1 Methods

1.1 Computing Feature Vectors

1.2 Feature Normalization

2 Visualizations

2.1 Successful Segmentations

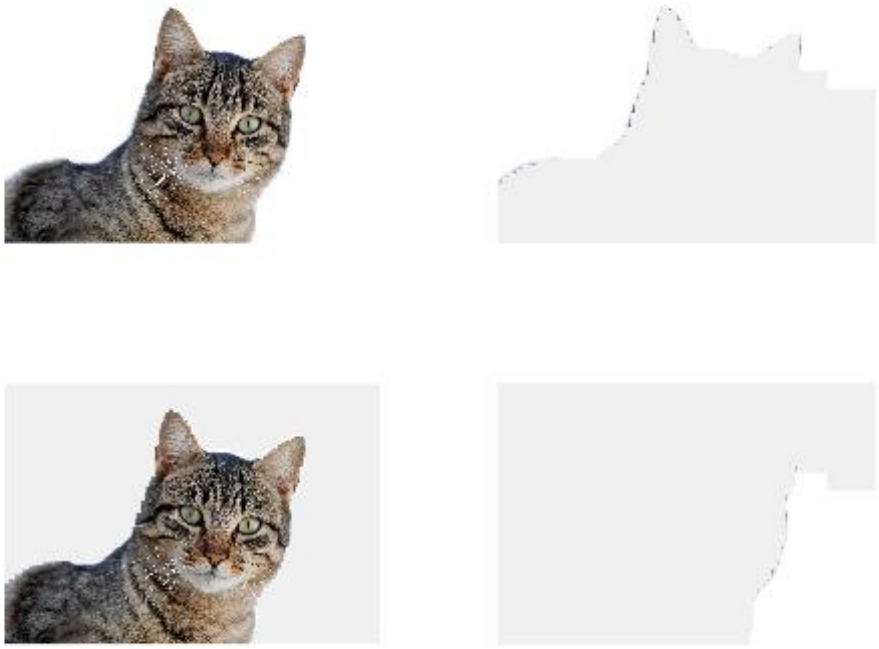

Figure 1: `cat_march.jpg`, using HAC with $k = 3$, position + color features, feature normalization, and a resize factor of 0.025.

Figure 2: `Cat_Bed.jpg`, using k-means clustering with $k = 4$, position + color features, and feature normalization.

Figure 3: `black_kitten_star.jpg`, using k-means clustering with $k = 3$, color features, and no feature normalization.

2.2 Unsuccessful Segmentations

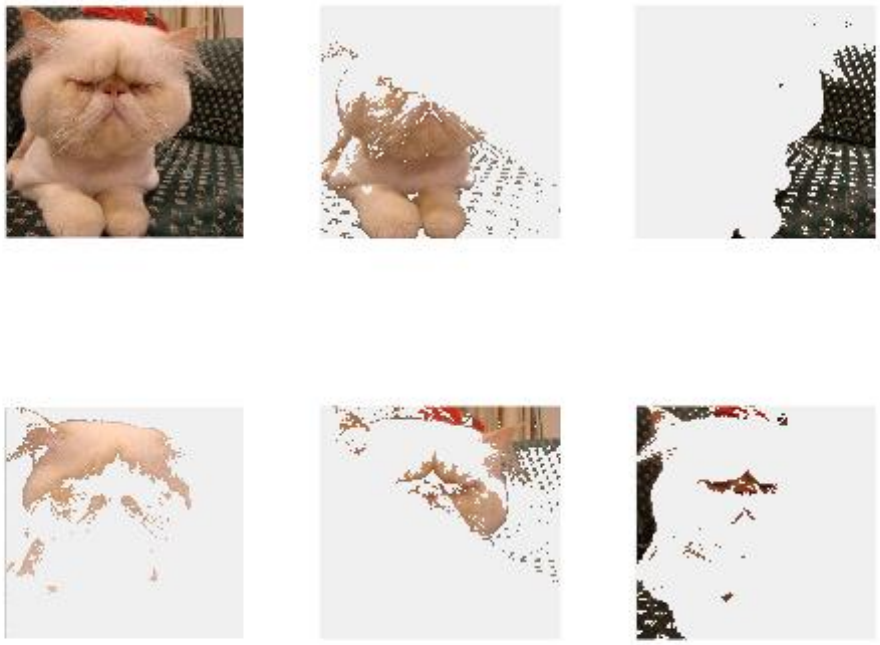

Figure 4: `cat_grumpy.jpg`, using k-means clustering with $k = 5$, position + color features, and no feature normalization.

Figure 5: `cat-jumping-running-grass.jpg`, using k-means clustering with $k = 3$, color features, and feature normalization.

Figure 6: `kitten16.jpg`, using HAC with $k = 3$, color features, feature normalization, and a resize factor of 0.25.

2.3 Composite Images

Using the script titled `GrabCat.m`, we were able to produce composite images by transferring segments from one image to another background image. This allowed us to create the two composite images shown below.

Figure 7: Input: `black_kitten_star.jpg, desert.jpg`, using k-means clustering with $k = 3$, color features, and feature normalization.

Figure 8: Input: `black_kitten.jpg, beach.jpg`, using HAC with $k = 5$, color features, feature normalization, and a resize factor of 0.2.

3 Evaluation

Feature Transform	Feature Normalization	Clustering Method	Number of Clusters	Resize (Max Pixels)	Mean Accuracy
Color	Yes	K-Means	3	50000	.8341
Color	Yes	K-Means	5	50000	.8736
Color	Yes	K-Means	7	50000	.8795
Color	Yes	K-Means	15	50000	.9087
Color	Yes	K-Means	30	50000	.9228
Color	No	K-Means	5	50000	.8680
Color/Position	Yes	K-Means	5	50000	.8765
Color/Position	No	K-Means	5	50000	.8802
Color/Edges	Yes	K-Means	5	50000	.7991
Color/Edges	No	K-Means	5	50000	.8670
Color/Gradients	Yes	K-Means	5	50000	.7905
Color/Gradients	No	K-Means	5	50000	.8775
Color/Position/Edges	Yes	K-Means	5	50000	.7951
Color/Position/Edges	No	K-Means	5	50000	.8800
Color/Position/Edges/Gradients	Yes	K-Means	5	50000	.7924
Color/Position/Edges/Gradients	No	K-Means	5	50000	.8866
Color	Yes	HAC	5	1000	.8623
Color	Yes	HAC	3	1000	.8340
Color	Yes	HAC	7	1000	.8691
Color	Yes	HAC	15	1000	.8906
Color	Yes	HAC	15	1000	.9123
Color	No	HAC	5	1000	.8585
Color/Position	Yes	HAC	5	1000	.8531
Color/Position	No	HAC	5	1000	.8585
Color/Edges	Yes	HAC	5	1000	.9288
Color/Edges	No	HAC	5	1000	.8585
Color/Gradients	Yes	HAC	5	1000	.9108
Color/Gradients	No	HAC	5	1000	.8578
Color/Position/Edges	Yes	HAC	5	1000	.9256
Color/Position/Edges	No	HAC	5	1000	.8585
Color/Position/Edges/Gradients	Yes	HAC	5	1000	.9052
Color/Position/Edges/Gradients	No	HAC	5	1000	.8550
Color	Yes	K-Means	5	1000	.8610
Color	Yes	K-Means	5	10000	.8649
Color	Yes	K-Means	5	100000	.8666
Color	Yes	HAC	5	2000	.8638
Color	Yes	HAC	5	4000	.8702