

Pengantar Computer Vision

Kecerdasan Tiruan (KP045)
Universitas Budi Luhur



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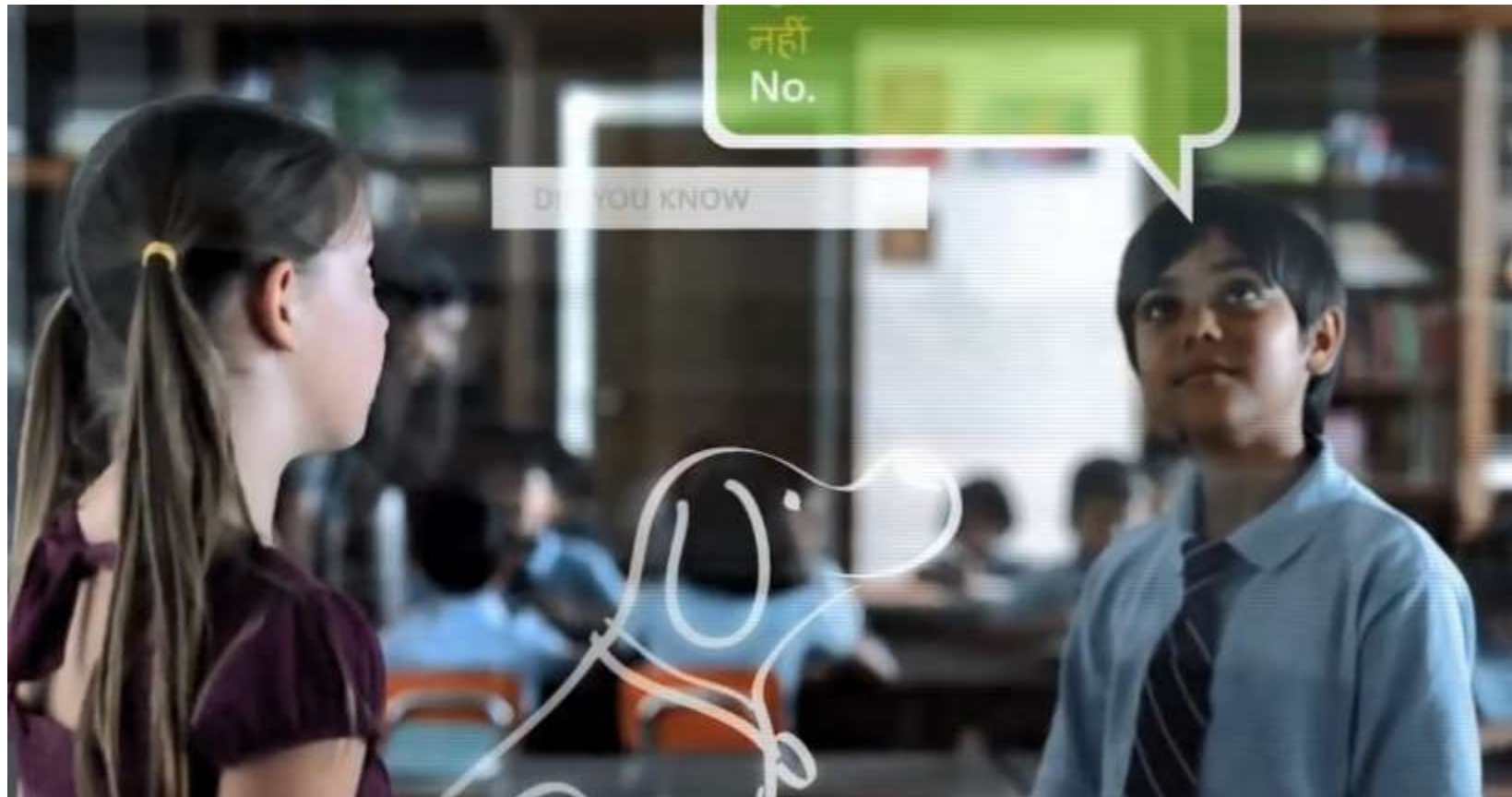
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slideshare.net/achmatim

