Computer Vision

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Acknowledgement

I will like to offer my great appreciation to all my group members.
I would like to offer my special thanks to **LESLIE LAMPORT** for inventing such a great typesetting programme.
I would like to express my very great appreciation to **Mr.Nikhil Khanna** for his valuable and constructive suggestions during the planning and development of this research work.His willingness to give his time time so generously has been very much appreciated.
My **SPECIAL THANKS** are extended to the staff of **"DEPARTMENT OF MATHEMATICS"**.

Overview

- Introduction
- Histroy Of Computer Vision
- Applications
- Typical Task
- Scope of Computer Vision
- System Methods
- Reference

Abstract

The field of computer vision is devoted to discovering algorithms, data representations, and computer architectures that embody the principles underlying visual capabilities. This article describes how the field of computer (and robot) vision has evolved, particularly over the past 20 years, and introduces its central methodological paradigms.


COMPUTER VISION

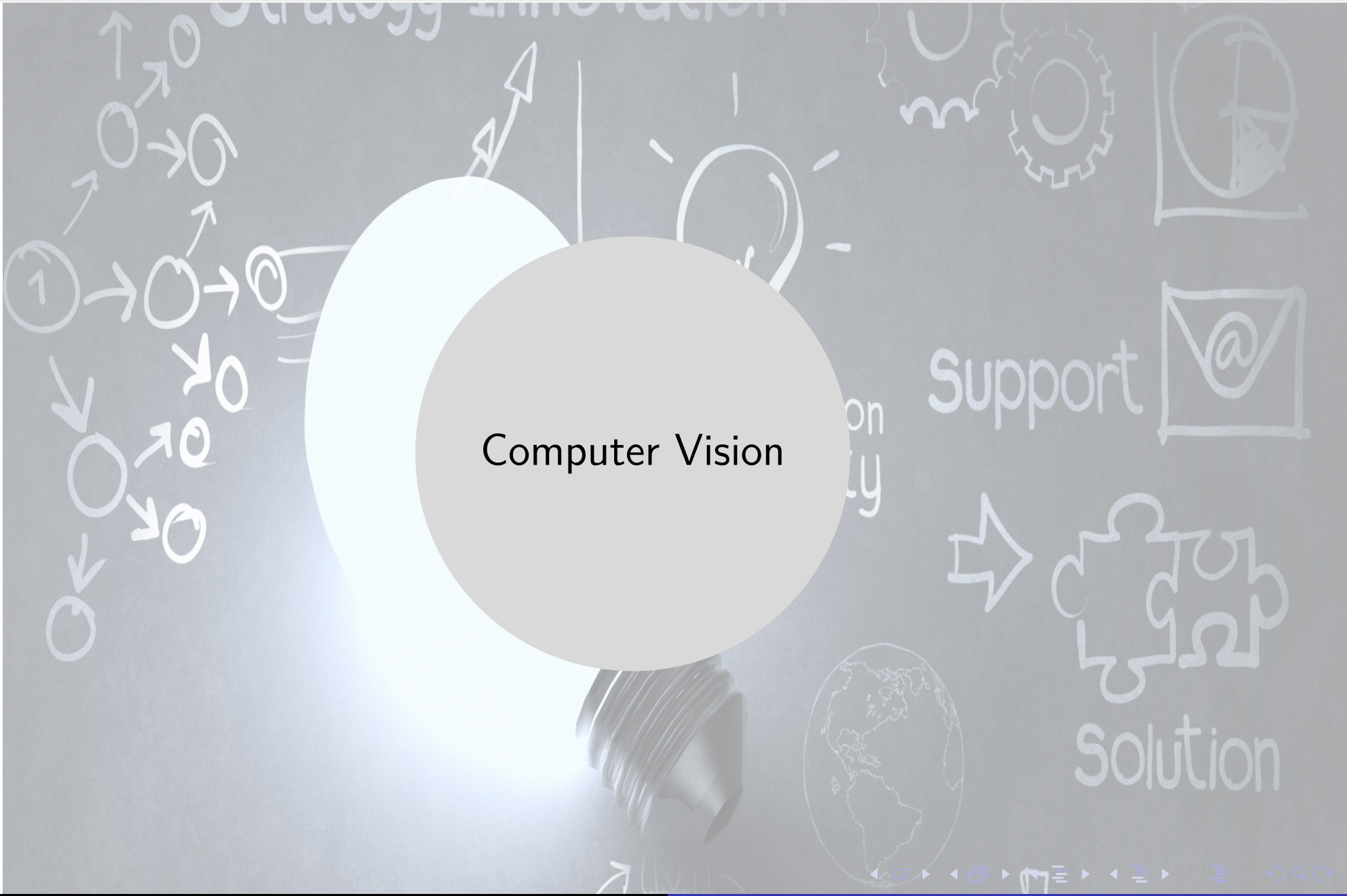
Applications of Computer Vision

Computer Vision, an Artifecial Intelligence(AI) technology that allows computers to understand & label images, is now used in convenienc stores, driverless car testing, daily medical diagonistics & in monitoring the health of crops and livestock.

Computer Vision is a booming industry that is being applied to many of our every day products.We have seen that computers are proficient at recognizing images. Today, top technology companies such as **amazon**, Google,**Microsoft** & **facebook** are investing billion of dollars($) in Computer Vision research and product development.

From my research, I've found that many of those use cases of computer vision fall into the following clusters.

Applications



Computer Vision

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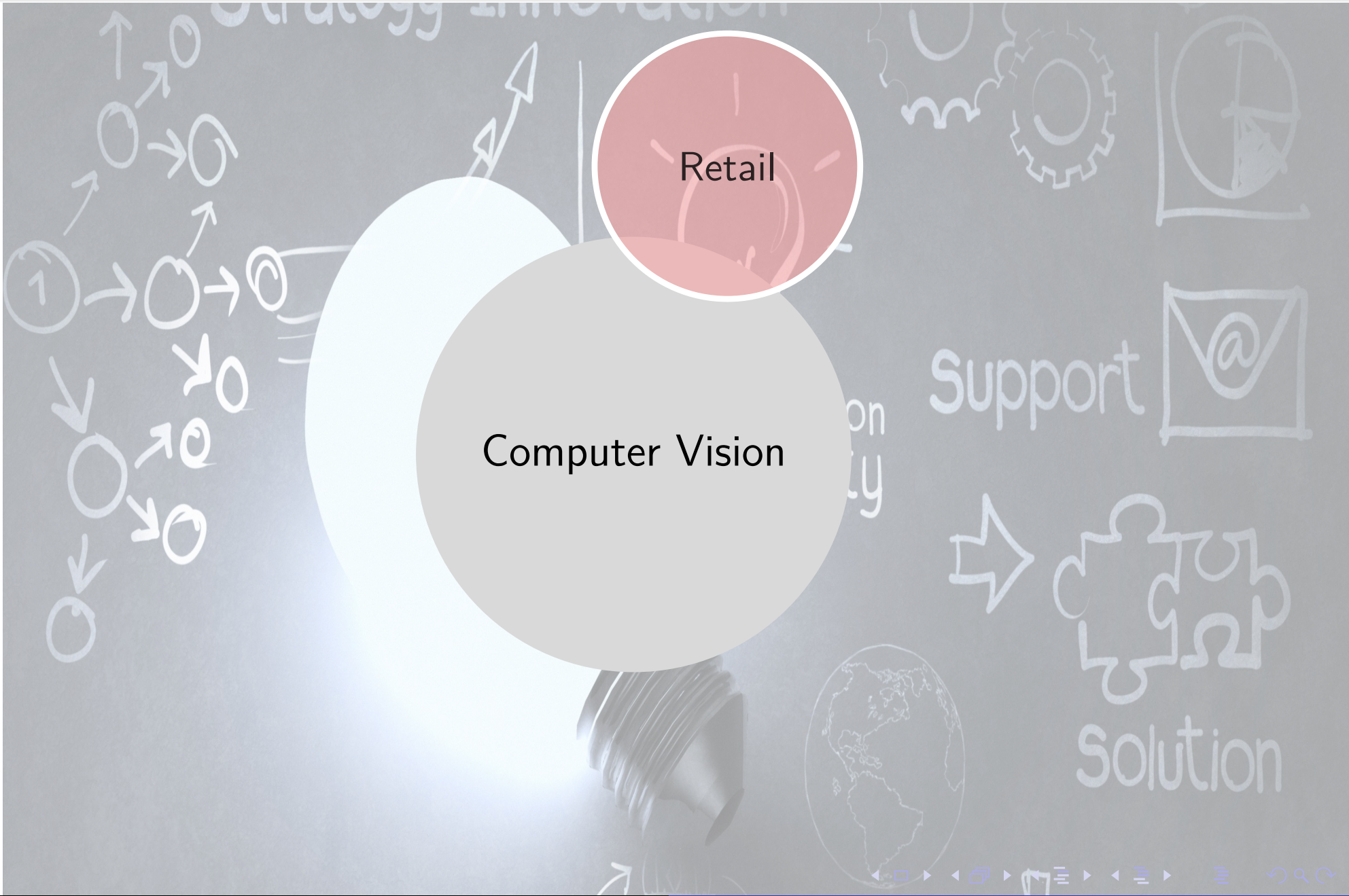

