

Lecturer: Bui Ha Duc, PhD

Email:

ducbh@hcmute.edu.vn

This course will cover the fundamental of Machine vision and provide you methods, tools to describe and analyze images.

Focus on robotic vision

After completing this course, you will be able to ▪

Analyze, enhance an image using different techniques ▪

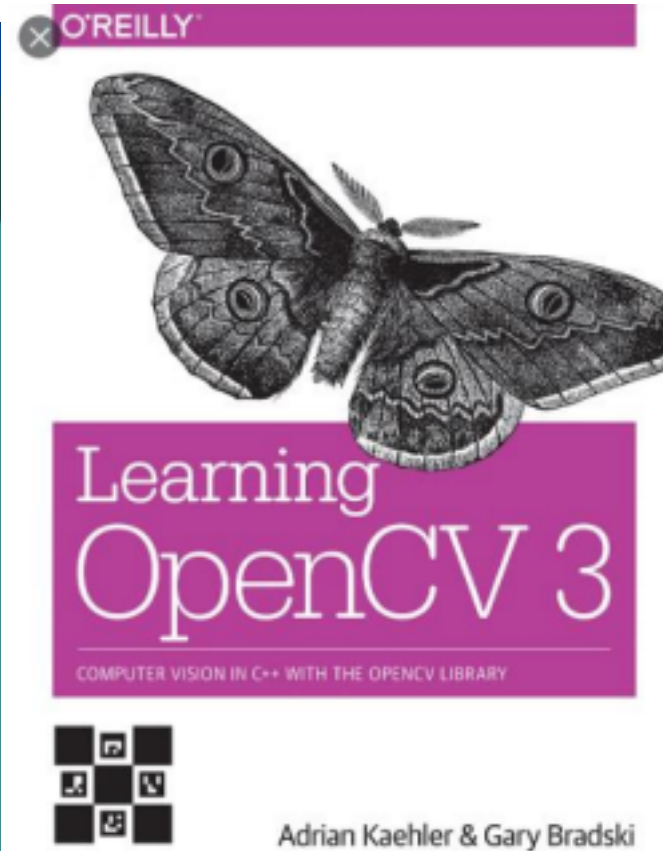
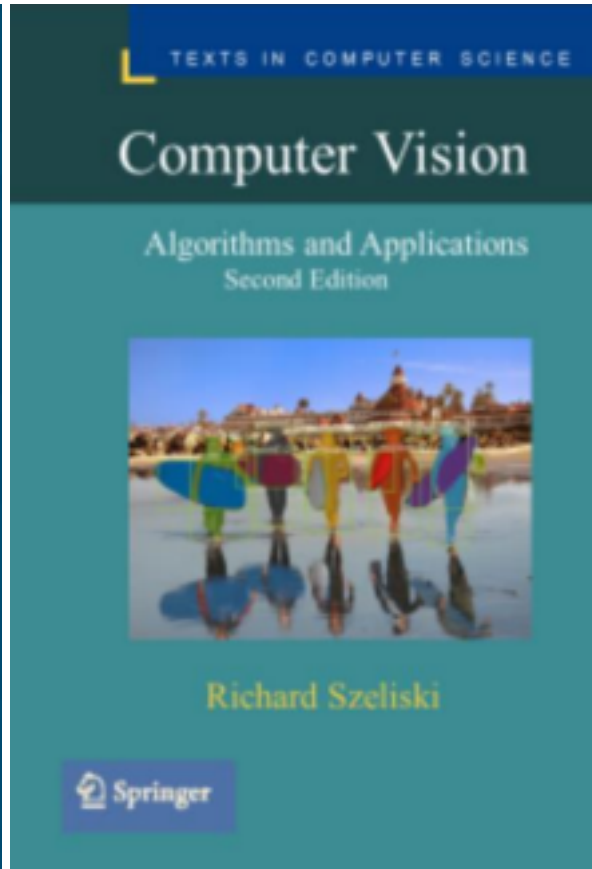
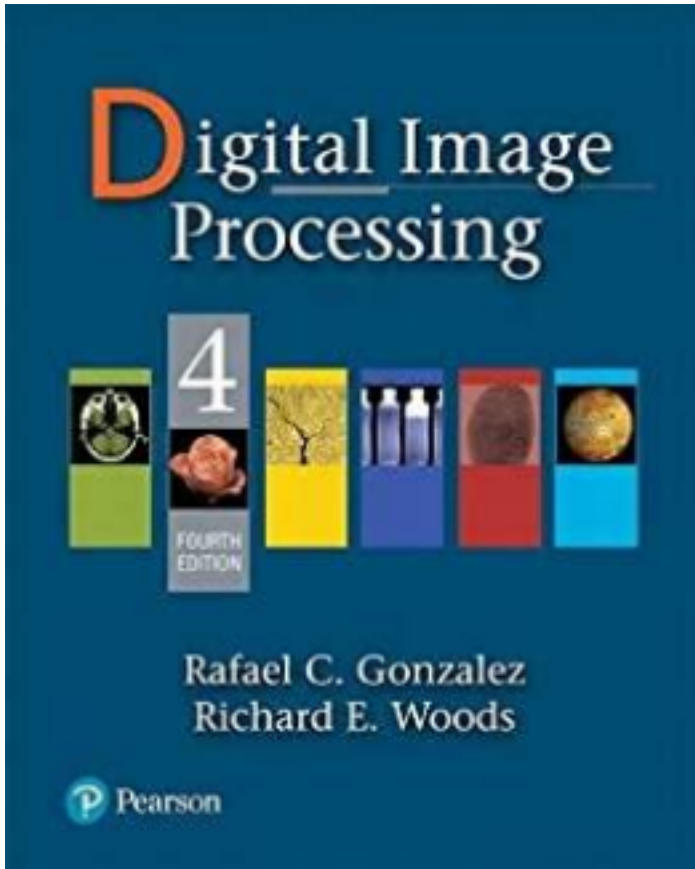
Extract information/features from an image automatically