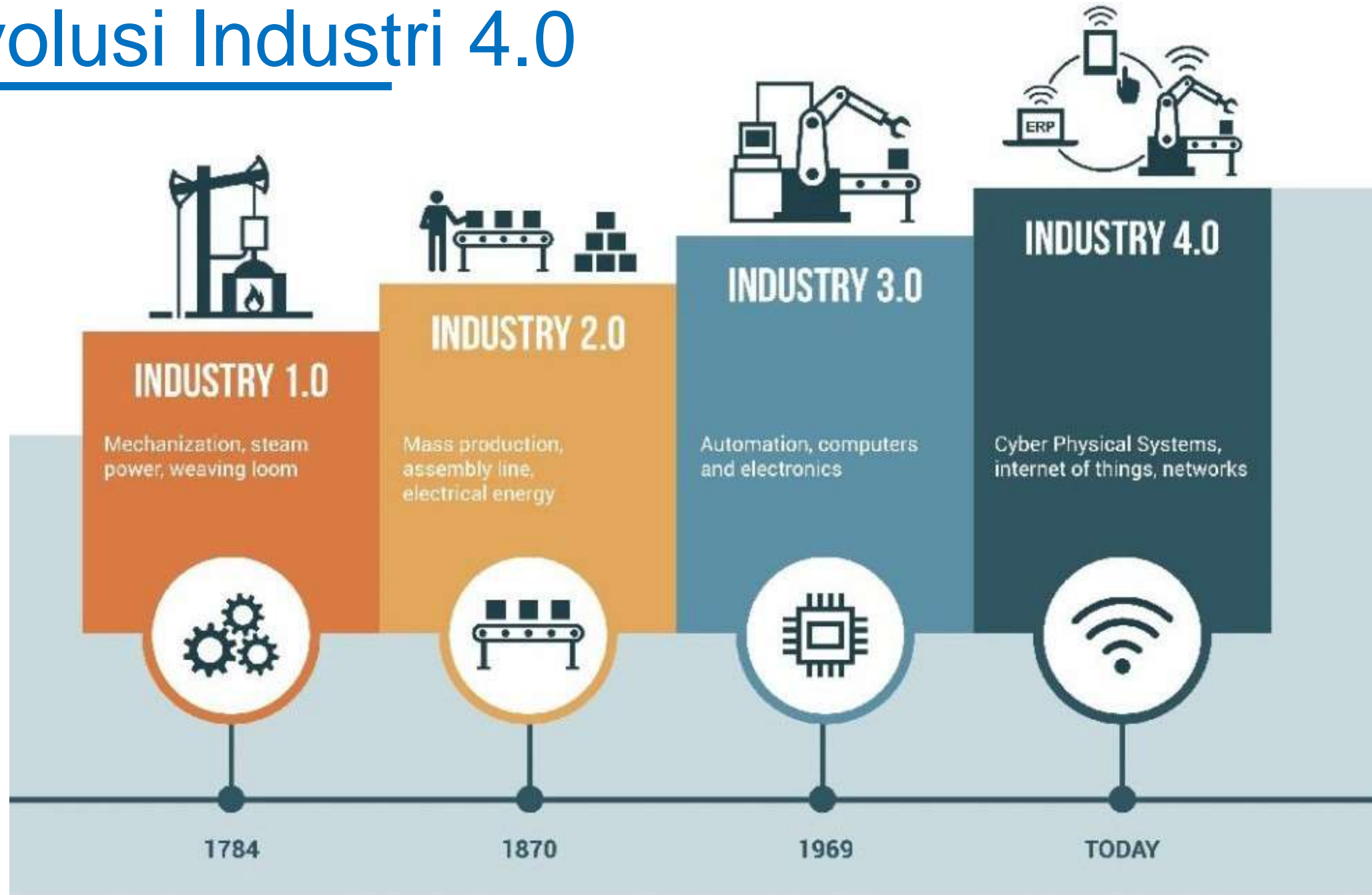


<http://achmatim.net>



Video: <https://www.youtube.com/watch?v=ozLakIIFWUI>

Revolusi Industri 4.0



Prinsip Industri 4.0



Interoperability



Information
transparency



Technical
assistance



Decentralized
decision-making

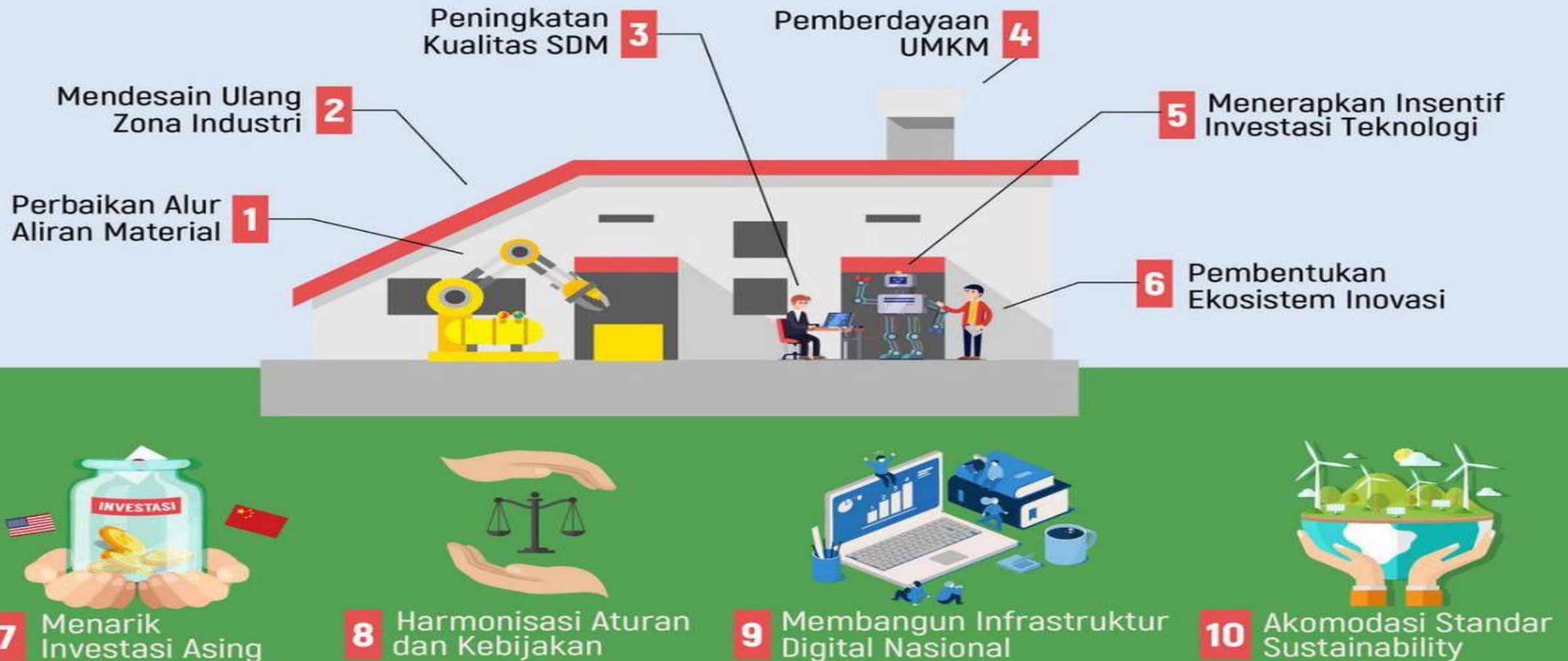


Making

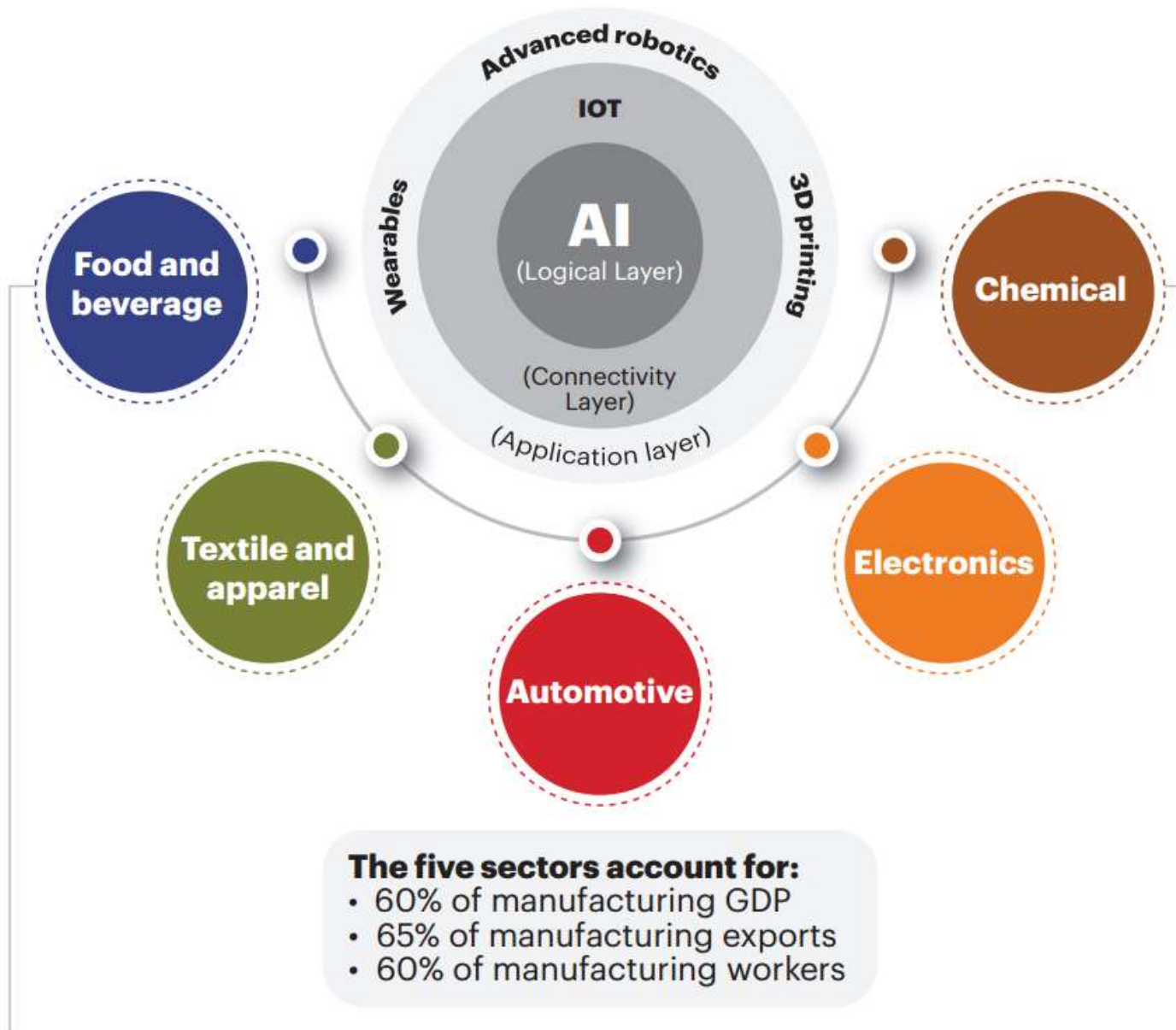
**Indonesia
4.0**

10 STRATEGI PRIORITAS NASIONAL UNTUK MAKING INDONESIA 4.0

Making Indonesia 4.0, sebuah roadmap atau peta jalan mengenai strategi Indonesia dalam implementasi memasuki Industri 4.0 untuk mencapai 10 besar ekonomi terkuat dunia di tahun 2030.