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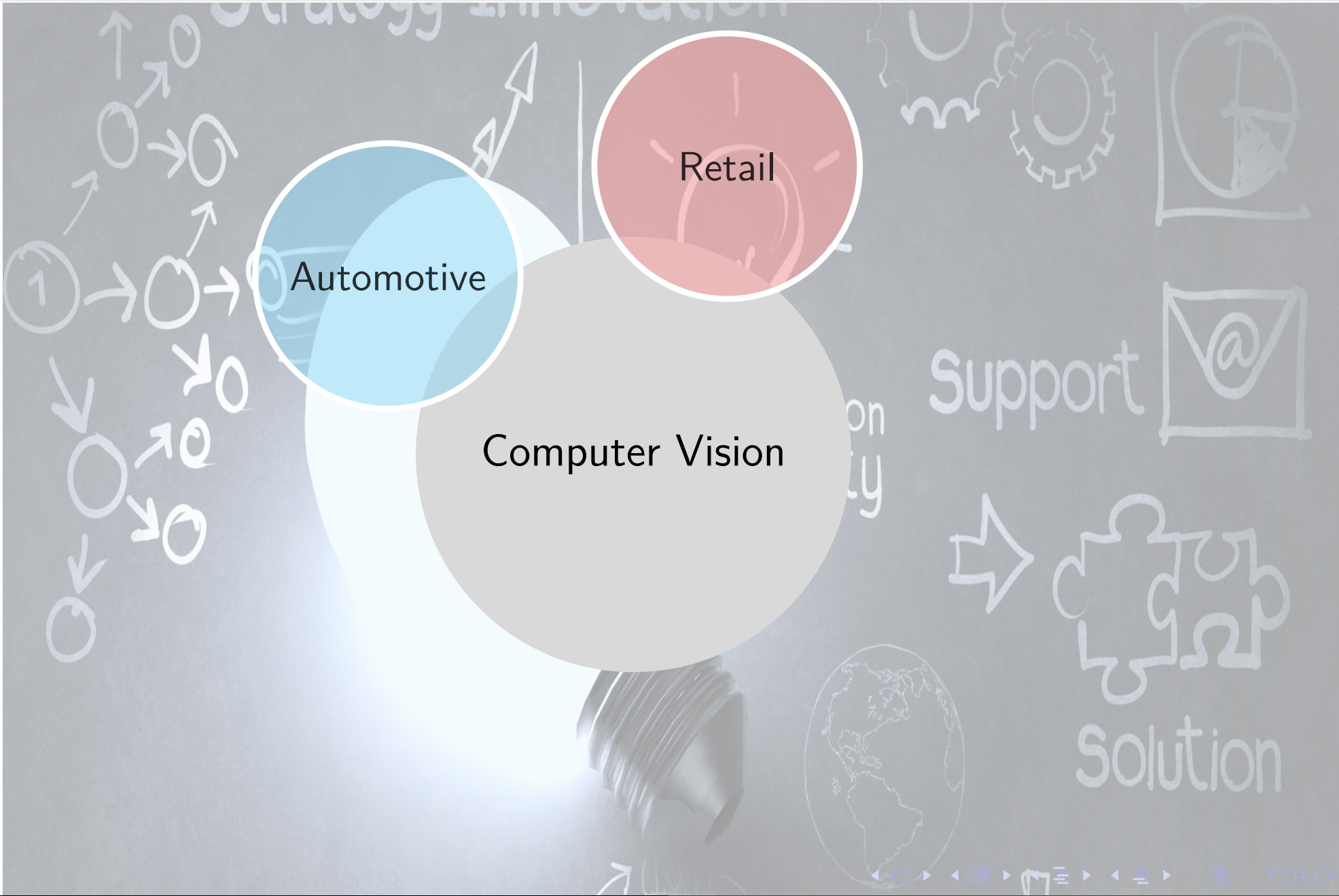

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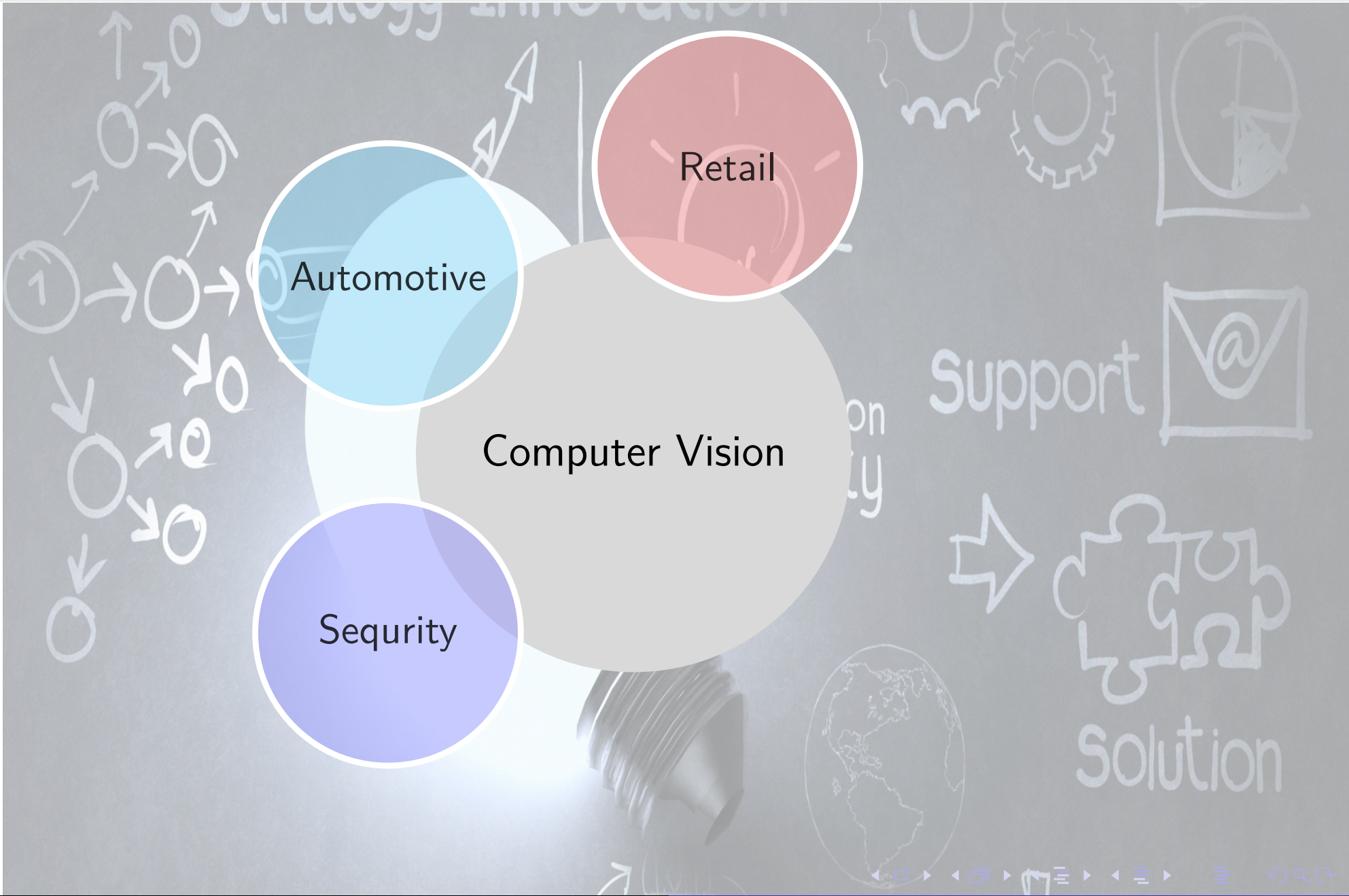

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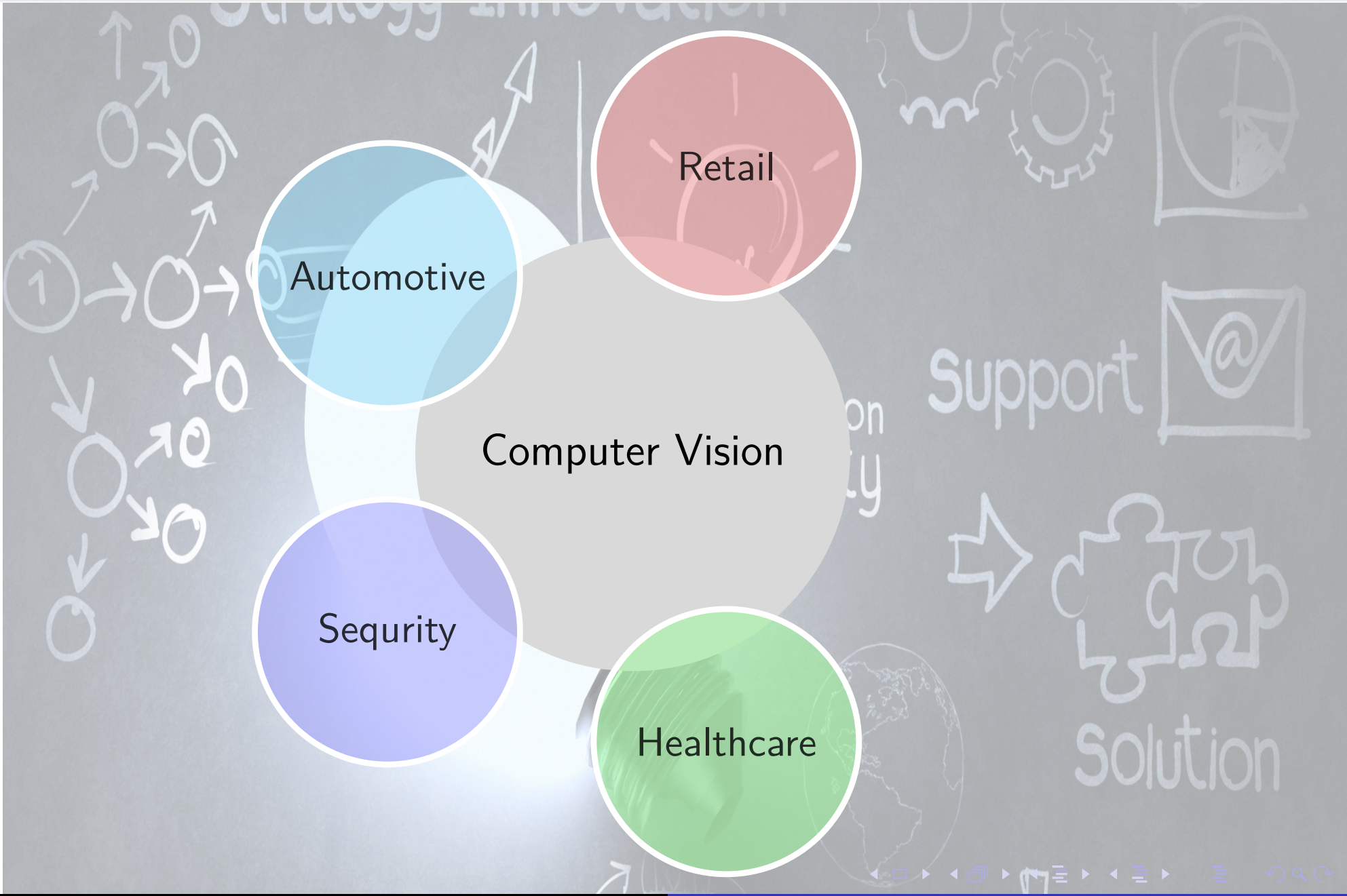

