EDGE DETECTION: WOULD MAGNITUDE THRESHOLDING WORK?

$I$  $\|\nabla I\| > \varepsilon$
Edge Detection: Would Magnitude Thresholding Work?

$I$

$\|\nabla I\| > \varepsilon$
**Edge Detection: Would Magnitude Thresholding Work?**

\[ I \]

\[ ||\nabla I|| > \varepsilon \]

Non-locality
**Edge Detection: Would Magnitude Thresholding Work?**

\[ \|\nabla I\| > \varepsilon \]

- Non-locality
- Discontinuity
CANNY EDGE DETECTOR

Canny, A Computational Approach to Edge Detection, TPAMI (1986)
**Edge Localization: Non-maximum Suppression**

Check if the pixel is local maximum along the gradient direction.

Gradient direction

Edge response

$I$
**Edge Localization: Non-maximum Suppression**

![Image of Einstein](image1.png)

- **I**: Input image

- **Gradient direction**: The direction of the gradient at a point

- **Edge response**: The result of applying the non-maximum suppression (NMS) algorithm

- **Check if the pixel is local maximum along the gradient direction**: If the pixel is not a local maximum, set it to 0.
**Edge Localization: Non-maximum Suppression**

- **Image:** A close-up of a person sticking out their tongue, with a red square highlighting a region.
- **Gradient Magnitude Map:** A grid representing the gradient magnitude at each pixel.
- **Gradient Direction Map:** A grid showing the gradient direction at each pixel.
- **Non-Maximum Suppression (NMS):** A process to identify local maxima along the gradient direction.

Check if the pixel is a local maximum along the gradient direction.
**Edge Linking**

- Image I
- Edge response
- Edge discontinuity
**Edge Linking**

$I$

- **Edge Response**
- **Edge Discontinuity**
- **Edge Linking**
**EDGE PREDICTION: Hysteresis**

Next edge pixel prediction

Tangent to the edge

Check if edge response is sufficiently large

Edge response

Edge linking
EDGE LINKING: HYSTERESIS
EDGE LINKING: HYSTERESIS

High thresholding
Edge Linking: Hysteresis

High thresholding

Low thresholding
**Edge Linking: Hysteresis**

High thresholding  
Low thresholding  
Hysteresis
Is Edge Detector Solved?

Canny edges
Is Edge Detector Solved?

Human perceived edges