WEEK 5 RECAP

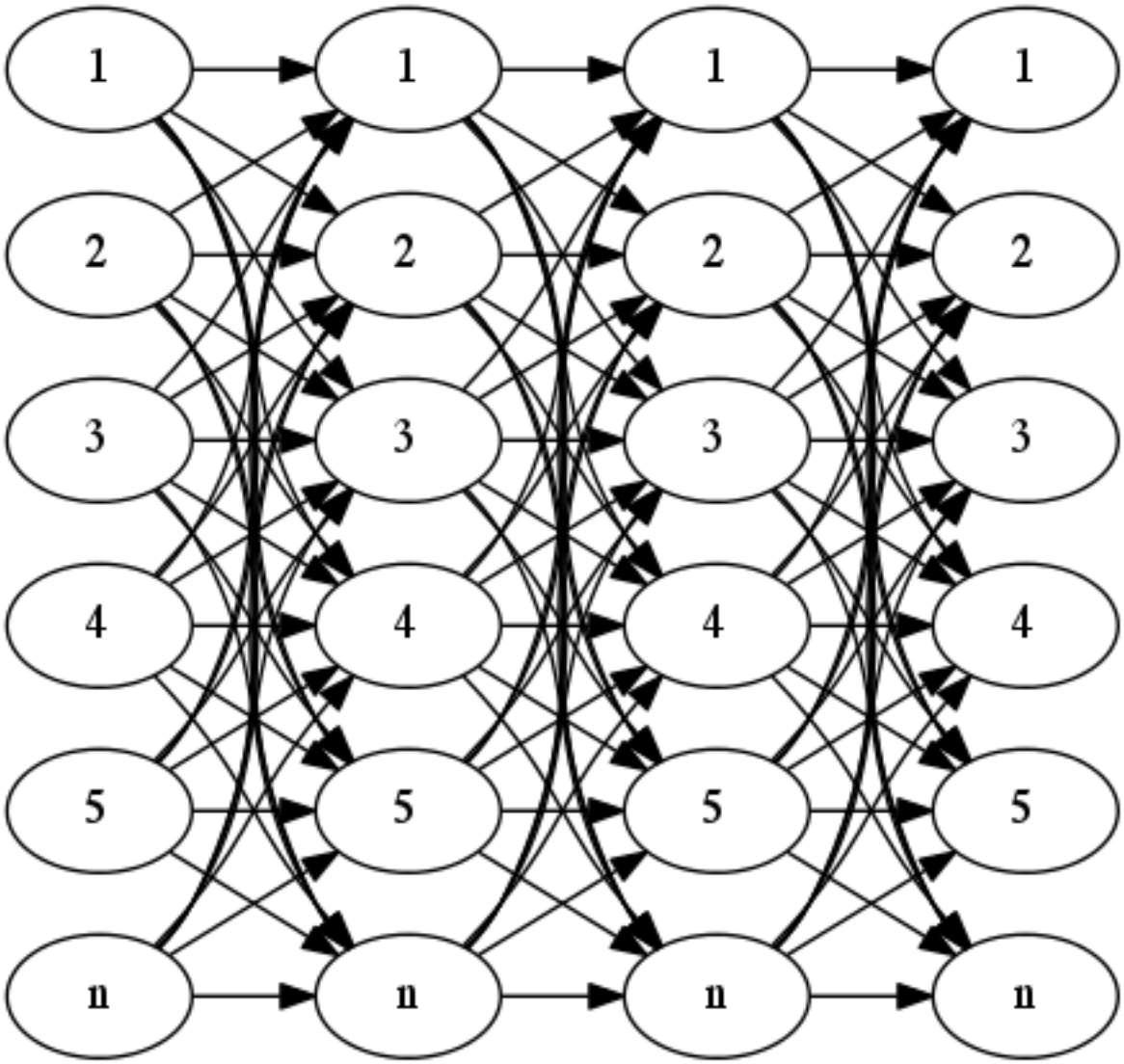
Sports Video Summarization

Khurram Soomro
Christian Weigandt
Levi Smith

Update

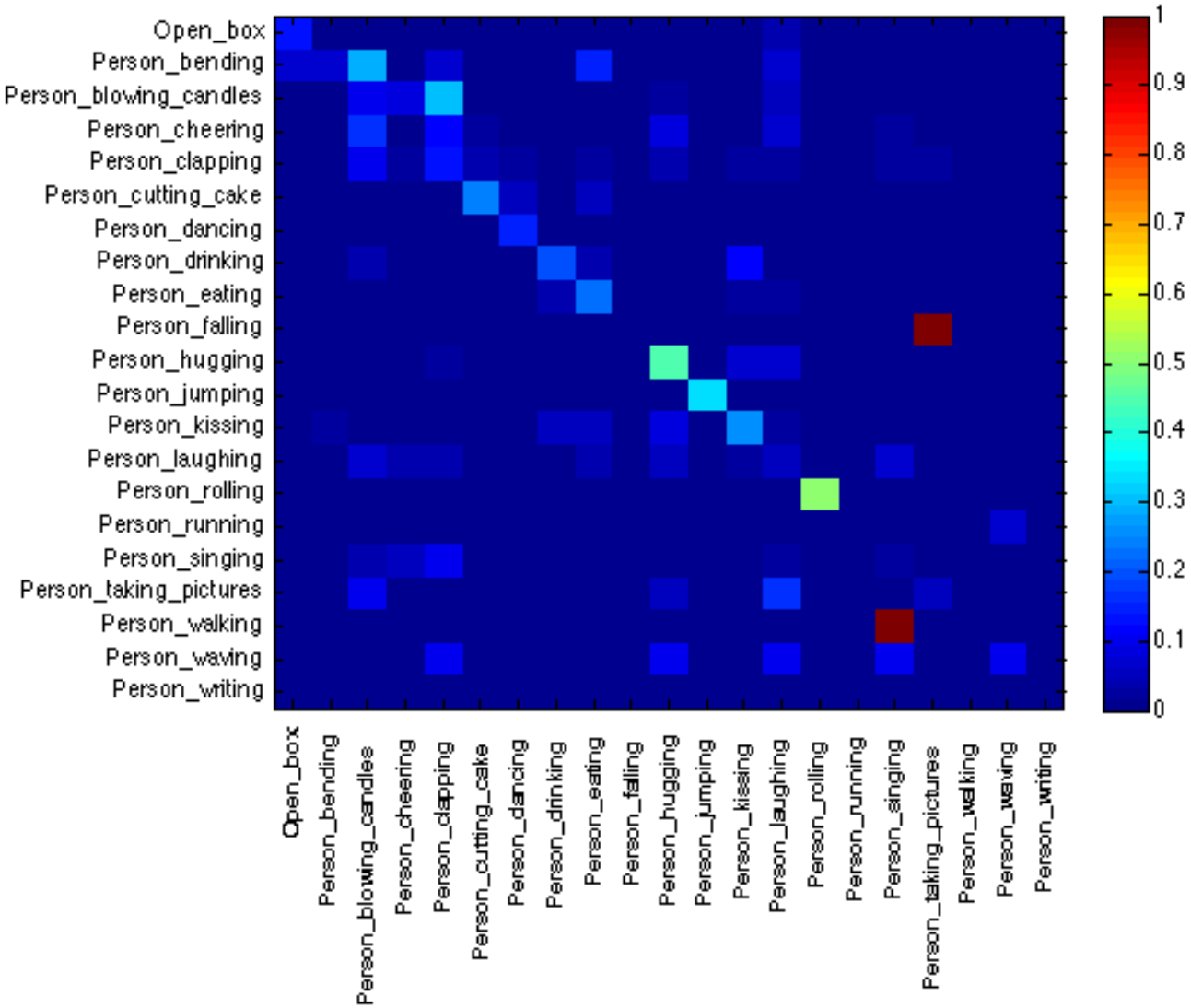
- Used one vs. all SVM classifier and got ~90% accuracy
- Calculated causality matrix for Trecvid Dataset
- Used iterative approach to improve accuracy on event 6
  - Using max SVM only we got 71% accuracy
  - Iterative approach gave 60% accuracy

Graph Representation



- Each column represents evenly spaced segments of the entire video
- There are *n* nodes in each column corresponding to *n* actions
- Each node is the probability of that action occurring in that segment
- The edges between nodes come from the causality matrix and are the probabilities that one action leads to the next

