Images are Data!
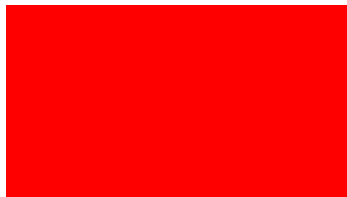
DSC 96
Colin Jemmott

Colors

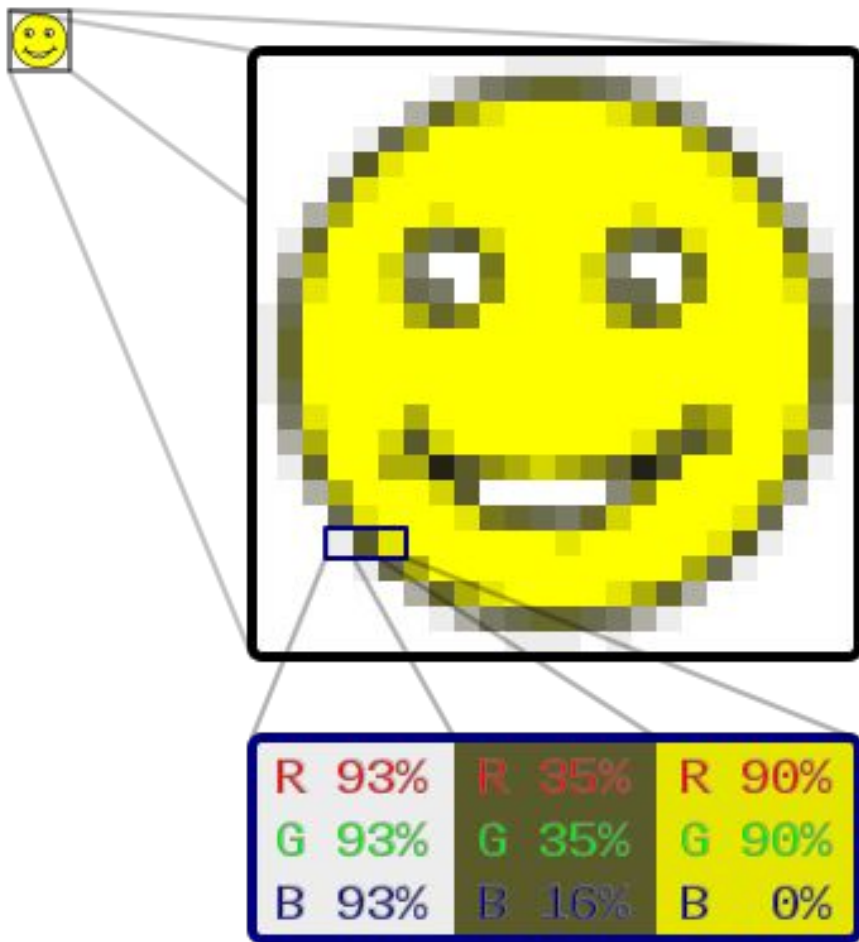To human:

To computer: 255, 0, 0 (in decimal) or #FF0000 (in hexadecimal)
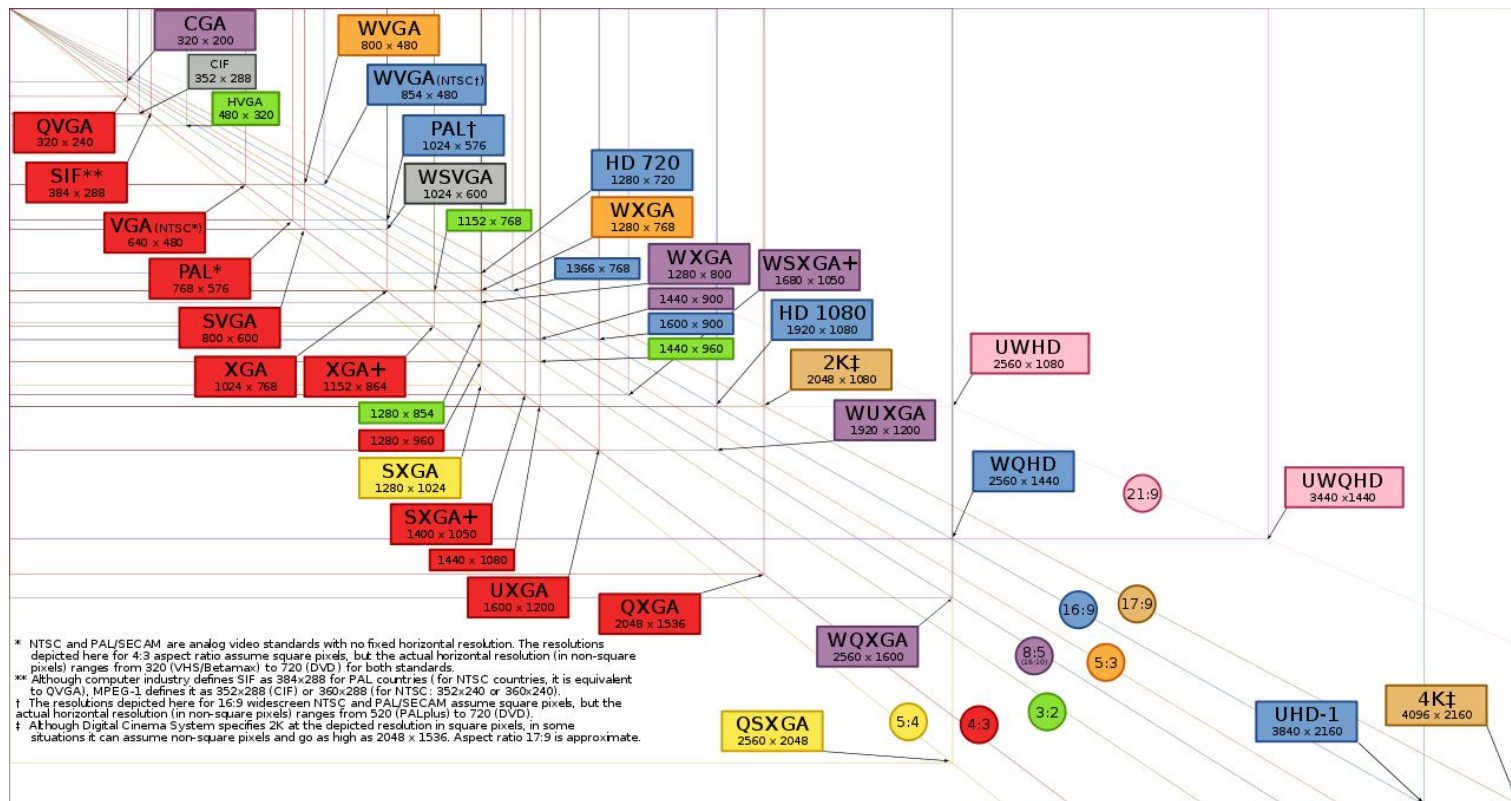
Computer can see more:

http://www.rapidtables.com/web/color/red-color.htm

Pixels

R	93%	R	35%	R	90%
G	93%	G	35%	G	90%
B	93%	B	16%	B	0%

Resolution

Image from https://en.wikipedia.org/wiki/Display_resolution

16 color vs 256 color

Colorspace

Image Processing

Original

Gaussian Blur

Sharpen

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\frac{1}{16}\begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix}$$

