Fitness Activity Recognition

Demo 3
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Classifiers:

XGBoost: Current Benchmark

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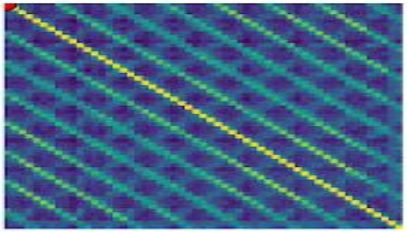
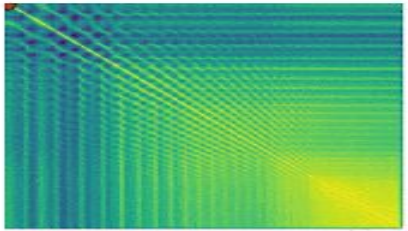
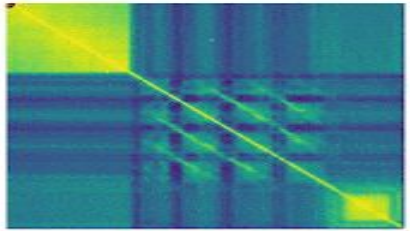
ACCURACY PER INSTANCE: 0.9147842361497731
F1_score: 0.8820335356174074
Precision: 0.9147842361497731
Recall: 0.9147842361497731
```

CatBoost	Accuracy: 0.9583783112503702 COnfusion Matrix [[36941 0 374 284 275] [1 600 0 74 3] [976 0 18638 337 346] [313 16 278 29964 131] [403 0 390 156 14181]] RMSE: 0.246988469731852
ExtraTrees	Accuracy: 0.9843811197829596 Confusion Matrix [[37573 0 192 68 41] [4 664 1 9 0] [351 0 19628 227 91] [75 1 205 30391 30] [60 0 198 82 14790]] RMSE: 0.06515031381052913
Random Forest	Accuracy: 0.9808943361259446 Confusion Matrix [[37514 0 195 115 50] [3 642 0 32 1] [493 0 19425 279 100] [78 1 196 30385 42] [99 0 221 95 14715]] RMSE: 0.08514439105472818

RepNet Implementation

RepNet is a model that takes as input a video that contains periodic action of a variety of classes and returns the period of repetitions found therein.



RepNet vs Training Data

Repnet Implementation

Repnet detects repetitions not activities including posing estimation.

BlazePose

	video_id	frame_count	fps	0	1	2	3	4	5	6	...
0	17.0	1.0	30.0	0.469707	0.482329	-0.002357	0.448683	0.460598	-0.030509	0.448470	...
1	17.0	2.0	30.0	0.469834	0.482433	-0.009200	0.449051	0.460630	-0.038493	0.448717	...
2	17.0	3.0	30.0	0.469793	0.482422	-0.034634	0.449083	0.460595	-0.064239	0.448725	...
3	17.0	4.0	30.0	0.469157	0.482434	-0.059984	0.448887	0.460432	-0.090335	0.448505	...
4	17.0	5.0	30.0	0.468733	0.482558	-0.057667	0.448780	0.460469	-0.089963	0.448384	...
...	...	...	...	...	...	...	...	...	...	...	...
113484	1093.0	1796.0	30.0	0.543352	0.017731	-0.107510	0.559971	-0.008384	-0.129019	0.563785	...
113485	1093.0	1797.0	30.0	0.543862	0.020051	-0.099013	0.560208	-0.005157	-0.119972	0.563985	...
113486	1093.0	1798.0	30.0	0.544616	0.021082	-0.046101	0.560863	-0.004102	-0.063948	0.564687	...
113487	1093.0	1799.0	30.0	0.543749	0.025784	-0.090839	0.560298	-0.000230	-0.110750	0.564301	...
113488	1093.0	1800.0	30.0	0.541734	0.024757	-0.108123	0.558251	-0.001467	-0.129163	0.563009	...

...	90	91	92	93	94	95	96	97	98	actions
...	0.932732	0.651811	0.257009	1.013107	0.818778	0.107989	0.981854	0.772962	0.278996	alternating_deadbug