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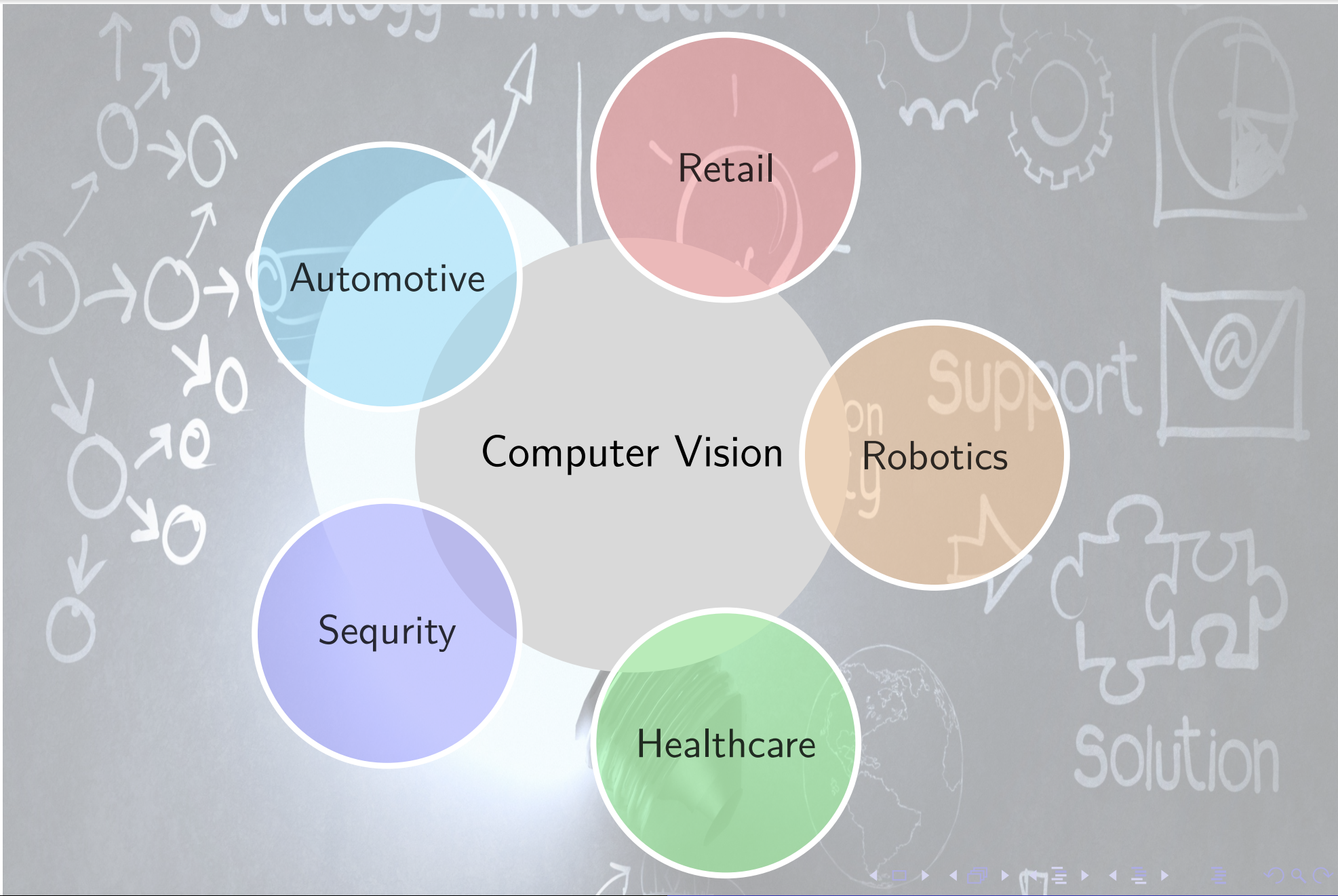

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Some early applications of Computer Vision in retail come from e-commerce, but increasingly, it is being used in physical retail stores to perfect shelf merchandising, enhance operational efficiencies and create a frictionless experience for shoppers.

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Kinect

Microsoft's Kinect is a virtual mirror that superimpose virtual clothes onto the reflection of the shoppers body and shopper can try any outfit without needing to put them on.

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Tesla

Another company that claims it has developed self driving cars is Tesla, which claiming that all its 3 Autopilot car modes are equipied for self driving compability

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Automatic Number Plate Recognition

The Automatic Number Plate Recognition (ANPR) system can record the registrations of all vehicles entering or leaving a site, and displays the registration.

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Gauss Surgical

Gauss Surgical has developed blood monitoring solutions that are described to estimate in real-time blood loss during medical situations.

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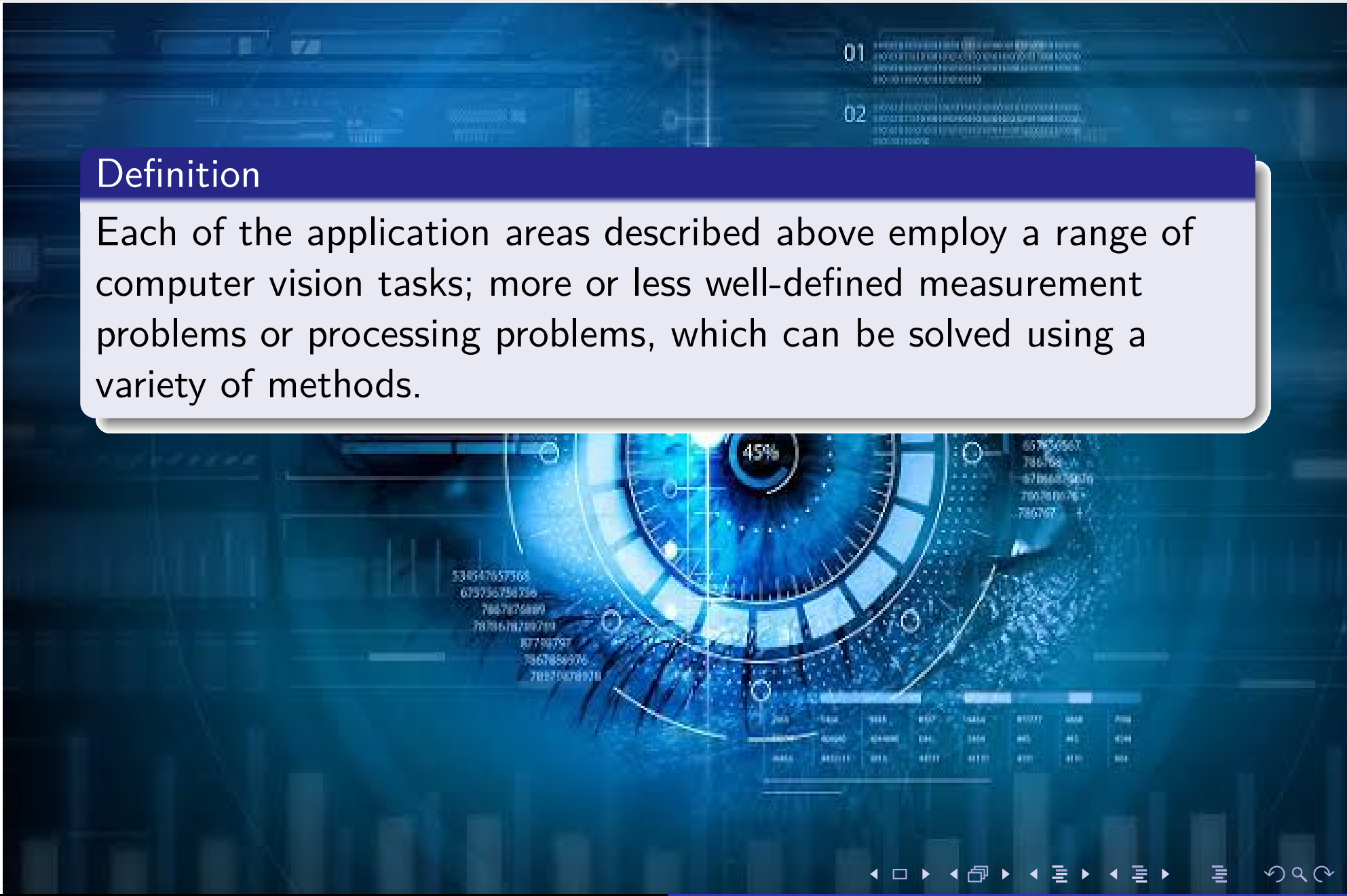

Definition

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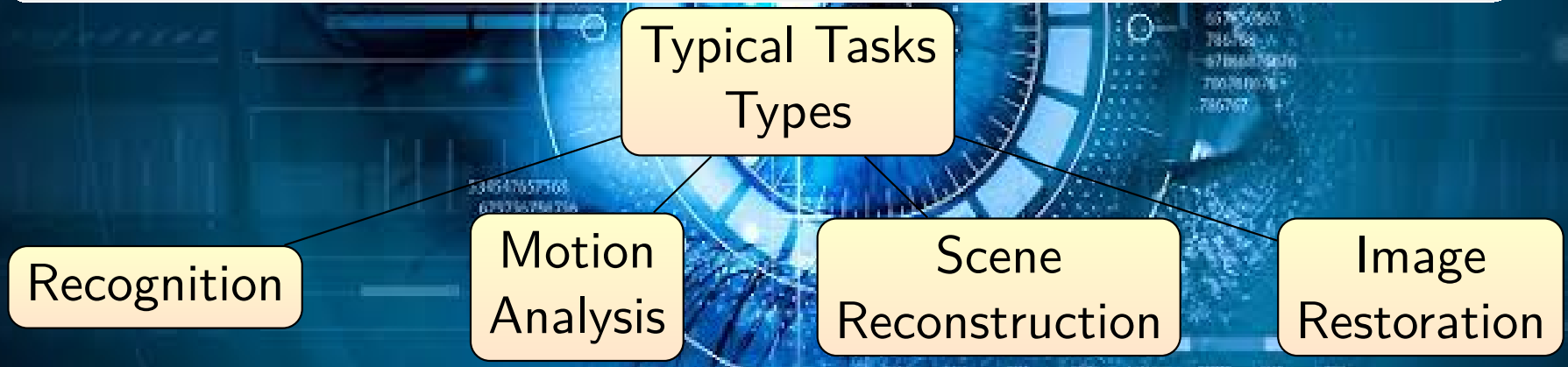

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Support of visual effects creation for cinema and broadcast, e.g., camera tracking (matchmoving),Surveillance,Tracking and counting organisms in the biological sciences typical tasks. Each of the application areas described above employ a range of computer vision tasks; more or less well-defined measurement problems or processing problems, which can be solved using a variety of methods.

