Multi-Class training and testing in food preparation recognition tasks

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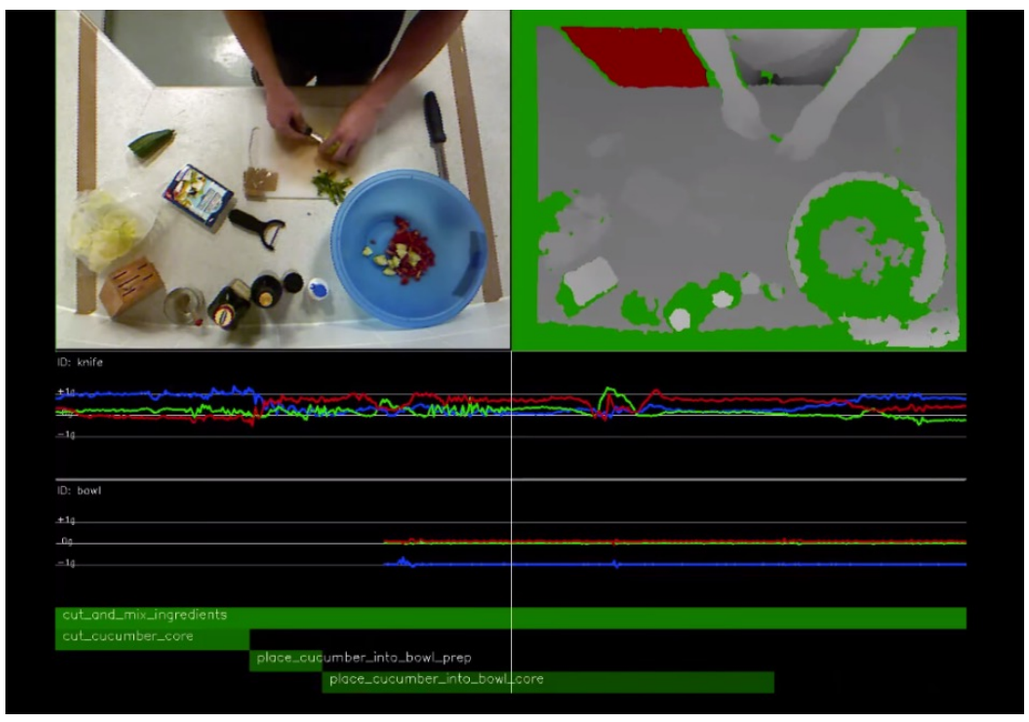
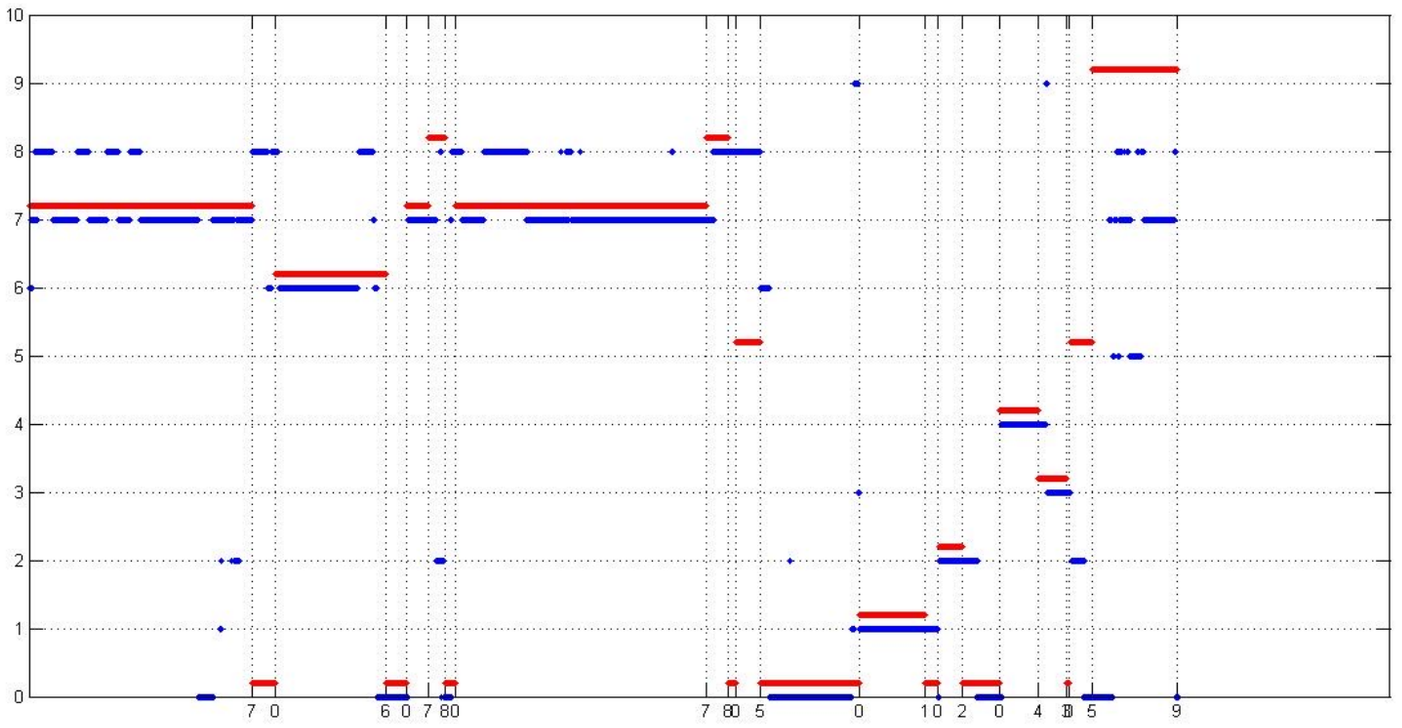
This project uses accelerometer data from a public dataset called '50 salads'. The accelerometer data is captured by devices attached to kitchen tools. Different classes represent different activity features. We can assign class posterior probabilities based on the outputs of the multiple SVMs, and then compare the classification results using Bayes' rule with the Gaussian likelihood functions.

