



# **Facial Expression Recognition**

## **(Deep Neural Network)**





















2017. 11. 20

영상처리 특강

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## CONTENTS. Challenges in Representation Learning : Facial Expression Recognition Challenge

2013년도 얼굴 표정 학습 대회에 56팀이 참가

Overview Data Discussion Leaderboard Rules Team								
In the money Gold Silver Bronze								
#	△ pub	Team Name	Kernel	Team Members	Score	Entries	Last	
1	—	RBM			0.71161	5	5y	
2	—	Unsupervised			0.69267	8	4y	
3	—	Maxim Milakov			0.68821	7	4y	
4	—	Radu+Marius+Cristi			0.67483	6	4y	
5	—	Lor.Voldy			0.65254	2	5y	
6	▲ 1	ryank			0.65087	2	5y	
7	▼ 1	Eric Cartman			0.64474	1	5y	
8	—	Xavier Bouthillier			0.64224	1	4y	
9	▲ 1	Alejandro Dubrovsky			0.63109	5	4y	
10	▼ 1	sayit			0.62190	2	5y	
11	—	jaberg			0.61967	6	4y	
12	▲ 1	bulbuloglu			0.59654	8	4y	
13	▼ 1	kg			0.59208	4	4y	
14	—	Liu			0.58623	8	4y	
15	▲ 1	12AngryBird			0.57899	2	5y	
16	▼ 1	shiggles			0.57592	3	4y	
17	▲ 1	multiboost			0.56812	4	4y	
18	▼ 1	Pikqu			0.56199	6	4y	
19	—	Anil Thomas			0.55363	7	4y	
20	—	dova			0.54444	1	4y	

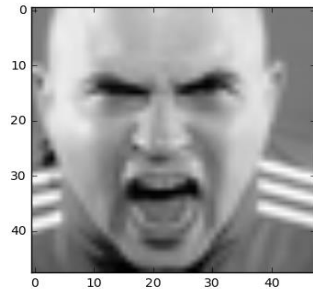
<https://www.kaggle.com/c/challenges-in-representation-learning-facial-expression-recognition-challenge>

## CONTENTS. Using Data Set

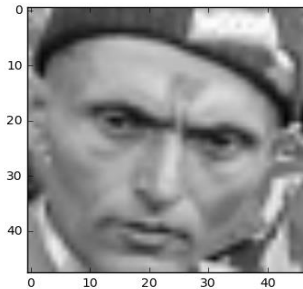
# Fer2013 Database ( 35887 facial expression images , 48x48 pixel size.)

- 7 classes

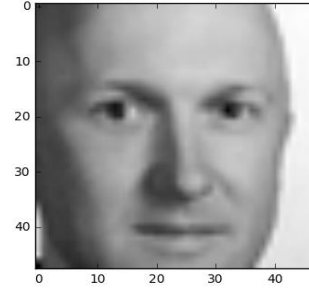
- Angry
- Disgust
- Fear
- Happy
- Sad
- Surprise
- Neutral