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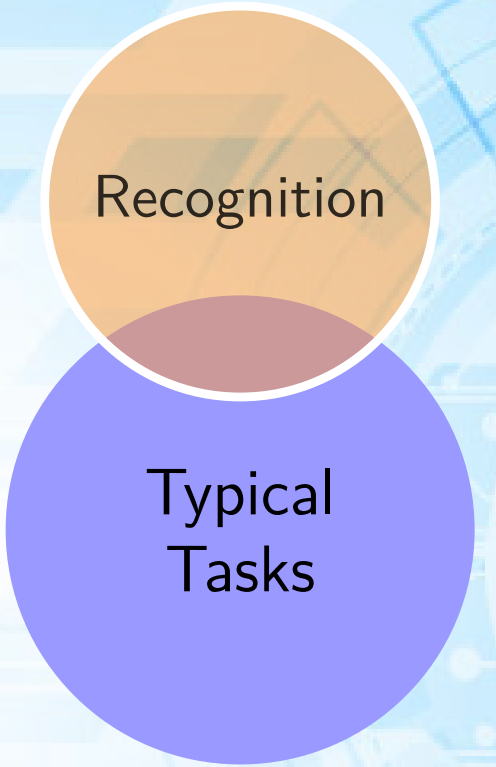

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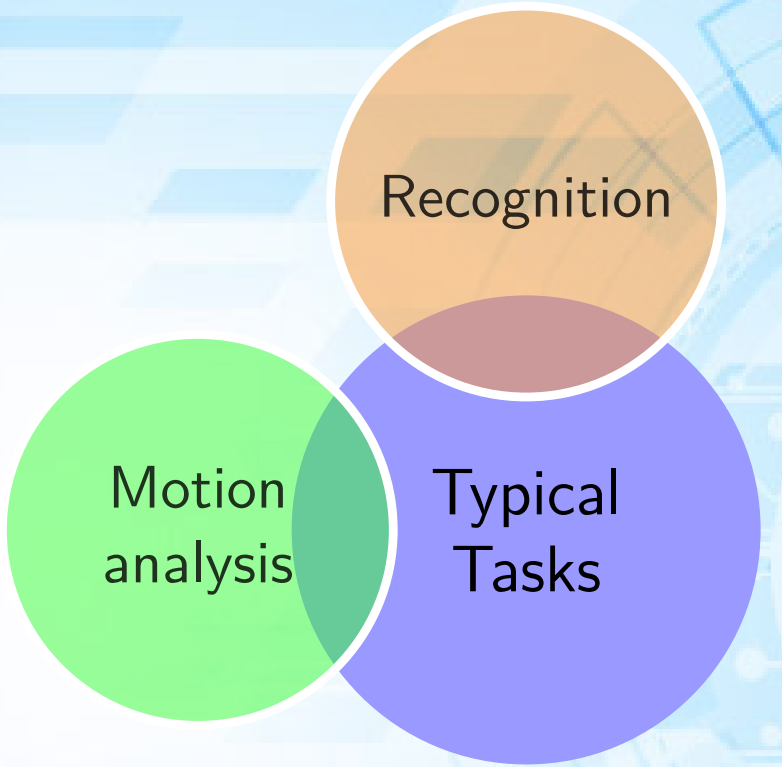

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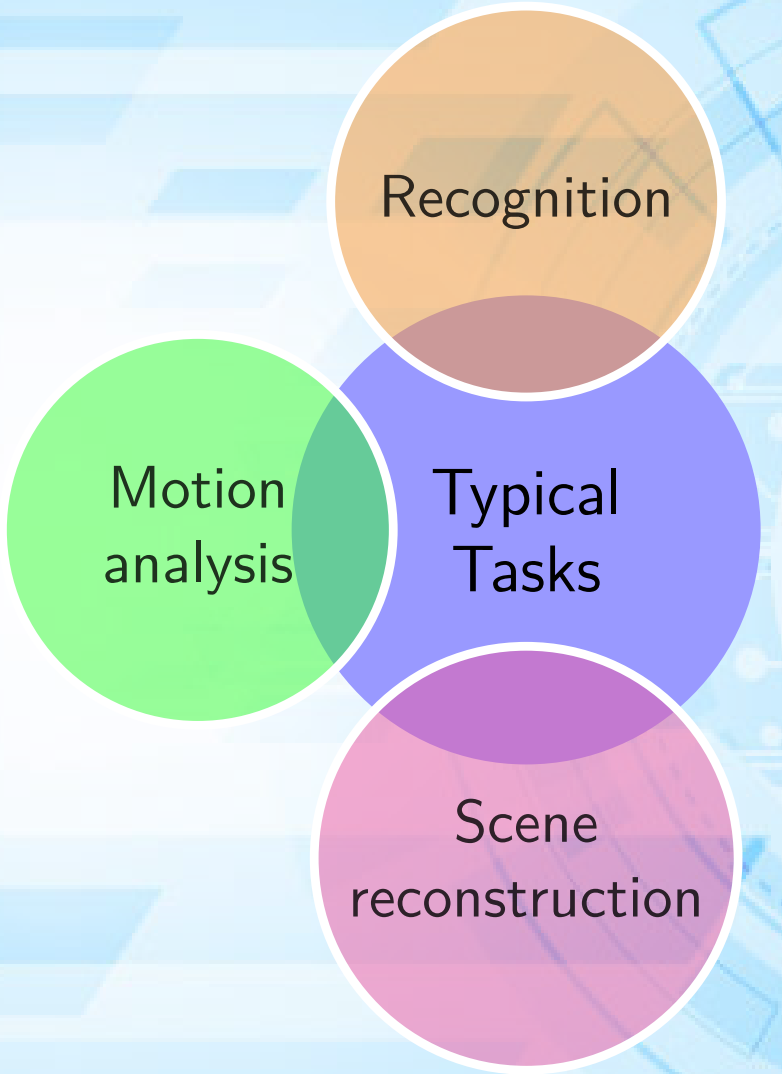

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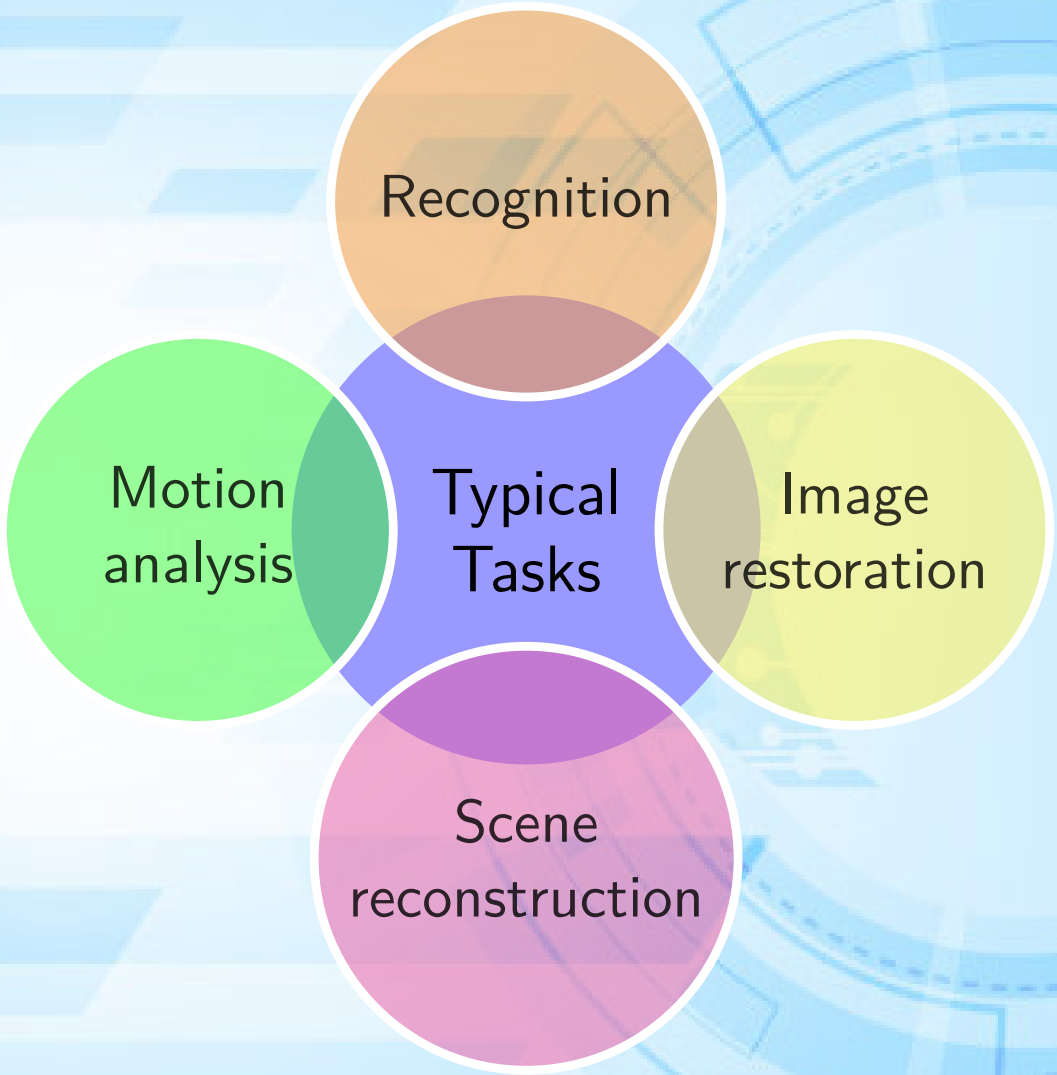

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* **Several specialized tasks , such as:**

- Content based image retrieval.
- Pose Estimation.
- Optical Character Recognition (OCR).
- 2D Code Reading.
- Facial Recognition.
- Shape Recognition Technology (SRT).

Object Recognition

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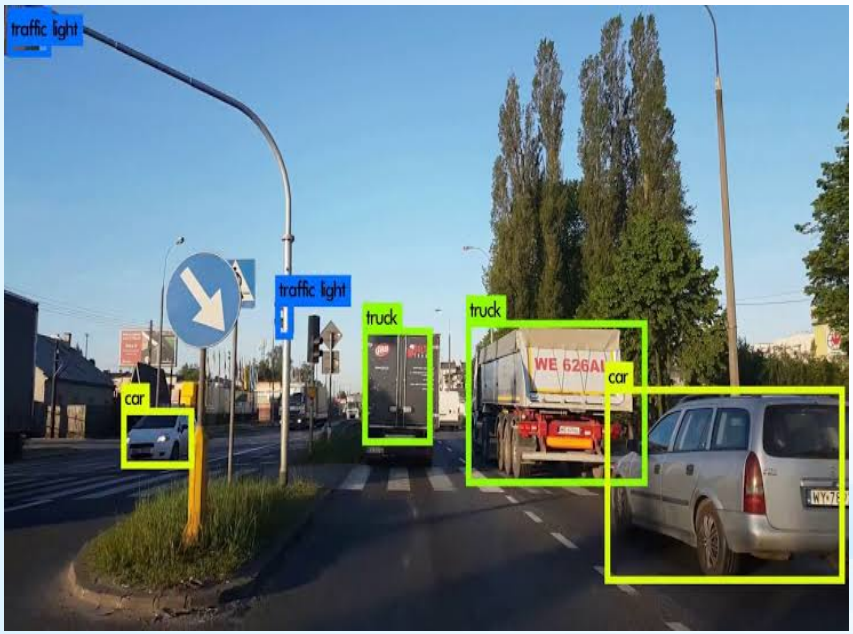

