We are learning on
Noongar land

CITS 5506
The Internet of Things
Lecture 01

Dr Atif Mansoor
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Contact Information

Email:

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Consultation:

Room G.06A, CSSE Building

Monday 2 pm to 3 pm

or

Through email appointment

Class (Face to Face)

Monday, 1200 - 1400

Location: PHY 243

Lab (Face to Face) (No Lab in first week)

Room G.01A, CSSE (IDEAS lab)

Material Delivery

- Microsoft Teams and LMS will be used for material delivery and discussions

- Mutual discussion through MS Teams

- LMS for related announcement

- Discussion Board at LMS should be first place to write generalized nature of queries.

Lab Instructions

No lab in Week 01

The first lab will be in week 02

Bring your laptops for lab 01 as there are no computing machines in IDEAS lab (G.01 of CSSE Building)

Lab Facilitator & Lab Technician

Lab Facilitators

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Lab Facilitator & Lab Technician

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Lab Technician

Andrew Burrell (Andy)

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– Room 1.48 Physics Building

- **Theoretical Component**
    - Discussion on Technology, Presentations, Research Papers/Articles
    - Guest Lectures
- **Practical Component**
    - Labs (Arduino board, Raspberry Pi, Dragino for LoRa Communications, TTGO ESP 32 (built-in features such as LoRa, GPS, Wi-Fi and Bluetooth module)), TinyML
    - Term Project

Grading

Practical Aspect:

- Labs (Attendance + Viva), 10% of unit marks
- Term group Project, 30% of Unit marks

- Mid Term Test (in class Test of 1 hour duration) on 9 Sept 2024, 20% of Unit Marks
  - In case of missing the mid term, marks will be assigned to final exam.

- Final Exam, 40% of Unit marks

Project Marks Distribution

The project will be having 30% weight of the total Unit. The total project marks are further distributed as following:

- 15% project Proposal
- 35% project Report
- 30% Project Prototype & its Demonstration
- 20% Project Presentation

FeedbackFruits will be used for self and peer assessment of individual contribution to group project. The Unit Coordinator retains the discretion to utilize Spark Plus for assessment purposes or other relevant uses.

5. Calculate the final grade: Multiply the student's project grade by their Group Contribution Factor to determine the final grade.

Example:

Thresholds:

- *Project grade x factor between 0.5 and 1*
- *Unaltered project grade between 1.01 and 2*
- *Zero between 0 and 0.49*

Group Contribution Factor Student 1   75 x 0.977 = 73.27
Group Contribution Factor Student 2   75 x 0.915 = 68.25

USE of AI Tool

Use of AI Tools is allowed but must be acknowledged.

Academic Conduct & Late Submissions

University Policy on Academic Conduct

http://www.governance.uwa.edu.au/procedures/policies/policies-and-procedures?policy=UP07%2F21

Late Submission Penalties

https://ipoint.uwa.edu.au/app/answers/detail/a_id/2711/~/consequences-for-late-assignment-submission

Group Project Aims

To learn working in a team

To learn collaboration

To learn time management

To work in a real-life professional scenario

Survey Form for Project's Team Formation

Kindly fill the survey form by midnight of **Friday, 26 July 2024 (week 1)** at following link:

https://bit.ly/3YjitMC

This is required to know the skills set of the students and help selecting a balanced project team (group members with prior software, hardware experience etc).

Project Teams will be formed by the Unit coordinator by Wednesday, 31 July 2024 (week 2) based on the submitted forms with aim to form team with balanced expertise.

The delay by a student to fill the form, may result in inclusion of such student in an **unbalanced** group.

Group Project

- Term Projects should be decided by the group, and title shared by **6 pm,7 August 2024** (week 3) along with short description of about 200 words. Titles will be approved by UC by **Tuesday 13 August 2024** (week 4)

- A list of topics will be uploaded in advance, but Groups are encouraged to propose their own projects.

- Project Proposal Document to be submitted by 11:59 pm **Sunday 25 August 2024**. See the rubric for grading.

- Graded Project Proposal with feedback will be given by Unit Coordinator by **Monday 2 September 2024**.

A video of student group project "Pet feeder" of 2020 can be seen at following link:
https://www.youtube.com/watch?v=jDToLjIALMA

Group Project

- Feedback fruits will be used for self and peer assessment of individual contribution to group project.

- Individual Private Groups at MS Teams made by UC.

- Group Accountability Document (uploaded at Lecture 01)

  - Recommended to plan and distribute tasks among group members

  - Weekly contribution of each group member

  - Submit separately week-wise along with the project

Any dispute or disagreement need to be reported at the earliest to Unit Coordinator, and not at the end of the semester.

FeedbackFruits: Individual Contribution Factor and its impact on the grade

5. Calculate the final grade: Multiply the student's project grade by their Group Contribution Factor to determine the final grade.