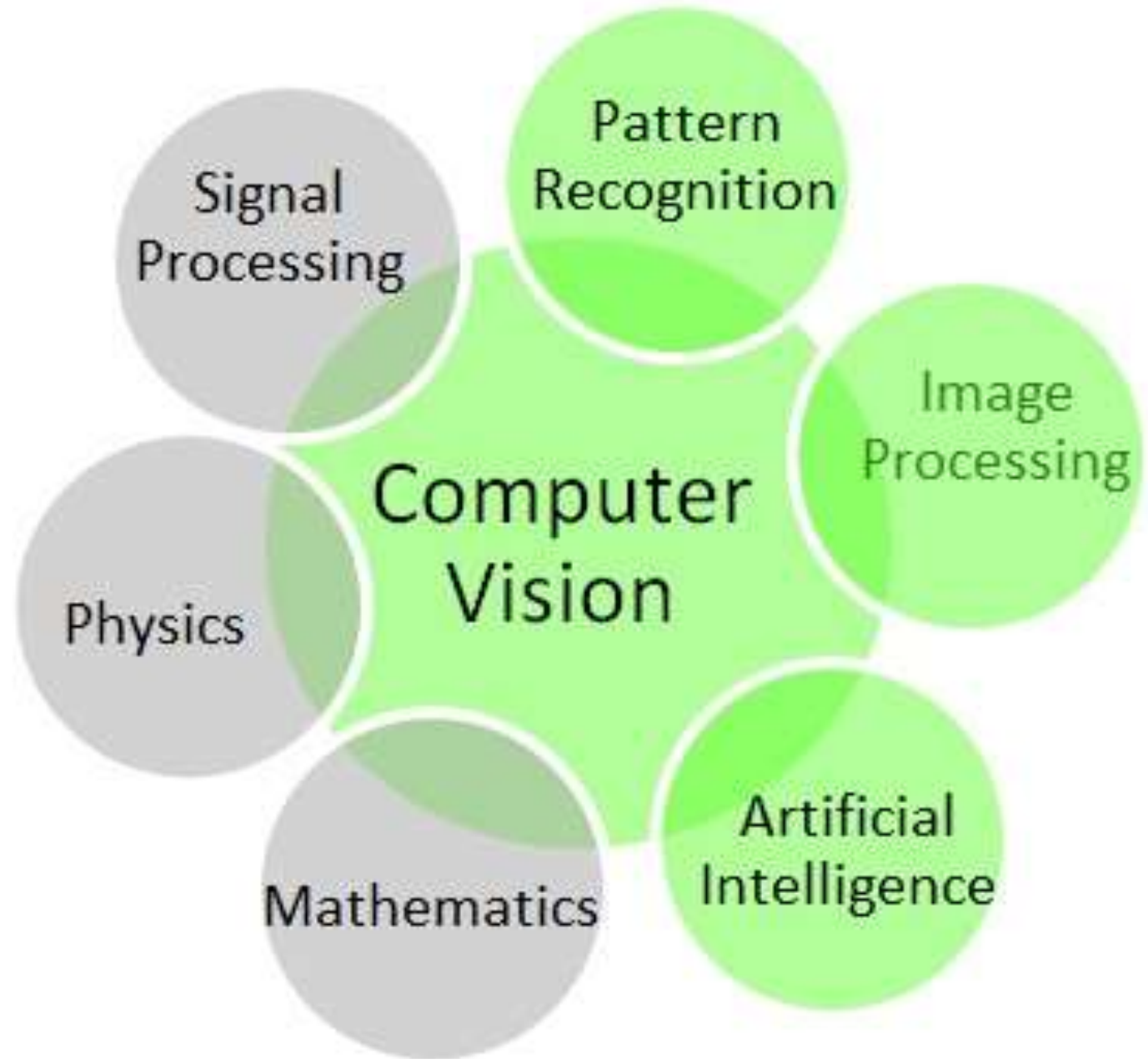
5 Sektor Prioritas



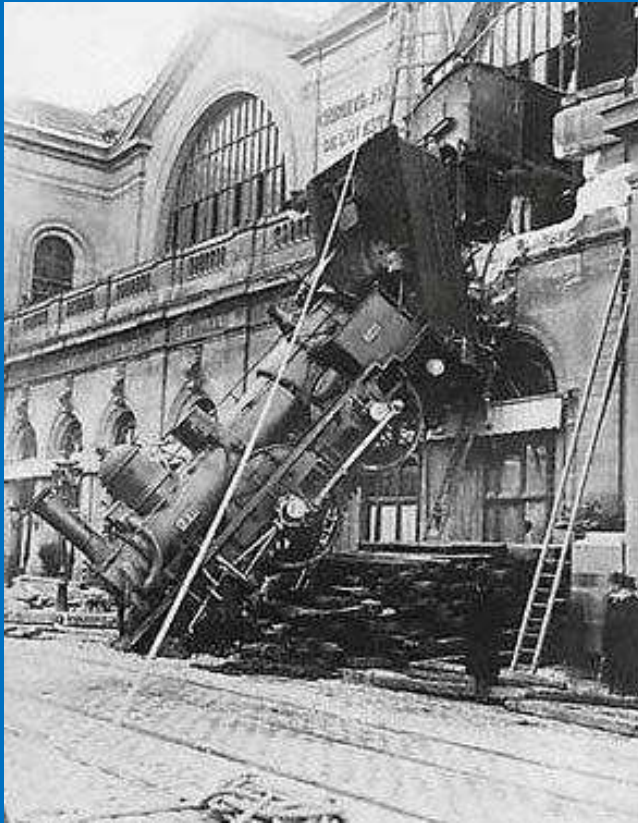
computer vision ?

Computer vision is an interdisciplinary field that deals with how computers can be made to gain high-level understanding from digital images or videos. From the perspective of engineering, it seeks to automate tasks that the human visual system can do.