Causality Matrix for Trecvid Dataset

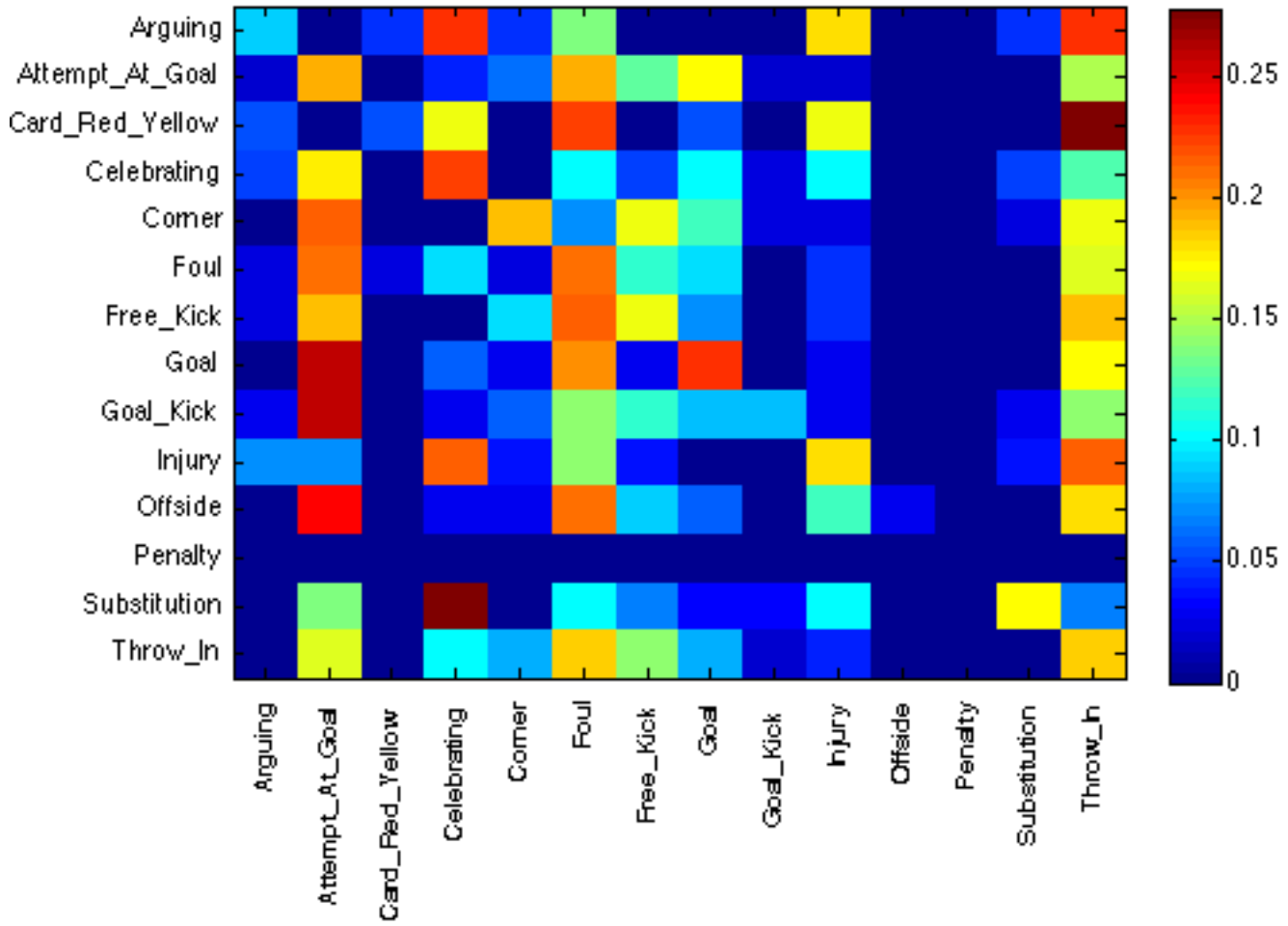


WEEK 6 REPORT

Sports Video Summarization

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SVM Classification for Soccer Dataset



Average Accuracy:
38%

Methods for Using Causality

- Compared different methods of using causality matrix to improve action recognition
- Compared it to the max SVM only results
- Methods
  - Iterative Process
  - Dynamic Programming
  - Markov Chain

Dynamic Approach with Different Time Intervals

	1	2.5	5	12	20
Attempting a Board Trick	0.6206	0.6256	0.6418	0.6505	0.6493
Animal Feeding	0.4807	0.4846	0.5026	0.5296	0.5206
Fishing	0.6419	0.6452	0.6548	0.6581	0.6548
Wedding	0.5021	0.3529	0.4076	0.3634	0.4496
Construction	0.7018	0.6456	0.7096	0.7727	0.8182
Birthday Party	0.687	0.583	0.4444	0.4576	0.497
Changing a Car Tire	0.7768	0.744	0.7894	0.7402	0.7667
Flash Mob Gathering	0.2713	0.293	0.307	0.2064	0.242
Getting a Car Unstuck	0.8353	0.8438	0.8523	0.8574	0.8353
Grooming an Animal	0.5034	0.5214	0.5395	0.5124	0.4695
Making a Sandwich	0.2667	0.2762	0.281	0.419	0.444
Parade	0.4249	0.4249	0.4283	0.4627	0.4416
Parkour	0.304	0.1585	0.1808	0.2254	0.2688
Repairing an Appliance	0.1163	0.1163	0.1226	0.1247	0.1099
Working on a Sewing Project	0.4964	0.506	0.5276	0.5588	0.5348

