Intelligent Fusion of IoT, AI, and Computer Vision, for Enhanced Perception and Decision-Making"
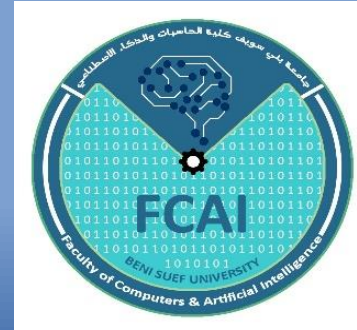
"الاندماج الذكي بين إنترنت الأشياء والذكاء الاصطناعي ورؤية الكمبيوتر لتعزيز الإدراك وصنع القرار"

Presentation by:

Dr. Ahmed Elngar
Head of Computer Science Department
Faculty of Computers and Artificial Intelligence,
Beni-Suef University
Egypt

Dr. Ahmed A. Elngar

- **Associate Professor and Head of Computer Science Department Faculty of Computers and Artificial Intelligence, Beni-Suef University, Egypt,**
- **Founder and Chairman** of Scientific Innovation Research Group
- **Co-Director** of the International Ranking Office, Beni Suef University,
- **(SIRG),**
- **Director** of Technological and Informatics Studies Center (TISC),
- **Director** of Beni-Suef University Electronic Portal
- **IEEE** member of Beni-Suef Section,
- **Associate Editor** of International Journal of Informatics, Media and Communication Technology (IJIMCT), Beni-Suef University.

Outline

☐ **Part One:**

☐ **Introducing Beni-Suef University**

☐ **Part Two:**

Intelligent Fusion of IoT, AI, and Computer Vision for Enhanced Perception and Decision-Making"

☐ Introduction:

☐ Definitions, trends, and IoT elements

☐ IOT ARCHITECTURE

☐ Tools, Programming languages, Applications

☐ Open challenges and future directions

☐ Conclusion and Future Research Directions

Part One: Introducing Beni-Suef University

http://www.bsu.edu.eg/home.aspx?lang=en&cat_id=1

Localization of Beni-Suef University

About Beni-Suef University:

Cairo University established its branch in Beni-Suef City in 1981

Beni Suef University was established as stand alone based on a Presidential Decree in 2005 and resigned from the prestigious of Cairo University

Prof. Dr. : Mansour Hassan

President of Beni-Suef University
Faculty of Medicine
Beni-Suef University
Egypt

Faculties of Beni-Suef University:

The University includes more than 33 of Faculties:

- Faculty of Computers and Artificial Intelligence
- Faculty of Commerce.
- Faculty of Law.
- Faculty of Arts
- Faculty of Science
- Faculty of Education
- Faculty of Medicine
- Faculty of Nursing
- Faculty of Engineering.
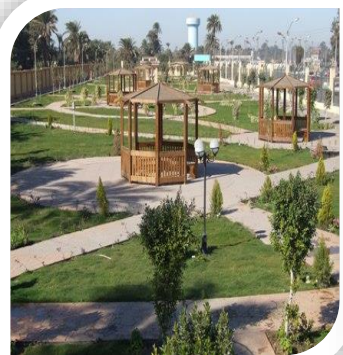- Faculty of Physical Education.
- And Others………

About Students and Facilities

BSU includes mor than 92,000 undergraduate and postgraduate students who enrolled into 85 undergraduate programs and 355 postgraduate programs (100 Diploma, 130 Master & 125 PhD programs).

In addition, Beni-Suef University has valuable and promising components in terms of the material resources of structures, buildings and land, which amounts to a total area of almost 636 acres,

For further Info.