...	0.932262	0.651182	0.264400	1.015914	0.821414	0.108853	0.981819	0.773844	0.300499	alternating_deadbug
...	0.918206	0.653155	0.285164	1.015106	0.821940	0.116092	0.976226	0.775637	0.331376	alternating_deadbug
...	0.908120	0.655573	0.289354	1.015628	0.822087	0.115743	0.970726	0.778361	0.335143	alternating_deadbug
...	0.898029	0.657241	0.301708	1.007267	0.820174	0.125473	0.961302	0.778066	0.350331	alternating_deadbug
...	...	...	...	...	...	...	...	...	...	...
...	0.734142	0.682779	0.457921	0.379827	1.003916	-0.338705	0.729911	0.847336	0.512368	streching
...	0.734165	0.685250	0.458887	0.380202	1.004015	-0.333193	0.730560	0.851611	0.512983	streching
...	0.734159	0.688111	0.451445	0.386311	1.004784	-0.321852	0.730925	0.855403	0.499850	streching
...	0.734225	0.691248	0.461681	0.387331	1.008372	-0.322749	0.730774	0.858116	0.519902	streching
...	0.734443	0.692079	0.477959	0.386931	1.012266	-0.324884	0.730790	0.858448	0.534682	streching

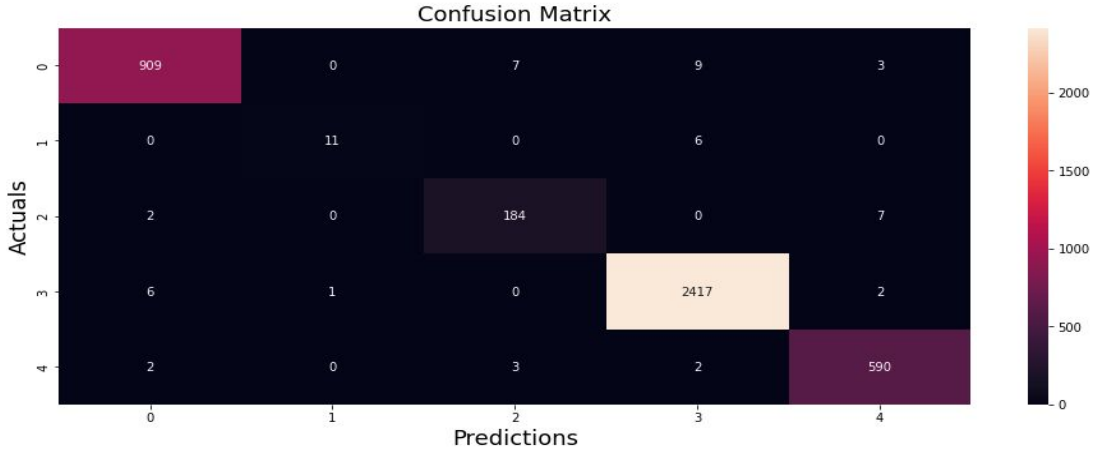
- Total of 113489 rows with 103 columns
- 0-98 represents the joint for x, y, and z for 33 joints
- Modified the dataset from last cohort that used MoveNet to compare the performance between two models

BlazePose

```
ACCURACY PER INSTANCE: 0.9879836577745734
F1_score: 0.9345255224840286
Precision: 0.9879836577745734
Recall: 0.9879836577745734
              precision    recall  f1-score   support

           0       0.99      0.98      0.98       928
           1       0.92      0.65      0.76        17
           2       0.95      0.95      0.95       193
           3       0.99      1.00      0.99      2426
           4       0.98      0.99      0.98       597

    accuracy                           0.99      4161
   macro avg       0.97      0.91      0.93      4161
weighted avg       0.99      0.99      0.99      4161
```



0 -> Idle_High, 1 -> Idle_Low, 2 -> Workout_High, 3 -> Workout_Low, 4 -> Workout_Transition

- Ran through XGBoost which the previous cohort chose
- Total accuracy of 99 percent
- 0,1,2,3,4 represents Idle_High, Idle_Low, Workout_High, Workout_Low, and Workout_Transition label

Next Steps:

- Data Review: Adding More subclasses
- Blazepose:
  - We propose to move ahead with Blazepose for key point extraction
  - Re-run tests on complete dataset (videos)
- Classifier Selection: With 3D coordinates, we might want to reconsider
- RepNet: Best to add it when designing qualitative engagement metric