Programming Paradigms

Module 1

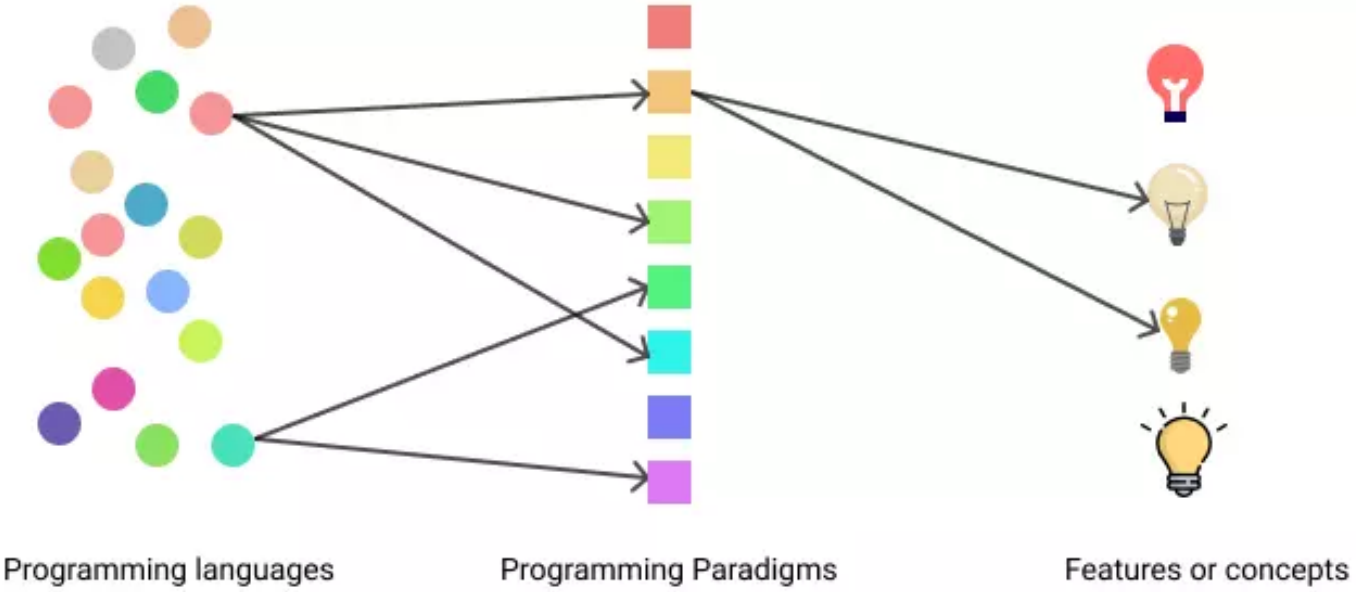
Luis Beltrán
beltran_prieto@utb.cz

Object-oriented Programming
Winter 2023
Tomas Bata University in Zlín – Faculty of Applied Informatics

