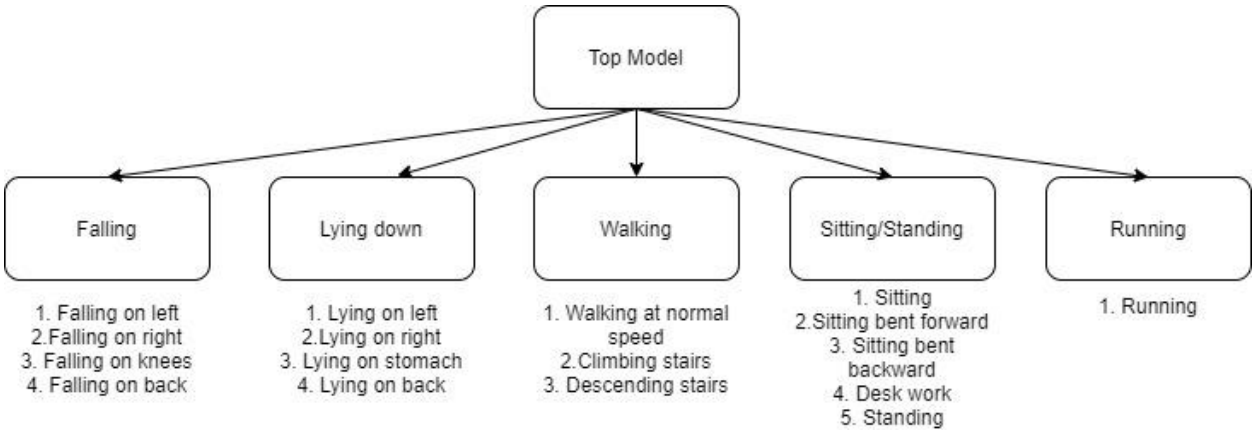
We use a hierarchical model approach, where the top level model classifies the subset of activities (falling, lying down, walking, standing/sitting, running). Once the model classifies the subset of activities, it moves into submodels to classify all the activities.



The model can successfully classify the 5 essential activities with an overall accuracy of **94%**. Using the LOSOXV strategy, we left out three subjects across 14 rounds, and 4 subjects on the last round (giving a total of 46 subjects left out), training the model on the whole dataset bar the left out subjects at each round. We obtained the following results:

Summary statistics for the top model (classifying essential activities)

Using 15 rounds of LOSOXV, the overall performance of the top-level model (for classification of essential activities) is as follows:

Class	**Accuracy**	**Precision**	**Recall**	**F1-score**
Falling	0.85	0.99	0.85	0.91
Lying down	0.96	0.97	0.96	0.96
Sitting/Standing	0.96	0.96	0.96	0.96
Walking	0.95	0.91	0.95	0.92
Running	0.95	0.92	0.95	0.92

Overall results on unseen subjects

1. Accuracy: 0.942
2. Precision: 0.945
3. Recall: 0.942

4. F1-score: 0.934

Summary statistics for the falling sub-model

Using 5 rounds of LOSOXV, the overall performance of the falling model (for classification of essential activities) is as follows:

Class	**Accuracy**	**Precision**	**Recall**	**F1-score**
Falling on left	0.86	0.89	0.86	0.89
Falling on right	0.92	0.89	0.92	0.88
Falling on back	0.74	0.89	0.74	0.91
Falling on knees	0.85	0.99	0.85	0.93

Summary statistics for the lying down sub-model

Using 9 rounds of LOSOXV, the overall performance of the lying down model is as follows:

Class	**Accuracy**	**Precision**	**Recall**	**F1-score**
Lying down left	1.00	0.82	1.00	0.80
Lying down right	0.92	0.94	0.92	0.88
Lying down on the back	0.74	1.00	0.74	0.80
Lying down on stomach	0.85	0.85	0.85	0.84

Summary statistics for the moving sub-model

Using 10 rounds of LOSOXV, the overall performance of the moving model is as follows:

Class	**Accuracy**	**Precision**	**Recall**	**F1-score**
Climbing stairs	0.60	0.71	0.60	0.73
Descending stairs	0.92	0.94	0.92	0.88
Walking at normal speed	0.90	0.95	0.90	0.90

Summary statistics for the sitting-standing sub-model

Using 8 rounds of LOSOXV, the overall performance of the sitting-standing model is as follows:

Class	**Accuracy**	**Precision**	**Recall**	**F1-score**
Sitting bent forward	0.78	0.71	0.78	0.73
Standing	0.42	0.50	0.42	0.65
Sitting	0.45	0.60	0.45	0.50
Desk work	0.75	0.83	0.75	0.77
Sitting bent backward	0.80	0.82	0.80	0.84