Computer vision
melibatkan
banyak disiplin
ilmu



Tujuan utama computer vision : mengekstrak “makna” dari piksel-piksel

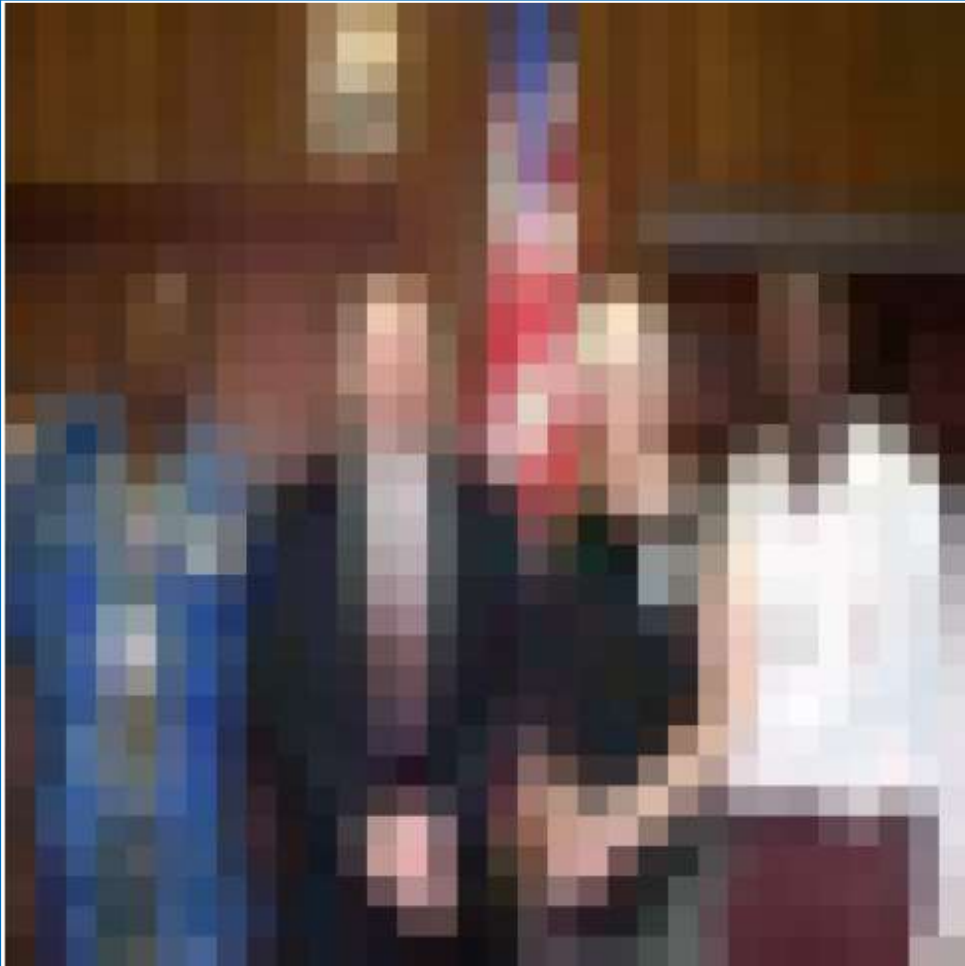


Apa yang kita lihat

0	3	2	5	4	7	6	9	8
3	0	1	2	3	4	5	6	7
2	1	0	3	2	5	4	7	6
5	2	3	0	1	2	3	4	5
4	3	2	1	0	3	2	5	4
7	4	5	2	3	0	1	2	3
6	5	4	3	2	1	0	3	2
9	6	7	4	5	2	3	0	1
8	7	6	5	4	3	2	1	0

Apa yang komputer lihat

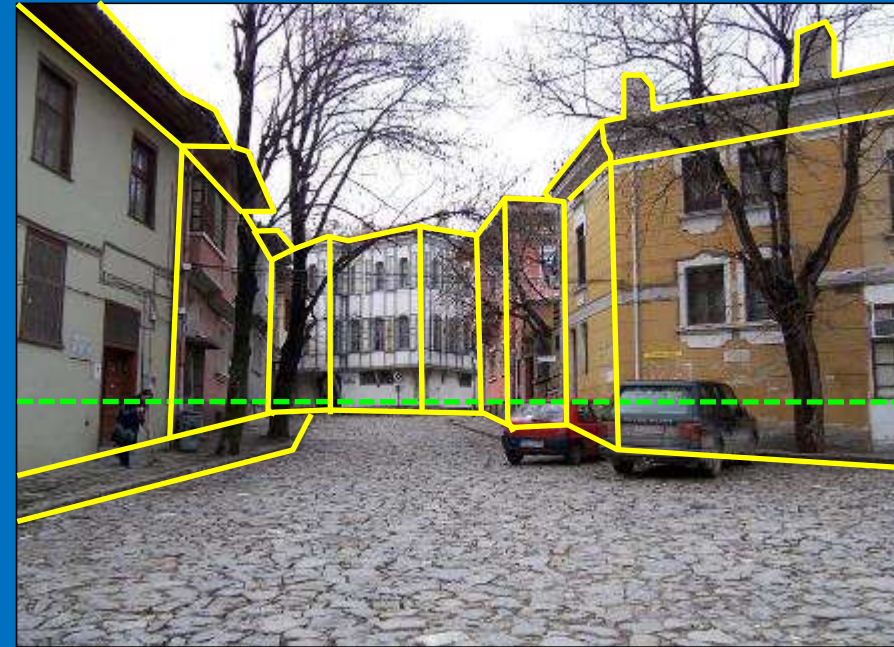
Tujuan utama computer vision : mengekstrak
“makna” dari piksel-piksel



Informasi apa saja yang dapat diekstraksi dari sebuah gambar?



Semantic information

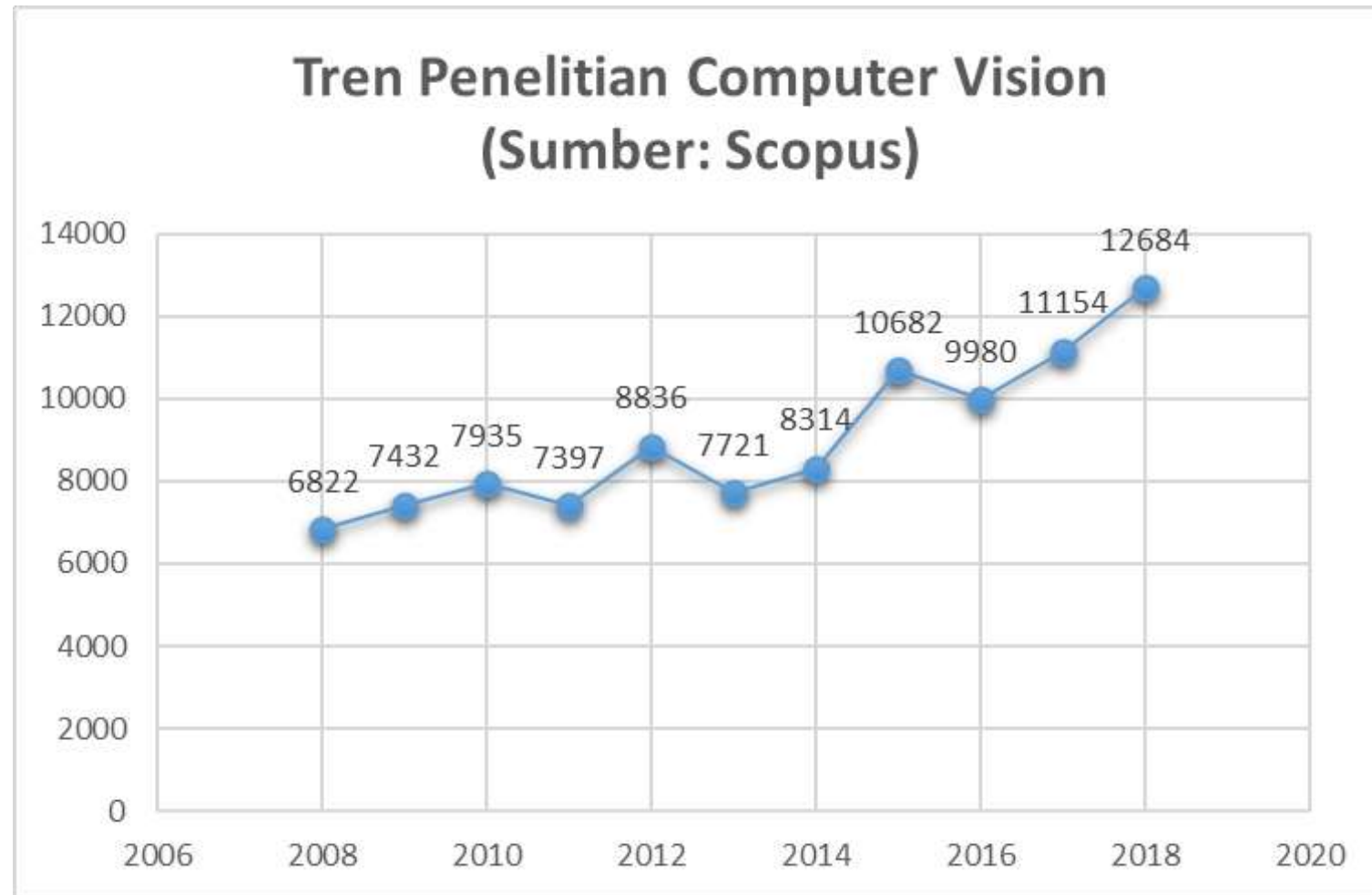


Geometric information

Mengapa belajar computer vision?

