

# Knowing a good HOG filter when you see it: Efficient selection of filters for detection Supplementary material

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## 1 Visualization of Selected Poselets

Figures 1 and 2 show visualization of parts selected by rankSVM and rankSVM+diversity. Figures show top 10 filters along with their seeds (positive chips).

## 2 Affect of $k$ in max- $k$ criteria for Diversity

We tested different values of  $k$  in the max- $k$  criteria for diversity selection as described in the paper. We got  $\Delta(AP) = -0.75$ ,  $\Delta(AP) = -0.50$  and  $\Delta(AP) = +0.01$  for  $k = 1, k = 5$  and  $k = 10$  respectively. Here  $\Delta(AP) = AP_{method} - AP_{oracle}$  and  $AP_{oracle} = 29.03$  as reported in the paper.

## 3 Per-Category Results for Poselets

Table 1 shows per category results for various methods using the poselet framework.

## 4 Per-Category Results for Exemplar SVMs

Table 2 shows per category results for various methods using the exemplar SVM framework.

## 5 Visualization of Selected Exemplars for E-SVM

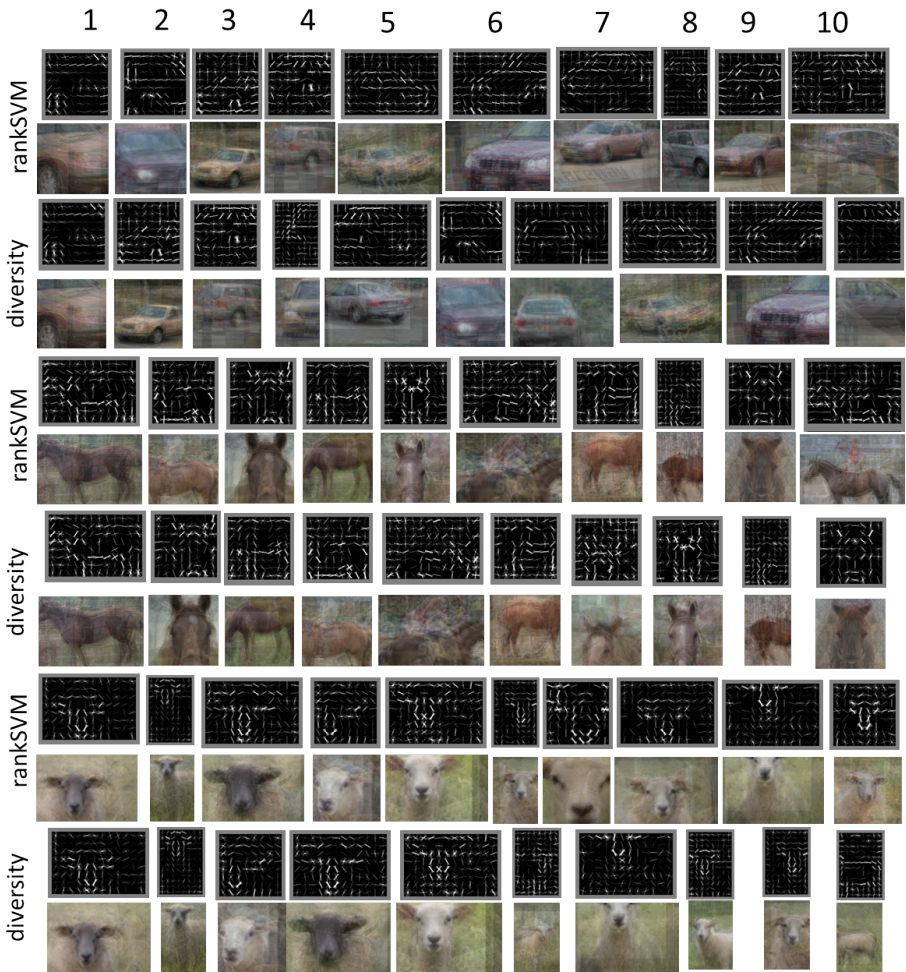
Figure 3 shows top 5 selected exemplars by Rank(lda)+Freq+Div.