- For more information you can visit the my university website

- http://www.bsu.edu.eg/Backend/Uploads/PDF/BSU/bsuresearchplan-160310222244.pdf
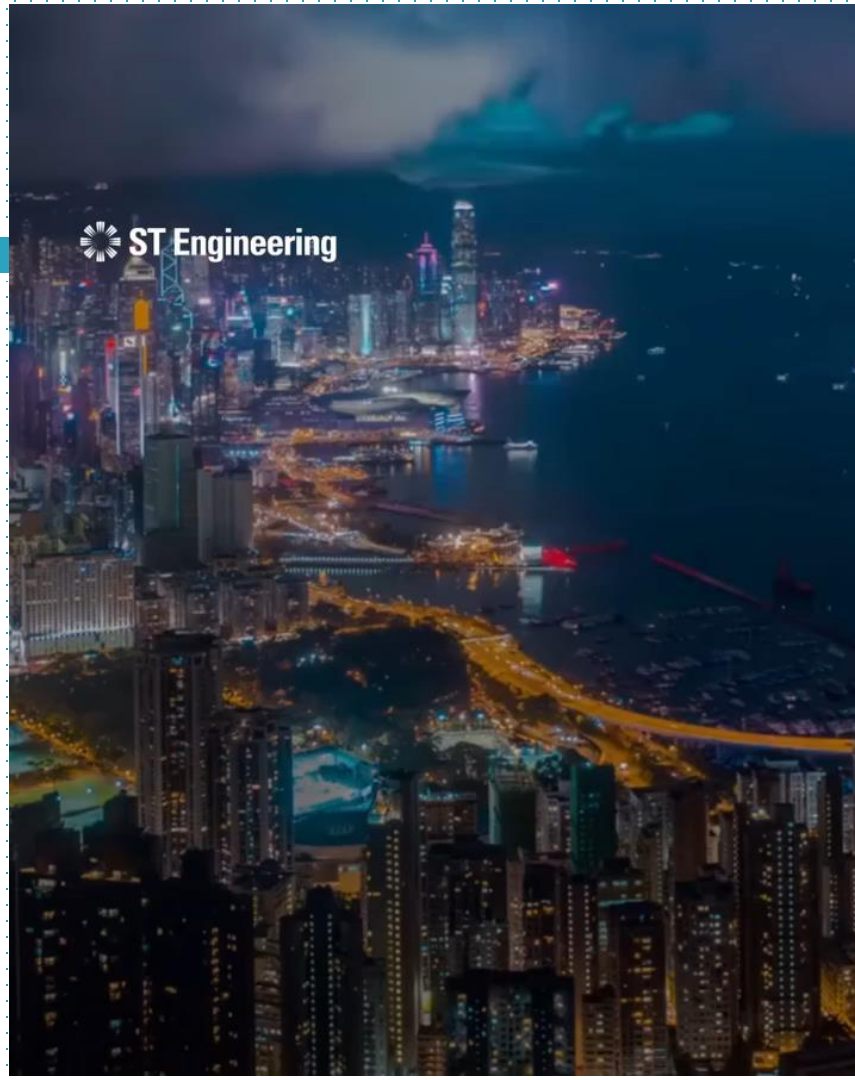
Part Two:

Intelligent Fusion of IoT, AI, and Computer Vision for Enhanced Perception and Decision-Making"

Abstract

ST Engineering

Abstract:

> The Internet of Things is an emerging technology across the world, that helps to connect sensors, vehicles, hospitals, industries, and consumers through internet connectivity.
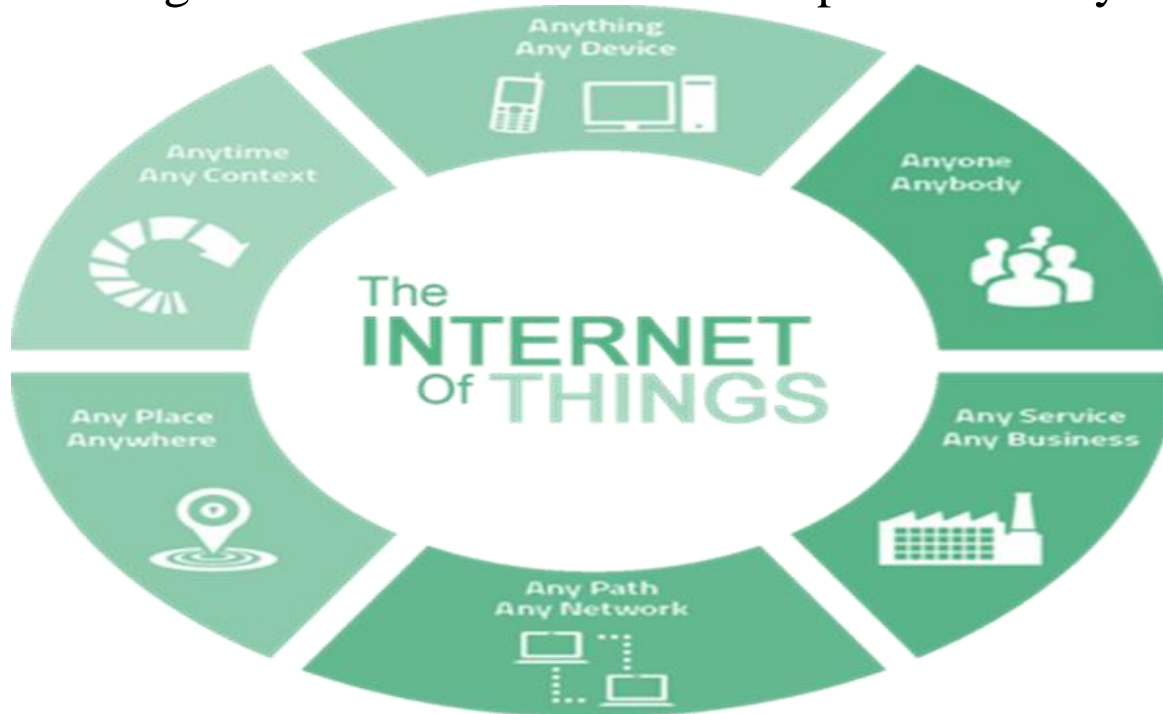
What we will talk about today:

❖ **Architecture of IoT**

❖ **Security challenges in IoT**

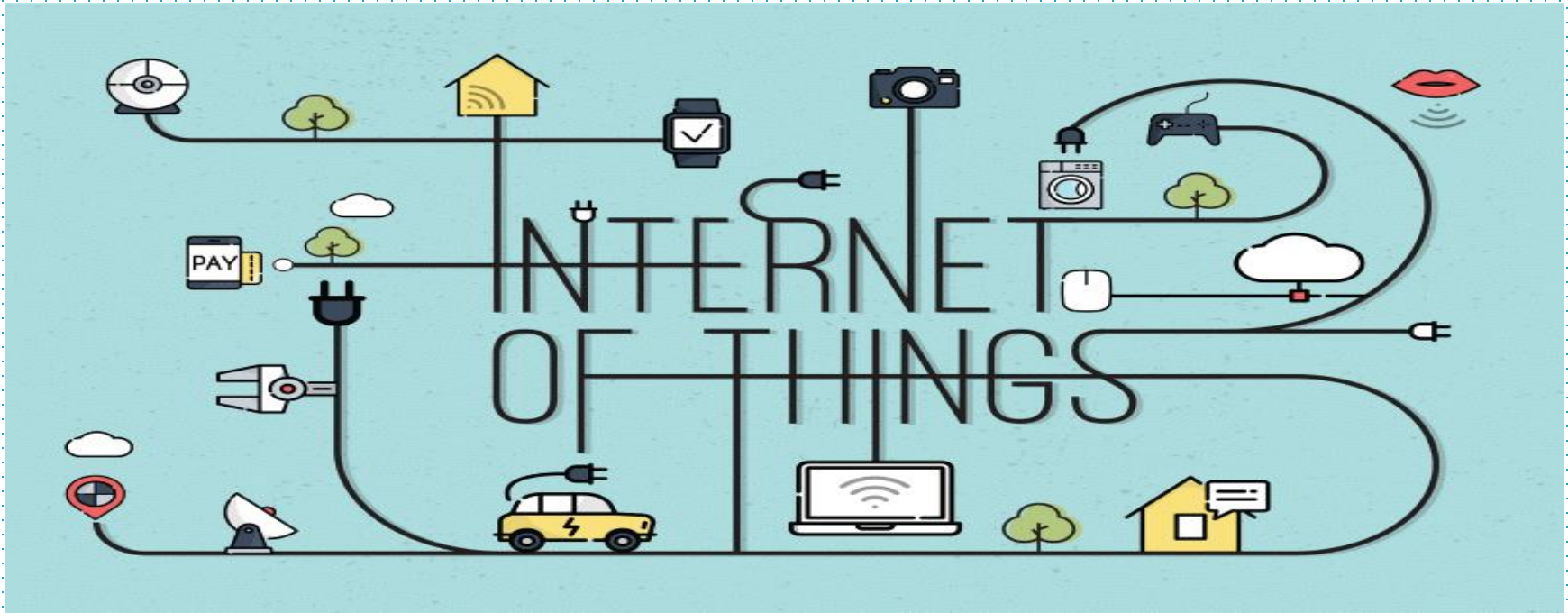❖ **A** Research direction for **future work in security for IoT.**

