

8. COMPUTER PROGRAMMING

Computer Programming: Programming paradigms and programming languages. OOP. Game programming. AI (VR, AR, MR, machine learning, deep learning). Robotics.

1. What is programming?
2. What are the most common programming paradigms?
3. What are the main development methodologies?
4. How are programming languages classified?
5. What are the most common programming tools?
6. What is Artificial Intelligence? How is AI used in our everyday life?
7. What are the main roles in game development? What technologies and languages are used for game development?
8. What are the current trends in game development?

Computer programs are developed by computer programmers or software engineers. Computer **programming** encompasses a broad set of activities that include **planning, coding, testing, and documenting**.

There are 2 main development methodologies. A **predictive methodology** requires extensive planning and documentation up front. It allows little room for adaptation and change. Predictive methodologies are preferred for large software development projects. In contrast to predictive methodologies, **an agile methodology** focuses on flexible development and specifications that evolve as a project progresses.

The term **programming paradigm** refers to a style of **programming** (not to a specific language, but rather to the way you program). There are lots of **programming languages** but all of them need to follow some strategy when they are implemented. And that strategy is a **paradigm**. Today's most popular programming paradigms are: **procedural, declarative and object-oriented**.

The **object-oriented paradigm** is based on the idea that the solution for a problem can be visualized in terms of objects that interact with each other. It is efficient for problems that involve real-world objects. The four principles of object oriented-programming are: Encapsulation, Abstraction, Inheritance, and Polymorphism. This approach to programming is well-suited for programs that are large, complex and actively updated or maintained. The organization of an object-oriented program also makes the method beneficial to collaborative development, where projects are divided into groups.

Programming languages can be divided into two major categories: **low-level languages** (machine languages and assembly languages) and **high-level languages** (based on human languages). A low-level language includes commands specific to a particular CPU or microprocessor family, while a high-level language uses command words and grammar based on human languages.

When planning is complete, programmers can begin coding, testing, and documenting. The process of coding a computer program depends on the programming language you use and the **programming tools** you select. Programmers can use a text editor, program editor, **IDE (integrated development environment)** or **VDE (visual development environment)** to code computer programs. When a program doesn't work correctly, it is usually the result of a syntax, logic, or runtime error.

The concept of **Artificial intelligence (AI)** is based on the idea of building machines capable of thinking, acting, and learning like humans. AI is not the same as **machine learning**. We should understand machine learning as a current application of AI that is focused on development of computer programs that can access data and learn from it automatically, without human assistance or intervention. Artificial intelligence, in its turn, is a bunch of technologies that include machine learning and some other technologies like **natural language processing, inference algorithms, neural networks**, etc.

Some people associate AI with the distant future, but many aspects of our lives are already affected by AI:

- Intelligent gadgets able to recognize our speech
- Services capable of recommending music based on your interests (Spotify, Apple Music)
- Smart home devices
- Self-driving cars like those produced by Tesla

Game development is the art of creating games and may involve concept generation, design, build, test and release. A game programmer writes the code that brings a video game to life and works closely with producers and other departments (game designers, artists, animators, sound designers, testers). An **augmented reality (AR)**, **virtual reality (VR)**, **mixed reality (MR)** became the new trend in the gaming industry. **Game engines** like Unreal and Unity are tools for game designers to code and plan a video game with lots of pre-made functions and features. The most popular languages for game programming are C++, C#, Java, Javascript, Python.