

Facial Expression Recognition Using Convolutional Neural Networks

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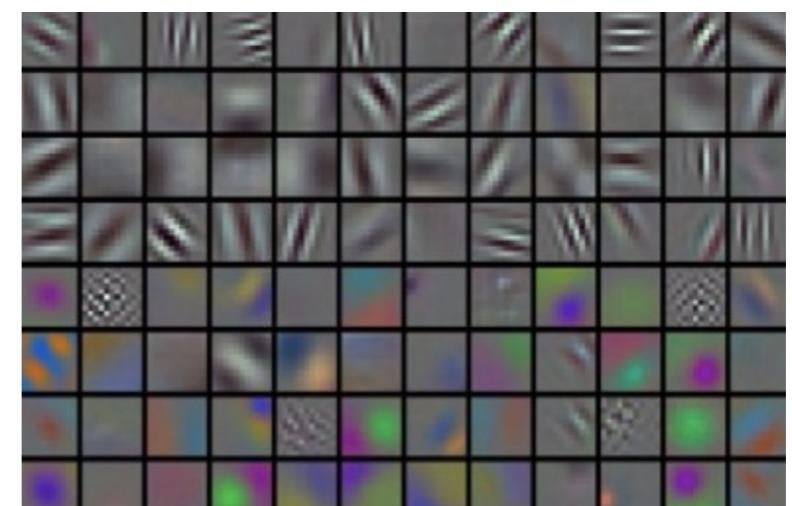
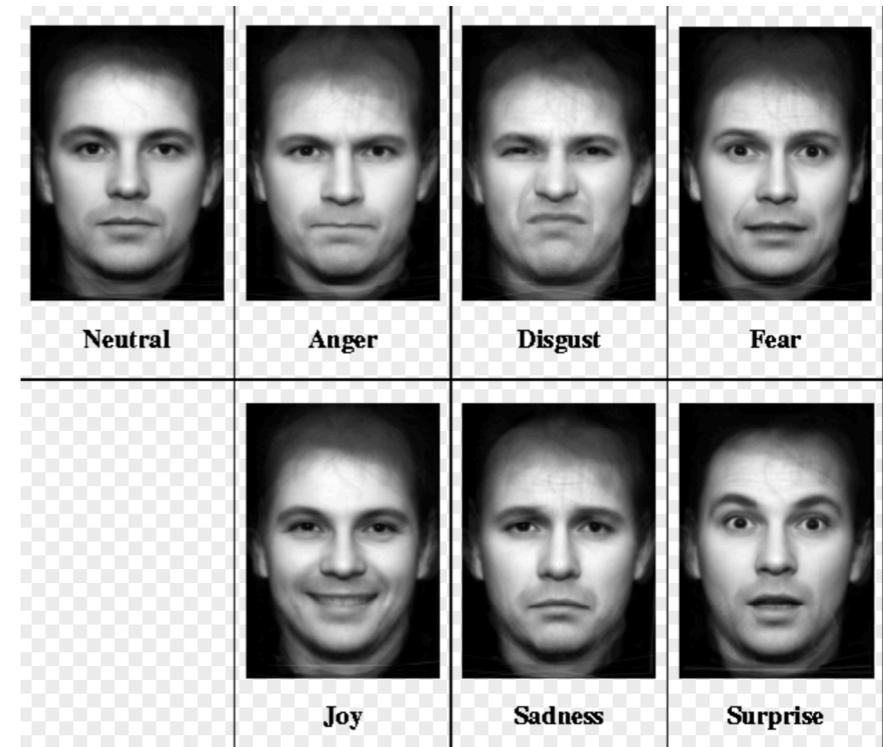


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Facial Expression Recognition Using Convolutional Neural Networks

Background and Motivation

- Facial expression is one of the most important features of human emotion recognition
- Images are high-dimensional objects
- Facial features over high-dimensional spaces can be counter-intuitive
- The convolutional network extracts larger features (dimensionality reduction) in a hierarchical set of layers
- The convolutional network takes large time in training, little time in practice