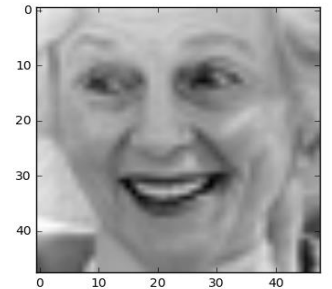
Class 0: Angry



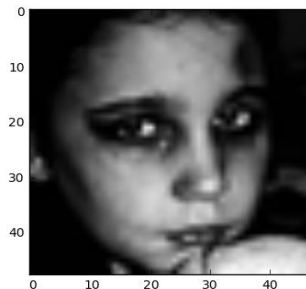
Class 1: Disgust



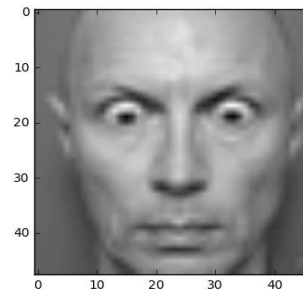
Class 2: Fear



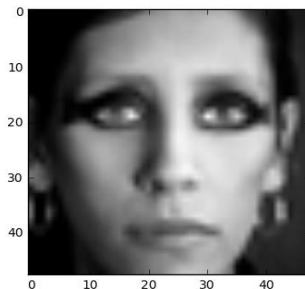
3:Happy



4=Sad



5=Surpr  
ise



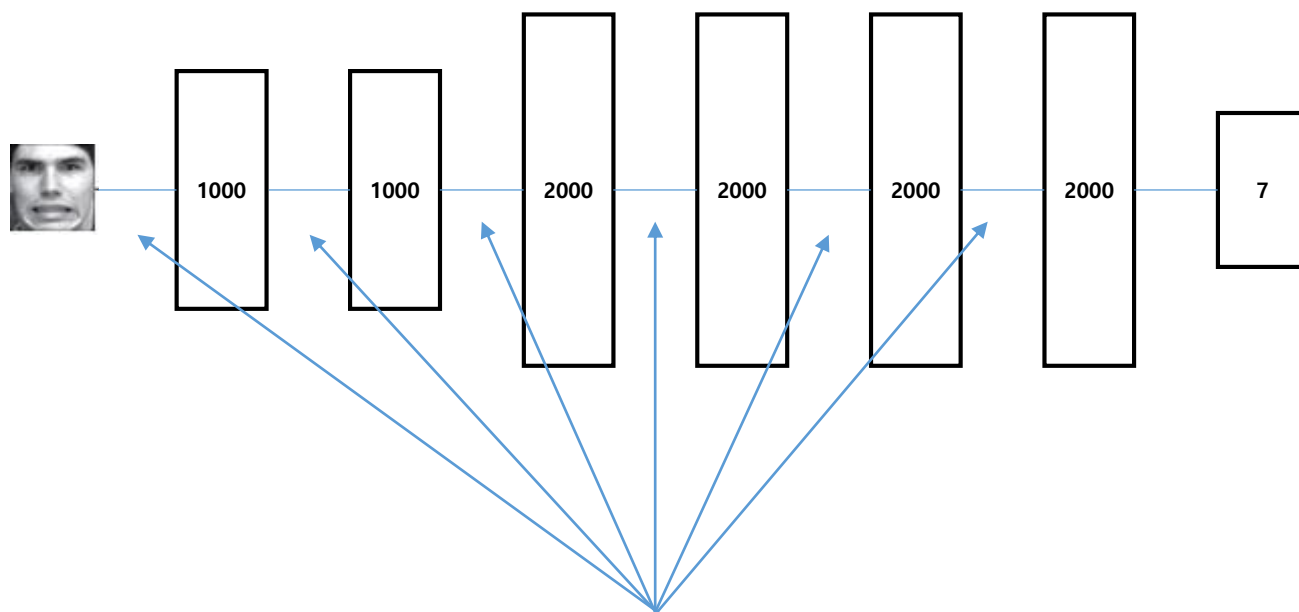
6=Neutral



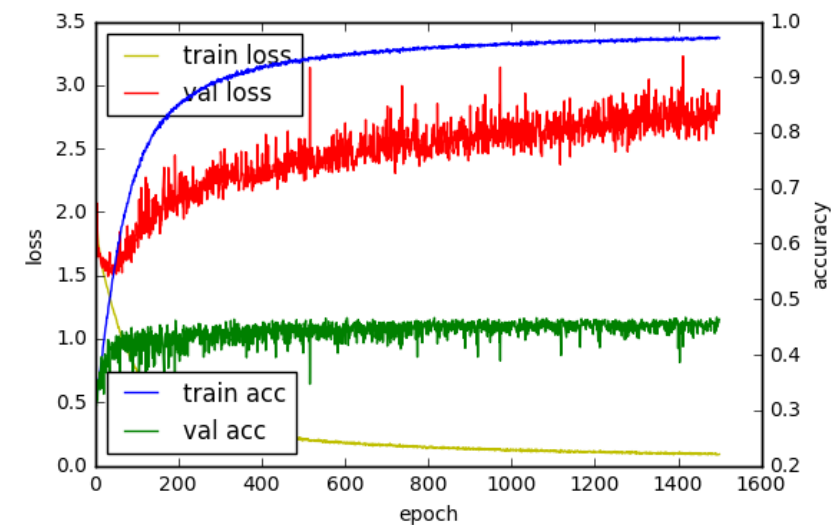


emotion	pixels	Usage
0	70 80 82 72 58 58 60 63 54 58 60 48 89 115 121 119 115 110 98 91 84 84 90 99 110 126 143 153 158 171 169 172 169 165 129 110 113 107 95 79 66 62 56 57 61 52 43 41 65 61 58	Training
0	151 150 147 155 148 133 111 140 170 174 182 154 153 164 173 178 185 185 189 187 186 193 194 185 183 186 180 173 166 161 147 133 172 151 114 161 161 146 131 104 95 132 1	Training
2	231 212 156 164 174 138 161 173 182 200 106 38 39 74 138 161 164 179 190 201 210 216 220 224 222 218 216 213 217 220 220 218 217 212 174 160 162 160 139 135 137 131 94 5	Training
4	24 32 36 30 32 23 19 20 30 41 21 22 32 34 21 19 43 52 13 26 40 59 65 12 20 63 99 98 98 111 75 62 41 73 118 140 192 186 187 188 190 190 187 182 176 173 172 173 25 34 29 35 2	Training
6	4 0 0 0 0 0 0 0 0 0 0 3 15 23 28 48 50 58 84 115 127 137 142 151 156 155 149 153 152 157 160 162 159 145 121 83 58 48 38 21 17 7 5 25 27 24 25 1 0 0 0 0 0 0 0 0 0 6 18 26 3	Training
2	55 55 55 55 55 54 60 68 54 85 151 163 170 179 181 185 188 188 191 196 189 194 198 197 195 194 190 193 195 184 175 172 161 159 158 159 147 136 137 136 146 120 86 93 114 1	Training
4	20 17 19 21 25 38 42 42 46 54 56 62 63 66 82 108 118 130 139 134 132 126 113 97 126 148 157 161 155 154 154 164 189 204 194 168 180 188 214 214 214 216 208 220 205 187 17	Training
3	77 78 79 79 78 75 60 55 47 48 58 73 77 79 57 50 37 44 56 70 80 82 87 91 86 80 73 66 54 57 68 69 68 68 49 46 75 71 69 70 70 72 72 71 72 74 77 76 83 84 82 81 81 69 60 60 46 57	Training
3	85 84 90 121 101 102 133 153 153 169 177 189 195 199 205 207 209 216 221 225 221 220 218 222 223 217 220 217 211 196 188 173 170 133 117 131 121 88 73 73 50 27 34 32 34	Training
2	255 254 255 254 254 179 122 107 95 124 149 150 169 178 179 179 181 181 184 190 191 191 193 190 190 195 194 192 193 196 193 192 188 182 173 162 152 144 129 116 113 106 1	Training