- Detect and track moving objects in image sequences
- Introduction to the course

- Course's content, assessment, references
- Application of Machine vision
- Basic of image processing
 - The image, its representation and properties
 - Processing procedure and Tools
- Image analysis and machine learning
 - Techniques used to enhance input images
 - Extract information from an image
 - Detect and track objects in an image sequence
- Assignments or Quizzes - 50% ▪ Final Project - 50%



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- On windows
 - Visual studio/Visual studio code
 - OpenCV 4



- On Linux Ubuntu
 - Visual studio code
 - <https://code.visualstudio.com/docs/setup/linux>
 - OpenCV 4
 - [How to install OpenCV 4.2 with CUDA 10.0 in Ubuntu 18.04 · GitHub](#)



Machine learning: use intelligent algorithms

to interpret meaning from images or video

Image processing: a process of manipulating pixels to identify target or extract features

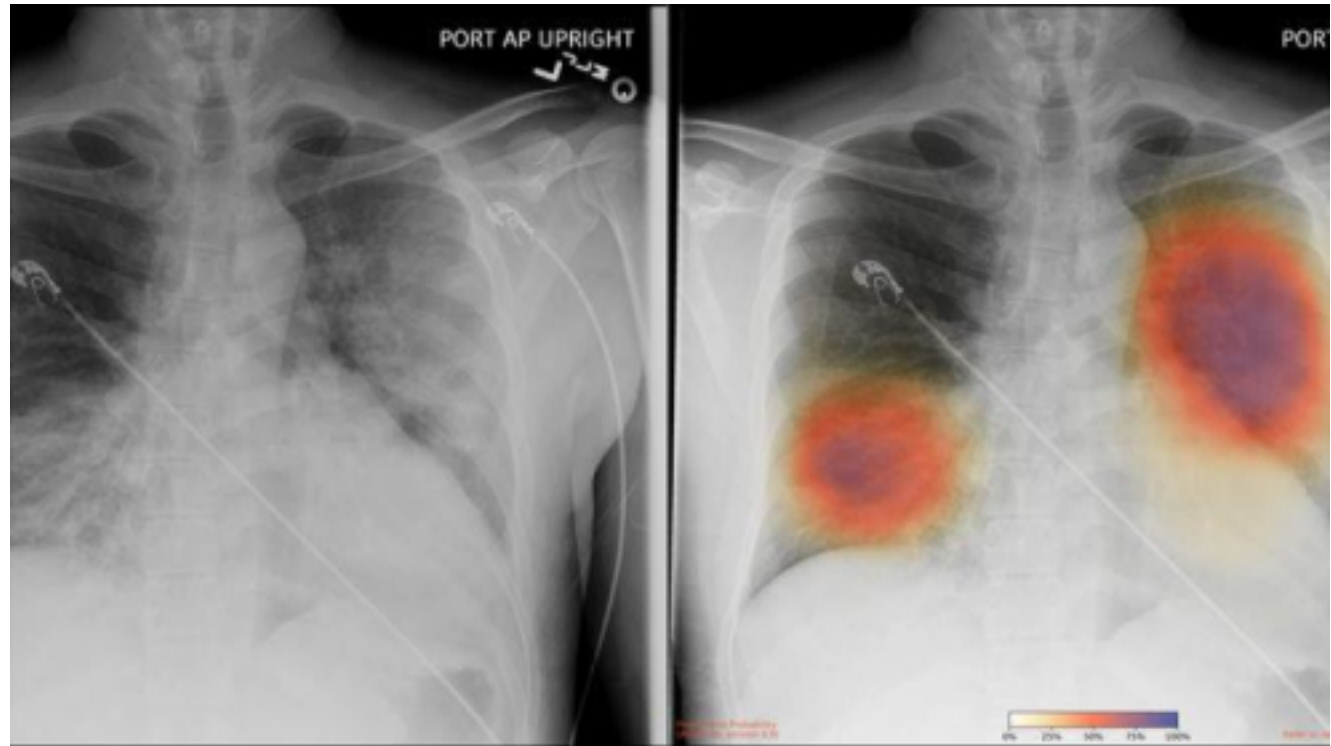
- Image processing is **analyzing** and **manipulating** an image using **math and computer science** knowledge.