- Vision is useful
- Vision is interesting
- Vision is difficult
 - Half of primate cerebral cortex is devoted to visual processing
 - Achieving human-level image understanding is probably “AI-complete”

Penelitian di Bidang Computer Vision



Aplikasi Computer Vision



retail



otomotif



kesehatan



pertanian



perbankan



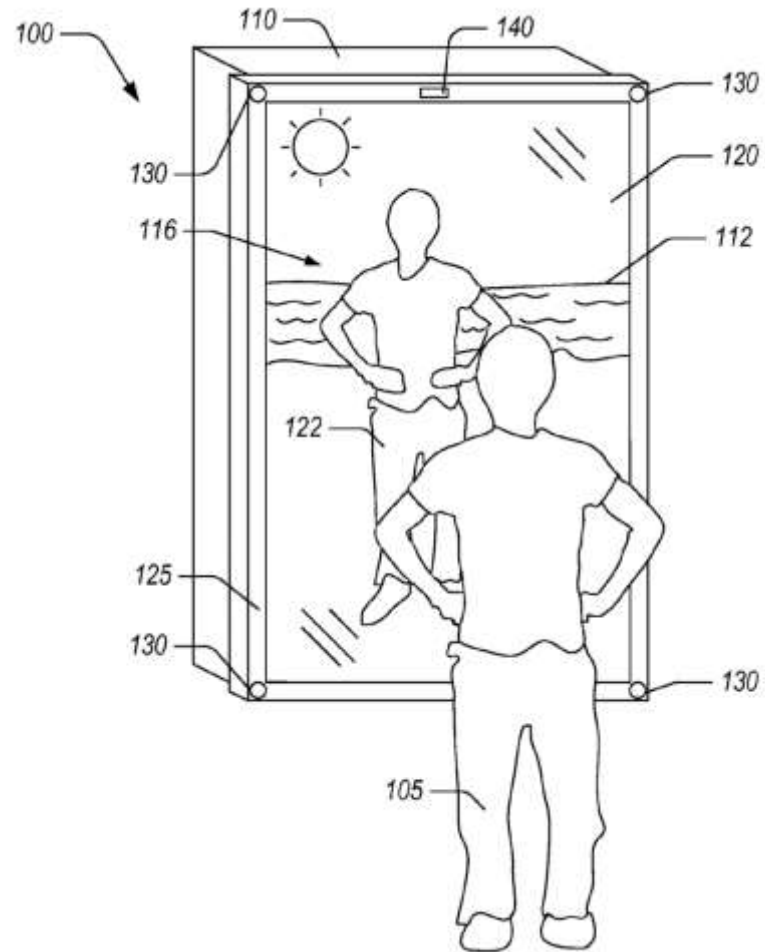
industri



Amazon Go



Video : <https://www.youtube.com/watch?v=u0KsY9HDk6o&t=6s>



virtual mirror technology



Video: <https://www.youtube.com/watch?v=Mr71jrkzWq8>

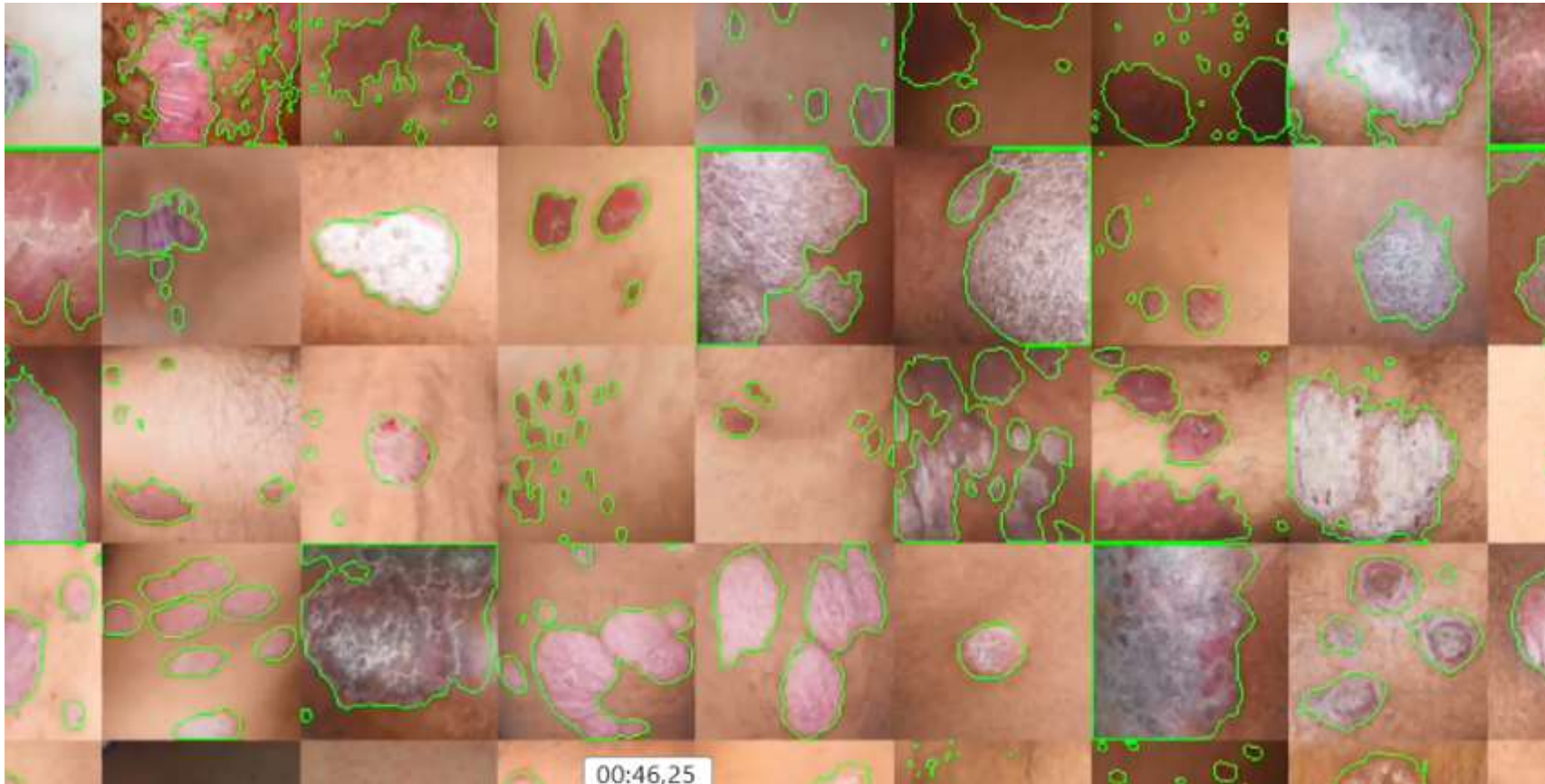


Self-Driving Car Project



Video: <https://www.youtube.com/watch?v=3XB-ygEJ93A>

DermLens: recognize psoriasis



Video: <https://youtu.be/8UQN8quZXKs>

Deteksi rumput



Video: <https://www.youtube.com/watch?v=2kSI1QOt96k>

Dan masih banyak contoh lainnya....