Up : 6 basic emotions and a neutral face
Down: examples of visualized weights for the first layer of a neural network



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Project Overview

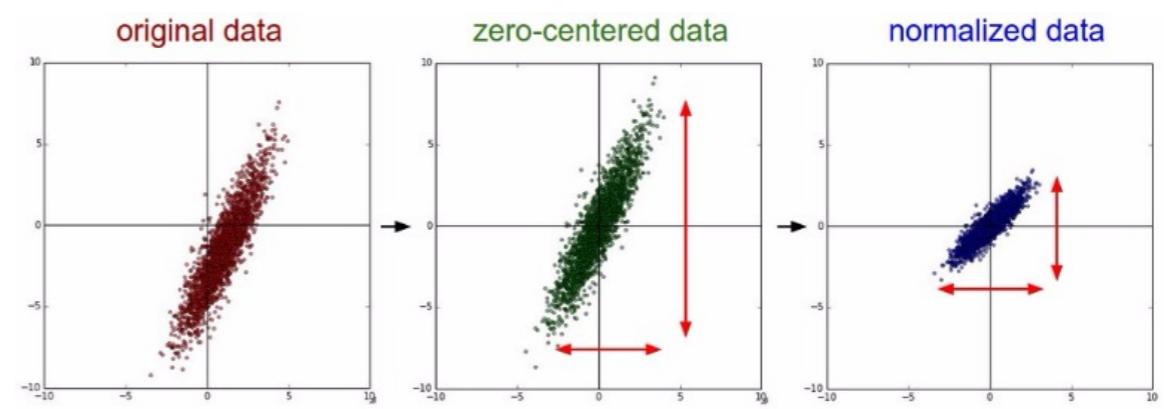
Network Architecture

Input:

- a sequence of frames
- images from CK+ dataset for training

Preprocessing:

- Face detection by Cascade Classifier
- Segment the ROI to 48x48x1
- Zero-center and normalize the data range from [0, 255] to [-1, 1]

