**Topic 3**

1. Computer programming and activities it involves

Planning (define scope of the problem), coding, testing, documenting

The art of programming is to take a large idea and break it apart into small subtasks

2. Programming paradigms

Event-driven (selecting user interface elements; Visual basic)

Procedural (linear steps; Pascal, Cobol, ADA)

Object-oriented (series of objects and methods; C++, C#)

Declarative (focus on the use of facts and rules; Prolog)

3. Types of programming languages

High-level (simple English words & familiar math expressions)

source program→compilation→object program

Application program – written in a specific programming language, designed to do specific tasks

Low-level (zeros and ones, assembly (short letter code instructions)

4. Object-oriented programming

Program consists of objects

object is an instance of a class

instance=example (object with specific implementation)

class – template for a group of objects with similar characteristics

method – code segment able to modify class state

message – activates method

Principles:

Inheritance (ability to re-use the code and add new features on top)

Encapsulation (disallow access to private data)

Abstraction (hides some properties while exposing only the necessary ones)

Polymorphism (ability to take many forms. Base interface and many classes implementing it)

5. Programming languages in demand

Python

Fast growing, large ecosystem of packages, used in scientific and machine learning tasks, able to do anything

Might lack speed in some cases but it is fixable

Easy to learn

Opensource

-Has issues with packaging and mobile development (although it’s way better now than e.g. 2 years ago)

Java is mostly used in enterprises’ legacy systems

Ruby

:shrug:

Standards compliance, useful libs, “strong” community

6. Artificial Intelligence, it’s usage, advantages and disadvantages

It is a study of training computers to mimic and act like a human

Advantages:

Satisfaction for users, autonomous systems (i.e. cities, cars), can do routine tasks, improvements in human performance

Disadvantages:

People losing jobs, high cost of creation and maintenance, making humans lazy, no emotions, no out of the box thinking

AI (machine learning inside (deep learning inside))

Translators, speech to text, image recognition, smart home appliances

7. Machine learning and deep learning

Deep Learning:

Subset of ML

More flexibility

Neural networks help in labeling data

Self-directed

virtual assistants, facial recognition

millions of data points

ML:

sub-branch of AI

can make predictions via automated algorithms

requires analysis to evaluate different variables

speech recognition, statistical arbitraging, thousands of data points

8. Virtual reality vs Augmented Reality

In AR, users’ real-time environment is enhanced with new virtual content

Virtual reality creates a fully-simulated environment without displaying the real world

9. Game programming: genres, components, programming languages

Genres: action, role-play, adventure, first-person

Components: artitechtures, lighting, 3D Modeling, particle systems, characters (look, characteristics), level (buildings, landscape, difficulty), audio (player sounds, bg music), lighting (atmosphere, stealth), story (linear, non-linear)

Languages: C++, C#, Java, Unreal Engine, Unity, Lua

10. Robots, consistent characteristics

Rolling (have wheels, good for flat surfaces)

Stationary (for industry settings)

Autonomous (self-contained, their own brains)

Remote-control (guided by a person)

Virtual (just blocks of code)

Robot (bot) – a computer-controlled machine which is designed to move, manipulate objects and perform work while interacting with the environment

11. Robotics system, main components

Robotics – science and study of robots

Components:

Motor/actuator (physical power)

Sensory system (light, sound, temperature)

End-effectors (movable parts)

Power supply

Program

CPU (Central Processing Unit)

12. Robotics, programming languages and approaches

Guided programming (follow preloaded set of instructions)

Offline programming (robot can receive instructions through a computer)

Programming languages: C/C++, Python, Java

13. Robotic systems, applications, benefits, challenges and treats

Cleaners, factory workers, teachers, surgeons, save time, companionship

Good:

Can help us explore the galaxy

New information

Work 24/7 without salary

More effective, automatic

Bad:

They need power supply

They need Maintenance

Costly

Less jobs for people