135	135	129	133	130	134	134	137
133	133	132	132	135	127	123	119
132	127	129	115	121	87	96	110
110	104	115	109	120	103	129	160
105	112	136	162	173	201	219	231
167	187	202	223	216	231	240	238
221	231	240	223	214	216	218	219
224	217	222	214	215	217	219	220

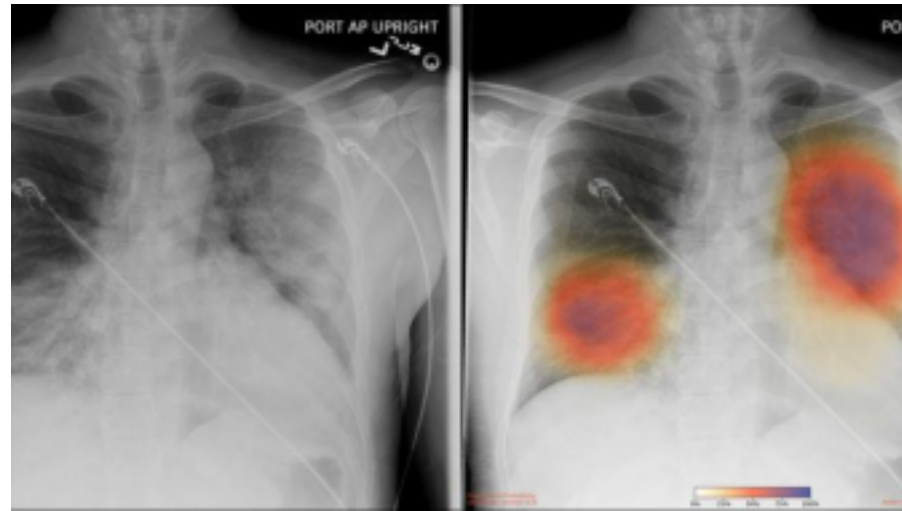


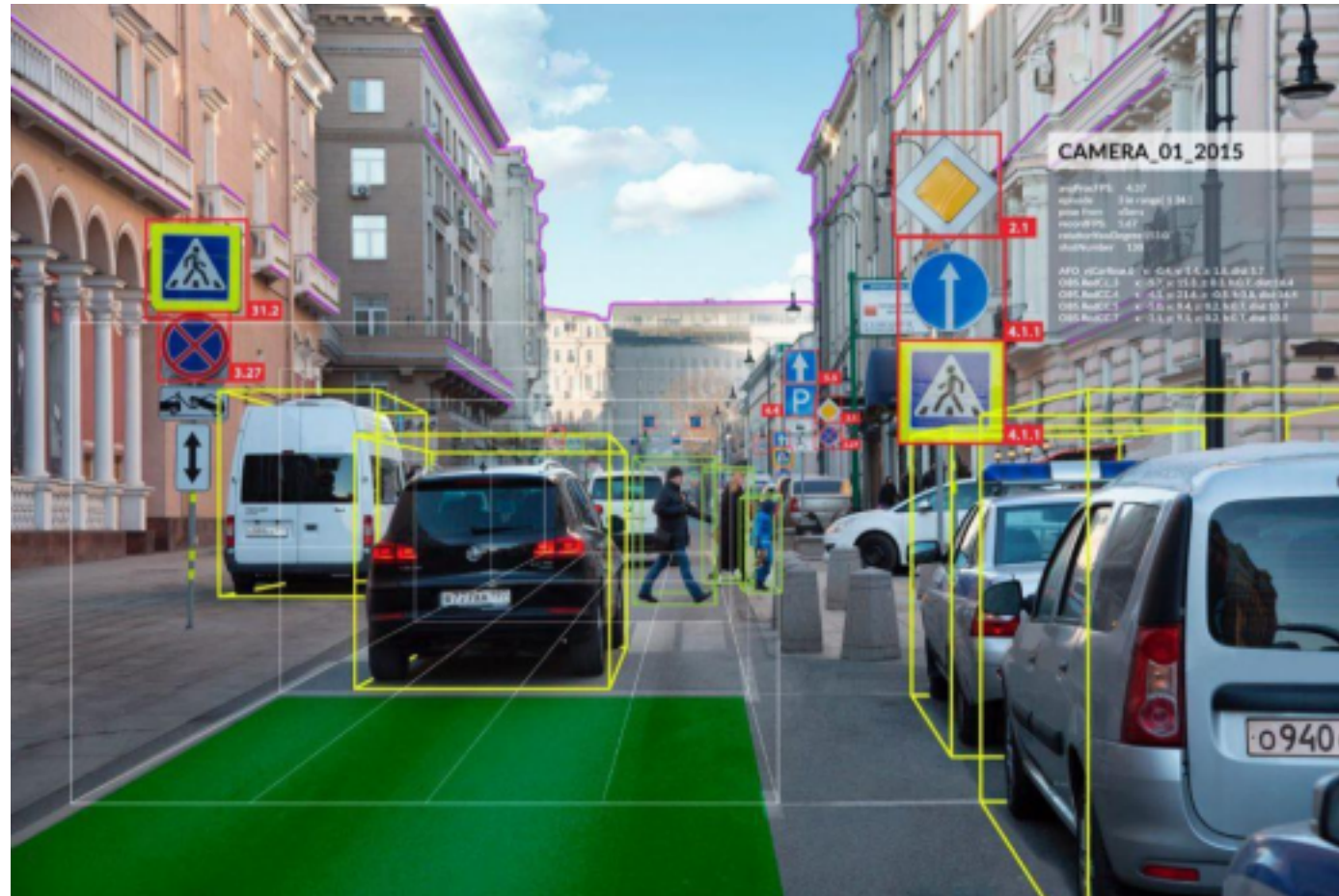
Pixel

value
Information