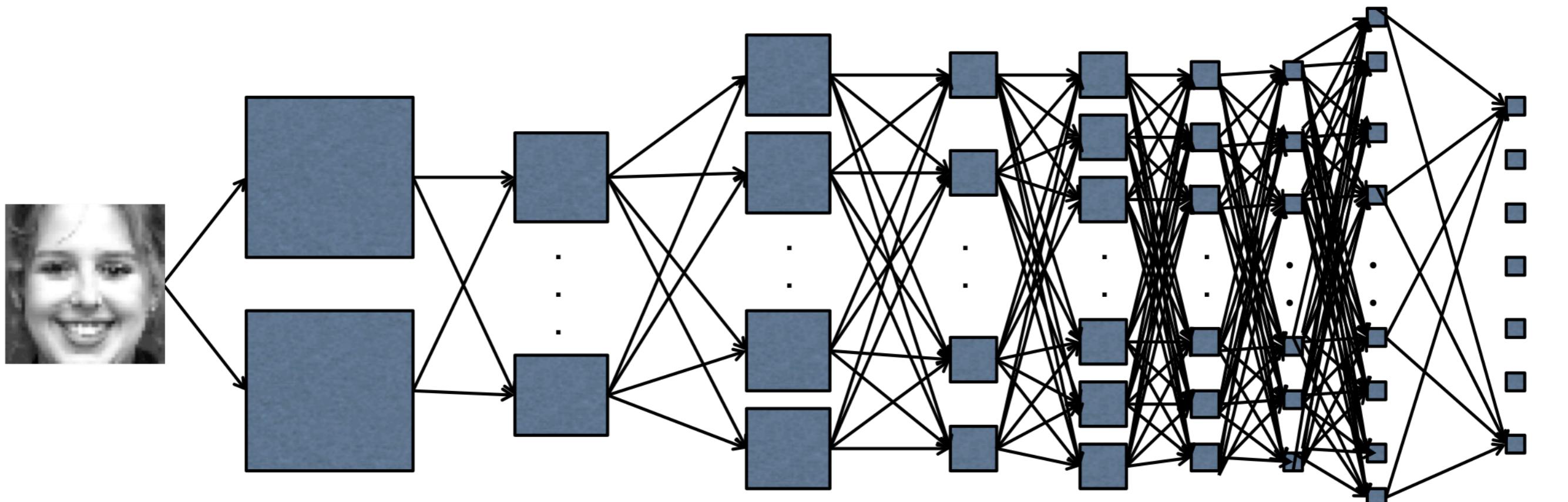


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Convolutional Neural Network Architecture:



L0	L1	L2	L3	L4	L5	L6	L7	L8	L9
input	Conv	Max Pooling	Conv	Max Pooling	Conv	Max Pooling	FC	FC	output
48x48x1	48x48x32	24x24x32	24x24x64	12x12x64	12x12x128	6x6x128	1x1x128	1x1x256	1x1x7



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Loss Function: cross-entropy

Hidden Neurons: 128, 256

Optimization Algorithm: adaptive gradient method (learning= 0.01, epsilon= 1e-8)

Batch-size: 32, epochs: 30

Activation Function: Tanh, ReLU (Rectified Linear Unit), Softmax



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Contributions:

- Reclassified CK+ dataset for 6 basic and neutral emotions classification
- CNN recognition accuracy is 0.844 for 7 emotion categories
- C++ application with Qt GUI