Activity Name	Class Num	Precision	Recall	F-Measure
Null	0	0.2476	0.4766	0.3177
Add_oil	1	0.8254	0.7815	0.7954
Give_pepper	2	0.8102	0.7737	0.7881
Dress_salad	3	0.7323	0.7301	0.7287
Mix_dressing	4	0.5730	0.6353	0.5774
Mix_ingredients	5	0.5529	0.6903	0.5962
Peel_cucomber	6	0.7867	0.8396	0.8093
Cut_into_pieces	7	0.7131	0.5202	0.5987
Place_in_bowl	8	0.5693	0.5221	0.5417
Serve_salad	9	0.7365	0.6427	0.6871
Average		0.6547	0.6612	0.6440

The average Precision, Recall and F-Measure for Class 0 to 9.



An example frame of the data sequence in '50 Salads' dataset



Max(P(Score|Class)) of 9th person prepares the 1st salad. The red line the red line indicates the true label. The blue line is the actual results.

In SVM classification process, one important result is the SVM Score. Score is calculated by the following formula.

$$f(x) = \sum_{J=1}^{n} a_J y_J G(x_J, x) + b$$

Where x is the samples, (a_1, ..., a_n, b) are the estimated SVM parameters, G (x_J, x) is the dot product in the predictor space between x and the support vectors. We use the SVM Score to do the evaluation of classification by introducing the Precision, Recall and F-Measure. We also use the SVM Score to build the Gaussian distribution model

Short Conclusion: Comparing with max Score, each feature with the highest Score almost corresponds to the Max (P (Score | Class)). In future works, I recommend to complete a Hidden Markov Model by combining the Transition Matrix.

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