# Multiscale Edge Detection

CS526 Project Idea

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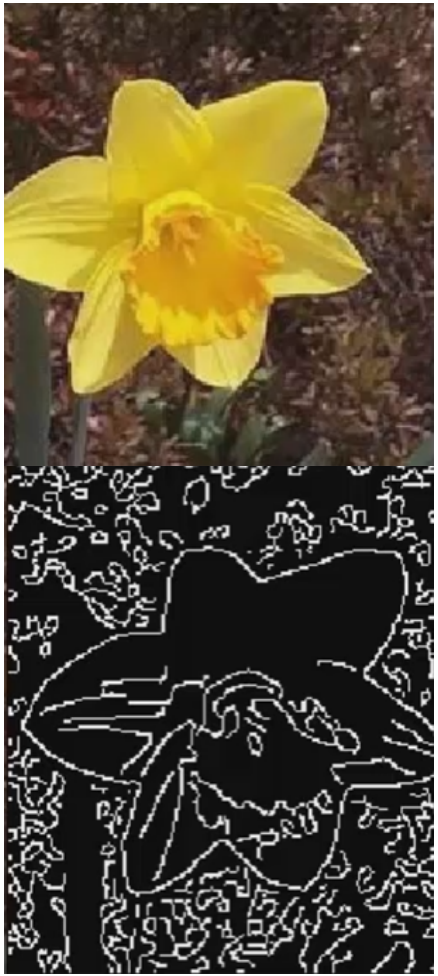
# Edge Detection?

- Computer Vision algorithm that runs on 2-D imagery (color or black and white)
- Finds “edges”, i.e. large spatial gradients, in an image
  - Done by convolving with a kernels like this

| | | |
|---|---|---|
| **-1** | **0** | **+1** |
| **-1** | **0** | **+1** |
| **-1** | **0** | **+1** |

| | | |
|---|---|---|
| **-1** | **-1** | **-1** |
| **0** | **0** | **0** |
| **+1** | **+1** | **+1** |

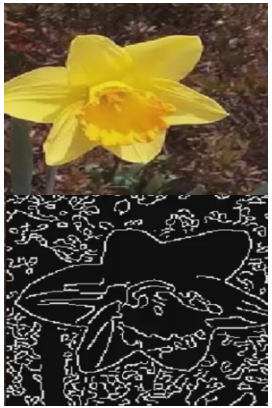
- Useful for various computer vision tasks like segmentation and optical flow



Images from: https://www.mathworks.com/discovery/edge-detection.html

# Multiscale Edge Detection

- Find edges at multiple resolution levels
- Two ways to do this
  a. Use larger and larger convolution kernels
  b. Downsample image to various levels, use same kernel, sample back up
- Helpful for finding edges that are more “blunt”
- Can find and segment objects in image that are larger in scale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something useful in computer vision

Images from: https://www.mathworks.com/discovery/edge-detection.html

# Opportunities for Parallelization

1. Individual (image □ kernel) convolutions can be done with MPI or ACC
    a. Very much like the “relaxation” techniques we did in the homework
    b. Convolution provides natural 2D checkerboard for MPI
2. Image upsampling and downsampling can be done with MPI or ACC
3. Each resolution level can be on a separate thread

# References


- “Multi-Scale Improves Boundary Detectionin Natural Images”
  - https://homes.cs.washington.edu/~xren/publication/xren_eccv08_multipb.pdf
- “Multiscale Edge-Based Text Extraction from Complex Images”
  - https://ieeexplore.ieee.org/abstract/document/4036951