Human Fall Detection

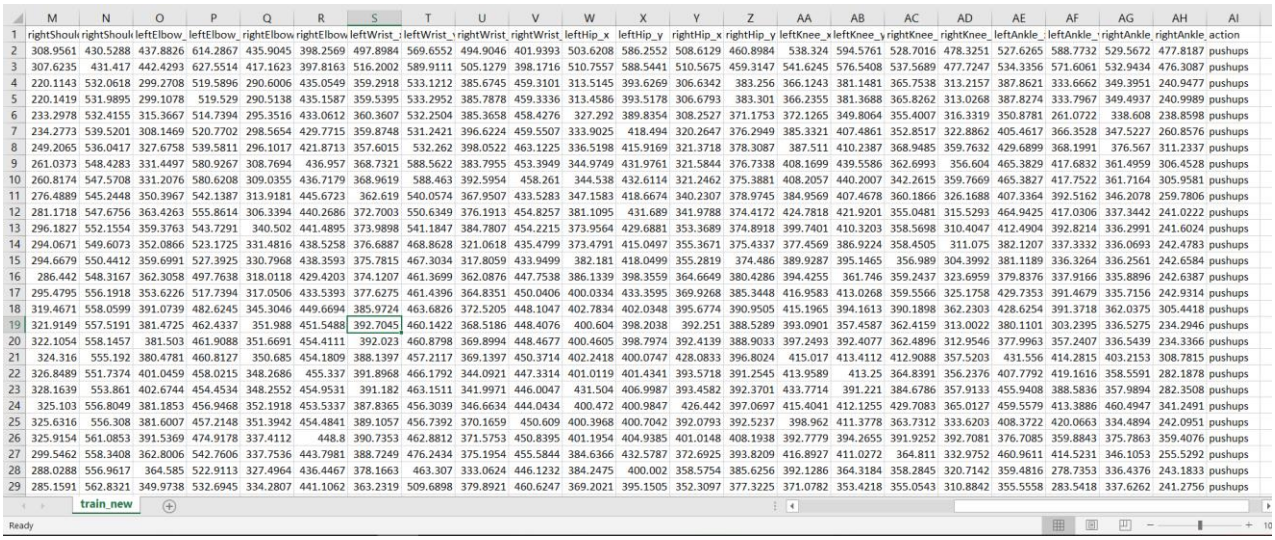
Week 04 (Due on 02nd July):

This assignment consists of two parts:

a. Modification of CSV file to make it better consumable for participants.
b. Training the data

a. Modification of CSV file:

1. Create a .csv file that has columns named after the key skeletal points (Left eye, right eye, left shoulder, right shoulder, etc.). This approach will mitigate the chances of short-comings and will be more useful to train the model accurately.
2. First create this array of all 34 names of skeletal points along with the action (total 35 columns) and add those as columns into the dataframe. Convert dataframe into .csv file.
3. Create a cumulative .csv file of all the actions by appending each action's data into the same .csv file.
   CSV sample