Figure: (a) *Objects Recognition*

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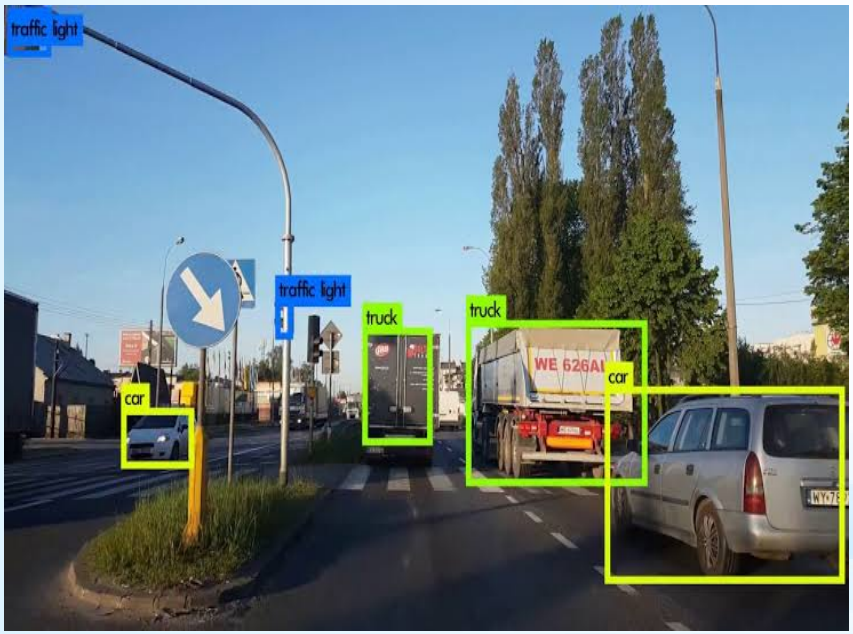

Figure: (a) *Objects Recognition*

Figure: (b) *Object Recognitions*

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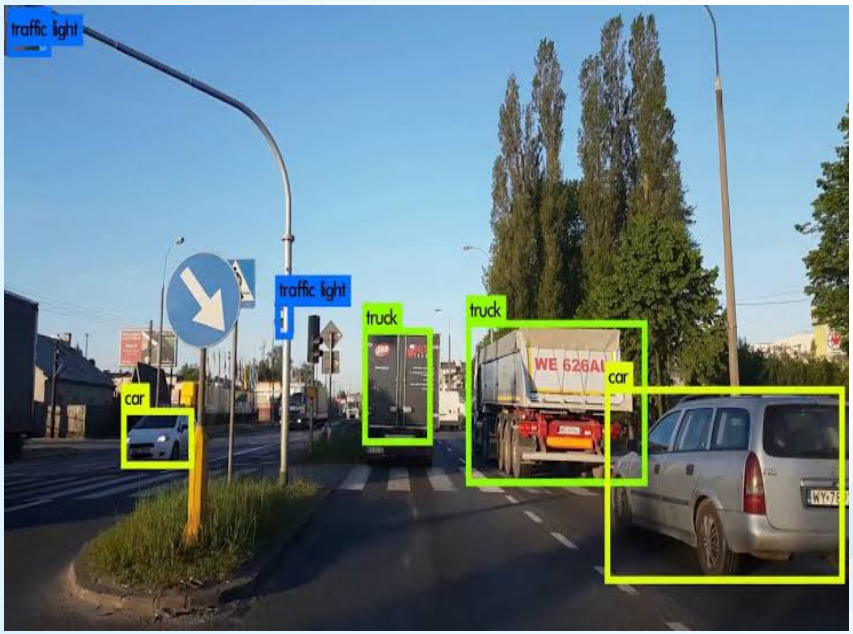

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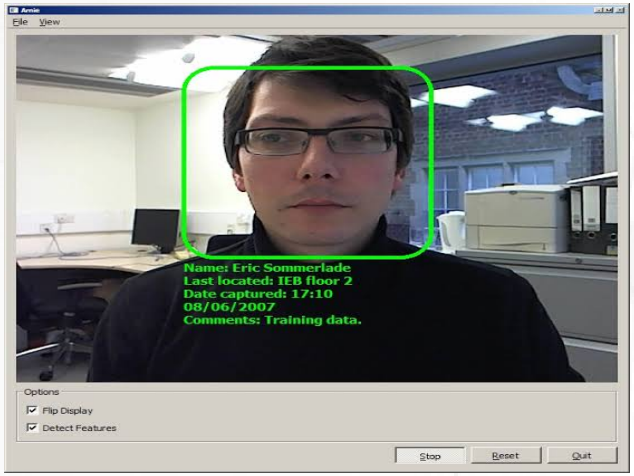

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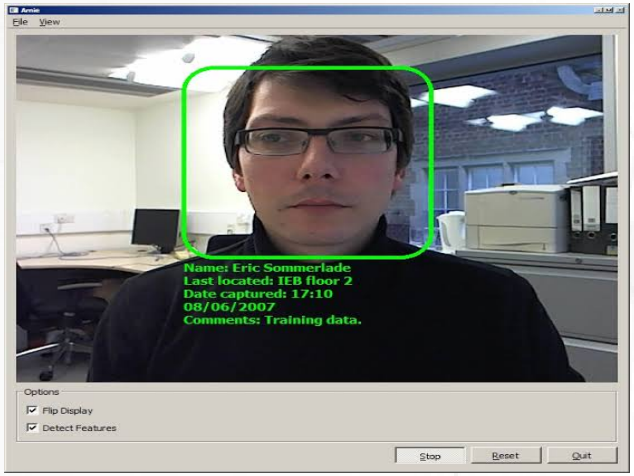

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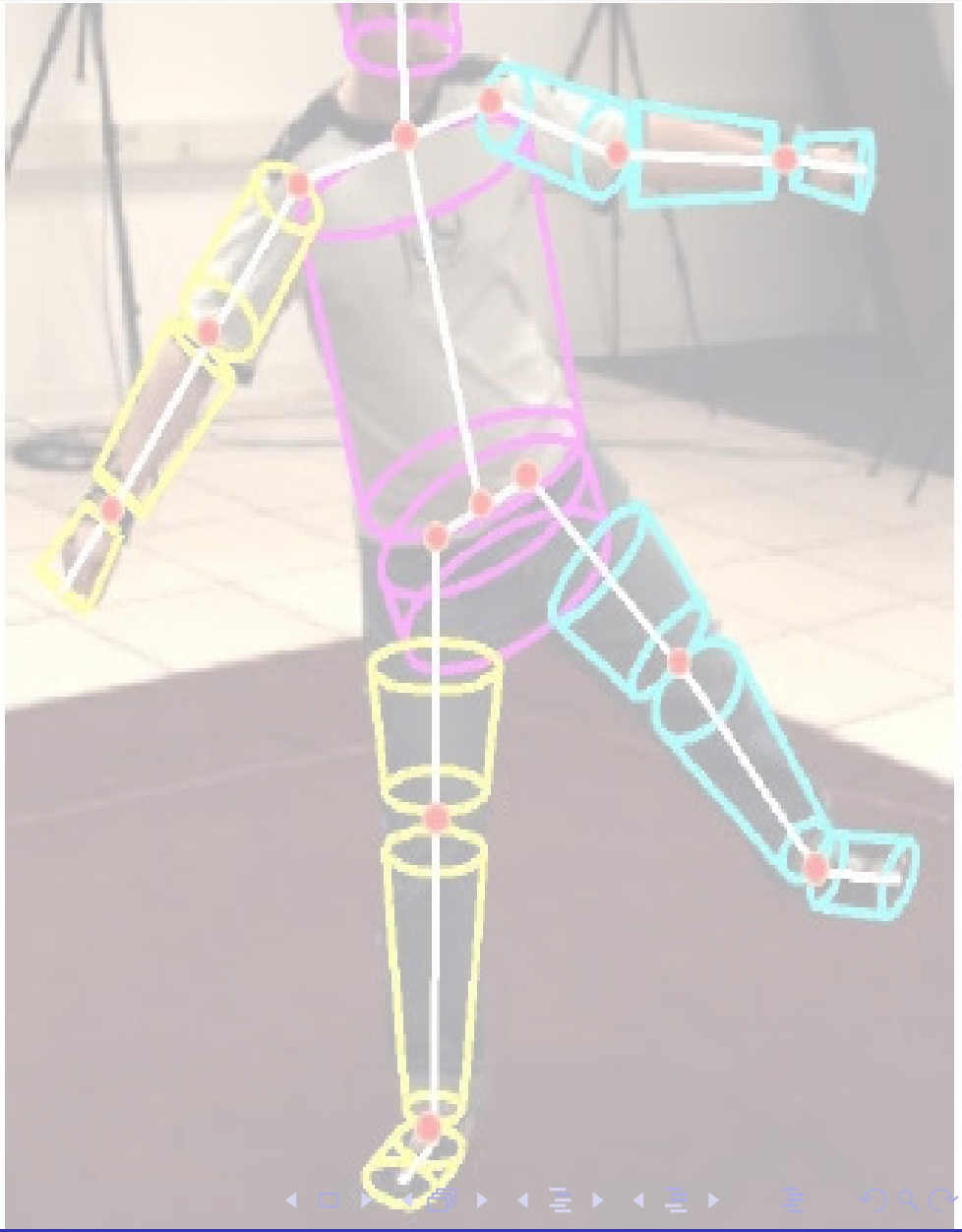
Detection - the image data are scanned for a specific condition. Detection based on relatively simple and fast computations is sometimes used for finding smaller regions of interesting image data which can be further analyzed by more techniques to produce a correct interpretation.

