NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

How to Do Engineering Projects?

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School of Mechanical & Aerospace Engineering

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This presentation is dedicated to …

- Final year students doing engineering projects for graduation.
- Undergraduate students doing engineering projects from course assignments.
- Undergraduate students doing engineering projects from internship companies.

ABOUT NTU

About NTU

Vision and Mission

A great global university founded on science and technology, nurturing leaders and creating societal impact through interdisciplinary education and research.

Leadership

Professor Ho Teck Hua
President and Distinguished University Professor

Professor Christian Wolfrum
Deputy President and Provost

About NTU

Ranked Among the Best in the World

3rd
Nature Index
Young University Rankings

1st
Times Higher Education
Young University Rankings

3rd
US News and World Report
Best Global Universities in Asia

4th
Times Higher Education
Asia University Rankings

15th
QS World University Rankings

4th
QS Asia University Rankings

27th
US News and World Report
Best Global University Rankings

30th
Times Higher Education
World University Rankings

10th
QS World's Most Photogenic Universities

About NTU

Ranked Among the Best in the World

NTU 2025 Strategic Plan

NTU 2025 reinforces NTU's strong commitment to the four core pillars of the University:

- Education
- Research
- Innovation
- Community

Addressing humanity's grand challenges:

- Mitigating our impact on the environment
- Harnessing the science, art and technology of learning
- Addressing technology's impact on humanity;
- Responding to the needs and challenges of healthy living and ageing

15-Year Sustainability Manifesto

Solidifying the University's position as a global leader in sustainability

- NTU's sustainability manifesto goals: carbon neutrality by 2035, halve net energy utilisation and new sustainability courses
- First university in the world to launch a sustainability-linked bond with an Aaa credit rating from Moody's
- Sustainable campus with eight zero-energy buildings, the most amongst organisations in Singapore
- Home to two of Asia's largest wooden buildings, Gaia and The Wave
- Winner of ISCN's Whole Systems Approach Excellence Award in recognition of sustainable practices in the areas of research, education, community engagement, and infrastructure developments

About NTU

Main Campus

200 hectares

State-of-the-art-facilities

25 halls of residence

The NTU Smart Campus is a living testbed of tomorrow's technologies and frequently named among the most beautiful campuses in the world.

About NTU

Medical Campus

School of Medicine

Learning and research

Sports and recreation

Home to the Lee Kong Chian School of Medicine in Novena, Singapore's healthcare district. The school aims to be a model for innovative medical education and a centre for transformative research.

