Facial Detection

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Goals of Project

- Predict keypoint positions on face images
- Build a real-time face detector

Use Cases

- Track faces in images and video
- Analyze facial expressions
- Detecting dysmorphic facial signs for medical diagnosis
- Auto-tag pictures
- Classifying pictures

Data Sources

- The datasets on Kaggle provided by provided by Dr. Yoshua Bengio of the University of Montreal:

M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
eyebro nner_en	left_eyebro w_inner_en d_y	left_eyebro w_outer_en d_x	left_eyebro w_outer_en d_y	right_eyebr ow_inner_e nd_x	right_eyebr ow_inner_e nd_y	right_eyebr ow_outer_e nd_x	right_eyebr ow_outer_e nd_y	nose_tip_x	nose_tip_y	mouth_left_ corner_x	mouth_left_ corner_y	mouth_righ t_corner_x	mouth_righ t_corner_y	mouth_cent er_top_lip_ x	mouth_cent er_top_lip_ y	mouth_cent er_bottom_ lip_x	mouth_cent er_bottom_ lip_y	Image
9532632	29.0336481	80.2271278	32.2281383	40.227609	29.0023218	16.3563789	29.6474707	44.4205714	57.066803	61.1953083	79.9701654	28.6144962	77.3889925	43.3126015	72.9354586	43.1307068	84.4857744	238 236 237 2
20 20 24	27 25 23 23	26 28 29 32	39 45 48 52	57 60 189	188 207 172	69 31 36	30 26 31 32	30 29 19 14	56 95 102	112 133 128	90 67 73 75	76 76 70 53	46 48 44 40	39 35 34 39	43 35 36 39	37 38 42 44	43 42 43 45	46 41 40 46
48 60 112	136 131 135	14 9874043	28.2759489	78.6342128	30.4059234	42.7288511	26.1460426	16.8653617	27.0588596	48.2062979	55.6609362	56.4214468	76.352	35.122383	76.0476596	46.6845957	70.2665532	45.4679149
85.4801702	219 215 204	1 7425263	27.5709474	78.8873684	32.6516211	42.1938947	28.1354526	16.7911579	32.0871158	47.5572632	53.5389474	60.8229474	73.0143158	33.7263158	72.732	47.2749474	70.1917895	47.2749474
78.6593684	144 142 159	1 57 52 54	74 73 62 47	34 29 12 15	53 82 89 91	91 89 82 71	68 68 75 86	97 101 98 98	102 109 112	115 121 130	128 128 133	133 129 128	129 129 123	121 118 117	116 120 124	118 113 108	103 100 94	85 82 85 89
94 101 108	111 111 113	118 109 61 42	4338087	30.9298643	77.9102609	31.6657252	41.671513	31.0499896	20.4580174	29.9093426	51.8850783	54.1665391	65.598887	72.7037217	37.2454957	74.1954783	50.3031652	70.091687
51.5611826	78.2683826	193 192 193	1 2 163 161	166 167 161	159 174 172	148 108 83	65 60 60 69	76 75 63 56	51 51 54 51	46 48 49 44	44 45 41 41	62 104 147	146 138 134	136 133 141	145 154 162	169 171 175	187 169 108	58 22 2 1 1
1 1 1 1 1 1	1 1 1 1 1 1	1 2 81 79	50 13 0 0 0	2 1 1 1 1 0	5 1 2495706	30.6721767	77.7629448	31.7372466	38.0354356	30.9353816	15.9258699	30.6721767	43.2995337	64.8895215	60.671411	77.5232393	31.1917546	76.9973006
44.9627485	73.7073865	44.2271411	86.8711656	147 148 160	1 7 123 111	112 108 77	46 48 52 46	43 45 43 39	36 41 51 48	45 43 42 50	48 40 44 54	55 59 57 48	47 51 54 62	65 59 57 75	89 87 66 56	68 86 99 101	101 102 104	105 106 105
107 108 108	106 104 58	19 23 20 17	28 34 34 33	34 37 37 43	46 83 140 170	1 7 7662804	31.6512897	83.3136449	35.3580561	39.408	30.5463925	14.9490841	32.1501308	52.468486	58.8	64.8690841	82.4711776	31.9904299