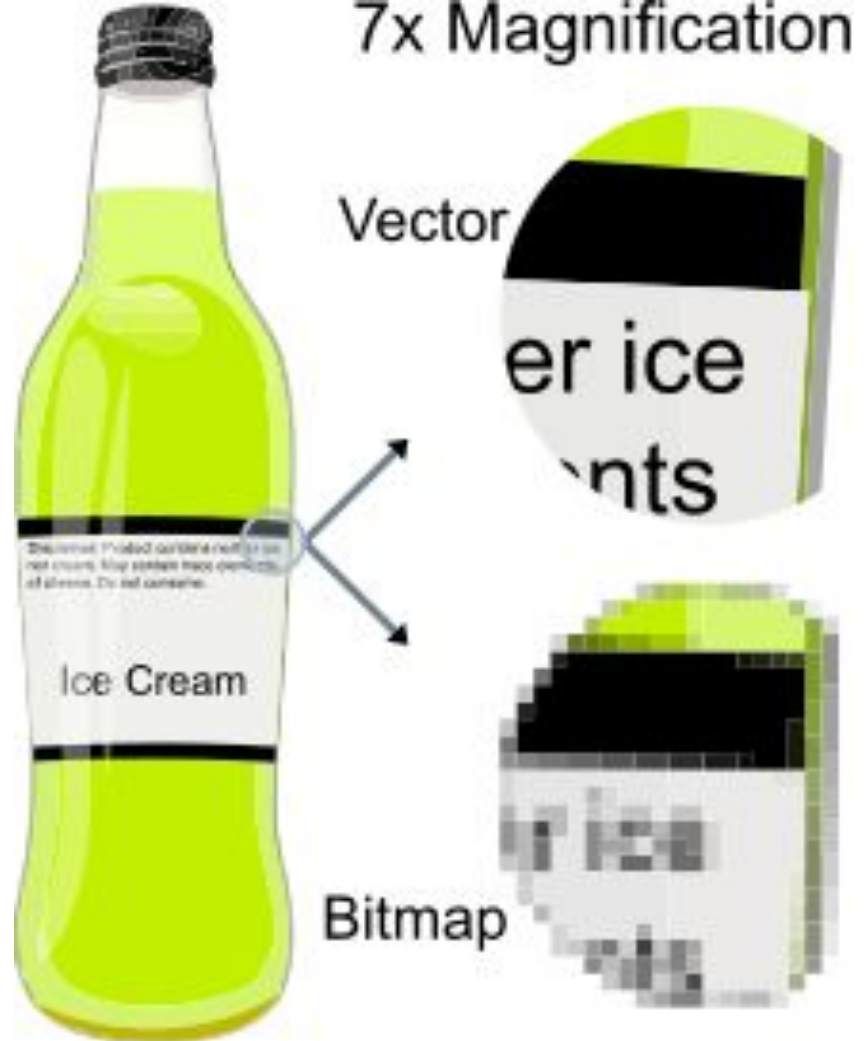$$\begin{bmatrix} 0 & -1 & 0 \\ -1 & 5 & -1 \\ 0 & -1 & 0 \end{bmatrix}$$
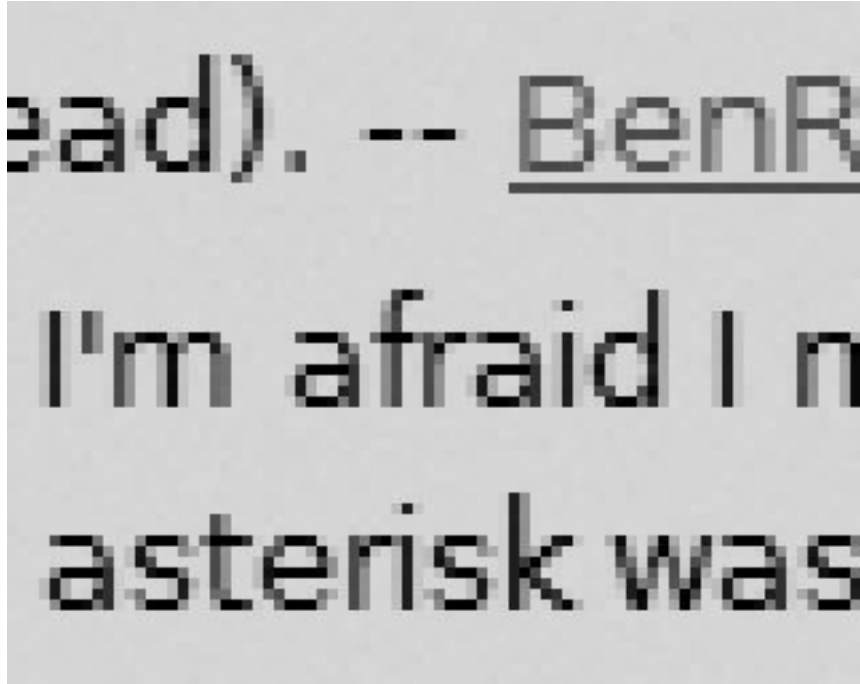
Image Processing