About NTU

At a Glance

35,400 students

24,800 undergraduates
10,600 postgraduates

8,000

faculty, researchers and staff from 73 countries

300,900 alumni

representing 172 nationalities

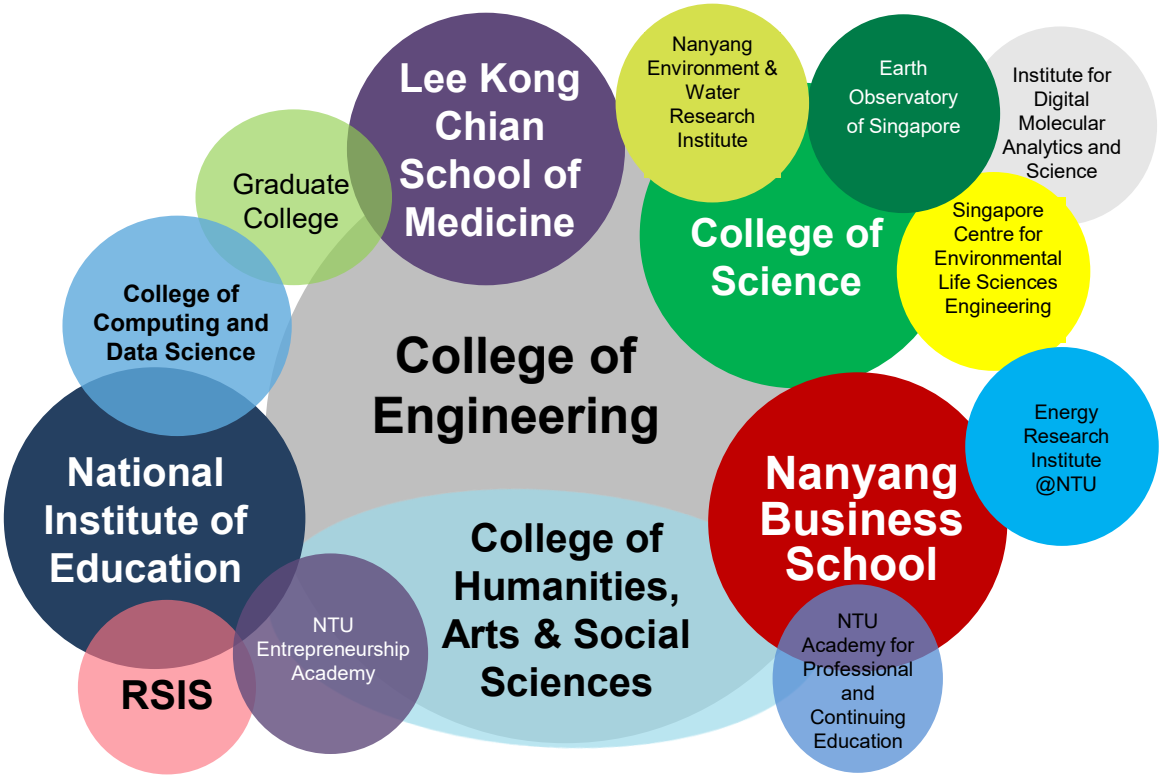
About NTU

At a Glance

6
Colleges

15
Schools

World-class institutes & research centres



NTU Academy for Professional and Continuing Education

- Consolidates continuing education and training capabilities and expertise within the University
- Enriches the lifelong learning experience of adult learners, including the University's alumni, making it easier for them to take charge of their own continuing education
- The FlexiMasters programme for continuing education at the Master's degree level, launched in 2020, has grown to more than 35 curricular offerings from all parts of the University

Global Alliance of Industries @ NTU

- Catalysing new university-industry partnerships through multiple consortia, corporate laboratories, multidisciplinary institutes and technology invention disclosures
- Over 250 industry partners and 20 corporate and joint labs with global entities such as Alibaba, Continental, Hewlett-Packard, Nanofilm Technologies, Rolls-Royce and Schaeffler

