LECTURER: TAI LE QUY

INTRODUCTION TO COMPUTER SCIENCE

Basic Concepts of Data Processing

1

Information Representation

2

Algorithms and Data Structures

3

Propositional Logic, Boolean Algebra and Circuit Design

4

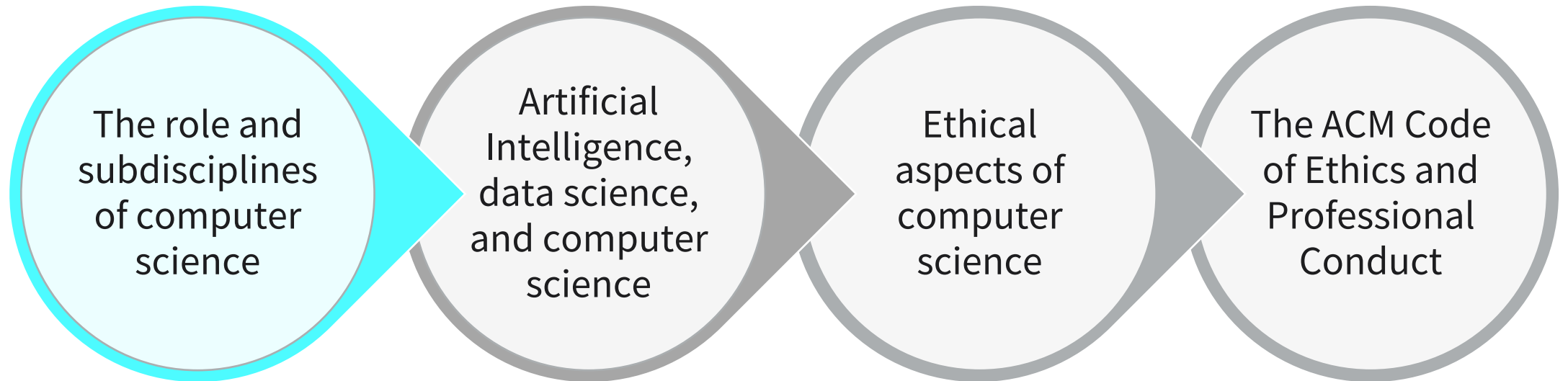## Hardware and Computer Architectures

5

COMPUTER SCIENCE AS A DISCIPLINE

On completion of this unit, you will have learned …

— … the role computer science plays in the modern workforce.

— … about different types of jobs related to computer science.

— … the basics of artificial intelligence and data science.
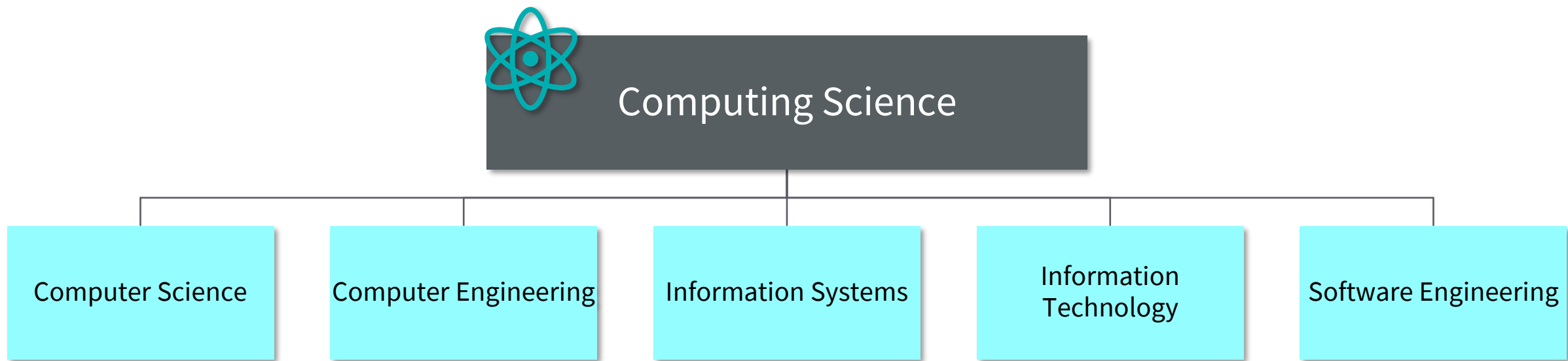
— … about the ethics of computer science.