Example:

Thresholds:

- *Project grade x factor between 0.5 and 1*
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Group Contribution Factor Student 1	*75 x 0.977 = 73.27*
Group Contribution Factor Student 2	*75 x 0.915 = 68.25*

Thus, the group members may have different marks on the basis of Group Contribution Factor, calculated on the basis of self and peer reviews.

Students Right and Responsibilities

Read UWA's Charter of Student Rights and Responsibilities

http://www.aps.uwa.edu.au/home/policies/charter

Every Student has right

1) to expect the University to provide a high quality of education including a high quality of teaching, supervision, curriculum and unit content, a commitment to inclusivity, and good access to staff;

2) to assessment that is valid, educative, explicit, reliable and fair;

Every Student has the responsibility

1) to bring an open and enquiring mind and enthusiasm to their studies;

2) to participate actively in the teaching and learning and research environment, in particular by attending classes as required, complying with workload expectations, and submitting required work on time;

3) to be mindful of language in writing any feedback as per UWA policy
http://www.governance.uwa.edu.au/regulations/computer

Enabling the Internet of Things: Fundamentals, Design, and Applications, Muhammad Azhar Iqbal; Sajjad Hussain; Huanlai Xing; Muhammad Ali Imran, Wiley-IEEE Press, 2021

Internet of Things: Concepts and System Design

Milenkovic, Milan

Publisher, Springer

ISBN: 3030413454

From Machine-to-Machine to the Internet of Things : Introduction to a New Age of Intelligence.

Tsiatsis, Vlasios.; Mulligan, Catherine.; Avesand, Stefan.; Karnouskos, Stamatis.; Boyle, David.; Holler, Jan.Jordan Hill : Elsevier Science; 2014

ISBN : 9780080994017
OCLC : (OCoLC)905840122
ISBN : 9780124076846

Reading List

Fundamentals of IoT Communication Technologies, Rolando Herrero, Springer International Publishing, 2021

Fundamentals of IoT and Wearable Technology Design, Haider Raad, 2020, The Institute of Electrical and Electronics Engineers, Inc.

Internet of Things with ESP8266.

Schwartz, Marco.
ISBN : 9781786466679

Internet of Things with 8051 and ESP8266.

Gehlot, Anita.; Singh, Rajesh.; Malik, Praveen Kumar.; Gupta, Lovi Raj.; Singh, Bhupendra.

 ISBN : 9781000258646

ISBN : 9780367534783

*ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability

Internet of Things : Integration and Security Challenges

Velliangiri, S. ,Kumar, Sathish A. P. ,Karthikeyan, P.

ISBN : 9781000291636

OCLC : (OCoLC)1204142479

ISBN : 9780367893873

Internet of Things Security : Challenges, Advances, and Analytics.

Patel, Chintan.; Doshi, Nishant.

Milton : Auerbach Publishers, Incorporated; 2018

Identifier

ISBN : 9780429845734

The Internet of Things : Technologies and Applications for a New Age of Intelligence.

Höller, Jan.; Tsiatsis, Vlasios.; Mulligan, Catherine.; Avesand, Stefan.; Karnouskos, Stamatis.; Boyle, David.

2nd ed.; San Diego : Elsevier Science & Technology; 2018

 ISBN : 9780128144367

OCLC : (OCoLC)1076802386

ISBN : 9780128144350

In your opinion, what is Internet of Things ?

In your opinion, What is the Significance of IoT and what are related prospects for you?

The Internet of Things

The term Internet of Things * generally refers to scenarios where network connectivity and computing capability extends to objects, sensors and everyday items not normally considered computers, allowing these devices to generate, exchange and consume data with minimal human intervention.

There is, however, no single, universal definition.

* An Overview : Understanding the Issues and Challenges of a More Connected World, Whitepaper, 2015 by The Internet Society.

The Internet of Things

- IC, electronic chip-- integrated circuit which can **sense** some physical event, which can **compute** to process that event in some way or fashion, and finally, which can **communicate**.

- Chip gets attached to the thing enabling this thing to become a piece of a bigger thing. Typically (but not always) the data that is collected from the thing is sent initially to a gateway. The gateway aggregates the data and sends the data to a Cloud, a computing Cloud.