About NTU

Top Industry Partners

About NTU

Top Academic Partners


UC Berkeley

Northeastern University


Australian National University


University of British Columbia


Imperial College London

Karolinska Institute


TUM


Seoul National University


Indian Institute of Technology, Madras


University of Toronto


Tsinghua University


University of Pennsylvania

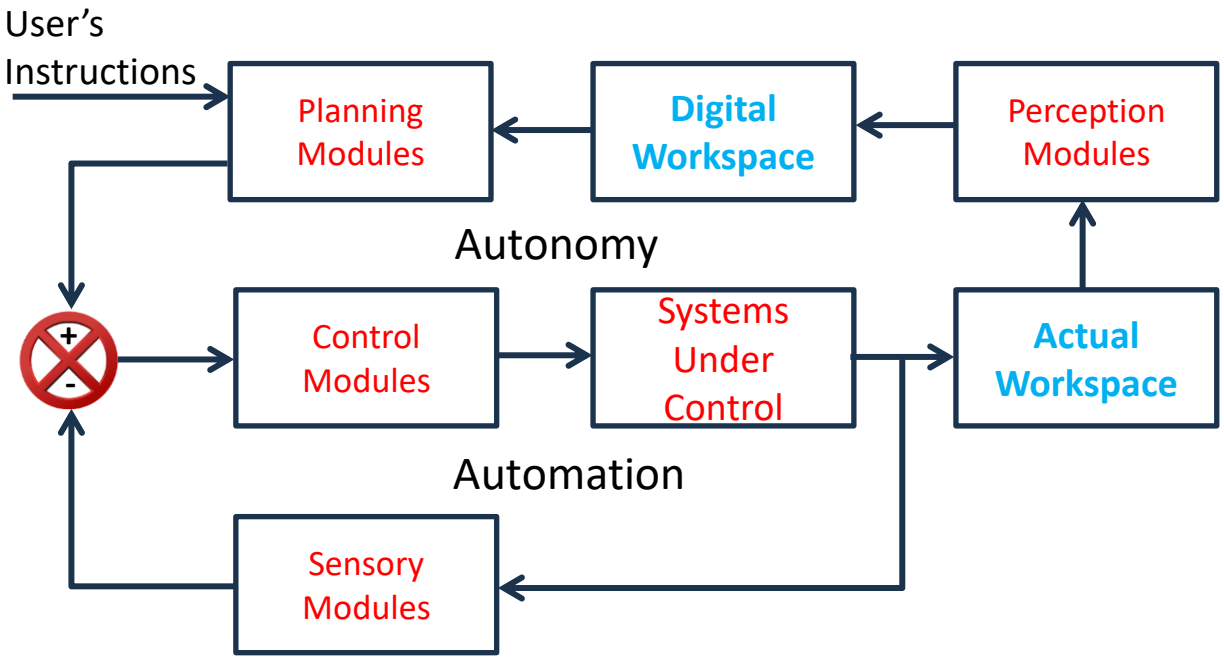
ABOUT YOU

Remember your mission as undergraduates …

- You are here to grow your knowledge and skills so as to be able to design machines with controllable behaviors and hopefully in some intelligent ways.

How to fulfill your mission?

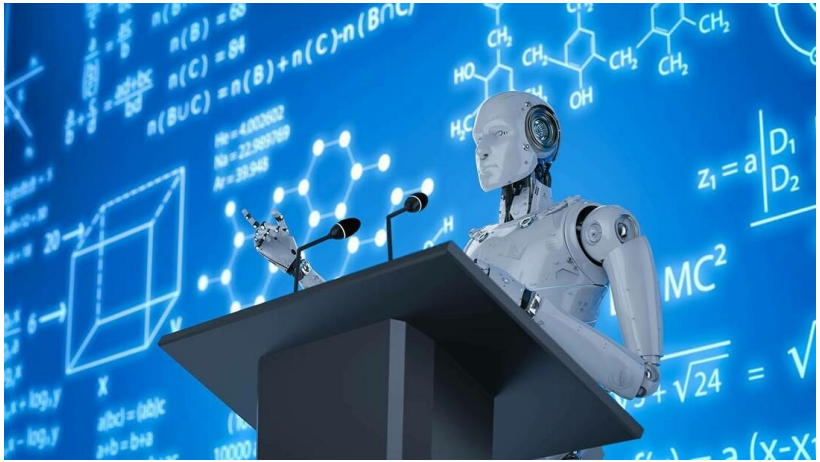
- To apply learnt knowledge and skills into the implementation of the following universal blueprint underlying all the intelligent machines or systems.



ABOUT ME

My role is to help you …

- To be motivated
- To be purposeful
- To be resourceful
- To be skillful
- To sharpen your mind



My experiences

Professor Xie Ming has been:

- Dean/Professor, School of Electrical Engineering and Control Science, Nanjing Tech University, China.
- Guest Professor, Huazhong University of Science and Technology, China.

Professor Xie Ming is now:

- President, Robotics Society of Singapore
- Editor-in-Chief, International Journal of Humanoid Robotics.
- Associate Professor, Nanyang Technological University, Singapore.

Professor Xie Ming has published:

- Three books in English
- Two edited books in English
- Two books in Chinese
- Over 40 International Journal Papers
- Over 100 International Conference Papers

Professor Xie Ming has received many awards and over 10 granted patents.

Ming XIE

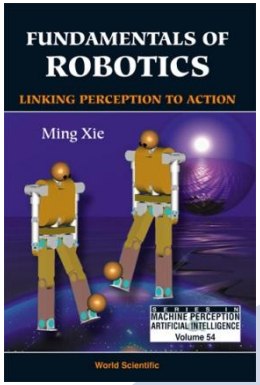
Associate Professor (1999 - present)
http://personal.ntu.edu.sg/mmxie

1984: B.Eng (China)
1986: Msc (France)
1989: Ph.D (France)

Recipient of
Chinese Government's
Overseas Scholarship
(1984 - 1989)

Knowledge
Innovation

2003

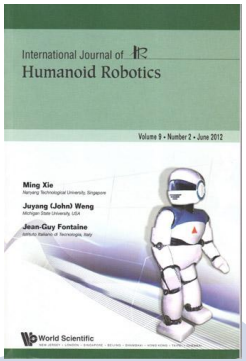


Technology
Innovation

2008

Product
Innovation
(Robot Driver)
(Robot Worker)