1. Explain the job of software engineer.
2. What is Artificial Intelligence?
3. What is ethical behavior?
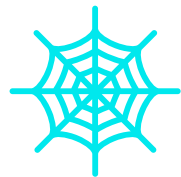
COMPUTER SCIENCE AS A DISCIPLINE

The role and subdisciplines of computer science

Artificial Intelligence, data science, and computer science

Ethical aspects of computer science

The ACM Code of Ethics and Professional Conduct

COMPUTING SCIENCE SUB CATEGORIES

Computing Science

Computer Science

Computer Engineering

Information Systems

Information Technology

Software Engineering

ROLES IN COMPUTER SCIENCE
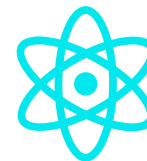
Software Engineer

Web Developer

System Analyst

User Interface (UI) Designer / Developer

Database Administrator

Data Scientist

Software Manager

Information Security Analyst

Information Systems (IS) Manager

Computer Hardware Engineer

Video Game Developer
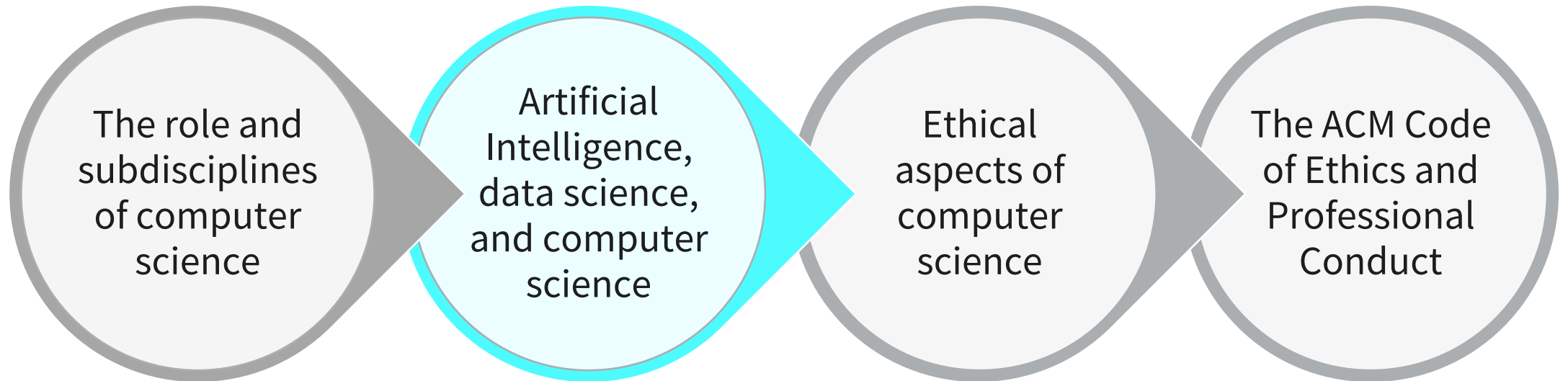
QA Analyst

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WHAT IS AI?