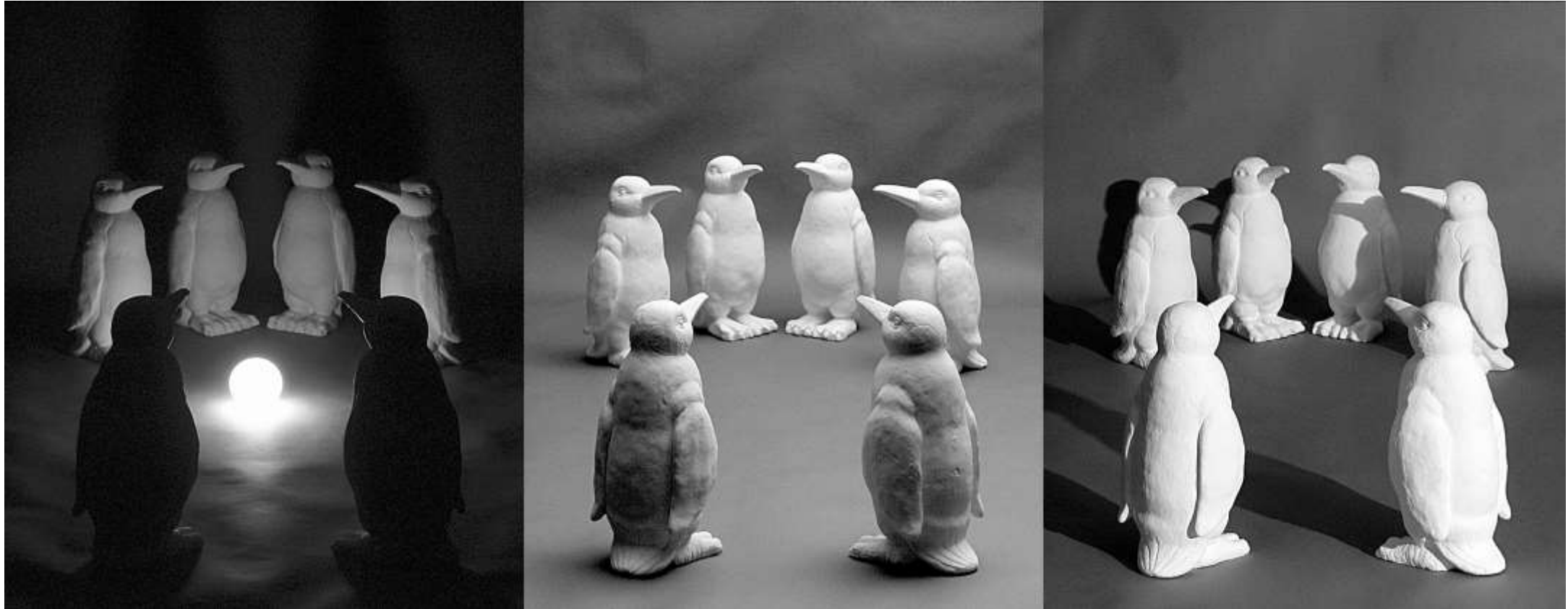
- Automated traffic law enforcement
- Intelligent Traffic Lights System
- Face recognition
- Pedestrian detection
- Object detection
- Facial expression
-

Tantangan di bidang computer vision

Challenges: viewpoint variation



Challenges: illumination



Challenges: scale



Challenges: deformation



Challenges: object intra-class variation



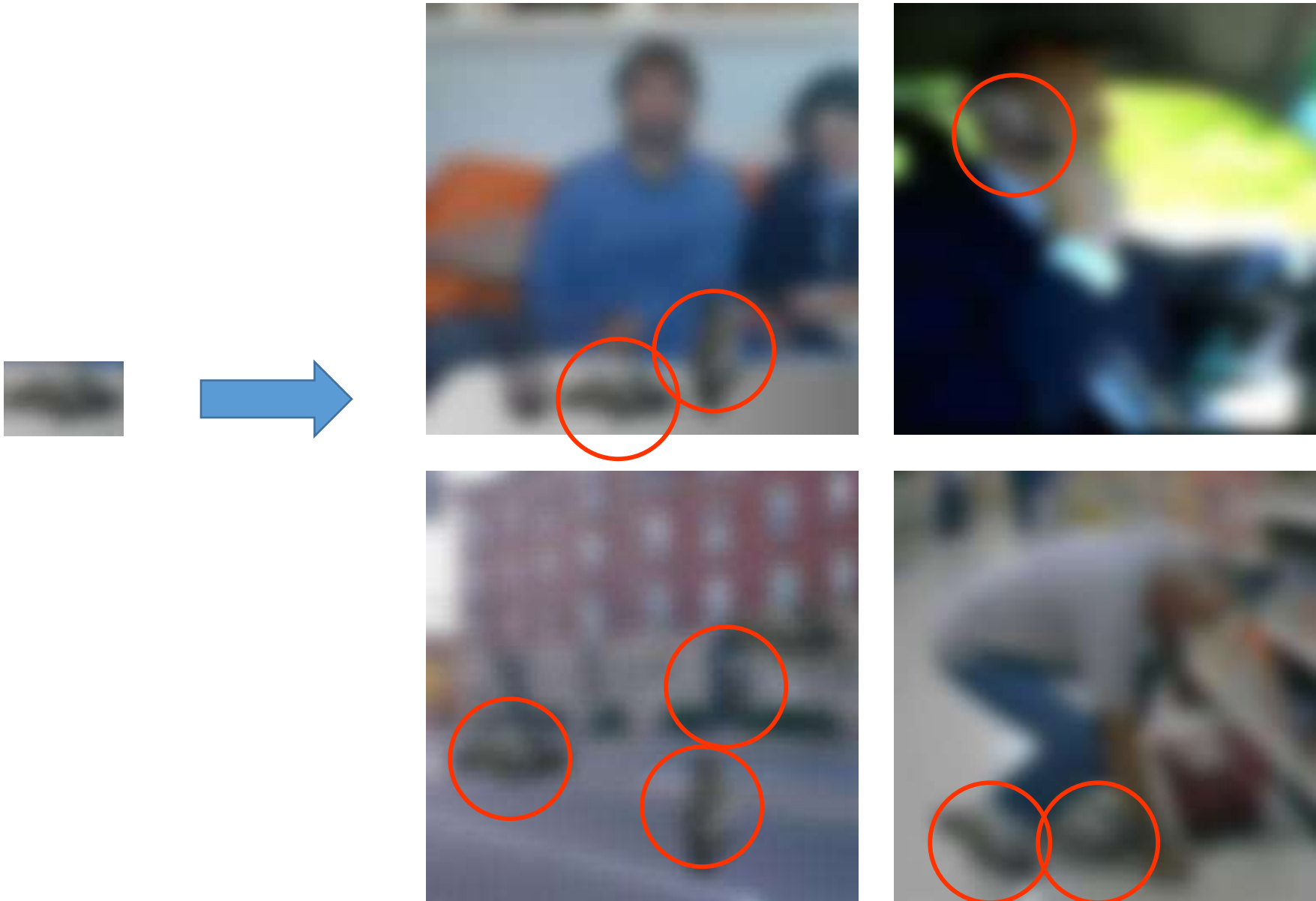
Challenges: occlusion, clutter



Challenges: Motion



Challenges: ambiguity



slide credit: Fei-Fei, Fergus & Torralba

Challenges: ambiguity

- Many different 3D scenes could have given rise to a particular 2D picture



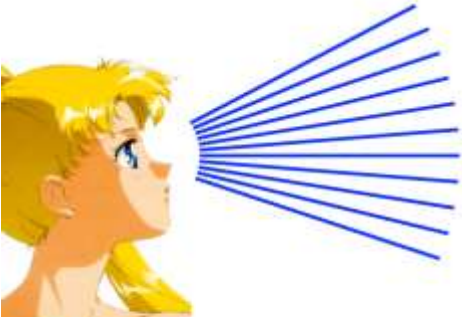
Challenges or opportunities?

- Images are confusing, but they also reveal the structure of the world through numerous cues
- Our job is to **interpret the cues!**

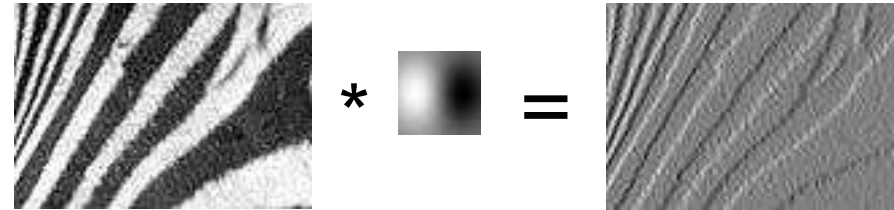


Bagaimana belajar
computer vision ?