	Oracle	Rand	10%	Norm ( $\Phi_{SVM}$ )	Norm + Div ( $\Phi_{SVM}$ )	$\Sigma$ -Norm ( $\Phi_{SVM}$ )	$\Sigma$ -Norm + Div ( $\Phi_{SVM}$ )	Rank ( $\Phi_{SVM}$ )	Rank + Div ( $\Phi_{SVM}$ )	Rank + Div ( $\Phi_{LDA}$ )	Rank ( $\Phi_{LDA}$ ) +Div ( $2\times$ seeds)
aeroplane	<b>32.37</b>	30.37	31.10	29.08	29.39	27.83	27.34	25.62	26.20	28.30	31.29
bicycle	50.00	47.75	49.81	43.46	47.08	44.69	48.49	43.76	<b>53.57</b>	50.79	47.49
bird	12.82	10.51	11.24	<b>13.54</b>	13.34	13.42	13.22	11.74	12.02	11.38	10.74
boat	16.36	14.30	14.30	<b>17.90</b>	17.47	17.61	16.41	17.76	17.32	16.70	15.17
bottle	31.57	29.85	26.76	32.37	33.06	32.94	<b>33.16</b>	32.15	31.14	29.72	31.43
bus	41.30	41.98	40.98	37.61	37.62	37.05	37.74	<b>42.59</b>	39.00	40.06	41.80
car	56.00	52.48	53.24	54.05	55.66	52.84	<b>56.50</b>	52.62	54.75	54.97	55.46
cat	<b>20.84</b>	16.37	19.59	20.52	20.62	20.52	20.05	20.52	19.43	19.80	20.31
chair	19.20	15.63	17.70	18.76	<b>19.34</b>	18.84	18.64	17.45	17.27	16.90	17.48
cow	37.55	32.73	37.68	32.31	35.43	32.97	34.14	38.32	37.22	35.59	<b>39.13</b>
diningtable	14.51	11.71	14.87	14.63	16.41	14.73	15.94	14.56	<b>18.11</b>	14.69	15.41
dog	<b>17.04</b>	11.19	15.15	14.12	15.35	14.94	15.57	15.14	15.27	14.91	16.72
horse	37.63	33.01	36.38	37.37	41.25	38.84	42.47	41.91	40.28	36.73	<b>43.03</b>
motorbike	35.91	34.30	36.86	31.07	31.47	30.93	33.87	33.82	37.50	38.64	<b>39.27</b>
person	<b>36.65</b>	30.75	34.81	34.43	33.95	34.59	34.50	35.23	35.96	33.06	34.82
pottedplant	13.14	11.79	11.61	12.25	12.78	12.25	12.84	12.72	13.06	13.21	<b>13.90</b>
sheep	31.87	29.56	26.81	30.10	31.43	31.01	31.88	28.52	<b>33.51</b>	31.14	31.89
sofa	23.35	23.46	25.80	22.08	21.99	22.08	22.53	20.92	23.50	23.12	<b>28.77</b>
train	24.31	<b>25.60</b>	22.52	19.84	21.18	19.91	21.75	20.30	25.29	25.42	24.94
tvmonitor	28.21	29.77	28.30	32.03	32.03	32.67	<b>33.16</b>	30.50	30.34	28.72	30.06
mean AP	29.03	26.66	27.78	27.38	28.34	27.53	28.51	27.81	29.04	28.19	<b>29.46</b>

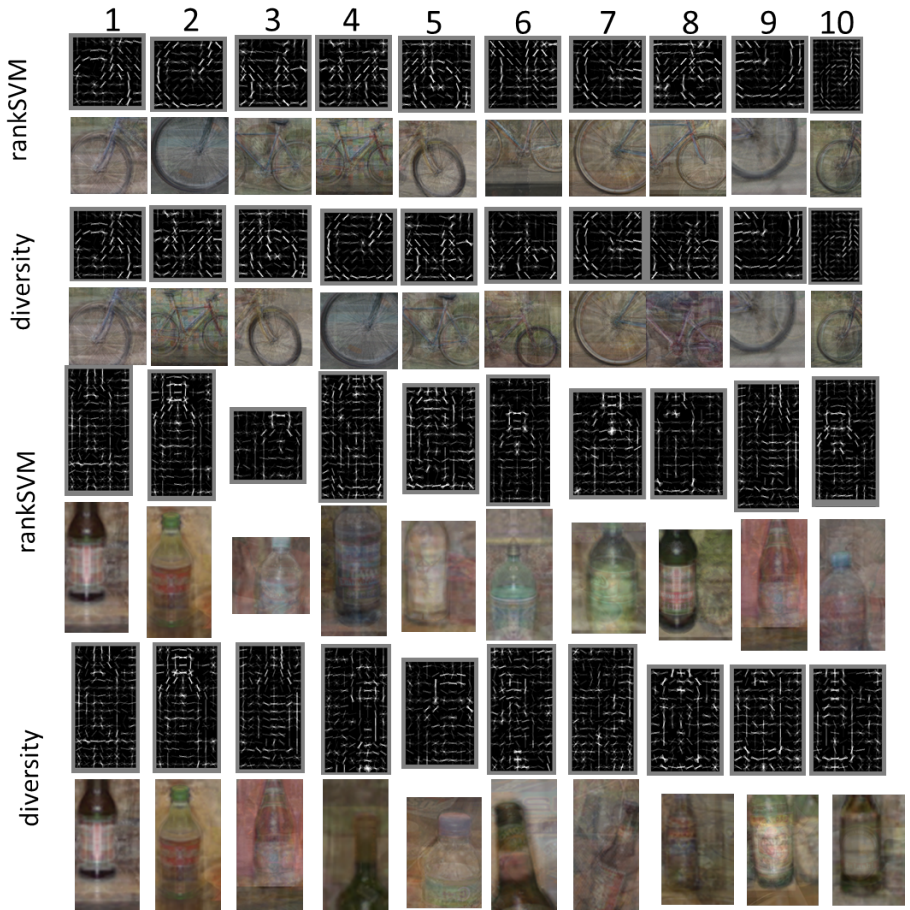
**Table 1.** Per Category Results for Poselets. Best results are highlighted in bold. Best mean average precision of 29.46 is obtained using Rank ( $\Phi_{LDA}$ ) + Div ( $2\times$  seeds). Note that this method resulted in  $8\times$  speed up of the training pipeline.

