



UNIVERSITY OF
GEORGIA

CSCI 8945 | Fall 2024

Advanced Representation Learning

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School of Computing

Lec 5: Visual system and pixels

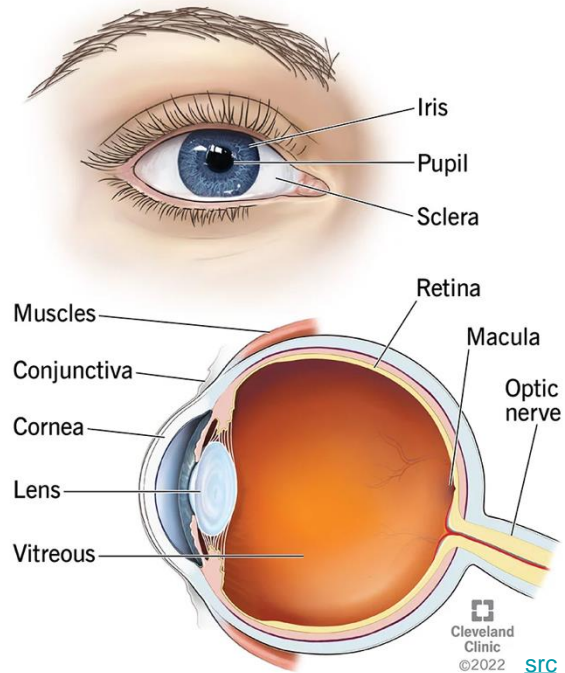
Outline

- Visual processing systems
- Image formation
 - Points and lines
 - Camera model

Human visual system

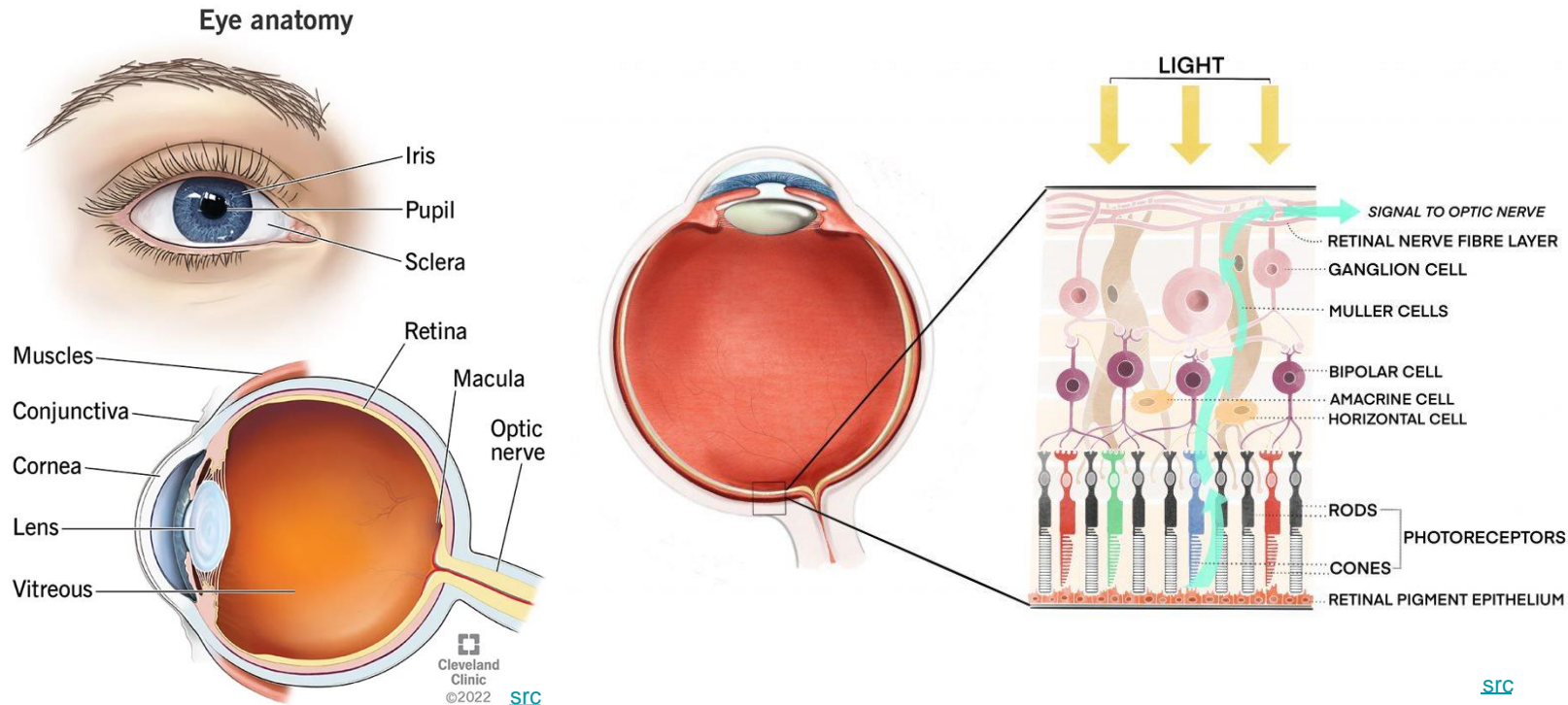
We can't talk about computer vision without talking about human vision