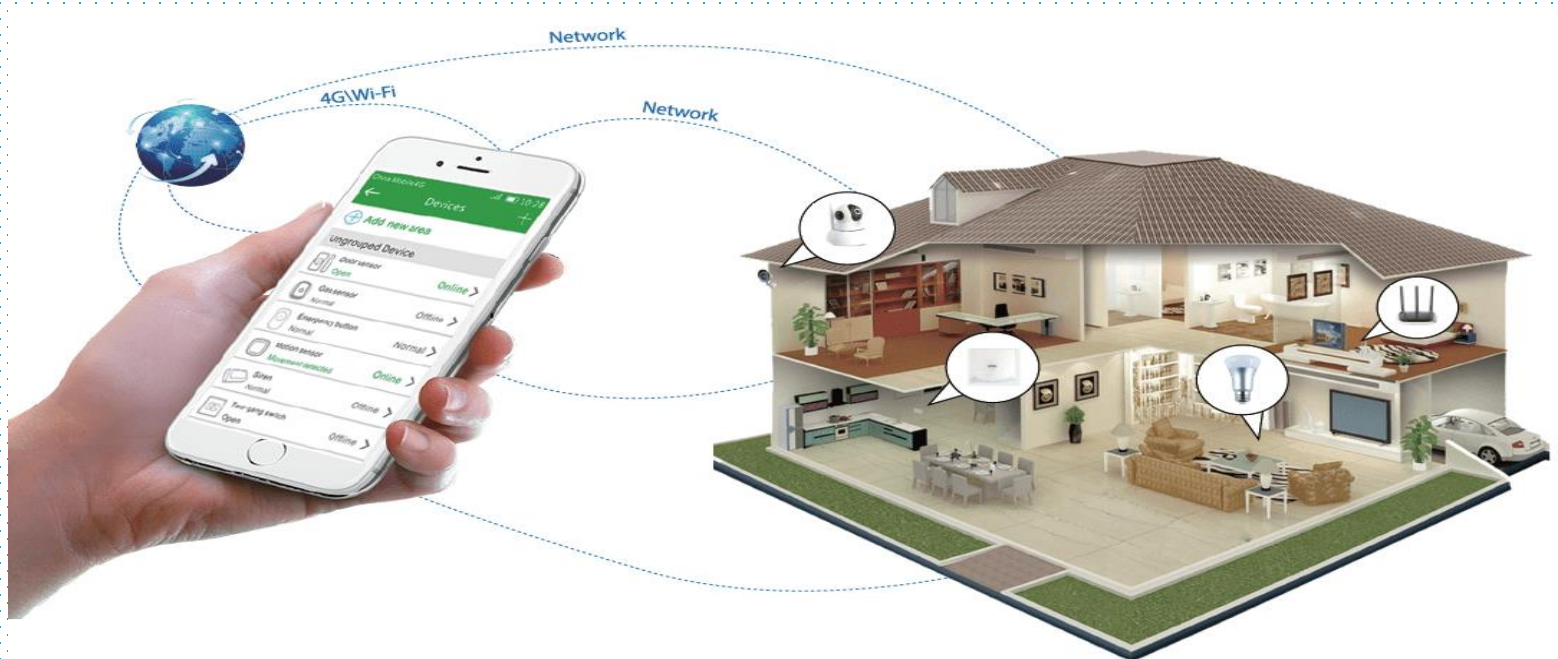- IoT is becoming one of the hottest research topics Nowadays.

Introduction

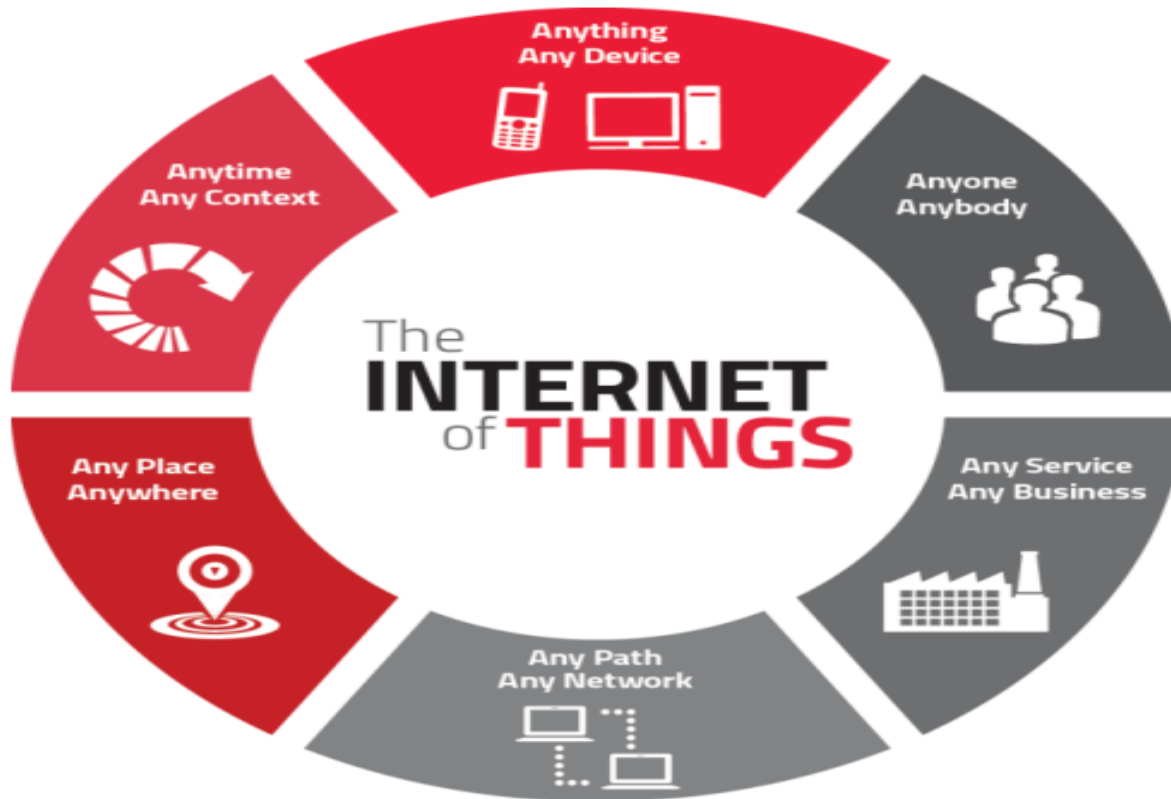❑ Internet of things as the name suggests, is the connectivity of everyday devices with each other.