2004

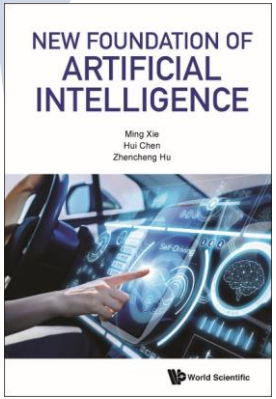


2010

RSS
Robotics Society of Singapore

Social
Service

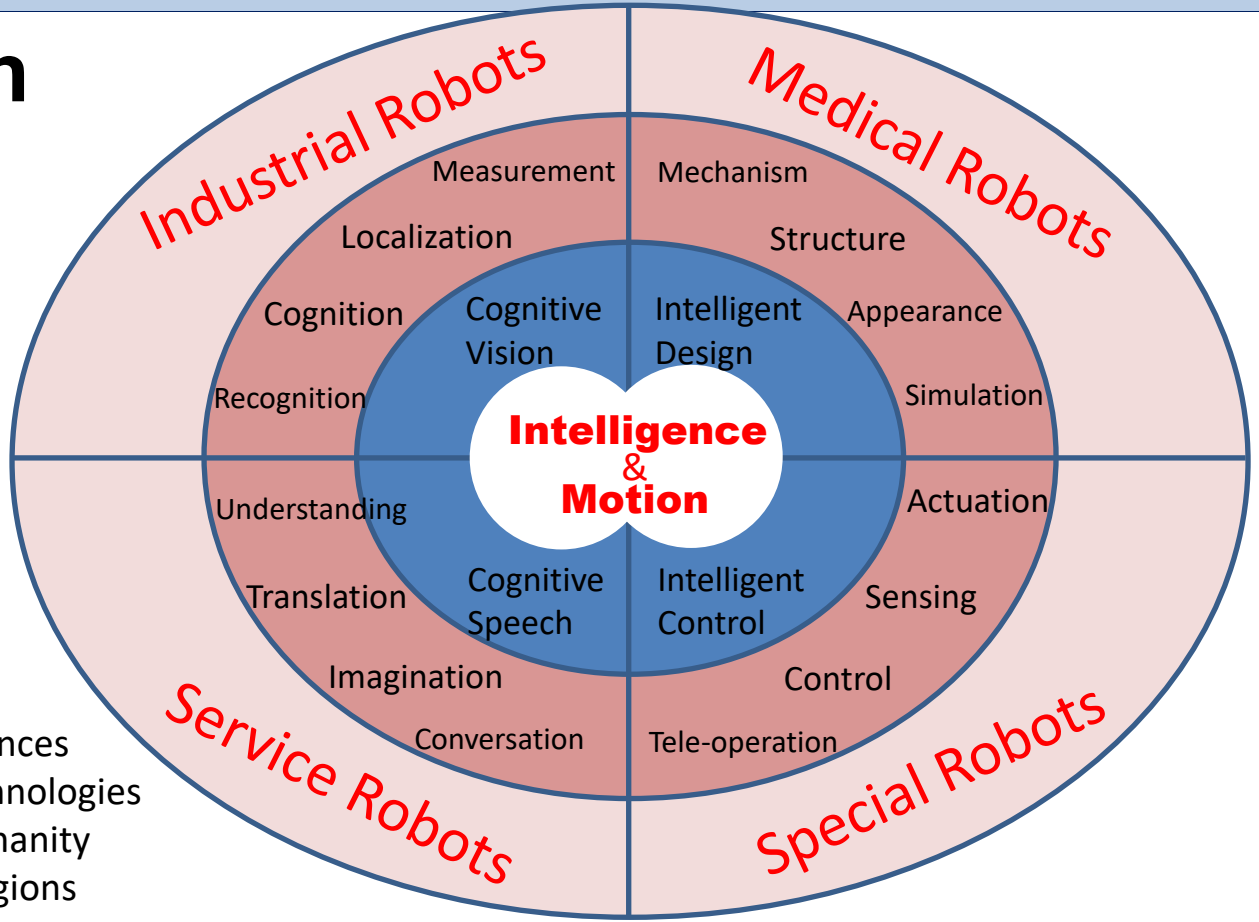
2021



Teaching Portfolio

1. Sensors
2. Robotics
3. Microprocessors
4. Machine Intelligence

Research



- Sciences
- Technologies
- Humanity
- Religions

My research

My research