Eye anatomy



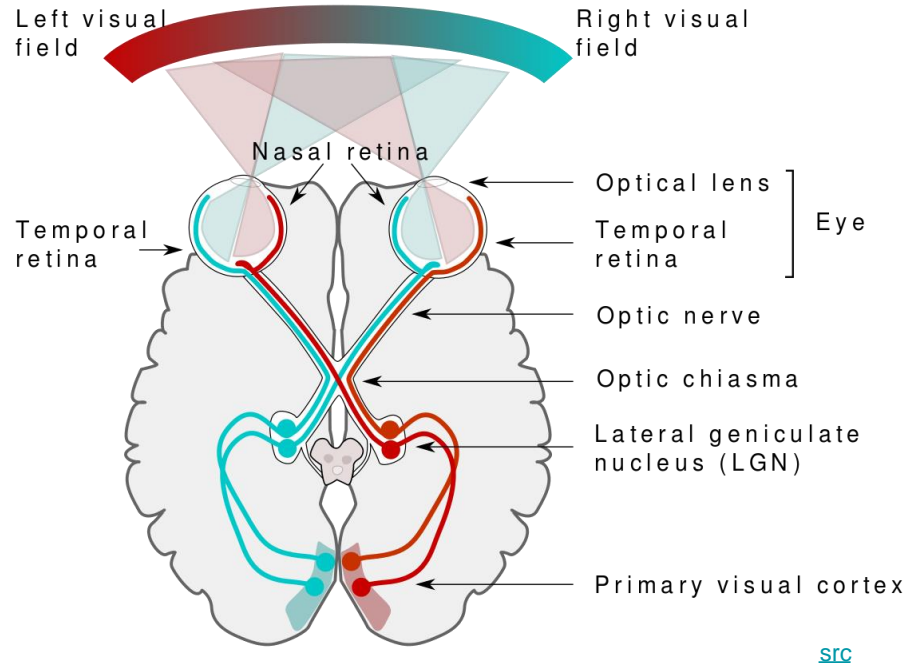
Human visual system

We can't talk about computer vision without talking about human vision



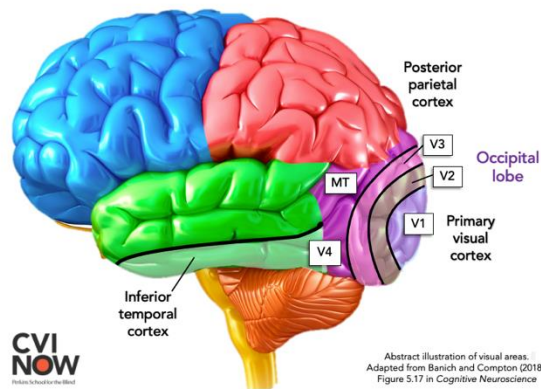
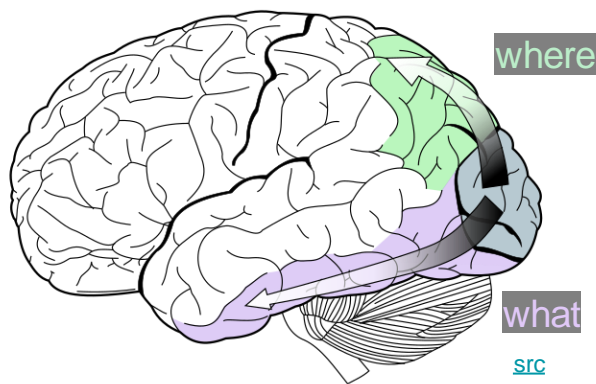
Human visual system