(2).Motion Analysis

Typical Tasks



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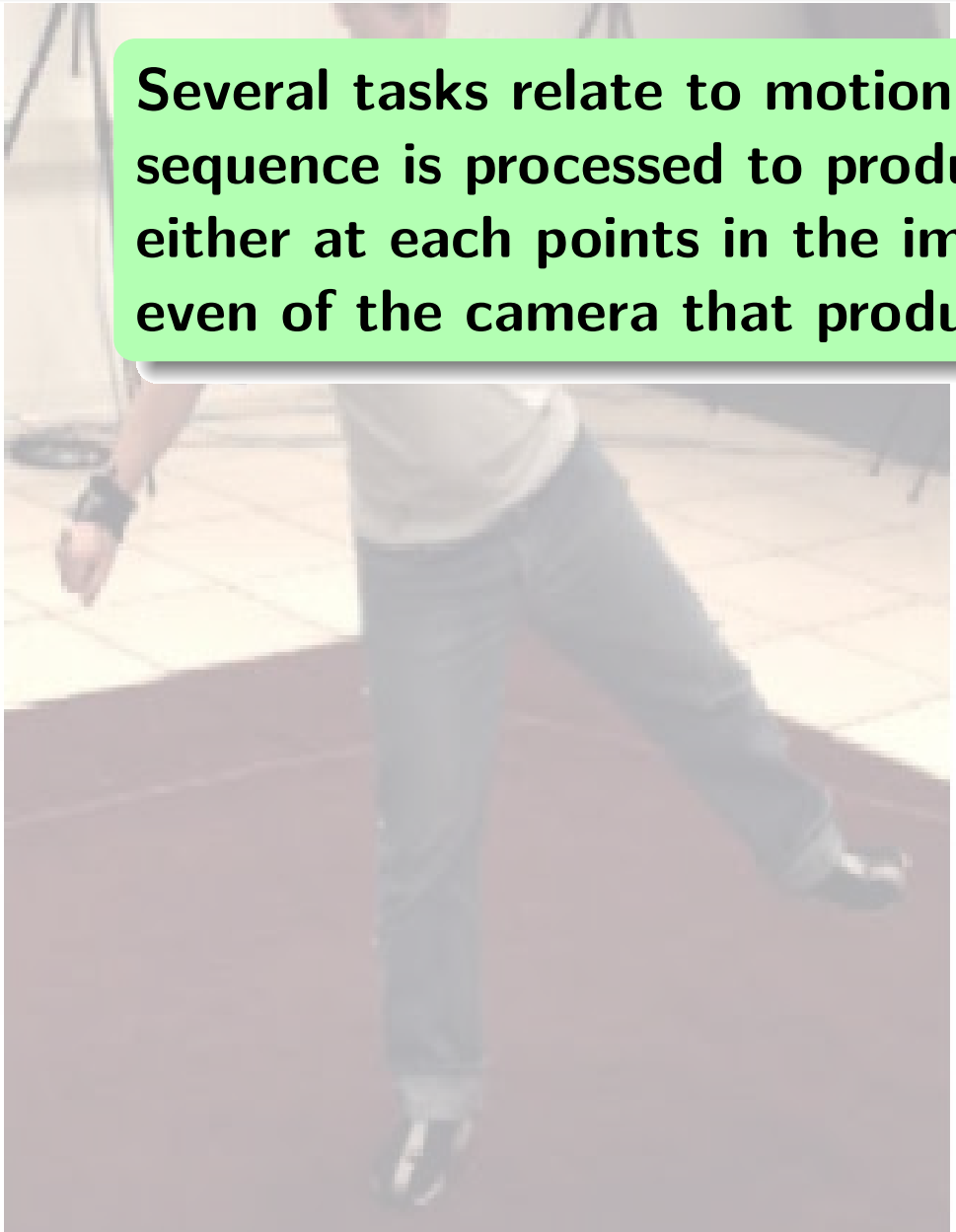
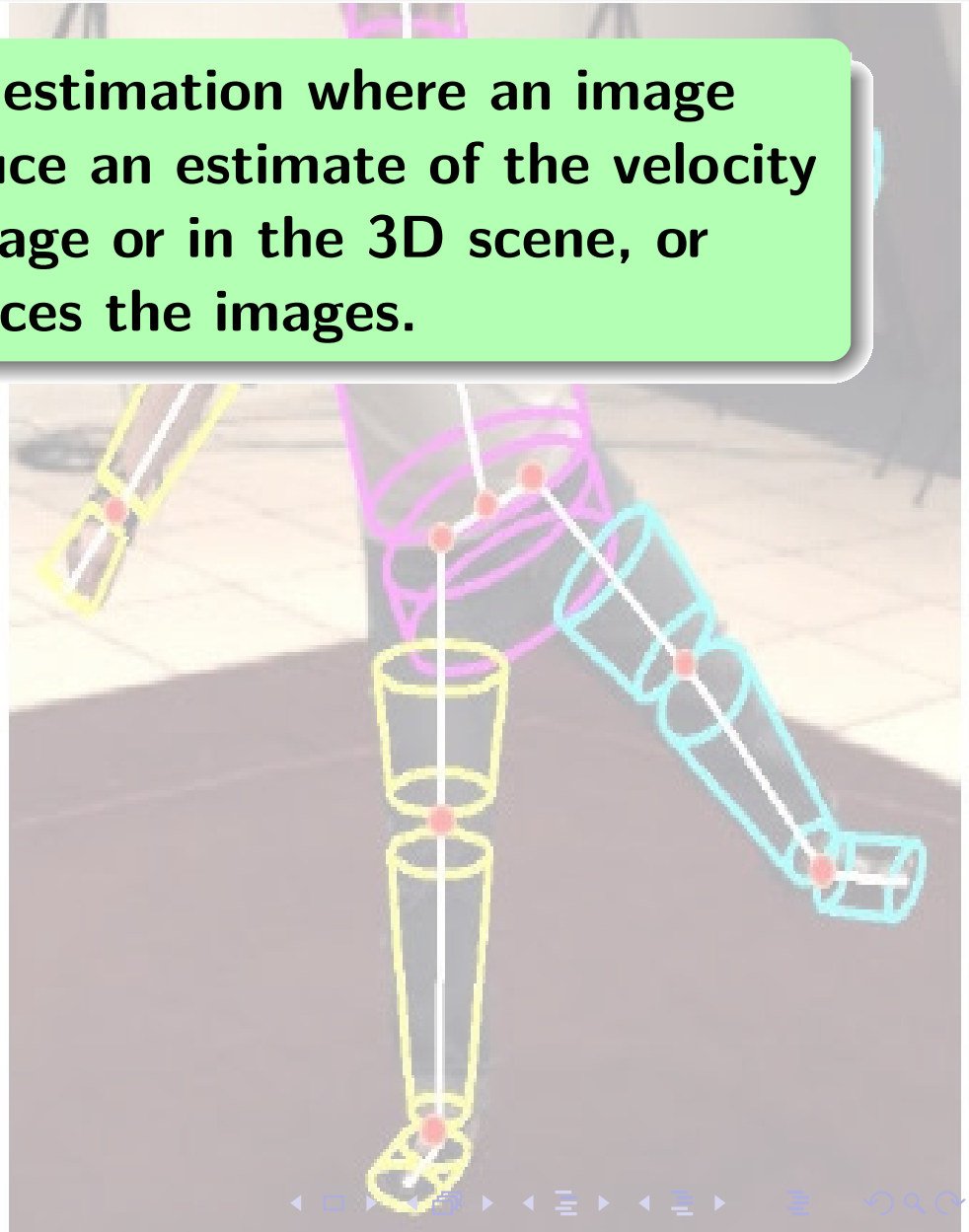
Several tasks relate to motion estimation where an image sequence is processed to produce an estimate of the velocity either at each points in the image or in the 3D scene, or even of the camera that produces the images.





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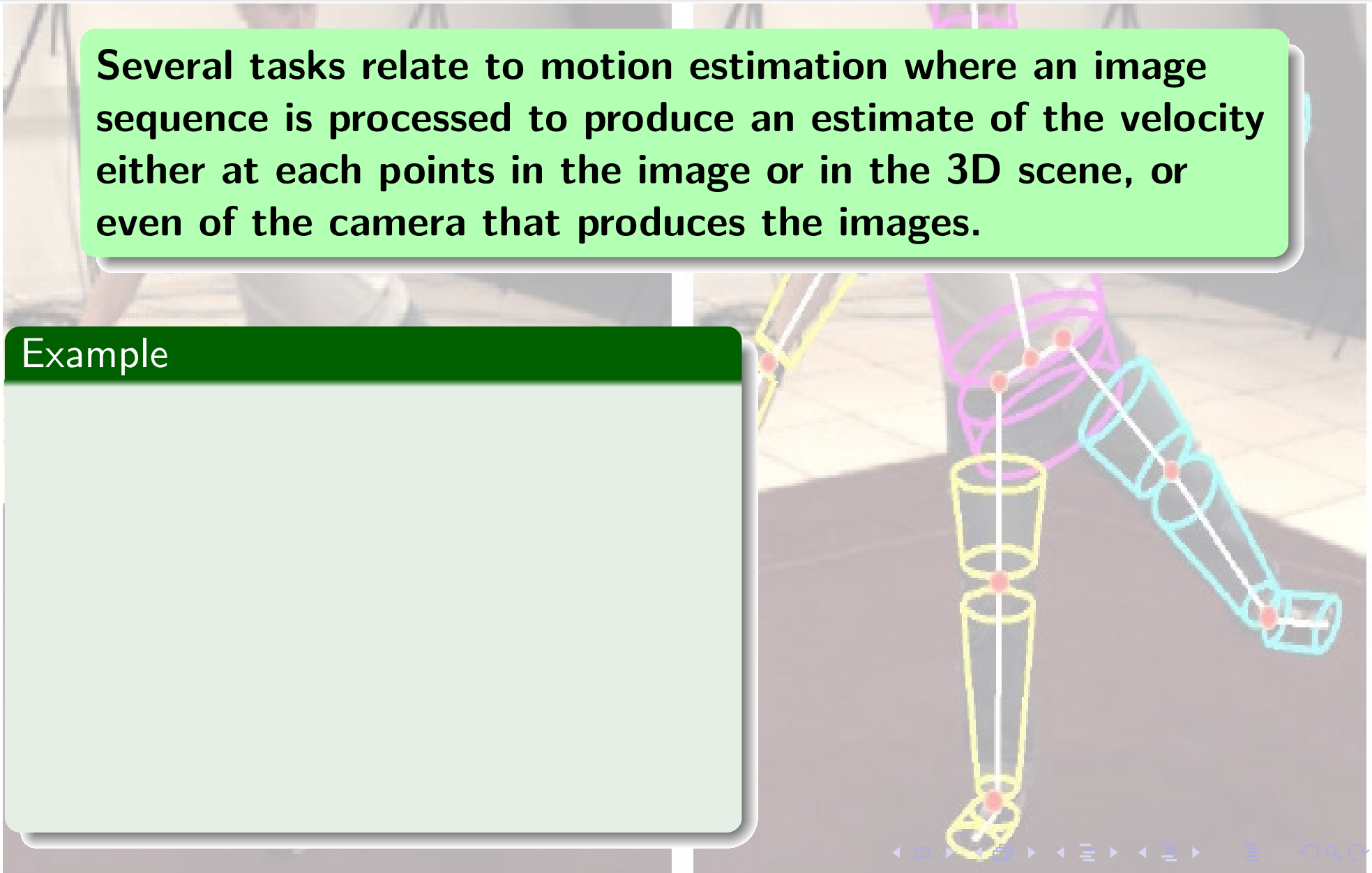