Analyze chest X-Rays for signs of Covid-19

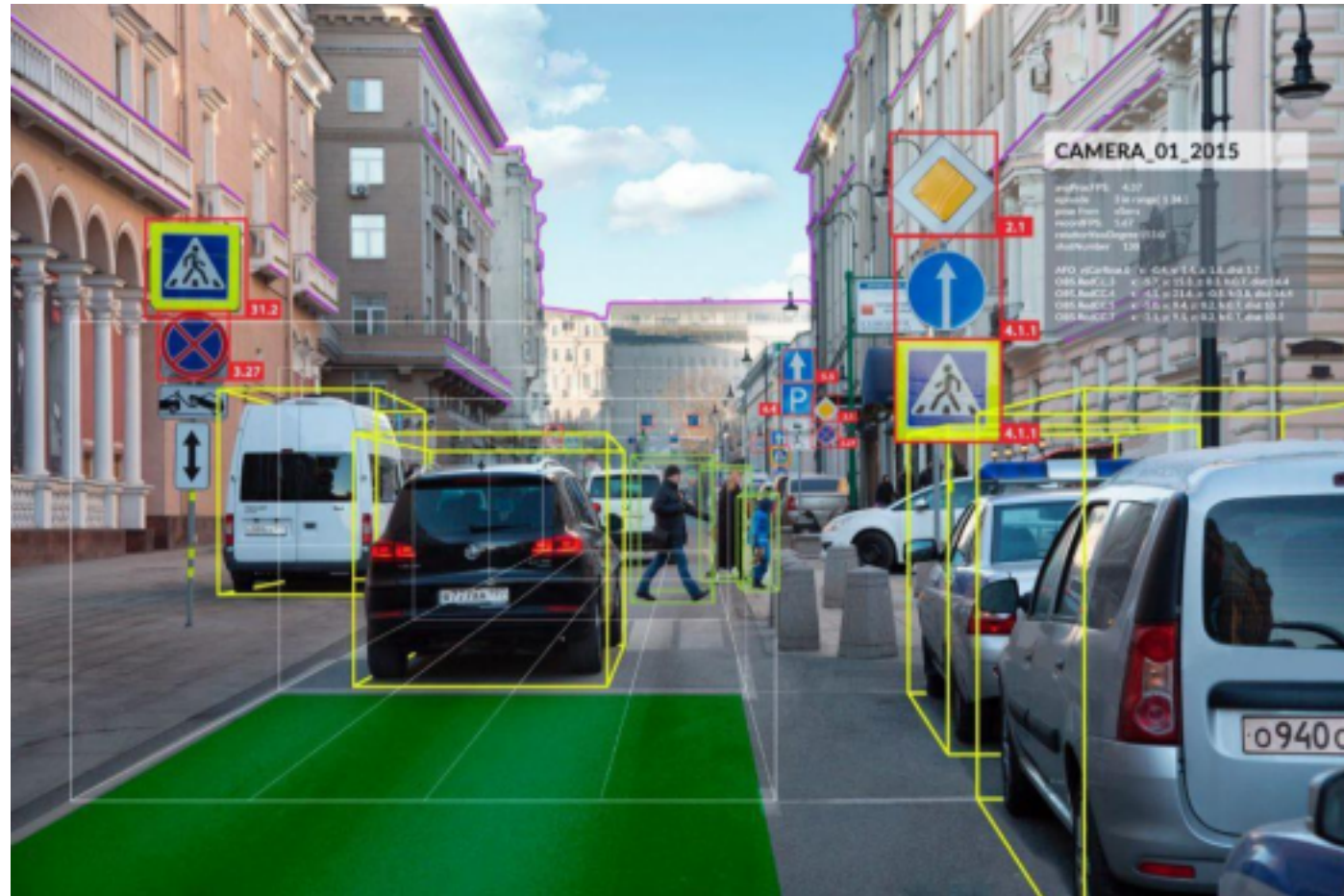




Computer vision for self-driving car

<https://www.youtube.com/watch?v=0rc4RqYLtEU>