We can't talk about computer vision without talking about human vision



Human visual system

We can't talk about computer vision without talking about human vision



How to map the brain? [Nature](#), 2019

Visual perception



foveal

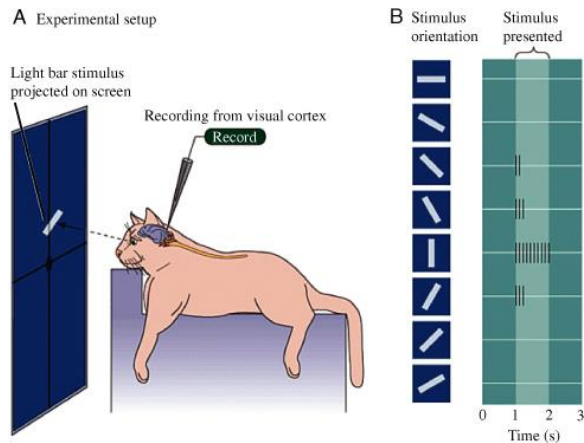


foveal + peripheral

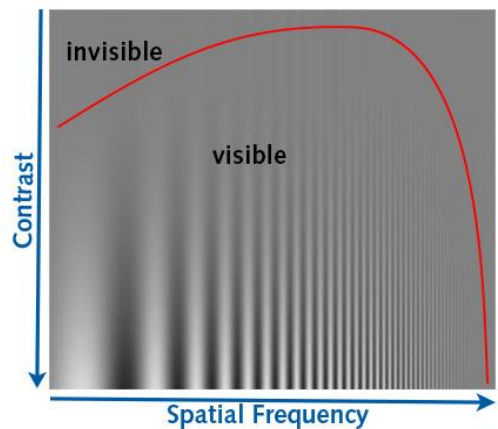
sic

Visual perception

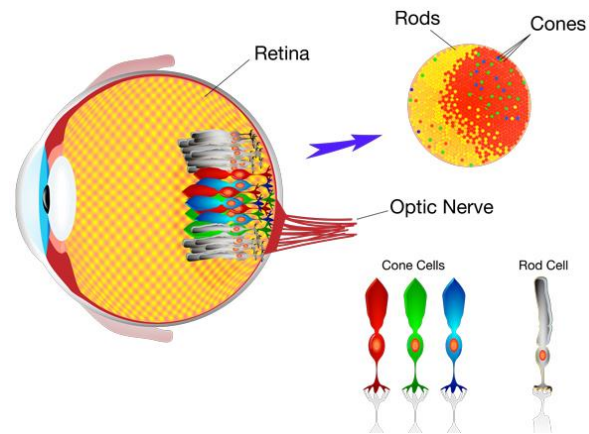
Low-level vision:



Hubel and Wiesel, Nobel Prize 1981 [src](#)



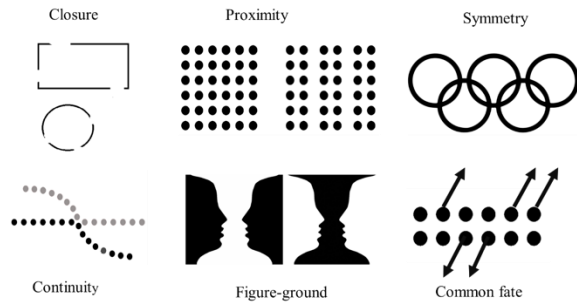
Spatial contrast sensitivity [src](#)



Color vision [src](#)

Visual perception

Mid- and high-level vision



Gestalt principles of visual perception [src](#)

It seems people use this in UX designs as well.