0	30 24 21 23 25 25 49 67 84 103 120 125 130 139 140 139 148 171 178 175 176 174 180 180 178 178 182 185 183 186 186 178 180 172 175 171 155 152 141 136 132 137 131 96 46	Training
6	39 75 78 58 58 45 49 48 103 156 81 45 41 38 49 56 60 49 32 31 28 52 83 81 78 75 62 31 18 19 19 20 17 20 16 15 12 10 11 10 23 36 65 59 9 3 5 7 93 69 86 90 84 75 51 129 133 63	Training
6	219 213 206 202 209 217 216 215 219 218 223 230 227 227 233 235 234 236 237 238 234 226 219 212 208 201 190 183 176 161 74 15 24 22 22 22 21 19 19 20 20 23 7 89 255 252 2	Training
6	148 144 130 129 119 122 129 131 139 153 140 128 139 144 146 143 132 133 134 130 140 142 150 152 150 134 128 149 142 138 156 155 140 136 143 143 139 144 160 170 154 181	Training
3	4 2 13 41 56 62 67 87 95 62 65 70 80 107 127 149 153 150 165 168 177 187 176 167 152 128 130 149 149 146 130 139 139 143 134 105 78 56 36 50 69 82 64 35 10 11 13 105 4 4 2	Training
5	107 107 109 109 109 109 110 101 123 140 144 144 149 153 160 161 161 167 168 169 172 172 173 175 176 171 170 166 165 162 162 157 150 149 145 140 136 132 128 111 98 111 1	Training
3	14 14 18 28 27 22 21 30 42 61 77 86 88 95 100 99 101 99 98 99 99 96 101 102 96 95 94 88 78 72 65 55 40 25 20 20 42 64 74 129 133 125 144 151 153 154 154 155 16 14 24 28 27	Training
2	255 255	Training
6	134 124 167 180 197 194 203 210 204 203 209 204 206 211 211 216 219 224 228 230 230 226 222 220 217 217 210 207 213 210 199 191 190 188 177 172 148 142 90 46 81 132 116	Training
4	219 192 179 148 208 254 192 98 121 103 145 185 83 58 114 227 225 220 203 202 168 154 157 164 182 211 164 94 122 155 176 238 240 242 192 87 43 39 60 85 34 57 82 130 113 1	Training
4	1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 7 12 23 45 38 35 14 43 27 31 24 18 20 29 18 6 2 4 2 0 1 1 1 1 0 5 13 16 16 16 15 14 1 1 1 1 1 1 1 1 1 1 0 0 3 7 9 27 44 43 42 26 28 60 76 61 42	Training
2	174 51 37 37 38 41 22 25 22 24 35 51 70 83 98 113 119 127 136 149 149 141 125 107 77 50 30 21 9 38 96 79 72 87 60 23 25 43 29 24 33 51 36 33 26 20 136 255 107 46 43 34 48 3	Training