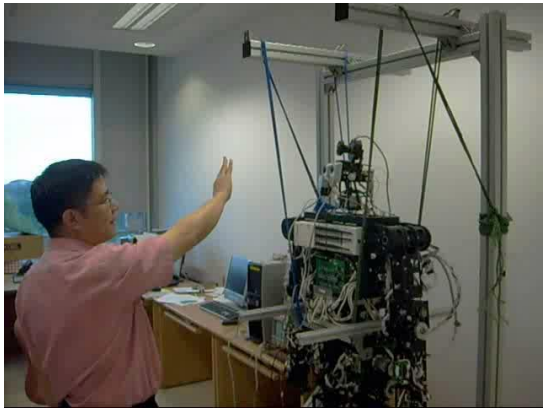

Small-sized Humanoid Robot

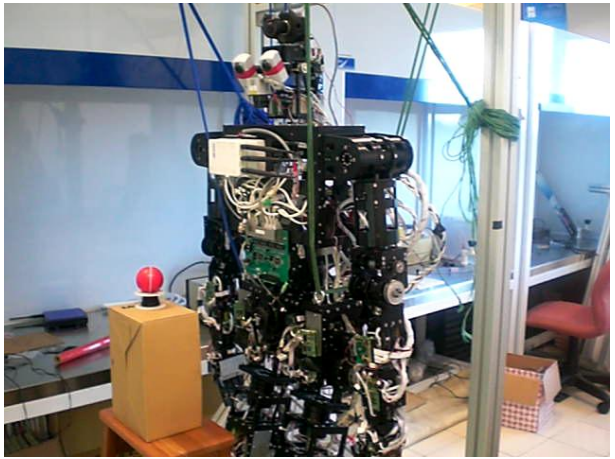

Medium-sized Humanoid Robot

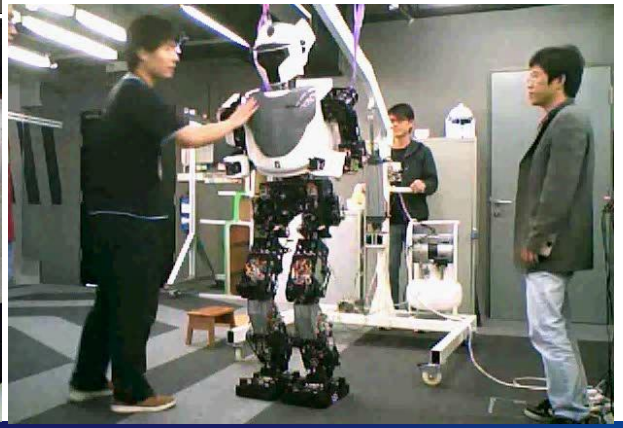

Humanoid


Full-sized Humanoid Robot

Robots with Intelligence Inside …

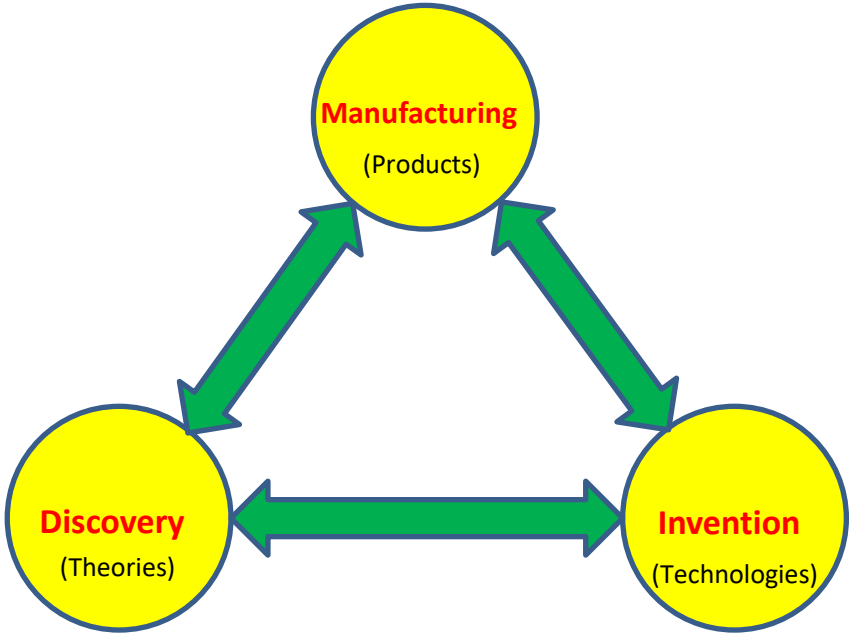






How to understand and improve the world?