It is the science and engineering of making intelligent machines, especially intelligent computer programs.
It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.
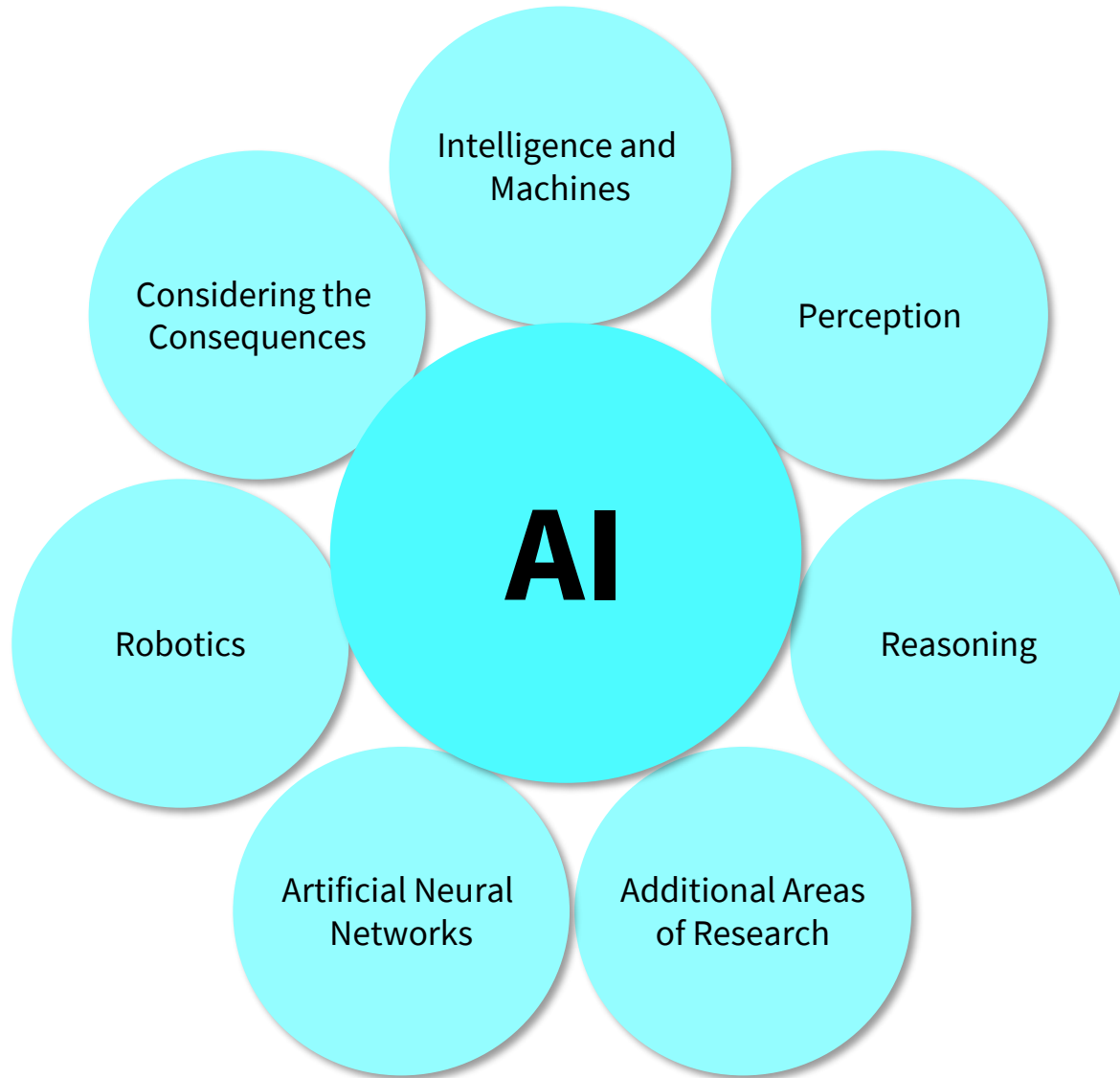
"I don't see that human intelligence is something that humans can never understand." ~ John McCarthy, March 1989