	Oracle	Rand	Freq	Rank(da)	Rank(da) + Freq	Rank(da) + Freq + Div
aeroplane	<b>23.58</b>	10.63	10.44	9.66	9.91	21.83
bicycle	41.72	<b>42.56</b>	34.82	38.86	40.66	40.30
bird	9.23	9.18	<b>9.25</b>	9.14	9.12	9.13
boat	<b>13.56</b>	10.53	9.49	10.18	9.36	10.04
bottle	<b>11.54</b>	9.34	9.18	9.46	9.19	9.23
bus	<b>39.56</b>	33.05	30.87	32.77	34.84	36.38
car	<b>37.96</b>	33.92	17.34	29.89	32.39	32.41
cat	9.41	9.38	9.36	<b>9.53</b>	9.15	9.21
chair	<b>9.98</b>	9.68	9.36	9.22	9.11	9.12
cow	<b>19.58</b>	14.64	14.69	15.24	18.66	18.54
diningtable	10.07	9.47	<b>10.29</b>	9.91	9.96	9.81
dog	<b>10.03</b>	9.41	9.32	9.31	9.23	9.22
horse	<b>41.70</b>	35.93	27.38	30.17	33.32	32.34
motorbike	<b>33.26</b>	32.28	25.33	31.67	32.64	32.64
person	<b>15.58</b>	10.08	9.65	9.90	10.40	11.04
pottedplant	9.62	9.51	<b>9.62</b>	9.41	9.10	9.23
sheep	<b>24.33</b>	18.69	14.47	18.51	20.23	22.07
sofa	<b>13.30</b>	9.95	9.77	11.07	11.22	11.26
train	<b>33.23</b>	25.20	26.14	28.09	26.98	28.08
tvmonitor	30.49	27.16	27.82	26.70	29.47	<b>30.58</b>
mean AP	<b>21.89</b>	18.53	16.23	17.93	18.75	19.62

**Table 2.** Per Category Results for Exemplar SVMs. Note how Freq and Div both play an important role for esvm along with ranker (result closest to the Oracle is obtained when all three, i.e. Rank, Freq and Div are used together). All these methods result in a speed-up of  $6.3\times$  relative to the Oracle.

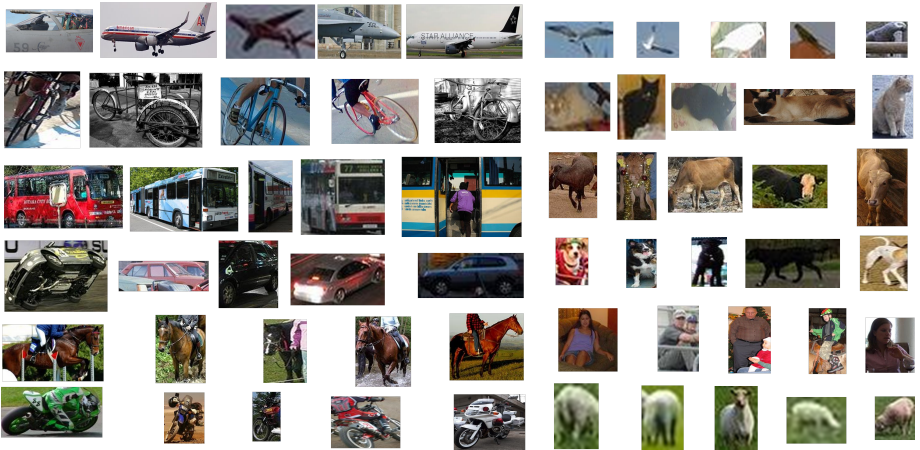


**Fig. 1.** Top 10 poselets (filter and seeds) per category discovered using rankSVM (top 2 rows). Re-ordering using our diversity selection method (bottom 2 rows). Note that parts that are ranked higher by rankSVM might not end up high in the ordering by diversity. Diversity selection picks diverse set of parts for instance in case of sheep, instead of just picking faces which might have high prediction capability by themselves, it also picks side view of sheep (last part).



**Fig. 2.** More examples of visualization of poselets selected by rankSVM and by rankSVM + diversity.





**Fig. 3.** Top 5 exemplars selected by our method  $\text{Rank}(\text{lda}) + \text{Freq} + \text{Div}$ . Categories in row major order - aeroplane, bird, bicycle, cat, bus, cow, car, dog, horse, person, motorbike and sheep.