1. Pengolahan Citra Digital



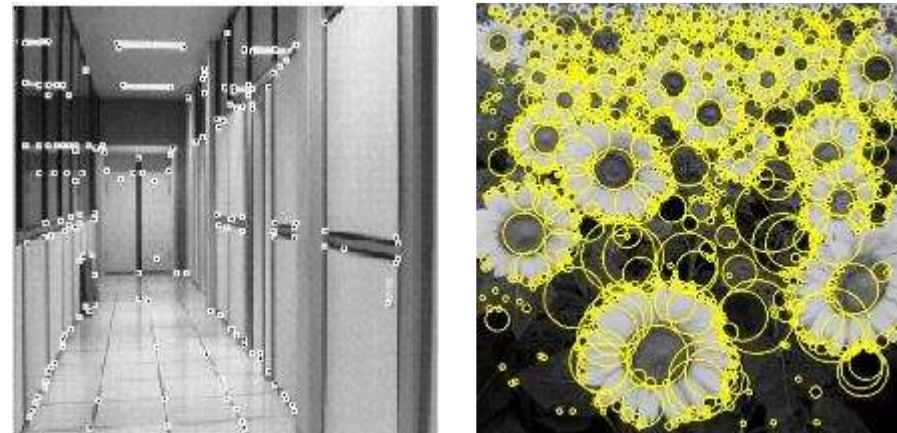
Cameras and sensors
Light and color



Linear filtering
Edge detection

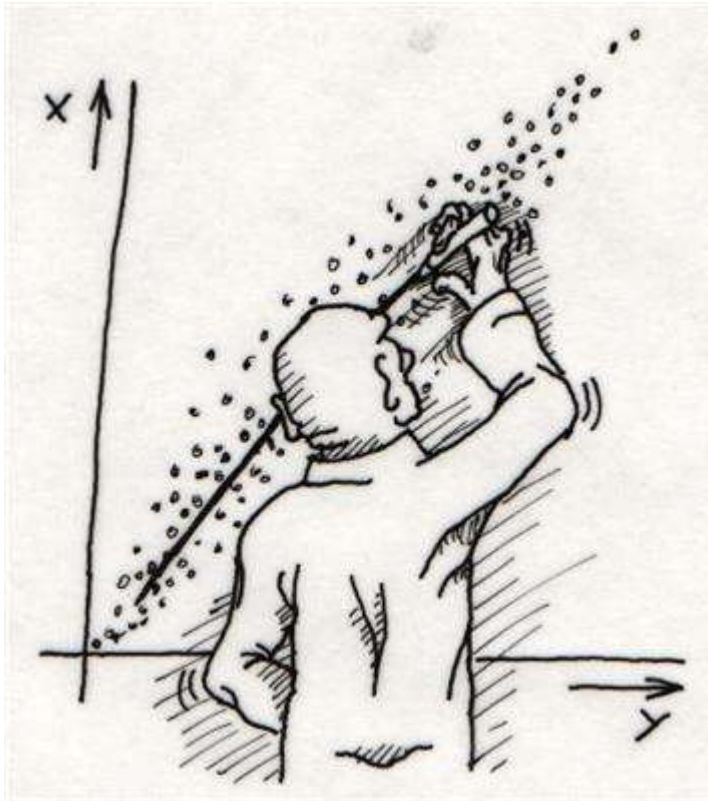


Image enhancement



Feature extraction, feature tracking

2. Fitting and Grouping

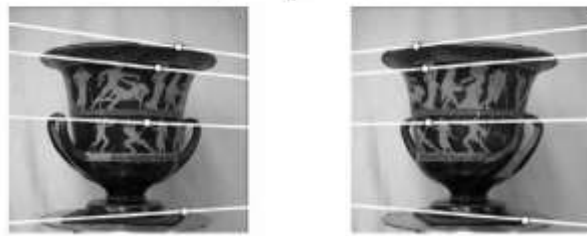


Fitting: Least squares
Hough transform
RANSAC



Alignment

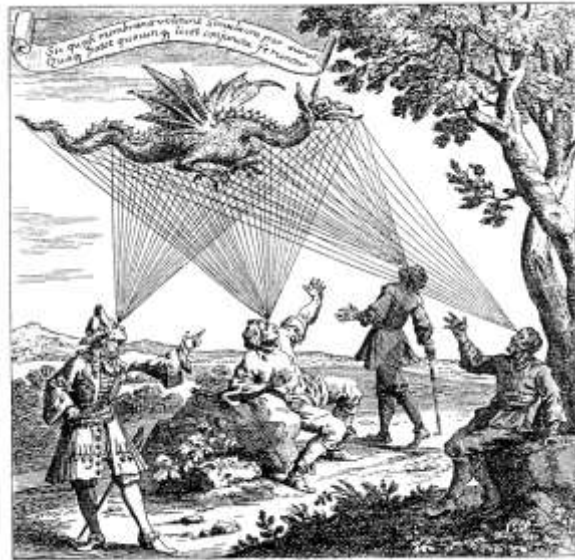
3. Multi-view Geometry



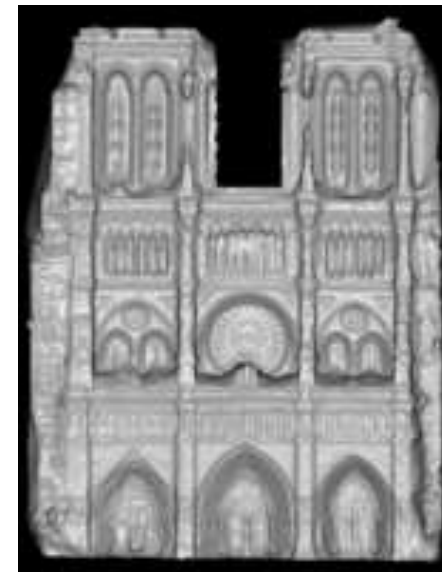
Epipolar geometry



Stereo

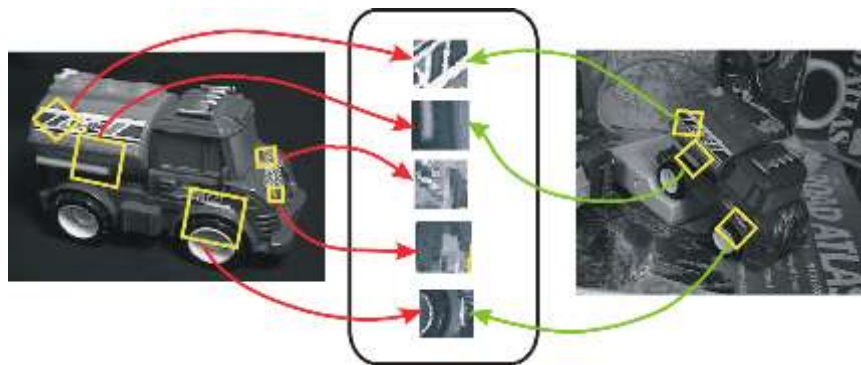


Structure from motion



3D Photography

Recognition



Instance recognition, large-scale alignment

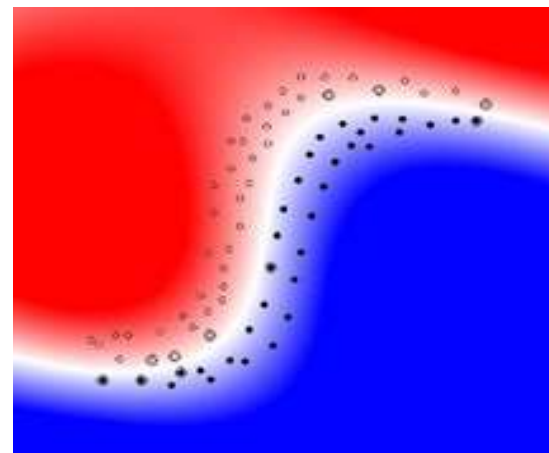


Image classification

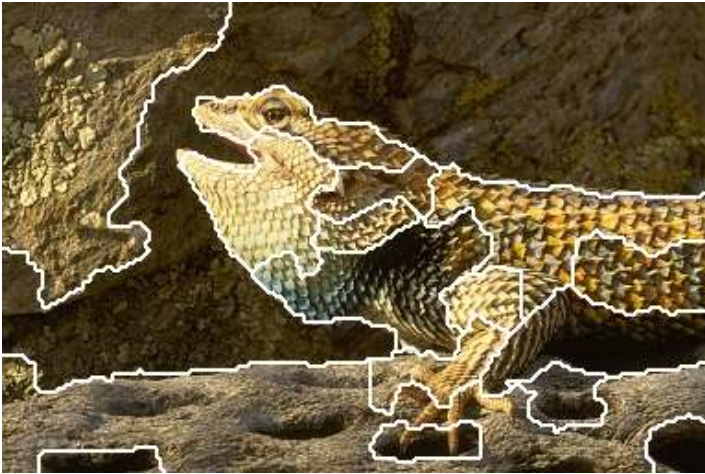


Object detection



Deep learning

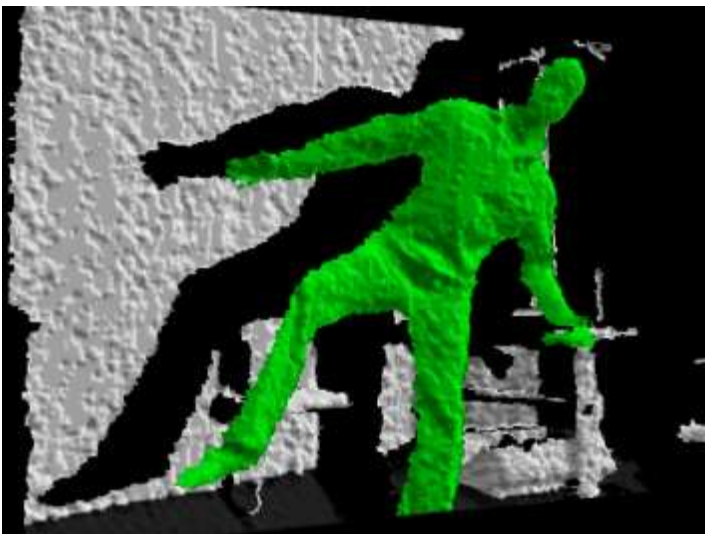
Terus belajar



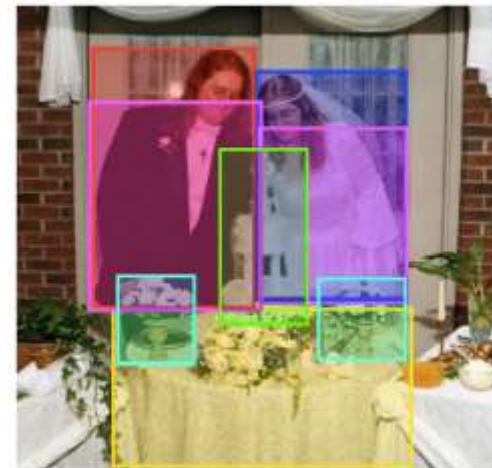
Segmentation



Video



RGBD images



A couple in their wedding attire stand behind a table with a wedding cake and flowers.

Images and text

Tools dan Pemrograman



Tools dan Pemrograman



- Fungsi sangat lengkap
- Powerfull
- Standar industri
- Komunitas dan referensi banyak
- Diajarkan di banyak universitas
- Berbayar



OpenCV (Open Source Computer Vision Library) is released under a BSD license and hence it's free for both academic and commercial use. It has C++, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android. OpenCV was designed for computational efficiency and with a strong focus on real-time applications. Written in optimized C/C++, the library can take advantage of multi-core processing.

Tools dan Pemrograman



GNU Octave is a high-level language, primarily intended for numerical computations. It provides a convenient command line interface for solving linear and nonlinear problems numerically, and for performing other numerical experiments using a language that is mostly compatible with Matlab. It may also be used as a batch-oriented language.

GNU Octave is also freely redistributable software. You may redistribute it and/or modify it under the terms of the GNU General Public License (GPL) as published by the Free Software Foundation.