Professor John McCarthy   Father of AI
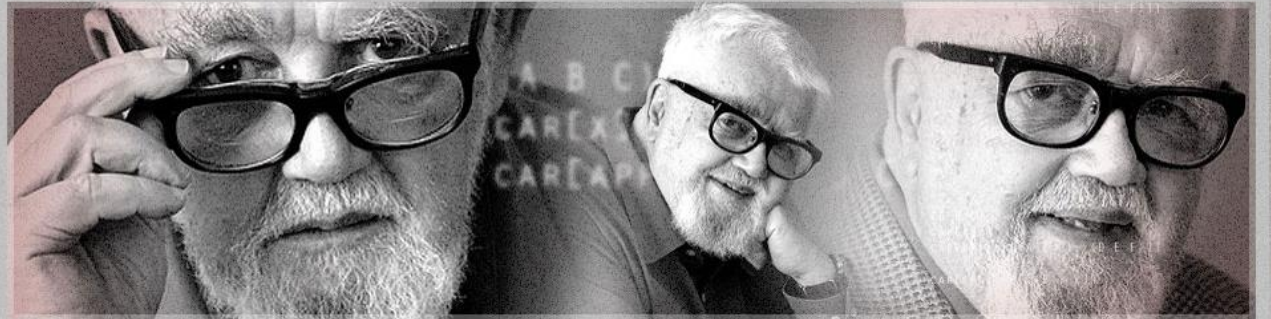
Q. What is intelligence?
A. Intelligence is the computational part of the ability to achieve goals in the world. Varying kinds and degrees of intelligence occur in people, many animals and some machines.

Q. Does AI aim at human-level intelligence?
A. Yes. The ultimate effort is to make computer programs that can solve problems and achieve goals in the world as well as humans. However, many people involved in particular research areas are much less ambitious.

THE IMITATION GAME

Which is machine, and which is woman???

Conversation...