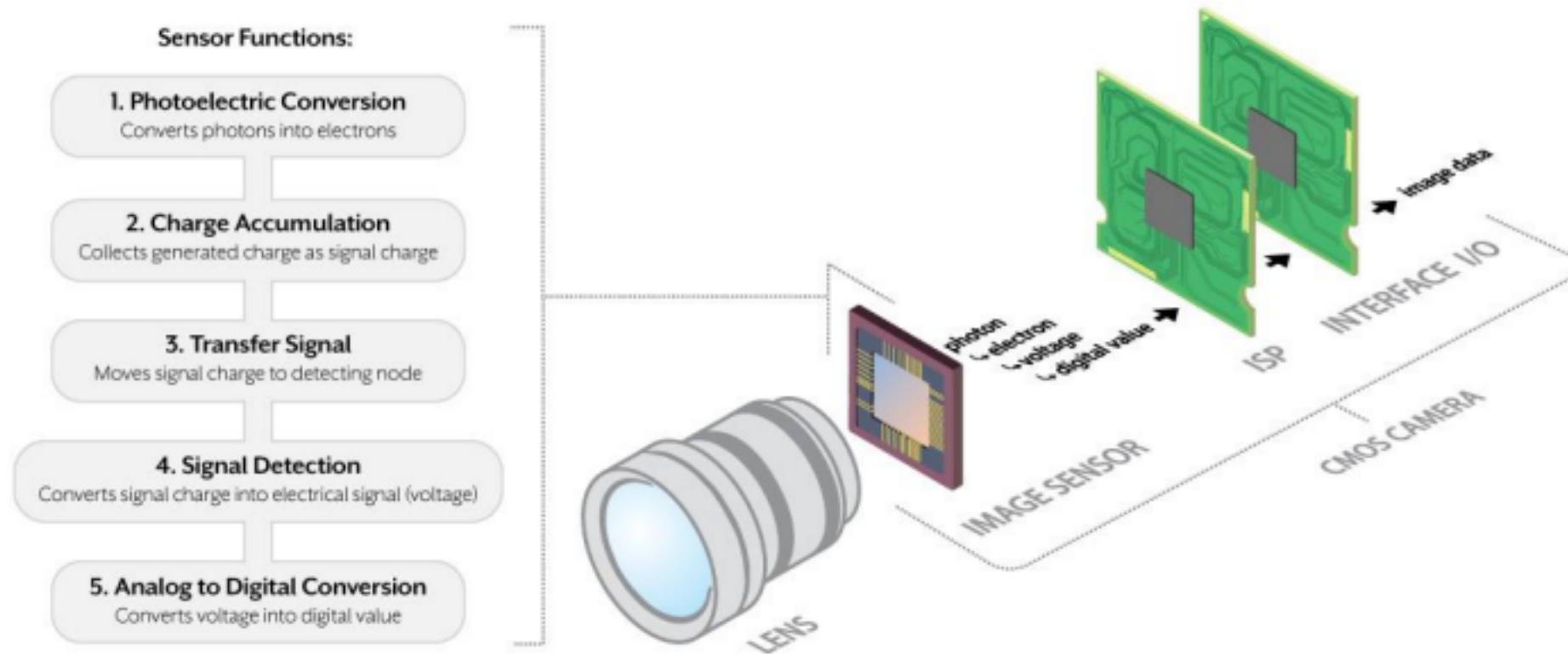


Computer vision for self-driving car



Image Reconstruction

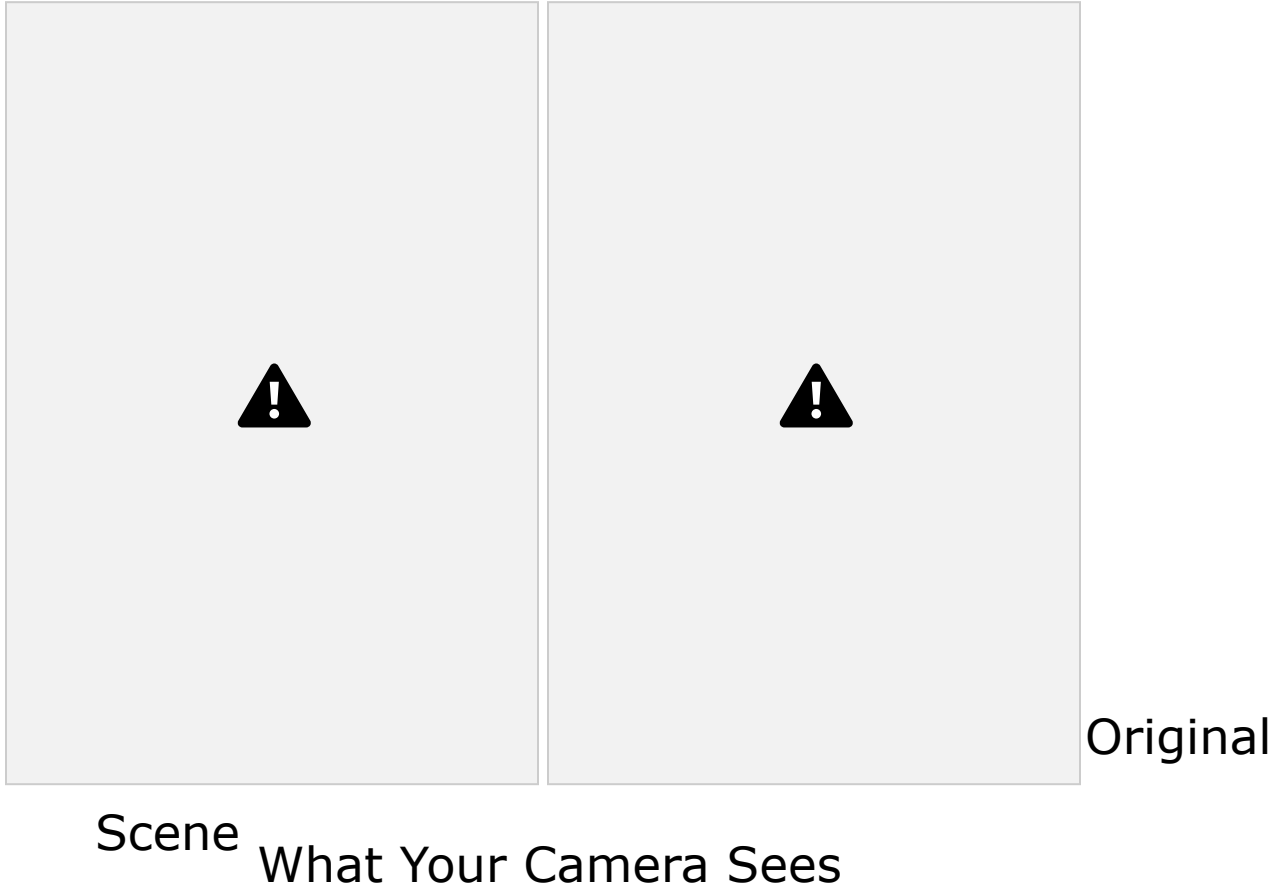
- <https://www.youtube.com/watch?v=oa2DbQcKAEU>