- Data is going to create value from the things --- **Analysis**, **Feedback**, **Act**

How IoT works : A Video
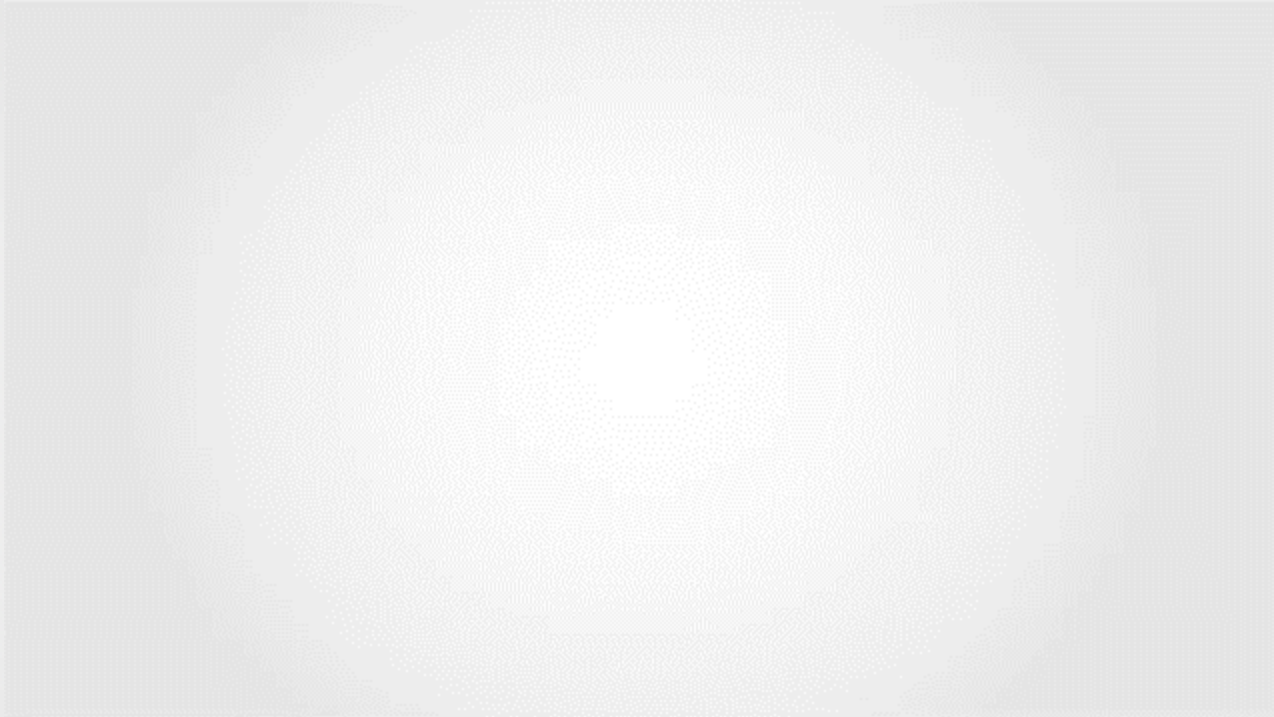
Billions of things ---- These things must be **networked**.

Therefore, one aspect of Internet of Things that really deals with massive networking connection of the devices must be in a fashion where the connectivity

- can be maintained,
- can be reliable,
- can be secure, and
- it doesn't overwhelm computing resources, or bandwidth in the radio frequency domain.

The Internet of Things

- We have **things** which can **sense** (provide some useful information about some physical phenomena) have some **computing** capability

- Able to **communicate** - A mechanism or means of communicating to other devices or to a network should exist

- **Act** - On the basis of analysis /insight gained from collected data something useful to happen

IoT is really all about data. We collect data, we analyse data, we act upon what the data tells us.

The Internet of Things

There are many ways of calling the Internet of Things. Some call it as:

- web of things,
- internet of everything,
- Cloud or Fog network.

There are distinctions between them but to a great degree they are very similar.

The Internet of Things

The Internet of Things is an emerging topic of technical, social, and economic significance.

Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live, and play.

Projections for the impact of IoT on the Internet and economy are impressive, with some anticipating as many as 100 billion connected IoT devices by 2025[1]

Estimated global economic impact of more than $11 trillion by 2025[1].

1. The Internet of Things : An Overview , Understanding the Issues and Challenges of a More Connected World Published by the Internet Society

The Internet of Things

3 | The Internet of Business – Connectivity technologies for the internet of things (IoT) vision.