	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
1	rightShoul	rightShoul	leftElbow_	leftElbow_	rightElbow	rightElbow	leftWrist_	leftWrist_	rightWrist_	rightWrist	leftHip_x	leftHip_y	rightHip_x	rightHip_y	leftKnee_x	leftKnee_y	rightKnee_	rightKnee_	leftAnkle_	leftAnkle_	rightAnkle	rightAnkle	action
2	308.9561	430.5288	437.8826	614.2867	435.9045	398.2569	497.8984	569.6552	494.9046	401.9393	503.6208	586.2552	508.6129	460.8984	538.324	594.5761	528.7016	478.3251	527.6265	588.7732	529.5672	477.8187	pushups
3	307.6235	431.417	442.4293	627.5514	417.1623	397.8163	516.2002	589.9111	505.1279	398.1716	510.7557	588.5441	510.5675	459.3147	541.6245	576.5408	537.5689	477.7247	534.3356	571.6061	532.9434	476.3087	pushups
4	220.1143	532.0618	299.2708	519.5896	290.6006	435.0549	359.2918	533.1212	385.6745	459.3101	313.5145	393.6269	306.6342	383.256	366.1243	381.1481	365.7538	313.2157	387.8621	333.6662	349.3951	240.9477	pushups
5	220.1419	531.9895	299.1078	519.529	290.5138	435.1587	359.5395	533.2952	385.7878	459.3336	313.4586	393.5178	306.6793	383.301	366.2355	381.3688	365.8262	313.0268	387.8274	333.7967	349.4937	240.9989	pushups
6	233.2978	532.4155	315.3667	514.7394	295.3516	433.0612	360.3607	532.2504	385.3658	458.4276	327.292	389.8354	308.2527	371.1753	372.1265	349.8064	355.4007	316.3319	350.8781	261.0722	338.608	238.8598	pushups
7	234.2773	539.5201	308.1469	520.7702	298.5654	429.7715	359.8748	531.2421	396.6224	459.5507	333.9025	418.494	320.2647	376.2949	385.3321	407.4861	352.8517	322.8862	405.4617	366.3528	347.5227	260.8576	pushups
8	249.2065	536.0417	327.6758	539.5811	296.1017	421.8713	357.6015	532.262	398.0522	463.1225	336.5198	415.9169	321.3718	378.3087	387.511	410.2387	368.9485	359.7632	429.6899	368.1991	376.567	311.2337	pushups
9	261.0373	548.4283	331.4497	580.9267	308.7694	436.957	368.7321	588.5622	383.7955	453.3949	344.9749	431.9761	321.5844	376.7338	408.1699	439.5586	362.6993	356.604	465.3829	417.6832	361.4959	306.4528	pushups
10	260.8174	547.5708	331.2076	580.6208	309.0355	436.7179	368.9619	588.463	392.5954	458.261	344.538	432.6114	321.2462	375.3881	408.2057	440.2007	342.2615	359.7669	465.3827	417.7522	361.7164	305.9581	pushups
11	276.4889	545.2448	350.3967	542.1387	313.9181	445.6723	362.619	540.0574	367.9507	433.5283	347.1583	418.6674	340.2307	378.9745	384.9569	407.4678	360.1866	326.1688	407.3364	392.5162	346.2078	259.7806	pushups
12	281.1718	547.6756	363.4263	555.8614	306.3394	440.2686	372.7003	550.6349	376.1913	454.8257	381.1095	431.689	341.9788	374.4172	424.7818	421.9201	355.0481	315.5293	464.9425	417.0306	337.3442	241.0222	pushups
13	296.1827	552.1554	359.3763	543.7291	340.502	441.4895	373.9898	541.1847	384.7807	454.2215	373.9564	429.6881	353.3689	374.8918	399.7401	410.3203	358.5698	310.4047	412.4904	392.8214	336.2991	241.6024	pushups
14	294.0671	549.6073	352.0866	523.1725	331.4816	438.5258	376.6887	468.8628	321.0618	435.4799	373.4791	415.0497	355.3671	375.4337	377.4569	386.9224	358.4505	311.075	382.1207	337.3332	336.0693	242.4783	pushups
15	294.6679	550.4412	359.6991	527.3925	330.7968	438.3593	375.7815	467.3034	317.8059	433.9499	382.181	418.0499	355.2819	374.486	389.9287	395.1465	356.989	304.3992	381.1189	336.3264	336.2561	242.6584	pushups
16	286.442	548.3167	362.3058	497.7638	318.0118	429.4203	374.1207	461.3699	362.0876	447.7538	386.1339	398.3559	364.6649	380.4286	394.4255	361.746	359.2437	323.6959	379.8376	337.9166	335.8896	242.6387	pushups
17	295.4795	556.1918	353.6226	517.7394	317.0506	433.5393	377.6275	461.4396	364.8351	450.0406	400.0334	433.3595	369.9268	385.3448	416.9583	413.0268	359.5566	325.1758	429.7353	391.4679	335.7156	242.9314	pushups