Introduction

❑ **To put it simply,** the Internet of Things enables devices (things) to interact and co-ordinate with each other thereby reducing human intervention in basic everyday tasks.

Introduction

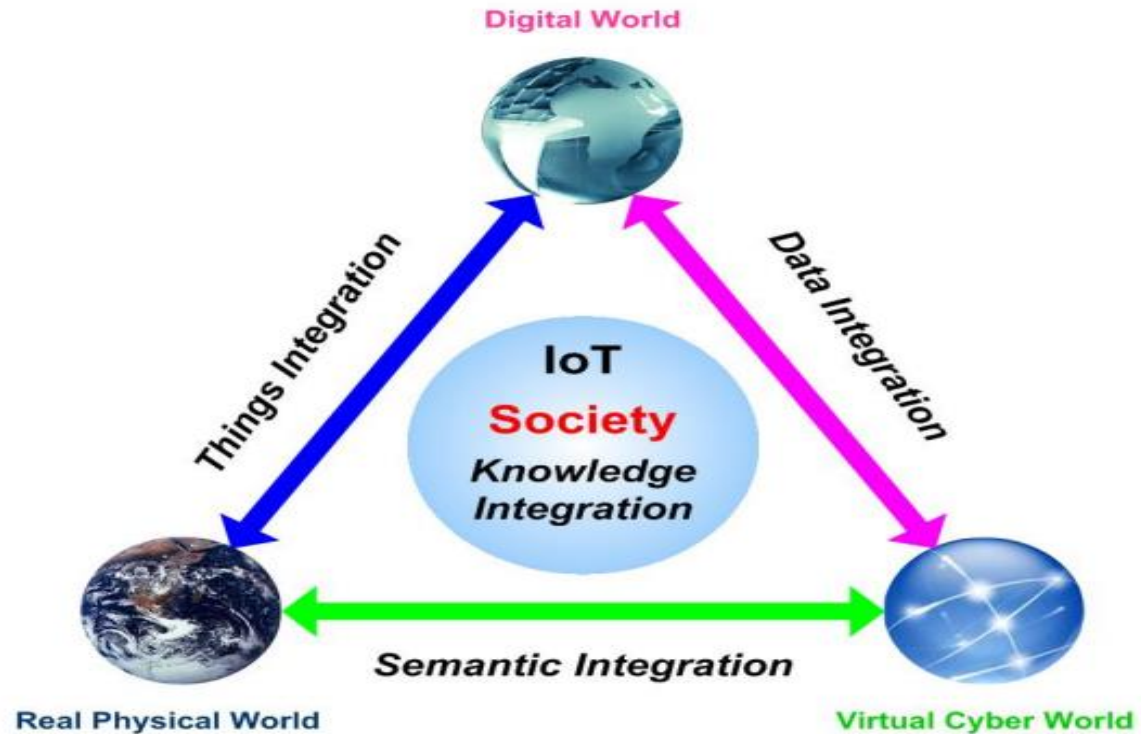# Internet of Things

- **There are three main visions of IoT:**

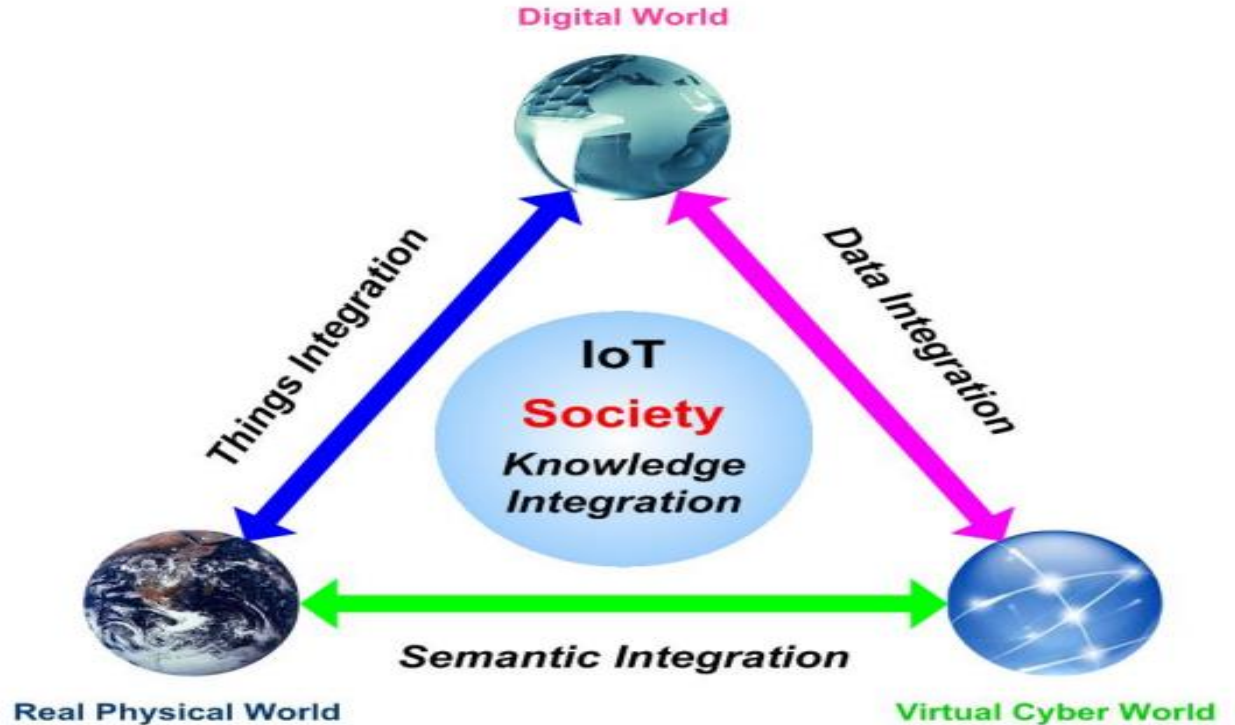## Things vision:

Internet of Things

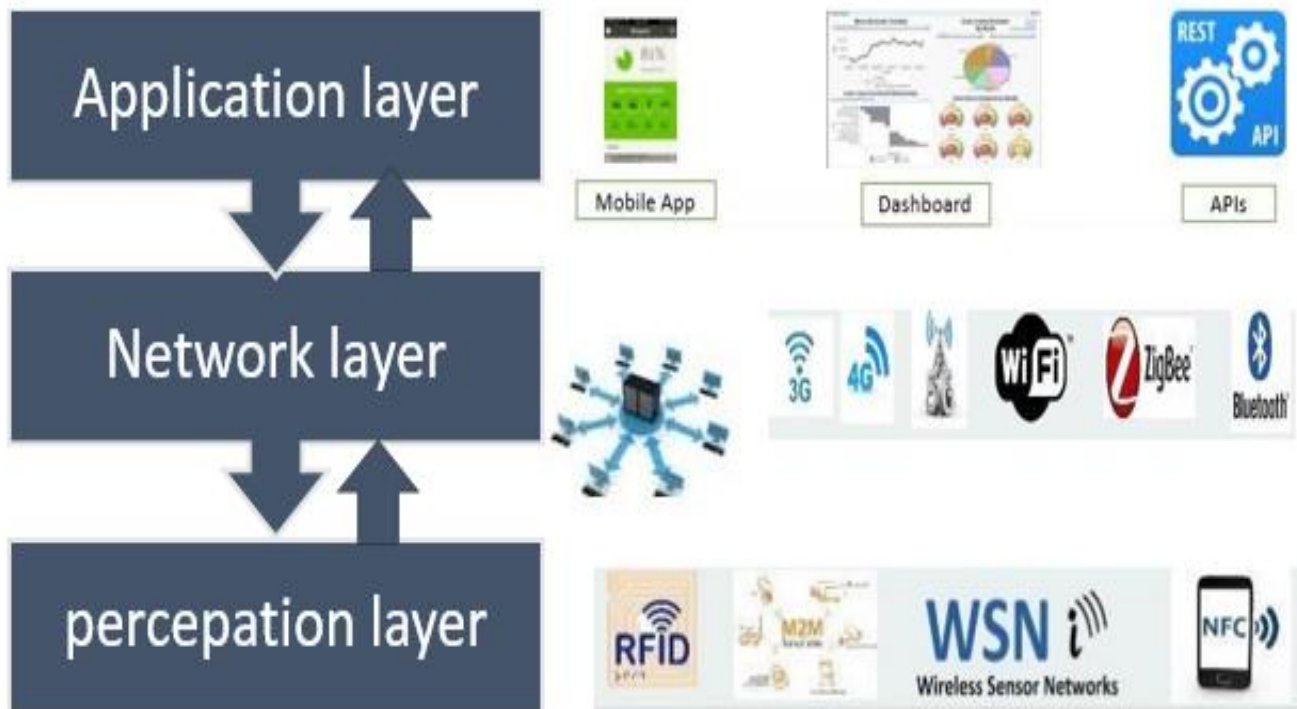