M2M World of Connected Services
The Internet of Things
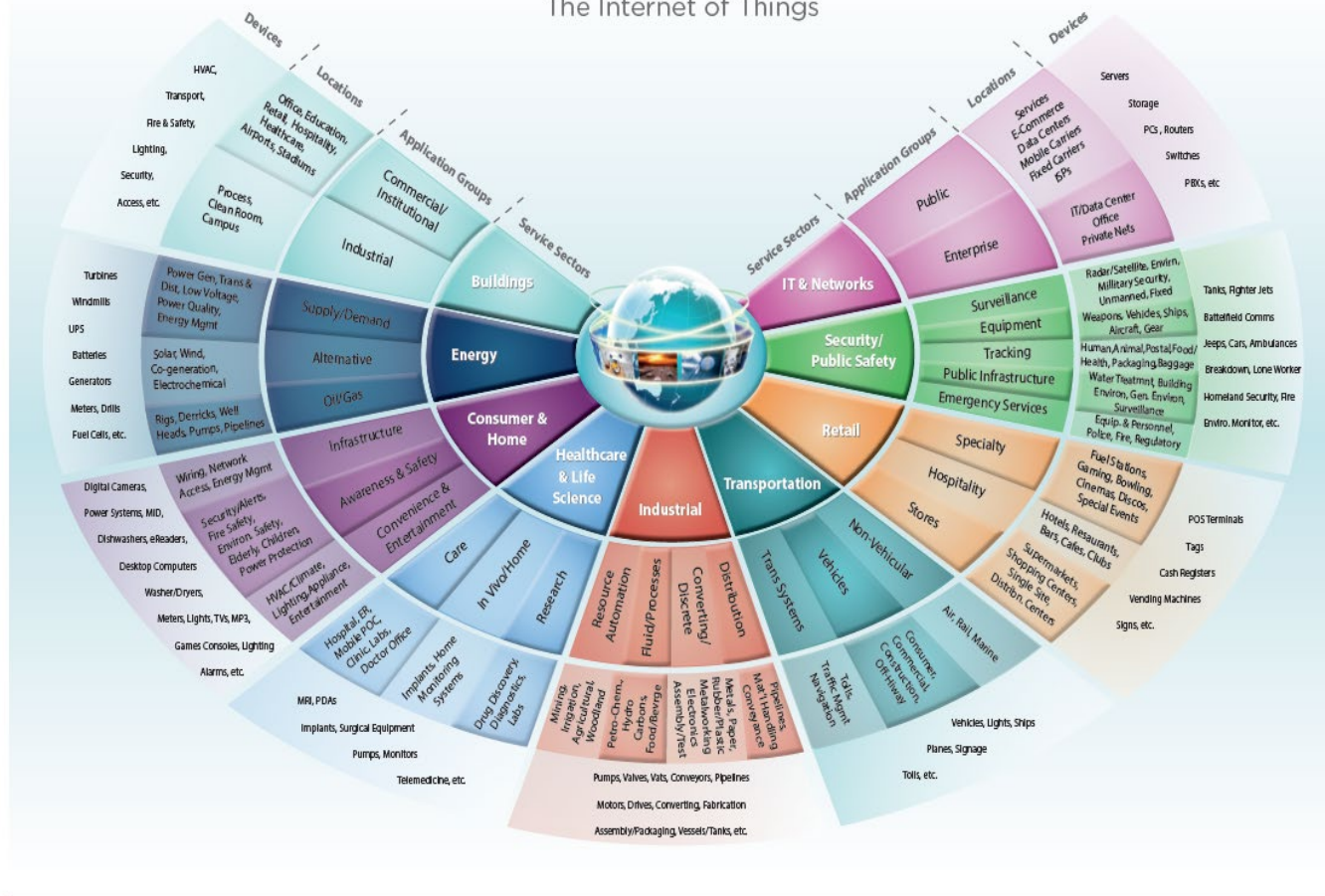
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HAPPY FORECAST

What is your opinion ?

Challenges for IoT

However, the Internet of Things raises significant challenges that could stand in the way of realizing its potential benefits.

Societal Challenges

- privacy fears

- surveillance concerns

- Security Concern (hacking of Internet-connected devices)

Technical challenges

- Sensors
- Power Consumption
- Security & Privacy
- Data Analytics
- Communication Technologies
- Interoperability / Standards
- Development Challenges/ Enabling Technologies

Challenges for IoT

- Enabling Technologies: The concept of combining computers, sensors, and networks to monitor and control devices has existed for decades.

- The recent confluence of several technology market trends, however, is bringing the Internet of Things closer to widespread reality.

- These include Ubiquitous Connectivity, Widespread Adoption of IP-based Networking, Computing Economics, Miniaturization, Advances in Data Analytics, and the Rise of Cloud Computing.

Legal Challenges

The use of IoT devices raises many new regulatory and legal questions:

- Issues related to cross border data flows

- Data collected by IoT devices is sometimes susceptible to misuse, potentially causing discriminatory outcomes for some users.

Challenges for IoT

Legal Challenges

- Conflict between law enforcement surveillance and civil rights

- Data retention and destruction policies

- Legal liability for unintended uses

- Security breaches or privacy lapses

It may force a shift in thinking about the implications and issues in a world where the most common interaction with the Internet comes from passive engagement with connected objects rather than active engagement with content.

THE INTERNET OF THINGS: AN OVERVIEW
Understanding the Issues and Challenges of a More
Connected World

https://www.internetsociety.org/wp-content/uploads/2017/08/ISOC-IoT-Overview-20151221-en.pdf