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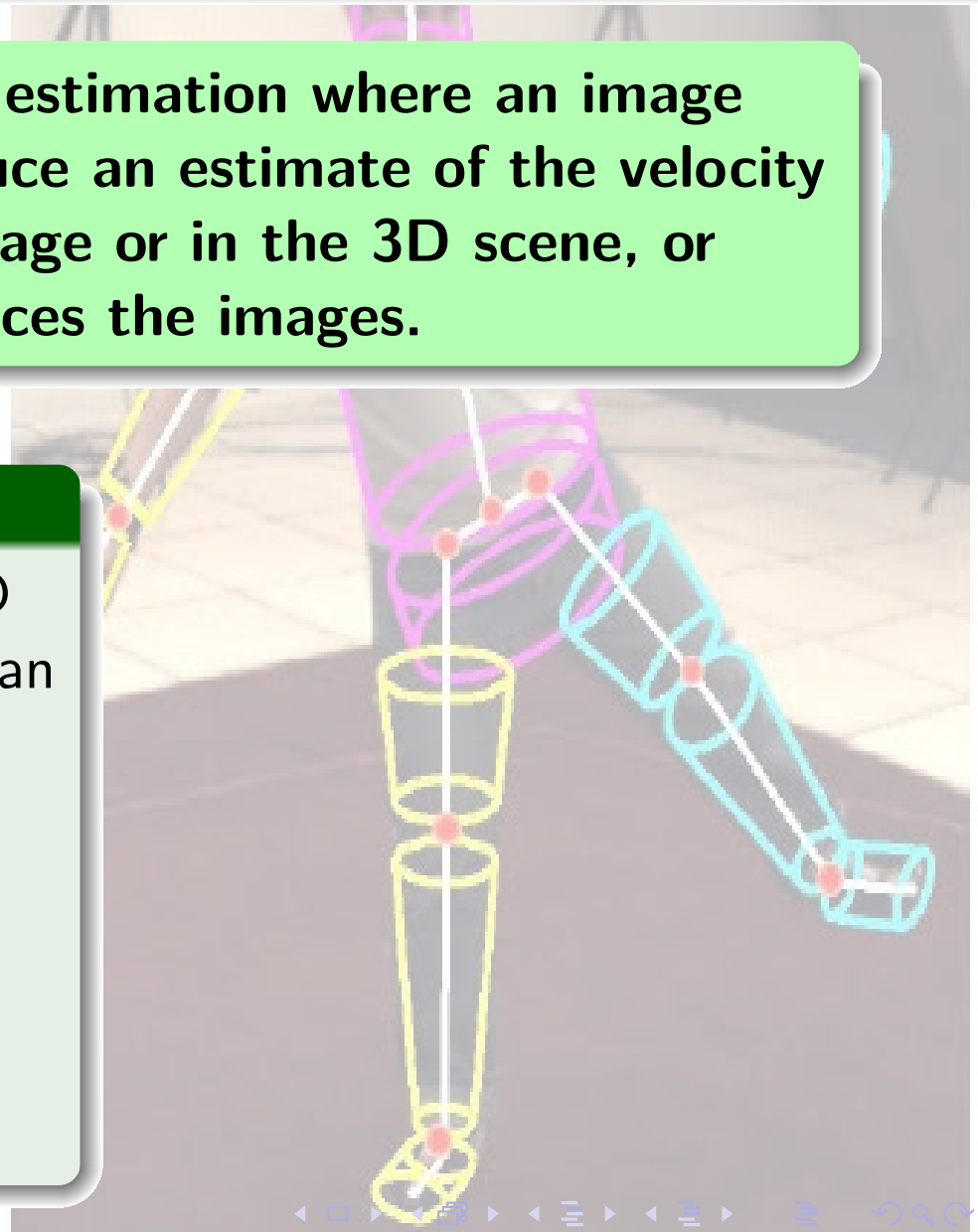

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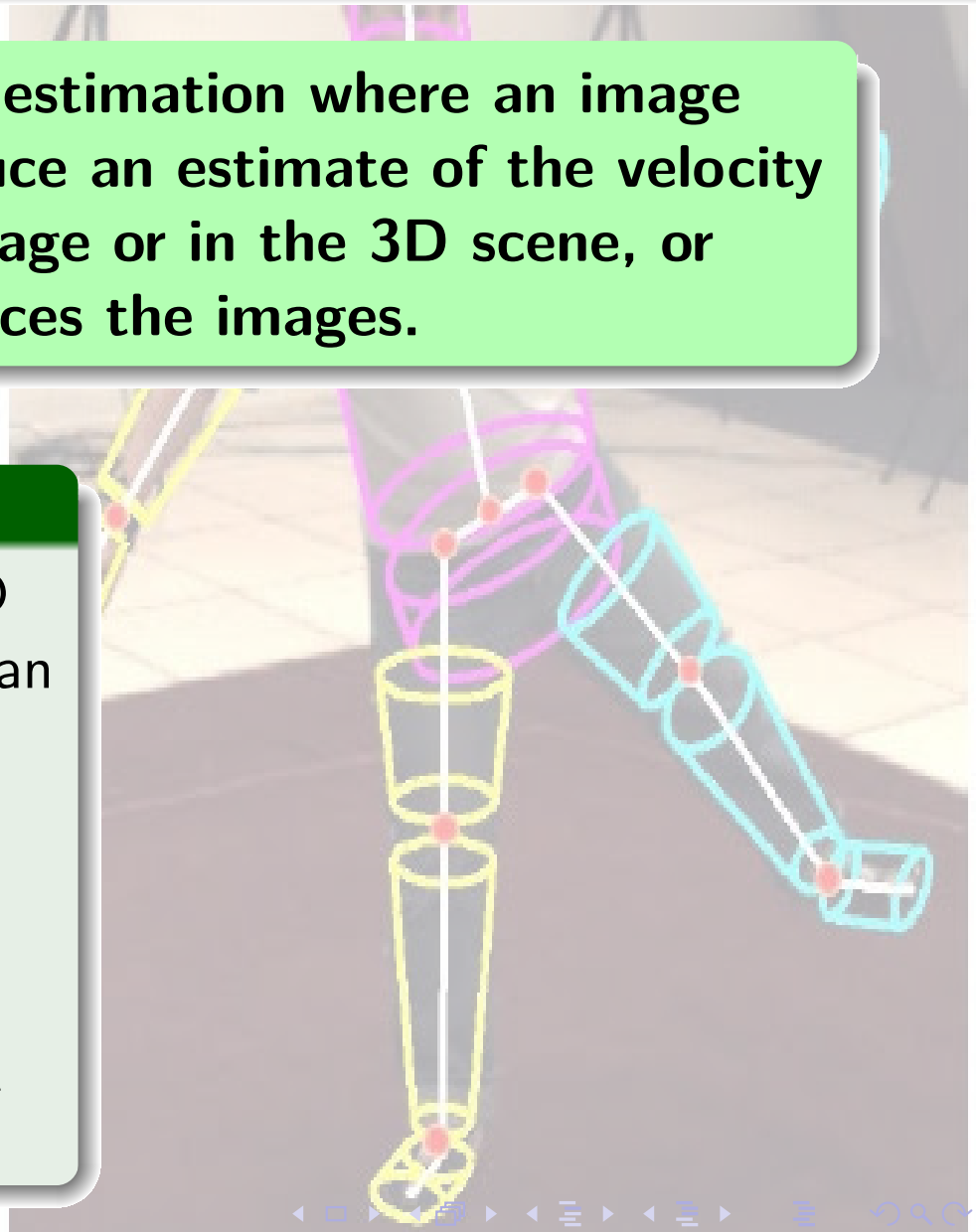
3. **Optical Flow** - object's apparent motion.



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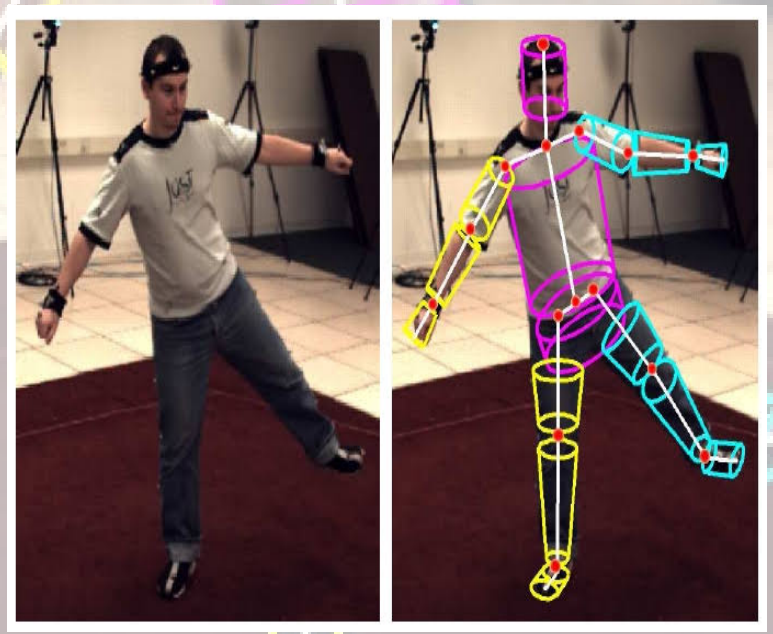

Figure: *Motion Analysis*

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Given one or (typically) more images of a scene, or a video, scene reconstruction aims at computing a 3D model of the scene. In the simplest case the model can be a set of 3D points. More sophisticated methods produce a complete 3D surface model. The advent of 3D imaging not requiring motion or scanning, and related processing algorithms is enabling rapid advances in this field. Grid-based 3D sensing can be used to acquire 3D images from multiple angles. Algorithms are now available to stitch multiple 3D images together into point clouds and 3D models.