(Source: <https://thinklucid.com/tech-briefs/understanding-digital-image-sensors/>)



(Source: <https://thinklucid.com/tech-briefs/understanding-digital-image-sensors/>)



(Source: <https://www.cambridgeincolour.com/tutorials/camera-sensors.htm/>)



Pixel
(8-bit value)

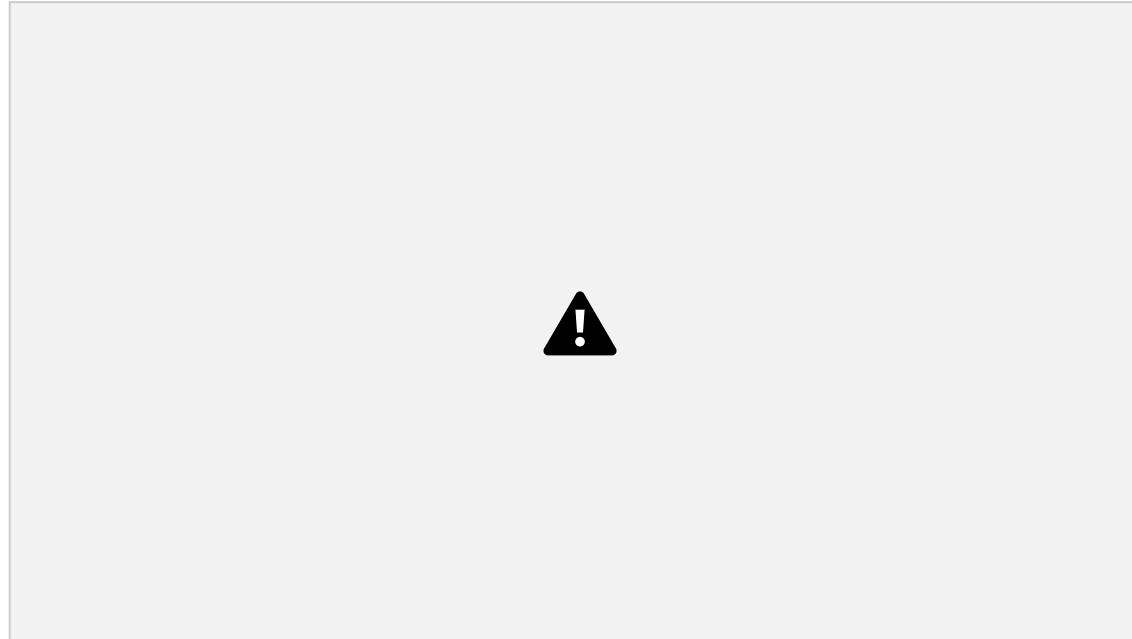
Camera Resolution:
Number of pixel on sensors