Conversation...
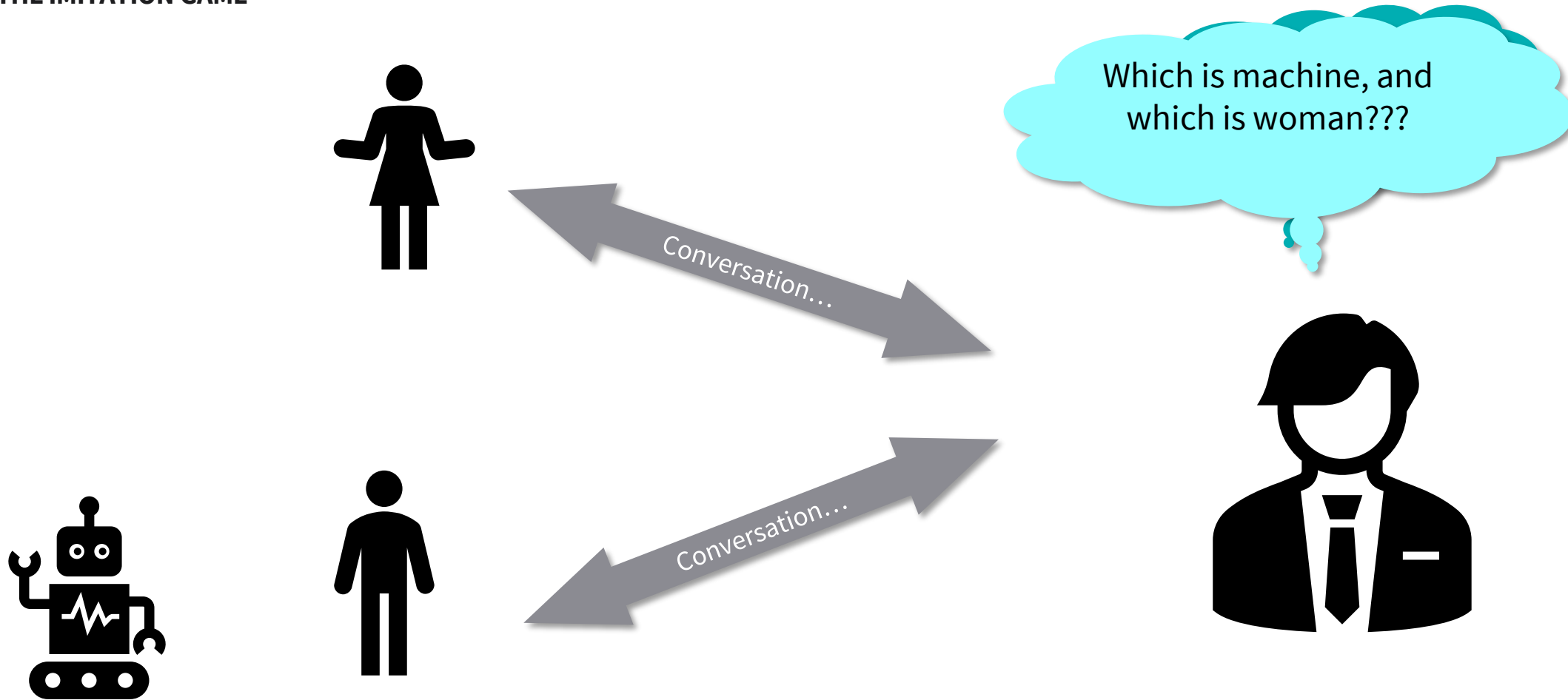
TURING TEST
Test setup: Human interrogator communicates with test subject by typewriter.
Test: Can the human interrogator distinguish whether the test subject is human or machine?
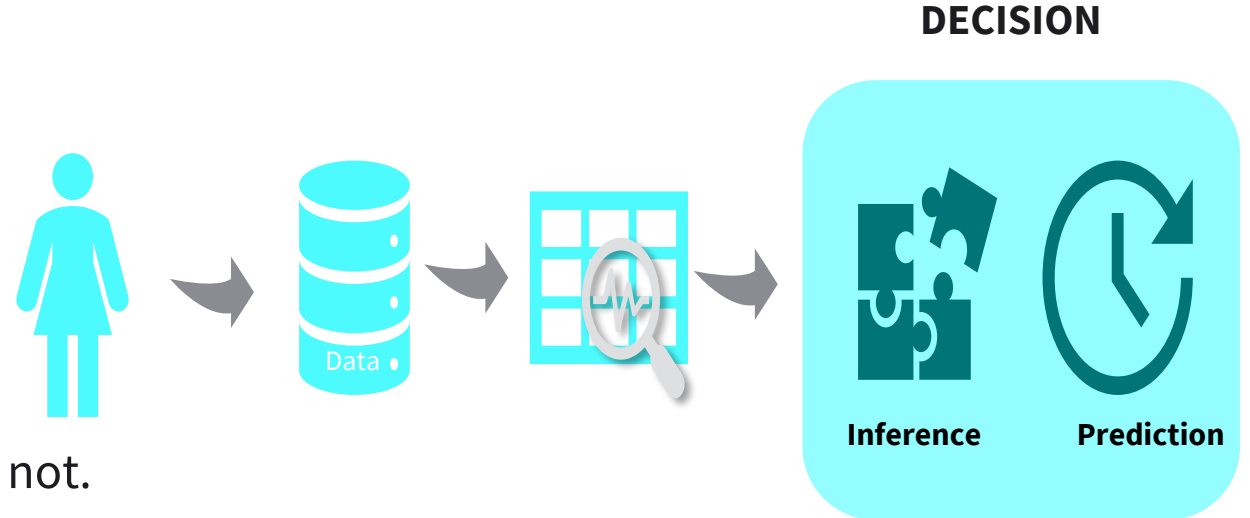
AI AND ROBOTICS

Video: https://youtu.be/fn3KWM1kuAw

Have you ever wondered how Amazon & eBay suggest items for you to buy?
How Gmail filters your emails into spam and non-spam categories?
How Netflix predicts shows to your liking?