- Research comes first.
- What is research? What are the 1,2,3 of research?
- Research has one objective which is to create values by finding better ways of solving problems.
- Research is not to create results by applying solutions.



Two Driving Forces of Research
1. Scientific Problems
2. Social Needs

1. Creation of New Theories
2. Creation of New Technologies
3. Creation of New Products

Outline of Today's Talk

- Why to Do Final Year's Engineering Project?
- Role of Supervisor
- Role of Student
- Key Questions Faced by Design Projects
- Time Management
- Deliverables
- Report and Presentation Layout
- Why to Do Literature Survey?
- Important Advices

Why to Do Final Year's Engineering Project?

- The final year projects are for students to demonstrate their abilities of independently solving engineering problems with learnt knowledge and skills.

- Put yourself into the mindset of engineer during the project.

Role of Supervisor

- Supervisor is playing the role of technical adviser.
- Supervisor is also playing the role of assessor.
- Supervisor is not supposed to be the beneficiary of final year projects.
- Supervisor is not supposed to be the leader of final year projects.

Role of Student

- Student is supposed to be the beneficiary of final year project.
- Student is supposed to be the leader of final year project.
- Student is supposed to be fully empowered to execute final year project.

Key Questions Faced by Design Projects

- Who are the users of systems or products to be developed by you?
- What are the needs of targeted users?
- What are the functionalities of systems or products to be developed by you, which could meet the selected needs of targeted users?
- What are the solutions behind each function of your systems or products?
- What are the best combination of solutions leading to the implementation of your systems or products?
- What are possible blueprints of design of your systems or products?
- What is the selected blueprint of design of your systems or products?
- What is the schedule of your final year project?

Time Management

- One FYP = 8 AUs over Two Semesters
- One Course = 3 AUs (commitment of 3 hours per week) over One Semester
- Hence, one FYP requires the time commitment of 4 hours per week.
- Please do the time management on weekly basis.
- Student is supposed to come out his or her own schedule of project.
- All students in the team are encouraged to work together 2 hours per week.

Deliverables

- Solution in the Form of Equations / Drawings / Diagrams
- Virtual Model
- Simulations with Virtual Model

Minimum Deliverables

- Prototype
- Test Results with Prototype
- Demonstrations with Prototype

Good-to-have Deliverables

Outline of Presentation

- Introduction
  - Who are the users? What are the needs of the users? What is your system or protype which could meet the needs of your users?
- Objective
- Scope of Works
- Literature Survey
  - Technical problem faced by your project? Existing theories and technologies? Existing systems/prototypes which apply existing theories/technologies?
- Proposed System or Prototype (What to develop?)
- Functionalities and Solutions (What are the details to develop?)
- Implementation or Simulation of Proposed System or Prototype
- Results of Simulation or Experiments of Implemented Outcome
- Conclusions and Future Works

Layout of Report

- Chapter 1: Introduction
  - (Who are the users? What are their needs? What is your system or prototype which could meet the needs of your users?)
- Chapter 2: Objectives and Scope of Works
- Chapter 3: Literature Survey
  - (What is the technical problem faced by your project? What are existing theories and technologies? What are existing systems or prototypes developed by others?)
- Chapter 4: Proposed System or Prototype (What to develop by you?)
- Chapter 5: Functionalities and Solutions (What are the details to develop?)
- Chapter 6: Implementation or Simulation of Proposed System or Prototype
- Chapter 7: Results of Simulation or Experiments of Implemented Outcome
- Chapter 8: Conclusions and Future Works
- List of References

Why to Do Literature Survey

- It is compulsory that you have to come out a workable solution.
- It is not compulsory that you must come out a better solution.
- The best way to come out a workable solution is to copy the solutions behind the best works done by your best competitors.
- Hence, literature survey is for you to know:
  - Who are the best engineers in the field of your engineering project?
  - What are the working principles and solutions for you to creatively copy or follow?
  - Why not to photocopy other people's works (plagiarism)?

Important Advices

- Get the first draft of your report and power-point presentation ready.

- Do a rehearsal in front of your supervisor before submitting the report to the moderator.

Thank You for Listening!

"Ask not what your country can do for you – ask what you can do for your country," - John F. Kennedy

"Do not think that you are needy – think that you are needed in the world", - Manis Friedman

"Study will make you knowledgeable, resourceful, and hence more needed", - Xie Ming

Welcome to visit: xieming.robotics.sg

ENJOY DOING YOUR ENGINEERING PROJECT!