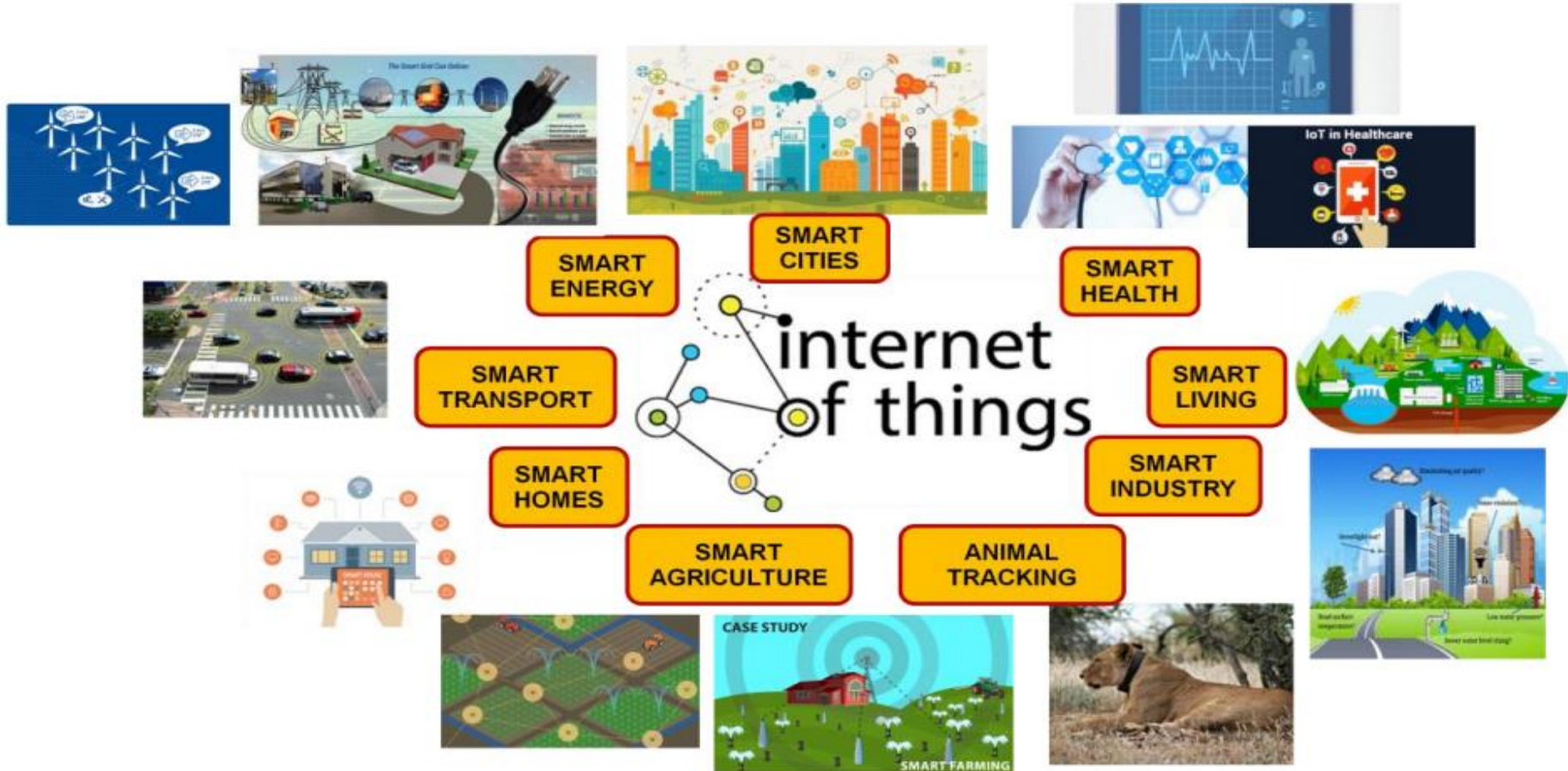- **Internet vision:**