Iterative Approach with Different Numbers of Iterations and a One Second Interval

	1	2	5	10	20
Attempting a Board Trick	0.6219	0.6219	0.6219	0.6219	0.6219
Animal Feeding	0.4717	0.4242	0.4422	0.4396	0.4409
Fishing	0.6419	0.6419	0.6419	0.6419	0.6419
Wedding	0.4559	0.4643	0.4664	0.4706	0.4748
Construction	0.8444	0.8344	0.8398	0.8382	0.8428
Birthday Party	0.6989	0.6953	0.6977	0.6953	0.6965
Changing a Car Tire	0.7705	0.7718	0.7755	0.773	0.7743
Flash Mob Gathering	0.3707	0.3567	0.3567	0.3567	0.3567
Getting a Car Unstuck	0.8506	0.8353	0.837	0.837	0.8387
Grooming an Animal	0.4334	0.4266	0.4357	0.4334	0.465
Making a Sandwich	0.2548	0.2548	0.2548	0.2512	0.2548
Parade	0.4494	0.4372	0.4394	0.4372	0.4372
Parkour	0.3181	0.3122	0.3063	0.3099	0.3063
Repairing an Appliance	0.1395	0.1353	0.1353	0.1353	0.1353
Working on a Sewing Project	0.4916	0.4964	0.4964	0.4964	0.4964

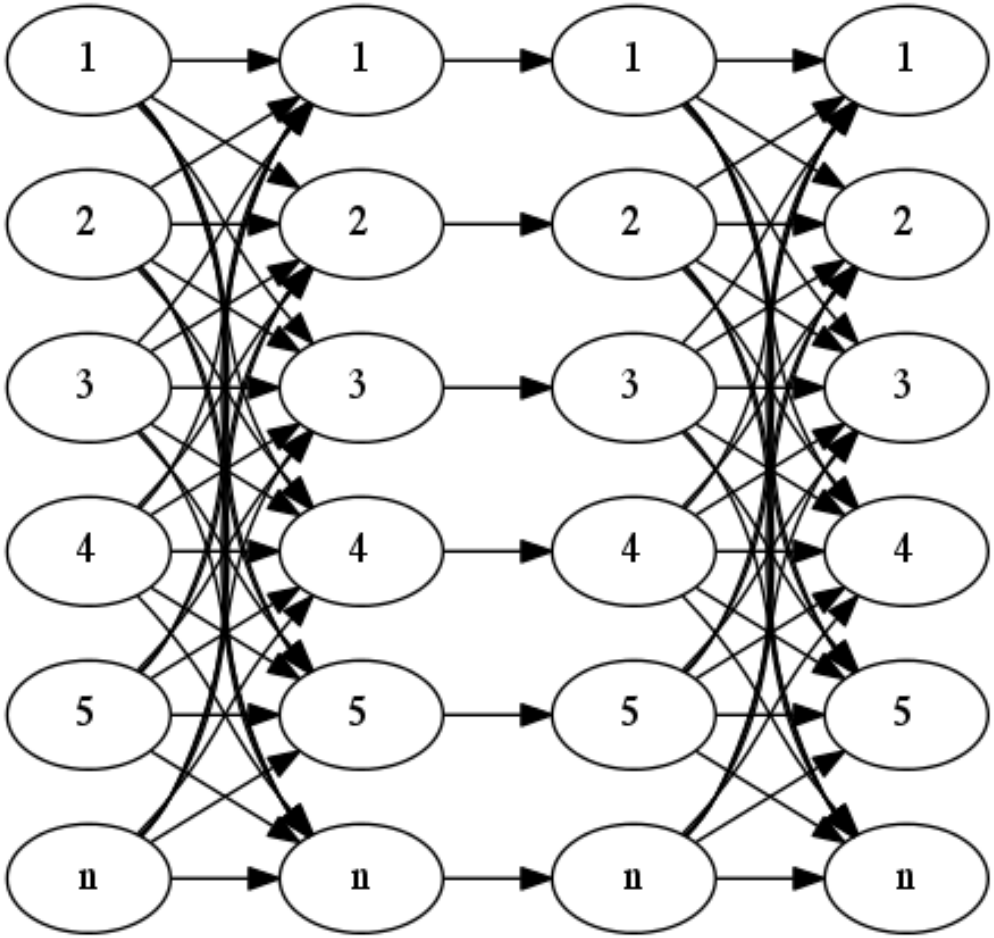
Iterative Approach with Different Numbers of Iterations and a Five Second Interval