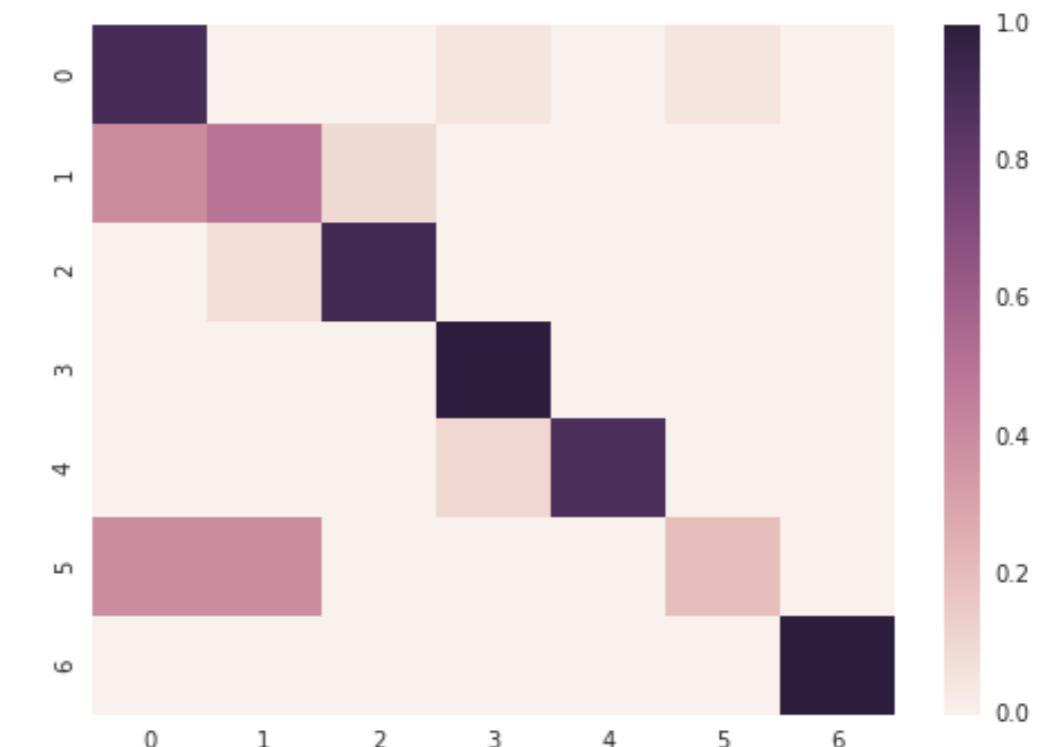
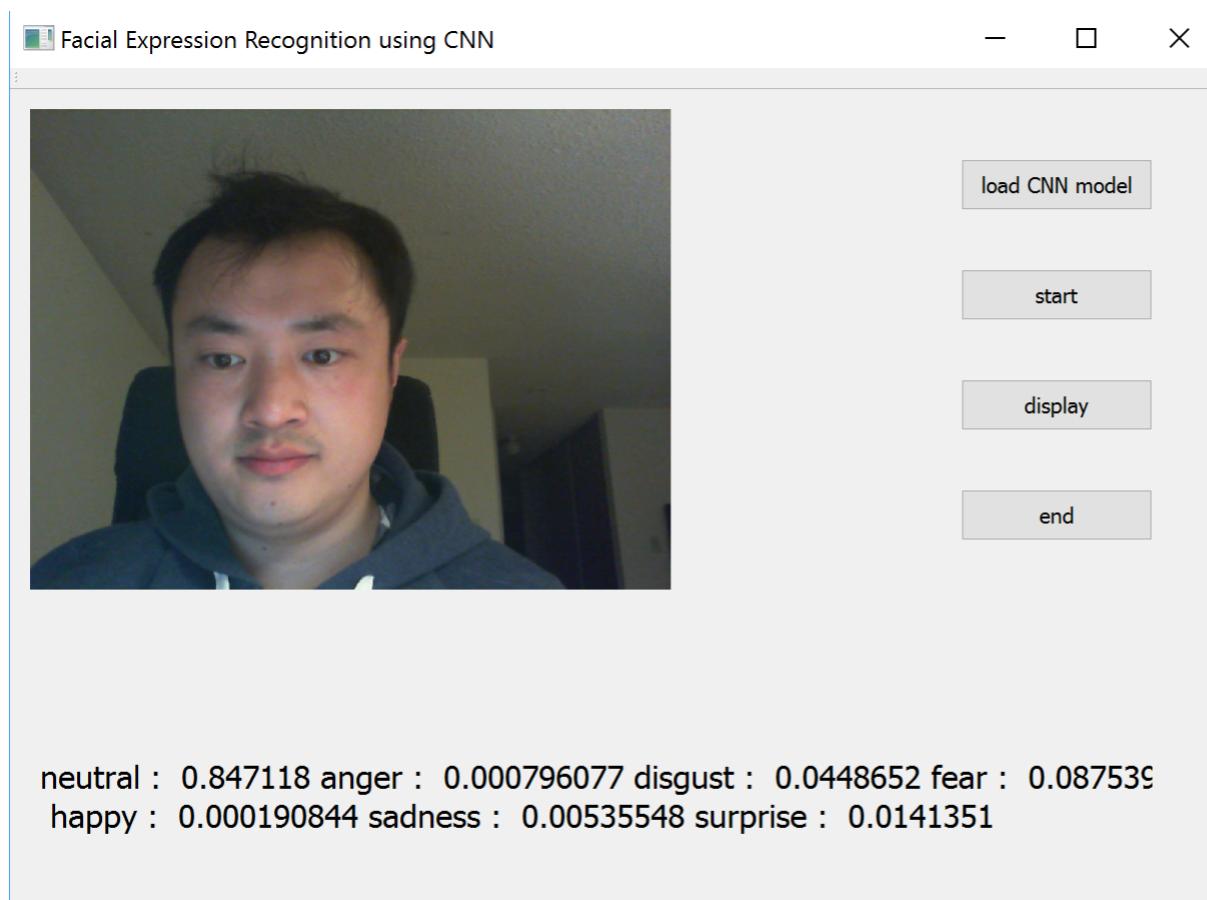


Figure: confusion map for 7 emotions

Demo

Thanks

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Multimedia Lab

The Edward S. Rogers Dept. of Electrical and Computer Engineering

http://www.dsp.utoronto.ca/projects/face_analysis/



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