Edge Detection

Vector Images

7x Magnification

Vector

er ice
nts

Ice Cream

Bitmap

Compression Artifacts

Digit Recognition & OCR

Improving the Convergence of
Back-Propagation Learning with
Second Order Methods

Sue Becker & Yann le Cun
Department of Computer Science, University of Toronto

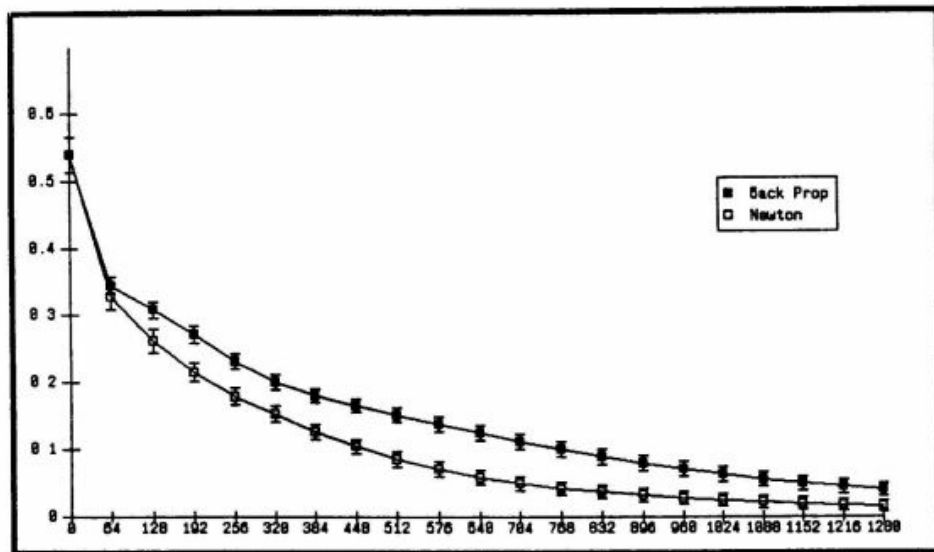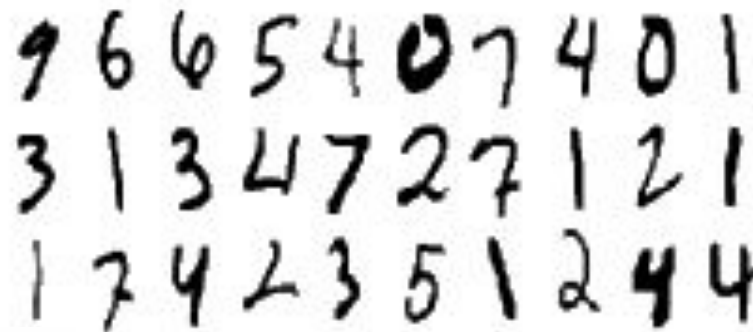Technical Report CRG-TR-88-5
Sept 1988

Figure 3: Mean error and standard deviation for 100 repetitions of 1280 pattern presentations with Batch Back Propagation versus Pseudo-Newton learning.

MNIST https://www.kaggle.com/c/digit-recognizer

Facial Recognition

Face detection

Detect one or more human faces in an image and get back face rectangles for where in the image the faces are, along with face attributes which contain machine learning-based predictions of facial features. The face attribute features available are: Age, Emotion, Gender, Pose, Smile, and Facial Hair along with 27 landmarks for each face in the image.

See it in action

```
Detection result:
JSON:
[
  {
    "faceId": "da5a0f39-d2bc-4c4b-83ba-41f62e555b4d",
    "faceRectangle": {
      "top": 115,
      "left": 265,
      "width": 140,
      "height": 140
    },
    "faceAttributes": {
      "hair": {
        "bald": 0.06,
        "invisible": false,
        "hairColor": [
          {
            "color": "black",
            "confidence": 1.0
          },
          {
            "color": "brown",
            "confidence": 0.95
          },
          {
            "color": "gray",
            "confidence": 0.43
```