	1	2	5	10	20
Attempting a Board Trick	0.6343	0.6418	0.648	0.6468	0.6455
Animal Feeding	0.4923	0.4524	0.4653	0.4563	0.4473
Fishing	0.6419	0.6548	0.6613	0.6645	0.6581
Wedding	0.5084	0.4916	0.4958	0.4748	0.479
Construction	0.822	0.8251	0.832	0.8344	0.8328
Birthday Party	0.6069	0.6165	0.5926	0.6022	0.5854
Changing a Car Tire	0.7503	0.7718	0.7667	0.7692	0.7692
Flash Mob Gathering	0.3758	0.3465	0.3363	0.3465	0.3503
Getting a Car Unstuck	0.8642	0.8557	0.8557	0.8557	0.854
Grooming an Animal	0.4605	0.4537	0.4673	0.4718	0.474
Making a Sandwich	0.2607	0.2762	0.2893	0.2917	0.2857
Parade	0.4549	0.4505	0.4483	0.4461	0.4438
Parkour	0.3674	0.3439	0.3509	0.3509	0.3486
Repairing an Appliance	0.1311	0.1395	0.1416	0.1459	0.1543
Working on a Sewing Project	0.4964	0.5156	0.5156	0.518	0.518

Iterative Approach with Different Numbers of Iterations and a Twelve Second Interval

	1	2	5	10	20
Attempting a Board Trick	0.6318	0.643	0.6542	0.6517	0.6505
Animal Feeding	0.5219	0.4871	0.4807	0.4794	0.4871
Fishing	0.6806	0.6677	0.6677	0.6677	0.6645
Wedding	0.4685	0.4811	0.4748	0.4643	0.4685
Construction	0.832	0.8459	0.8475	0.8575	0.8451
Birthday Party	0.5723	0.5603	0.5352	0.5424	0.546
Changing a Car Tire	0.7276	0.7352	0.7352	0.7377	0.744
Flash Mob Gathering	0.3554	0.349	0.3414	0.321	0.3389
Getting a Car Unstuck	0.8506	0.8472	0.8489	0.854	0.854
Grooming an Animal	0.5147	0.5079	0.5214	0.5124	0.5282
Making a Sandwich	0.294	0.2988	0.3262	0.331	0.3369
Parade	0.4516	0.4483	0.4494	0.4527	0.4572
Parkour	0.3756	0.3732	0.3697	0.3721	0.3779
Repairing an Appliance	0.1755	0.1607	0.1564	0.1734	0.1734
Working on a Sewing Project	0.5084	0.5324	0.5252	0.5276	0.53

Markov Chain Approach



Comparison of Methods

	Max SVM	Iterative 1s:1	Iterative 5s:1	Iterative 12s:1	Iterative 12s:20	Dynamic 12s	Markov 12s
Fishing	0.6419	0.6419	0.6419	0.6806	0.6645	0.6581	0.6839
Working on a Sewing Project	0.4916	0.4916	0.4964	0.5084	0.5300	0.5588	0.5875
Making a Sandwich	0.2548	0.2548	0.2607	0.2940	0.3369	0.4190	0.4667
Parade	0.4449	0.4494	0.4549	0.4516	0.4572	0.4627	0.5640
Attempting a Board Trick	0.6219	0.6219	0.6343	0.6318	0.6505	0.6505	0.653
Animal Feeding	0.4756	0.4717	0.4923	0.5219	0.4871	0.5296	0.5668
Grooming an Animal	0.4379	0.4334	0.4605	0.5147	0.5282	0.5124	0.5237
Flash Mob Gathering	0.3669	0.3707	0.3758	0.3554	0.3389	0.2064	0.5439
Repairing an Appliance	0.1374	0.1395	0.1311	0.1755	0.1734	0.1247	0.3531
Parkour	0.3063	0.3181	0.3674	0.3756	0.3779	0.2254	0.4026
Wedding	0.4433	0.4559	0.5084	0.4685	0.4685	0.3634	0.6050
Getting a Car Unstuck	0.8506	0.8506	0.8642	0.8506	0.8540	0.8574	0.8591
Changing a Car Tire	0.7680	0.7705	0.7503	0.7276	0.7440	0.7402	0.7755
Birthday Party	0.6894	0.6989	0.6069	0.5723	0.5460	0.4576	0.6440
Construction	0.8575	0.8444	0.8220	0.8320	0.8451	0.7727	0.8475