Internet of Things

- **Semantic vision:**

IOT ARCHITECTURE

- Implementing IoT requires an open architecture based on several layers:

Internet of things: Enabling technology

IoT Applications

➢Roadmap

➢ I wanna give you a roadmap for the IoT and its related concepts such as :

➢ **Research lines**

➢ **Tools**

➢ **Programming languages**

➢ **Etc.**

➤Research lines

➤ Nowadays, the research lines focused on the integration of the Internet of Things (IoT) with Artificial Intelligence (AI) and Computer Vision, holds great promise for advancing technology in various domains.

➤ Here is a suggested some research lines such as :-

suggested research

Sensor Network Optimization:
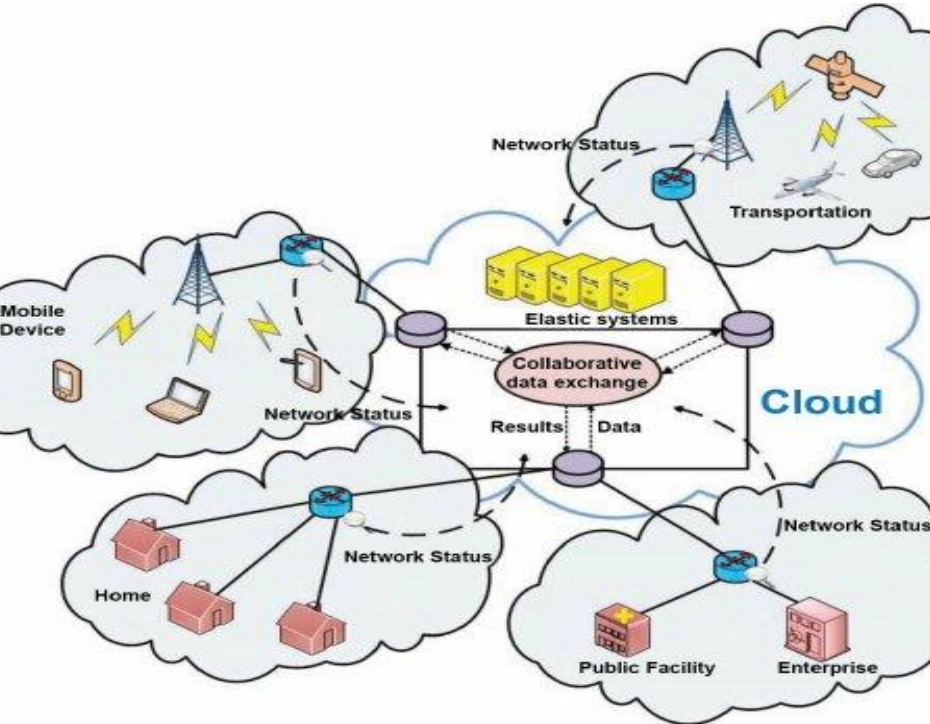
Integration of AI for Data Analytics:

suggested research

Security and Privacy in IoT-AI Systems

Energy-Efficient AI for IoT Devices:

Tools

➢ The tools for a research line involving the integration of Internet of Things (IoT) with Artificial Intelligence (AI) and Computer Vision can vary based on specific research goals and objectives.

➢ Here are some categories of tools that researchers often use in this domain:

Tools

❖ **IoT Platforms and Frameworks:**

➢ **IoT Platforms (e.g., AWS IoT, Azure IoT, Google Cloud IoT):**

❖ **IoT Frameworks:**

➢ **Development Frameworks for AI and Computer Vision:**

Tools

❑ **Simulators and Emulators:**

- **Cooja (Contiki OS simulator)**
- **Gazebo**

❑ **IoT Hardware Prototyping:**

- **Raspberry Pi, Arduino**
- **ESP8266, ESP32**

Tools

Security Tools:

- **HashiCorp, AWS Key Management Service (KMS):**
- **IoT Security Frameworks:**

Visualization Tools:

- **Matplotlib, Seaborn, Plotly**
- **Tensor-Board**

Tools

Remember that the specific tools you choose may depend on:

❖ Your project's requirements,

❖ Platforms you're working with, and

❖ Your team's expertise.

Programming languages

❖ When working on a research line that involves the integration of Internet of Things (IoT) with Artificial Intelligence (AI) and Computer Vision, a combination of programming languages is often required to cover different aspects of the project.

❖ Here are some programming languages commonly used in this domain:

Programming languages

Python:

C/C++:

Programming languages

Java

JavaScript (Node.js)

Programming languages

R

R Programming

Go (Golang)

Golang Let's GO!

➢ Integrating Internet of Things (IoT) with Artificial Intelligence (AI) and Computer Vision brings tremendous potential, but it also presents several challenges.

➢ Here are some common IoT challenges and how AI and Computer Vision can be leveraged to address them:

Data Overload and Processing:

- **Challenge:** IoT devices generate vast amounts of data, leading to challenges in processing, storage, and analysis.

- **AI/Computer Vision Solution:**

Understanding **Data Processing in IoT** for Smart Cities

IoT challenges and how to solve using AI and Computer vision

Security and Privacy:

- **Challenge:** IoT devices are susceptible to security breaches, and privacy concerns arise due to the collection of sensitive data.

- **AI/Computer Vision Solution:**

Energy Efficiency:

- **Challenge:** Many IoT devices are battery-powered and face challenges in energy consumption.

- **AI/Computer Vision Solution:**

Environmental Adaptability:

- **Challenge:** IoT devices may operate in diverse and unpredictable environments.

- **AI/Computer Vision Solution:**

Remember

By combining the capabilities of AI and Computer Vision with IoT, these solutions can help overcome challenges, making IoT systems more intelligent, efficient, and adaptable to real-world scenarios.
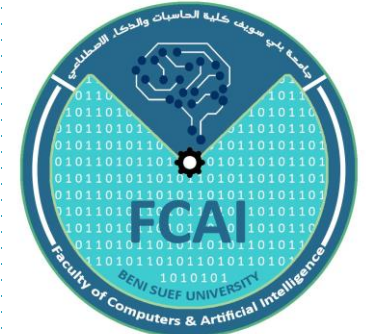
Conclusion

➢In conclusion, Integrating the intelligent fusion of IoT (Internet of Things), AI (Artificial Intelligence), and computer vision holds significant promise for enhancing perception and decision-making in various domains.

Thank you