How do they do it?

DECISION

– Such tasks are impossible without
the availability of data.

– Data science is all about using data
to solve problems.

– The problem could be decision-making such
as identifying which email is spam and which is not.

– The core job of a data scientist is to understand
the data, extract useful information out of it and
apply this in solving the problems

Inference   Prediction

Image: https://towardsdatascience.com/intro-to-data-science-531079c38b22

DATA SCIENCE LIFE CYCLE

Step 1:
— Define Problem Statement

Step 2:
— Data Collection

Step 3:
— Data Quality Check and Remediation

Step 4:
— Exploratory Data Analysis

Step 5:
— Data Modelling

Step 6:
— Data Communi-cation

INTRODUCTION TO DATA SCIENCE

Video:https://youtu.be/csj6RE-EmSU

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Ethics and computer ethics manifest themselves in the world as "codes of ethics" and "codes of conduct" developed by different organizations.

– Companies build codes of conduct and ethics.

– Professional organizations build codes of conduct and ethics.

– Is anyone aware of such codes of conduct?

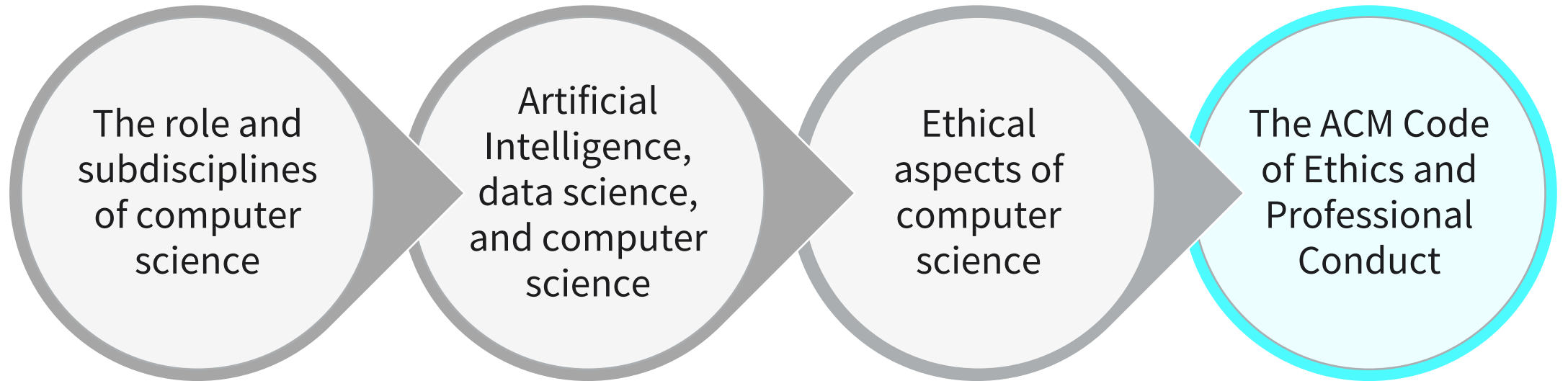Source of the photo: Brett Jordan on Unsplash

Thomas Wotruba and colleagues have suggested that such codes of ethics have at least three purposes.

Whenever a group puts together a code of ethics, it indicates that the group is
- **concerned about ethics**
- **transmitting the specific set of ethics to its group, and**
- **ultimately affecting the group's behavior.**

In addition, codes of ethics provide a signal to those that interact with the relevant group as to what to expect of the group members.

Source of the text: Chonko et al., 2003, pp.237–252.

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1.1 Contribute to society and human well-being.

1.2 Avoid harm to others.

1.3 Be honest and trustworthy.

1.4 Be fair and take action not to discriminate.

1.5 Honor property rights including copyrights and patents.

1.6 Give proper credit to intellectual property.

1.7 Respect the privacy of others.

1.8 Honor confidentiality.

https://www.acm.org/code-of-ethics

As an ACM computing professional I will ….