0	123 125 124 142 209 226 234 236 231 232 235 223 211 196 184 181 182 186 185 193 208 211 208 201 196 192 191 192 194 201 207 216 225 225 223 220 219 220 172 124 124 122	Training
0	8 9 14 21 26 32 37 46 52 62 72 70 71 73 76 83 98 92 80 90 110 148 158 149 166 172 166 166 164 179 196 197 189 185 194 189 174 173 177 179 186 197 192 191 185 176 171 146	Training
3	252 250 246 229 182 140 98 72 53 44 67 95 95 89 89 90 90 93 94 89 88 88 83 82 81 73 74 69 69 64 58 49 46 49 35 32 27 25 24 21 13 9 11 15 15 15 21 24 254 246 221 176 156 129	Training
3	224 227 219 217 215 210 187 177 189 200 206 212 210 208 204 207 206 207 205 203 203 206 206 201 204 199 196 189 187 187 186 185 184 186 183 182 182 173 161 154 176 202	Training
5	162 200 187 180 197 198 196 192 176 152 136 114 109 117 124 133 162 182 195 200 202 203 204 200 201 202 200 200 200 200 198 195 192 189 185 183 168 152 130 114 106 97 9	Training
0	236 230 225 226 228 209 199 199 193 196 211 199 198 194 199 214 209 202 207 179 156 154 152 157 156 151 144 136 138 140 140 148 183 209 192 177 158 179 232 255 254 255 255 255	Training
3	210 210 210 210 211 207 147 103 68 60 47 70 124 118 119 123 124 131 136 138 146 144 147 152 157 159 162 165 165 164 163 161 159 159 159 162 159 159 156 151 143 135 131	Training
5	50 44 74 141 187 187 169 113 80 128 181 172 76 62 37 41 40 37 55 44 37 36 48 45 40 48 82 82 78 69 56 60 50 42 52 69 125 154 128 68 57 46 50 51 46 40 37 38 48 76 114 116 128	Training
3	234 233 228 231 234 233 236 230 236 196 112 85 100 114 129 133 132 132 147 164 180 156 161 156 151 150 137 117 139 157 138 145 137 132 114 94 80 70 65 88 88 144 228 227	Training
6	244 214 198 187 105 89 47 38 40 28 26 29 42 39 33 48 35 22 28 31 42 46 42 58 61 54 42 46 54 43 38 49 50 86 100 101 93 65 69 71 61 114 161 211 237 242 248 250 222 207 198 12	Training
3	88 116 108 66 61 52 56 74 80 70 55 57 61 68 57 44 62 69 65 61 60 61 68 55 51 65 66 71 60 79 95 94 86 113 112 99 113 108 116 118 88 72 68 25 46 135 102 99 125 123 68 64 77 7	Training
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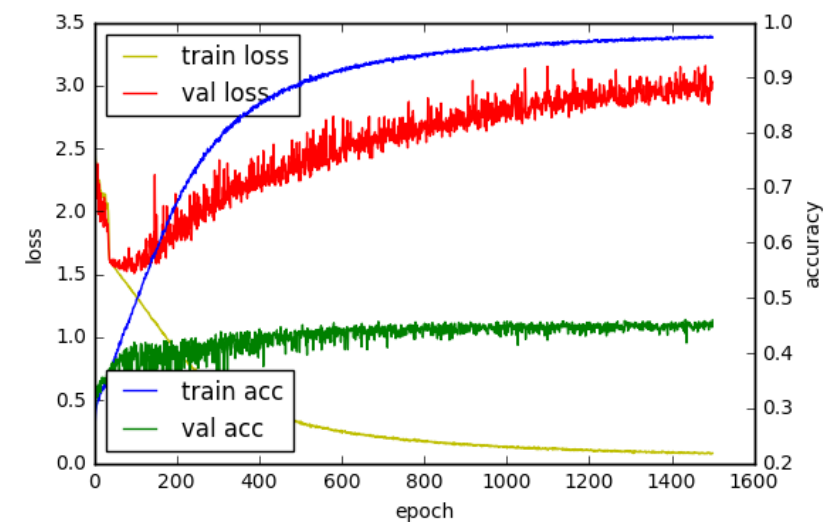
## CONTENTS. Model Architecture