18	319.4671	558.0599	391.0739	482.6245	345.3046	449.6694	385.9724	463.6826	372.5205	448.1047	402.7834	402.0348	395.6774	390.9505	415.1965	394.1613	390.1898	362.2303	428.6254	391.3718	362.0375	305.4418	pushups
19	321.9149	557.5191	381.4725	462.4337	351.988	451.5488	392.7045	460.1422	368.5186	448.4076	400.604	398.2038	392.251	388.5289	393.0901	357.4587	362.4159	313.0022	380.1101	303.2395	336.5275	234.2946	pushups
20	322.1054	558.1457	381.503	461.9088	351.6691	454.4111	392.023	460.8798	369.8994	448.4677	400.4605	398.7974	392.4139	388.9033	397.2493	392.4077	362.4896	312.9546	377.9963	357.2407	336.5439	234.3366	pushups
21	324.316	555.192	380.4781	460.8127	350.685	454.1809	388.1397	457.2117	369.1397	450.3714	402.2418	400.0747	428.0833	396.8024	415.017	413.4112	412.9088	357.5203	431.556	414.2815	403.2153	308.7815	pushups
22	326.8489	551.7374	401.0459	458.0215	348.2686	455.337	391.8968	466.1792	344.0921	447.3314	401.0119	401.4341	393.5718	391.2545	413.9589	413.25	364.8391	356.2376	407.7792	419.1616	358.5591	282.1878	pushups
23	328.1639	553.861	402.6744	454.4534	348.2552	454.9531	391.182	463.1511	341.9971	446.0047	431.504	406.9987	393.4582	392.3701	433.7714	391.221	384.6786	357.9133	455.9408	388.5836	357.9894	282.3508	pushups
24	325.103	556.8049	381.1853	456.9468	352.1918	453.5337	387.8365	456.3039	346.6634	444.0434	400.472	400.9847	426.442	397.0697	415.4041	412.1255	429.7083	365.0127	459.5579	413.3886	460.4947	341.2491	pushups
25	325.6316	556.308	381.6007	457.2148	351.3942	454.4841	389.1057	456.7392	370.1659	450.609	400.3968	400.7042	392.0793	392.5237	398.962	411.3778	363.7312	333.6203	408.3722	420.0663	334.4894	242.0951	pushups
26	325.9154	561.0853	391.5369	474.9178	337.4112	448.8	390.7353	462.8812	371.5753	450.8395	401.1954	404.9385	401.0148	408.1938	392.7779	394.2655	391.9252	392.7081	376.7085	359.8843	375.7863	359.4076	pushups
27	299.5462	558.3408	362.8006	542.7606	337.7536	443.7981	388.7249	476.2434	375.1954	455.5844	384.6366	432.5787	372.6925	393.8209	416.8927	411.0272	364.811	332.9752	460.9611	414.5231	346.1053	255.5292	pushups
28	288.0288	556.9617	364.585	522.9113	327.4964	436.4467	378.1663	463.307	333.0624	446.1232	384.2475	400.002	358.5754	385.6256	392.1286	364.3184	358.2845	320.7142	359.4816	278.7353	336.4376	243.1833	pushups
29	285.1591	562.8321	349.9738	532.6945	334.2807	441.1062	363.2319	509.6898	379.8921	460.6247	369.2021	395.1505	352.3097	377.3225	371.0782	353.4218	355.0543	310.8842	355.5558	283.5418	337.6262	241.2756	pushups

train_new

Ready

4. **Balance the data of each action.** Data for each action must be about same in size.

b. ***Training the data:***

1. Training approach I (Make your own Neural Network)-
   - Split Train and test data (80:20).
   - Use sequential model with dense layers having batch normalization layer between 2 dense layers.
   - Compile model with loss function = 'categorical_crossentropy', optimizer = adam with very small learning rate, metrics = accuracy. (Read about all this if needed).
   - Fit the model with different batch size and epochs to get better accuracy.
   - Save models.
   - Test the model for test data.
   - Plot confusion matrix to get the better visualization of accuracy for all actions.

2. Training approach II (CNN) –
   - Use sequential model with Conv2D layers with by dropout layer in between followed by flatten layer and then dense layers with again dropout in between.
   - Compile with loss function = 'sparse_cateorical_crossentropy' this time with similar other parameters.
   - Fit the model with different epochs.
   - Save models.
   - Test the model for test data.
   - Plot confusion matrix to get the better visualization of accuracy for all actions.