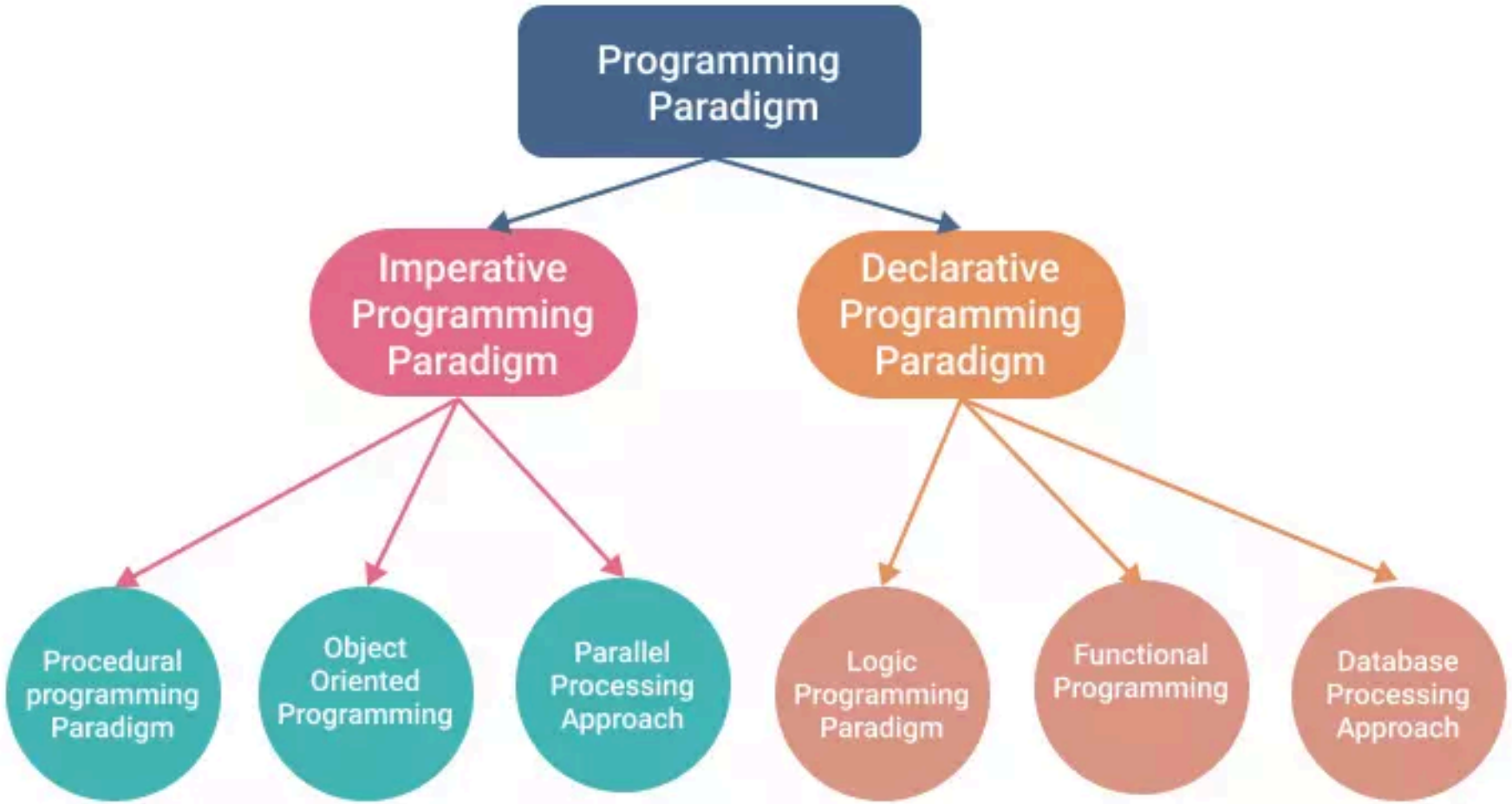
Programming Paradigms

- A paradigm is a strategy or methodology.

- A programming paradigm is an **approach, a way to solve problems using a programming language, tools and techniques**.



Programming paradigm types



1. Imperative programming

- The oldest paradigm, it describes how the program executes.
- Developers are more concerned with how to get an answer step by step, as a sequence, with explicit instructions.
- It follows the most basic idea of programming: code is executed step-by-step by **changing the current state of the program**.
- It contains individual statements, instructions, or function calls.
- It is supported by many programming languages (C, C++, Java, PHP, Python, JavaScript, Pascal, C#, Scala, Ruby…)

```c
#include<stdio.h>

int main() {
  int result = 0;
  for (int i = 0; i < 10; i++) {
    result = result + i;
  }
  printf("Result = %d", result);
  return 0;
}
```

Imperative Programming categories

- **Procedural programming paradigm:** It includes procedures (subroutines, methods, functions) that let you reuse the code.
- **Object Oriented Programming (OOP):** It is used to work on real-world entities in form of class and objects. A class is the blueprint of the object and you can replicate as many as the object you want. These classes contain some properties and methods which all are replicated in objects.
- **Parallel processing:** A program is processed by dividing it into multiple processors. The system contains multiple processors to solve the problem in less time.

Demo #1 – Imperative Programming

2. Declarative programming

- The programmer describes **the property of the result** (what the program must accomplish) without focusing on how to achieve. It is up to the programming language's implementation to determine how to achieve results.
- The main focus is **what is to be done** rather than how it should be done.
- Declarative programming is used in programming languages used in a database query, regular expression, functional programming, logical programming, etc.
- Some of the programming languages that support the declarative paradigm are: Prolog, Python, JavaScript, Scala, Lisp, SQL, Clojure, Xquery, C#...

```
const sumOfSquaresOfEven = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
                           .filter(num => num % 2 === 0)
                           .map(even => even * even)
                           .reduce((x, y) => x + y);
```

```
SELECT * FROM Books
         WHERE Category='Programming'
         AND language='english';
```

Declarative programming categories

- **Logic programming paradigm:** It uses sentences in logical form and creates an expression by using symbols. In machine learning and artificial intelligence, there are many models that use these programs. The programs are executed very much like some mathematical statement.
- **Functional programming paradigm:** It is the programming in which a program is constructed by creating and using functions to map and change one value to another value. It is the key feature of JavaScript.
- **Database programming approach:** It is based on enquiring data, its modification, its movement, etc.

Demo #2 – Declarative Programming

Object-Oriented Programming (OOP)

- One of the most popular programming paradigms.
- The core concept of OOP is to separate concerns into **entities** which are coded as **objects**.
- Each entity will group a given set of information (**properties**) and actions (**methods**) that can be performed by the entity.
- OOP makes heavy usage of **classes** (which are a way of creating new objects starting out from a blueprint or boilerplate that the programmer sets).
- Objects that are created from a class are called **instances**.

Programming Paradigms

Module 1

Thank you for your attention!

Luis Beltrán
beltran_prieto@utb.cz

Object-oriented Programming
Winter 2023
Tomas Bata University in Zlín – Faculty of Applied Informatics