2.1 Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.

2.2 Acquire and maintain professional competence.

2.3 Know and respect existing laws pertaining to professional work.

2.4 Accept and provide appropriate professional review.

…

As an ACM member and an organizational leader, I will ....

3.1 Articulate social responsibilities of members of an organizational unit and encourage full acceptance of those responsibilities.

3.2 Manage personnel and resources to design and build information systems that enhance the quality of working life.

3.3 Acknowledge and support proper and authorized uses of an organization's computing and communication resources.

…

As an ACM member I will ....

4.1 Uphold and promote the principles of this Code.

4.2 Treat violations of this code as inconsistent with membership in the ACM.

Source of the text: ACM, n. d.

You have learned …

- … the role computer science plays in the modern workforce.
- … about different types of jobs related to computer science.
- … the basics of artificial intelligence and data science.
- … about the ethics of computer science.

TRANSFER TASK
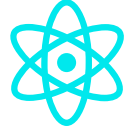
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Computer Hardware Engineer

Video Game Developer

QA Analyst

Select one role, describe:

- Job description
- Requirements of qualifications
- Top companies
- Salary

Professional and Ethical Dilemmas

In software engineering dilemmas are often found:

1. **Mission Impossible Dilemma**
   - occurs when an individual is asked to create or accept a schedule that he or she knows to be impossible to meet.

2. **Fictionware Dilemma**
   - occurs when an organization or individual promises or contracts to deliver a system for which some agreed on features are not feasible.

3. **Rush Job Dilemma**
   - can arise in which quality is compromised because of either poor work ethic or perceived pressure to deliver.

Select one Dilemma, explain the situation, possible consequences and provide ideas to prevent the dilemma using a practical example. What ACM imperative is applicable?

Please present your results.

The results will be discussed in plenary.

Mission Impossible Dilemma

Dilemma:

— The Mission Impossible dilemma occurs when an individual is asked to create or accept a schedule that he or she knows to be impossible to meet.

Example:

A software company had a difficult time during the pandemic. They were looking for any possible job during this time because the company is in financial trouble. Unexpectedly the company received multiple orders for the new product ssimultaneousnessly, and the boss accept it the orders because of financial pressure. The project were then handed over to the development department. The head of the development department has to deal with it. Because of felt political pressure or for other reasons the person creates or accepts the schedule knowing that it is not realistic.

Consequence:

The consequences of this lapse of judgment can range from loss of qualified staff to significant loss of revenue. Loss of staff comes from overwork and burnout. Loss of revenue could derive from the premature announcement of the availability of a product that is then delayed in the marketplace: customers stop buying the current product in anticipation of the new product arriving.

Countermeasures:

Good managers Invite their stuff to speak openly and to address known problems upfront. Building an atmosphere with open discussions, free of pressure lead to more realistic behavior. Good managers analyze situations in terms of solving problems before they put pressure on staff members.

Applicable ACM imperative:

Honor contracts, agreements and assigned responsibilities – "a computing professional has a responsibility to request a change in any assignment that he or she feels cannot be completed as defined"

1. Besides programming, the study of Computer Science also involves?
   a) geology
   b) physics
   c) mathematics
   d) sociology

2. A web developer should be fluent in:
    a) FORTRAN
    b) C++
    c) CSS
    d) BASIC

3. An artificial intelligence system that can perform many tasks and learn like a human would be called a:

   a) general AI
   b) specific AI
   c) narrow AI
   d) aggressive AI

4. An ethical user should avoid unauthorized access to data and:
   a) piracy
   b) chain emails
   c) paid web sites
   d) the internet

5. The ACM code of ethics states that a computer professional in a leadership role should:
   a) undergo yearly qualification training
   b) submit employees to lie detector tests
   c) quit their job to protest ethical violations
   d) encourage social responsibility in the group

How did you like the course?

☹️ 😐 🤩

LIST OF SOURCES

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