Events with Causality

Attempting a Board Trick
'Person_falling'
'Person_flipping'
'Person_jumping'
'Person_running'
'Person_sliding'
'Person_surfing'
'Person_walking'

Changing a Car Tire
'Hands_visible'
'Person_bending'
'Person_fitting_bolts'
'Person_hammering'
'Person_jacking_car'
'Person_running'
'Person_spraying'
'Person_squatting'
'Person_turning_wrench'
'Person_using_tire_tube'
'Person_walking'
'Person_wiping'

Fishing
'Hands_visible'
'Person_bending'
'Person_casting'
'Person_reeling'
'Person_throwing'

Grooming an Animal
'Hands_visible'
'Person_cutting'
'Person_petting'
'Person_washing'
'Person_wiping'

Working on a Sewing Project
'Hands_visible'
'Person_bending'
'Person_cutting_fabric'
'Person_measuring'
'Person_pointing'
'Person_sewing'

Animal Feeding
'Animal_approaching'
'Animal_eating'
'Hands_visible'
'Person_petting'
'Person_pouring'
'Person_throwing'

Repairing an Appliance
'Hands_visible'
'Open_door'
'Person_drilling'
'Person_fitting_bolts'
'Person_pointing'
'Person_squatting'
'Person_washing'
'Person_wiping'

Wedding
'Person_cutting_cake'
'Person_dancing'
'Person_drinking'
'Person_eating'
'Person_hugging'
'Person_kissing'
'Person_taking_pictures'
'Person_throwing'
'Person_walking'

Making a Sandwich
'Hands_visible'
'Open_door'
'Person_eating'
'Person_pouring'
'Person_using_knife'
'Shake'
'Spreading_cream'
'Stir'

Events without strong Causality

Construction

'Person_carving'
'Person_cleaning'
'Person_cutting'
'Person_drilling'
'Person_hammering'
'Person_measuring'
'Person_painting'
'Person_planing'
'Person_polishing'
'Person_sawing'
'Person_spraying'
'Person_turning_wrench'
'Person_writing'

Getting a Car Unstuck

'Person_bending'
'Person_pushing'
'Person_walking'
'Vehicle_moving'
'Wheel_rotating'

Birthday Party

'Open_box'
'Person_bending'
'Person_blowing_candles'
'Person_cheering'
'Person_clapping'
'Person_cutting_cake'
'Person_dancing'
'Person_drinking'
'Person_eating'
'Person_falling'
'Person_hugging'
'Person_jumping'
'Person_kissing'
'Person_laughing'
'Person_rolling'
'Person_running'
'Person_singing'
'Person_taking_pictures'
'Person_walking'
'Person_waving'
'Person_writing'

Flash Mob Gathering

'People_dancing'
'Person_bending'
'Person_clapping'
'Person_dancing'
'Person_falling'
'Person_flipping'
'Person_jumping'
'Person_kissing'
'Person_running'
'Person_squatting'
'Person_taking_pictures'
'Person_walking'
'Person_waving'

Parade

'Animal_approaching'
'People_marching'
'Person_clapping'
'Person_dancing'
'Person_playing_instrument'
'Person_running'
'Person_walking'
'Person_waving'
'Vehicle_moving'
'Wheel_rotating'

Parkour

'Person_climbing'
'Person_falling'
'Person_flipping'
'Person_jumping'
'Person_rolling'
'Person_running'
'Person_sliding'
'Person_walking'
'Person_waving'

Results

- Average accuracy improvement for all 15 groups
  - 8.59%

- Separating them into groups
  - With Causality
    - 10.47% improvement
  - Without Causality
    - 5.76% improvement

Current

- Extracting MFCC features
- Improving accuracy by correcting for confusion among similar actions using HMM
- Combining different features to improve baseline action recognition accuracy from the SVM
- Combining with causality
  - Co-occurrence
  - Frequency (total and distinct)
  - Replays
- Include non-actions in our model

Other Improvements

- Add other features
  - MBH
  - Audio
  - Shot detection and classification
- Looking at different ways of using the causality matrix