BatchNormalization  
relu  
Dropout(0.5)



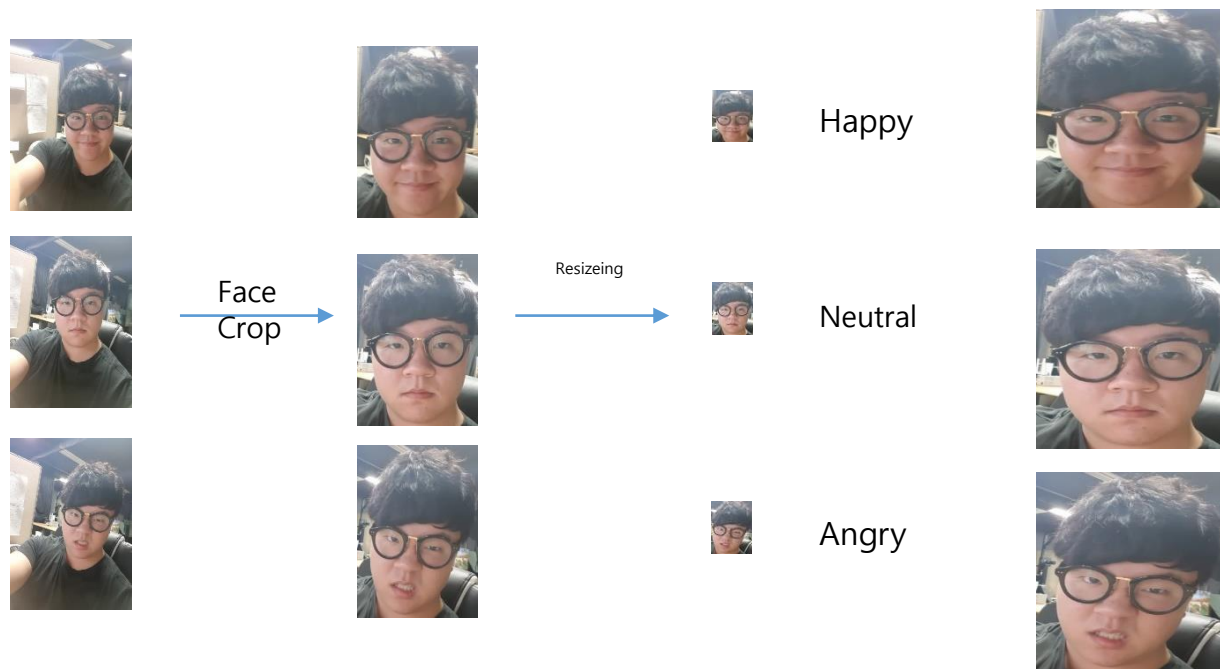
**Adam : 48.5%**



**Sgd : 45.97%**



## CONTENTS. My Model Image Test



Prediction / True label

Fear != Happy

	0	1	2	3	4	5	6
0	0	0	0.999943	0	5.4566e-11	5.69393e-05	9.00507e-32

Surprise != Neutral

	0	1	2	3	4	5	6
0	0	0	1.53056e-15	0	0	1	0

Surprise != Angry

	0	1	2	3	4	5	6
0	1.1513e-33	0	1.78815e-15	5.14898e-29	2.2844e-23	1	1.52059e-25

화난, 혐오, 두려움, 행복, 슬픔, 놀람, 평범한