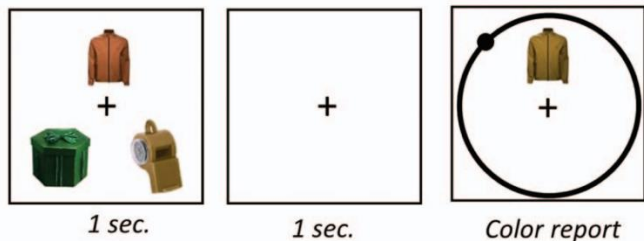


Cognitive process of navigation, [src](#)

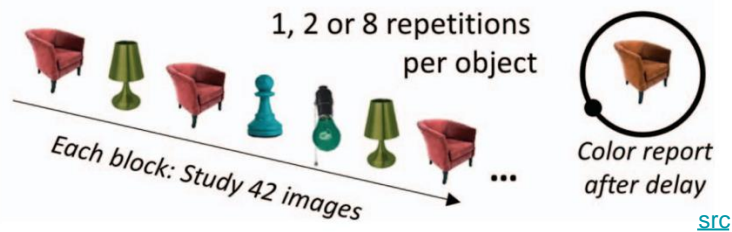
Visual memory

Humans have a limited capacity of memorizing visual objects.

A) Visual working memory



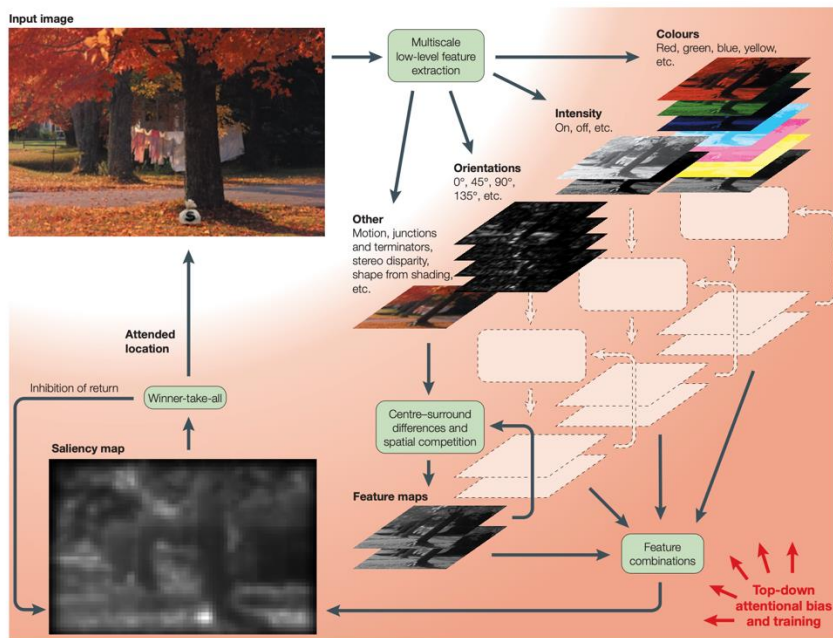
B) Visual long-term memory



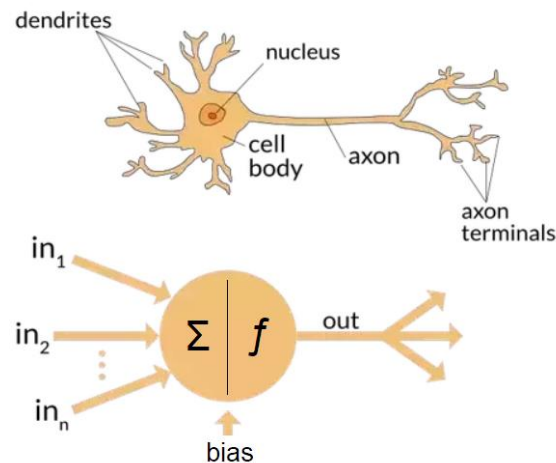
[SIC](#)

Human vision vs computer vision

Before DL: computer vision research has been inspired by human vision.



A saliency model proposed by [Itti et al.](#)



An artificial neuron inspired by biological neuron. [Src](#)

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See whiteboard demonstration