- **Automatic number plate recognition**



- **Challenges:**
 - **Plate localization** - finding and isolating the

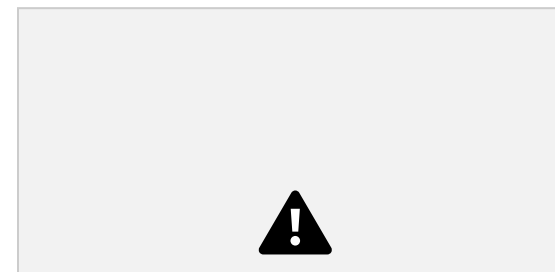


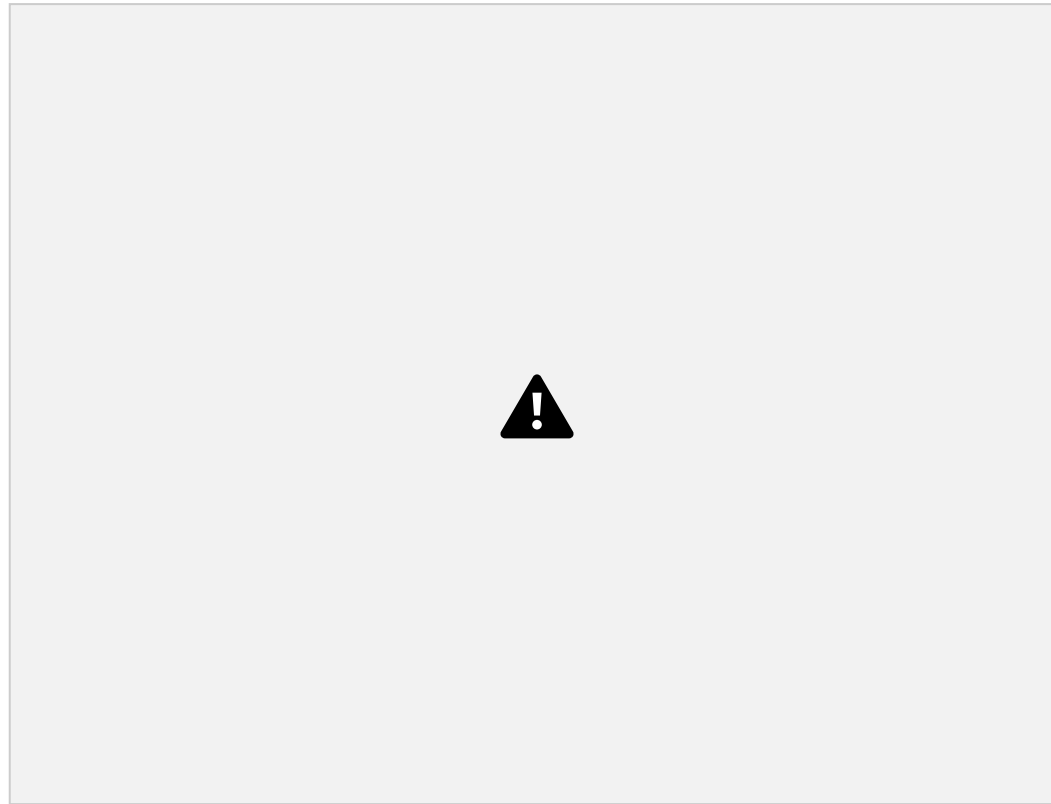
plate on the picture

- **Plate orientation and sizing** - compensates for the skew of the plate and adjusts the dimensions to the required size
 - **Normalization** - adjusts the brightness and contrast
 - **Character segmentation** - finds the individual characters on the plates
 - **Character recognition**
-
- **Plate localization**



<https://lebgeeks.com/forums/viewtopic.php?id=7786>

- **Character segmentation**



<https://lebgeeks.com/forums/viewtopic.php?id=7786>

- OpenCV tutorial

- https://docs.opencv.org/4.2.0/d9/df8/tutorial_root.html (C/C++/python) ▪

- <https://www.pyimagesearch.com/2018/07/19/opencv-tutorial-a-guide-to-learn>

[opencv/](#) (Python)

- C++ for computer vision

- https://www.youtube.com/playlist?list=PLNXSvvgC2Xkm-HALq-qSR_4xHzBt_KyMs