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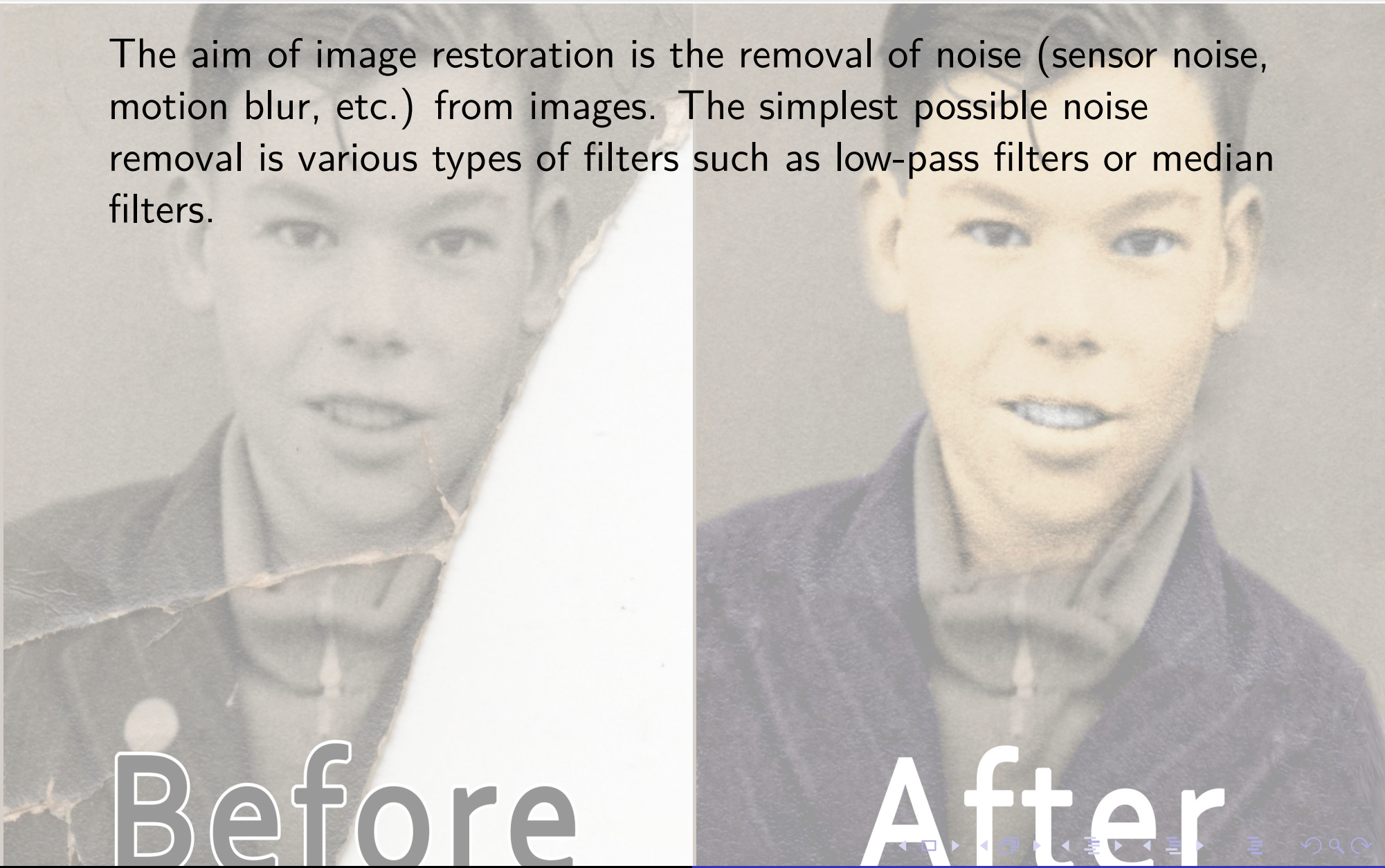

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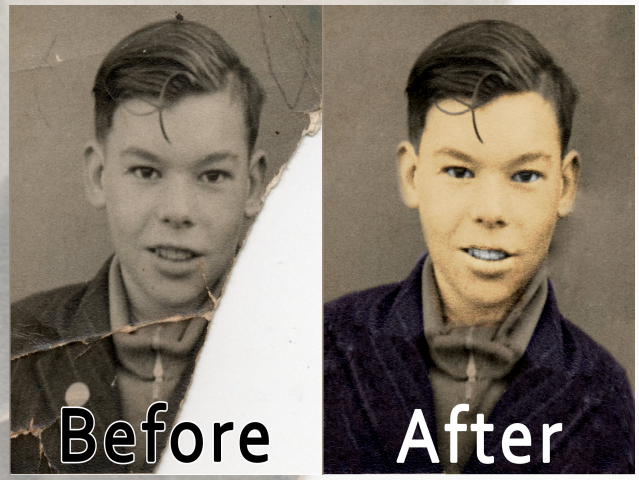

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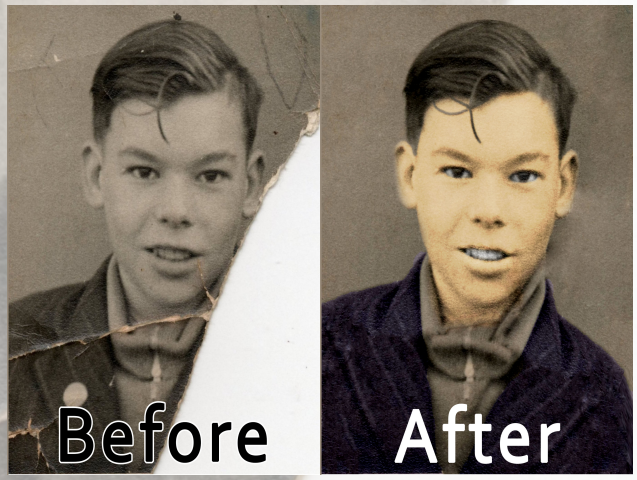

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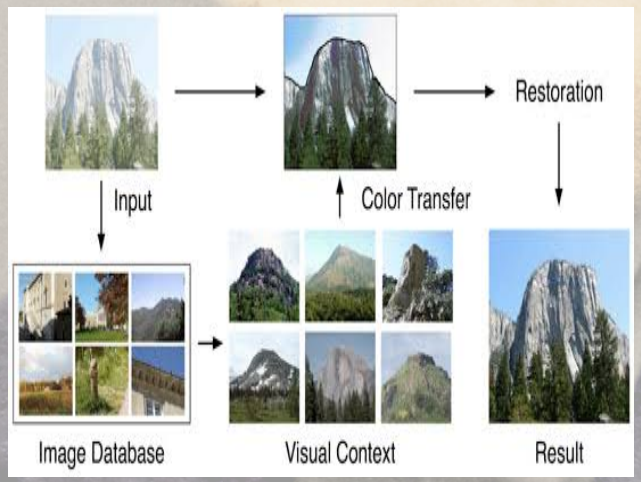
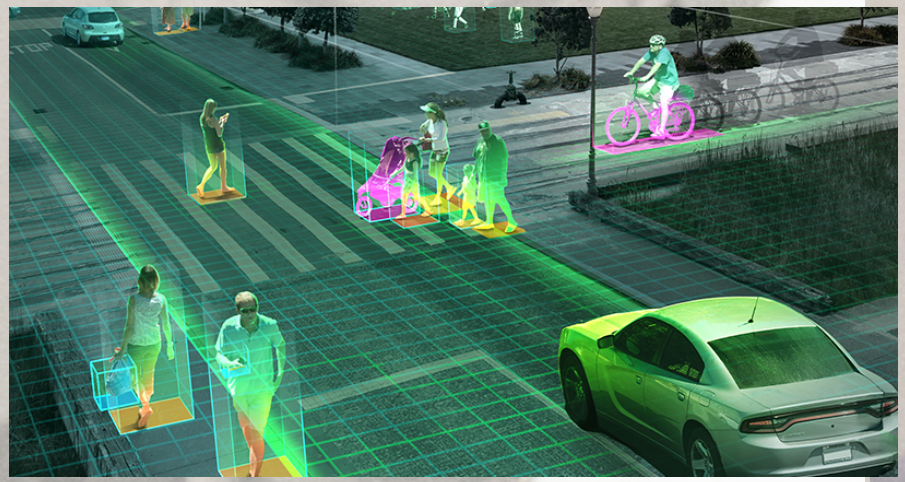


(b) Method of Restoration

Figure: Figure (A) and (B) showing Image Restoration

Before After

SCOPE OF COMPUTER VISION



Before

After

FUTURE OF COMPUTER VISION

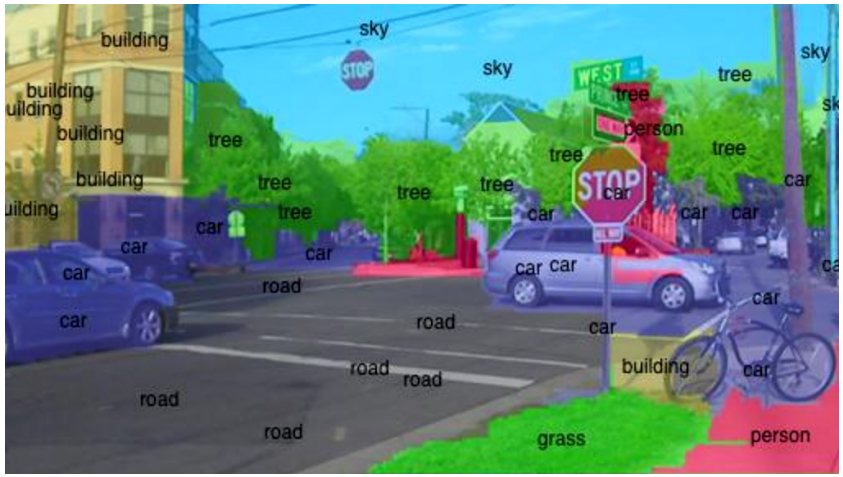
1. **The rapid growth of technology has revolutionized computer vision and robotic perception in many frontiers.**
2. **Recent advancements in robotic vision, machine learning, and low-power electronics have allowed researchers and developers to build robotic and automation systems with extraordinary capabilities.**
3. **Although these systems are used in various applications such as self-driving cars, aerial surveying, and human-robot interaction.**
4. **In this brief technical talk, several recent concepts related to robotics and computer vision are presented.**
5. **Developments have significant economic and scientific impacts on our society and will open new horizons towards the real-time and reliable utilization of computer vision and machine learning systems.**

FUTURE OPPORTUNITIES FOR VISION INDUSTRIES

- Depth sensing (near feild)
- Visual odometry
- Digital image stabilisation
- Hyperspectral
- UV
- LiDAR
- Chemical sensors and spectrometers
- Microphones
- RFID readers

CAREER IN COMPUTER VISION:-

It is one of the most in-demand job titles, perched at the Number 3 spot of Indeed 2018 list of Best Jobs in US. With the rapid flow of investments in AI technologies — both at the startup level as well as within some of the world's leading technology companies — techies and engineers can restart their career with computer vision.



CAREER IN COMPUTER VISION:-

some of the reasons behind the exponential growth of computer vision

- Hardware advancements in terms of availability of GPUs
- Emergence of deep learning, which has changed our way of performing tasks such as image classification
- The availability of large datasets such as ImageNet and Caltech 101 that enables beginners and advanced practitioners to work on computer vision applications.

CAREER IN COMPUTER VISION:-

How One Can Start Career In Computer Vision:-

Whether you are a beginner or at an intermediate level, the best place to gain practical knowledge about algorithms and computer vision application programming is with **OpenCV** — an open

MORE ABOUT COMPUTER VISION:-

- A commonly used resource in computer vision is Open Source Computer Vision Library (or OpenCV library).
- One of the best courses out there to learn more about OpenCV and how it interacts with other computer vision tools is on Udemy.
- 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.
- Enabled with OpenCL, it can take advantage of the hardware acceleration of the underlying heterogeneous compute platform.
- OpenCV has more than 47 thousand people of user community and estimated number of downloads exceeding 14 million.

References

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The End