Tools dan Pemrograman



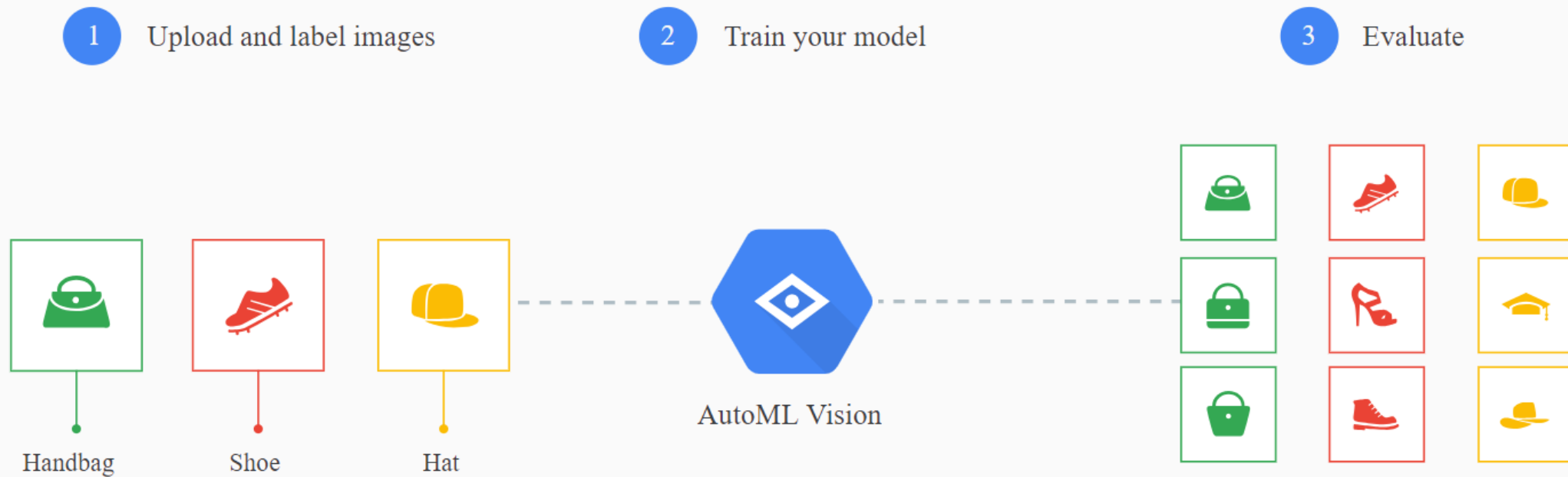
Cloud Vision API

<https://cloud.google.com/vision/>

Google Cloud Vision API enables developers to perform image processing by encapsulating powerful machine learning models in a simple REST API that can be called in an application. Also, its Optical Character Recognition (OCR) functionality enables you to detect text in your images.

Tools dan Pemrograman

How AutoML Vision^{BETA} works



Tools dan Pemrograman

Amazon Rekognition

Easily add intelligent image and video analysis to your applications.

Amazon Rekognition makes it easy to add image and video analysis to your applications. You just provide an image or video to the Rekognition API, and the service can identify the objects, people, text, scenes, and activities, as well as detect any inappropriate content. Amazon Rekognition also provides highly accurate facial analysis and facial recognition on images and video that you provide. You can detect, analyze, and compare faces for a wide variety of user verification, people counting, and public safety use cases.

<https://aws.amazon.com/rekognition/>

Tools dan Pemrograman

Microsoft Azure Computer Vision API

<https://azure.microsoft.com/en-in/services/cognitive-services/computer-vision/>

Extract rich information from images to categorize and process visual data—and perform machine-assisted moderation of images to help curate your services.

“Semakin banyak yang kita pelajari,
semakin menunjukkan kebesaran,
karunia dan kuasa Tuhan”

فَبِأَيِّ ءَا لَاءِ رَبِّكُمَا تُكَذِّبَانِ ﴿٥٥﴾

Maka nikmat Tuhan kamu yang manakah
yang kamu dustakan?

Referensi

- Making Indonesia 4.0 - <http://www.kemenperin.go.id/download/18384>
- Beberapa slide berdasarkan materi Computer Vision dari Universitas Illinois - <http://slazebni.cs.illinois.edu/spring16>
- <https://hub.packtpub.com/top-10-computer-vision-tools/>
- https://en.wikipedia.org/wiki/Computer_vision
- Beberapa gambar diambil melalui situs pencari Google.

Terima Kasih



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