81.6690841	49.3081121	78.4876262	49.4323738	93.8987664	167 169 170	1 5611544	27.0913289	76.2252886	29.1073289	40.2330201	27.0913289	19.5008859	27.6673289	46.8550872	53.0061745	55.7817987	70.570953	33.8983087
70.282953	45.1277315	65.0995973	45.4157315	78.0570201	109 109 125	1 0141359	27.3339029	84.1304854	31.2910136	39.769165	26.9173748	11.8615922	31.9158058	47.8918835	56.9079612	66.8439612	80.0257864	30.1892039
81.2751845	48.1001942	71.2786019	48.5168155	91.0639223	178 177 178	1 231 220	208 197 210	223 221 218	211 210 213	211 206 207	217 217 216	212 209 205	198 186 178	177 179 188	197 209 218	216 216 216	211 211 205	200 193 194
203 203 200	197 194 189	186 180 182	184 178 170	151 96 76	76 94 97	105 96 93 98	1 7.50784	25.0304	79.2736	28.63424	36.3424	26.17472	12.88896	31.32288	48.06976	55.34848	65.5168	73.36832
31.19424	74.79808	49.21344	67.648	49.49952	83.09312	164 158 118	7 18 22 25	21 18 40 71	87 93 96 98	100 100 98 98	95 89 87 82	79 77 78 79	83 91 98 104	111 116 120	123 125 129	131 132 128	129 126 122	126 127 126
125 124 118	115 112 110	106 100 99 96	96 101 104	105 103 104	101 99 104	92 47 26 29	20 14 1 9710769	28.4897231	75.9470769	29.5897846	36.6190769	29.3147692	16.8178462	33.9901538	48.9950769	54.3415385	65.7716923	69.1926154
32.7692308	72.2178462	49.2701538	67.5427692	49.5452308	76.8935385	226 227 225	2 109 100	87 91 91 89	91 91 93 93	94 94 91 91	94 96 95 91	87 84 82 77	74 76 175	237 224 215	210 206 195	181 170 164	168 177 187	187 189 192
198 199 189	180 171 163	157 156 157	154 159 159	155 153 153	154 158 160	161 166 170	174 177 178	17 3967547	28.2710943	76.1578868	28.2710943	38.5168302	26.2478491	16.6605283	27.8671698	47.421283	51.746717	57.1344906
71.5797736	34.0646038	70.7701132	46.469434	65.2600755	46.2067925	81.6978113	52 51 54	57 5 180	209 208 208	205 207 204	205 205 204	204 202 203	199 199 199	198 196 195	194 105 94	78 69 59	55 65 72	67 41 44
76 79 50	40 85 114	119 119 119	124 121 126	126 127 121	113 107 101	98 95 100	102 107 108	108 111 112	117 115 120	120 121	55.6544	29.876	81.0392	35.596	44.2136	29.1608	15.612	34.1664
48.504	56.6904	61.7328	82.432	33.488	81.36	48.504	72.7792	47.7888	94.588	142 124 123	1

- Scope:
  training.csv: list of training 7049 images.
  test.csv: list of 1783 test images.
  predictResult.csv: list of 27124 keypoints to predict

Milestones | Methodology

- 11/07—12/08 :
- 11/07-11/11(Week1) Load the data and read the images
- 11/12-11/20(Week2-3) Detect the faces
  Build an algorithm that, given an image of a face, automatically locates where these key points are located;
  Use the information about the intensity of each pixel to identify the key points;
  Extract a patch around the key point in each image, and average the result.
  Unit test cases.
- 11/21-12/08(Week4-4.5) Real time detection (using **openCV**, **haar classifier**, **Akka** Streams, **Spark**) and test our app.

Acceptance Criteria

- Facial key points detection: use the training data set to evaluate the performance.
  - Low RMSE(…depending on the datum)(to be continued).
  - High correct rate: >70%

THANKS