SYLLABUS DEL CORSO

Linguaggi e Computabilità

2122-2-E3101Q111

Aims

The course puts in relation formal language theory with the parsing of programming languages and aims to make the student aware of the limits of computing. The student will be able to define regular and context-free grammars that are necessary to use standard parsing tools and to use basic mark-up languages

Contents

Finite automata, regular languages and regular expressions. Context-free languages, context-free grammars and pushdown automata. Elements of the theory of computation: Turing machine, the Church-Turing thesis, the Universal Turing machine, unsolvable problems. Mark-up and serialization languages and their relation to grammars

Detailed program

1. Introduction and motivations. Basic mathematical concepts for automata theory
2. Deterministic finite state automata. Non-deterministic finite state automata. An application: searching in texts. Finite state automata with epsilon-moves
3. Regular expressions. Finite state automata and regular expressions. Applications of regular expressions. Algebraic properties of regular expressions
4. Properties of regular languages. The Pumping Lemma as a tool to (dis)prove regularity of a language. Regular languages closure in respect to boolean operations. Equivalence and minimization of automata
5. Grammars. Context free grammars. Parse trees. Applications of context free grammars. Ambiguity of grammars and of languages
6. Turing Machines. Uncomputable problems. The basic Turing machine. Extensions of the basic Turing

machine. Reduced Turing Machines

7. Computability. Non Recursively Enumerable languages. Recursively Enumerable and Recursive languages. Undecidable problems and Turing Machines
8. Lexical and syntactic parsers. Mark-up languages: XML

Prerequisites

The contents of the first year's courses

Teaching form

Lectures, recitations, laboratory. Language: Italian.

Some self-assessment exercises will be weekly published on the eLearning (Moodle) web page.

Textbook and teaching resource

Textbook (the english version is also available):

- J.E. Hopcroft, R. Motwani, J.D. Ullman, Automi, linguaggi e calcolabilità, Addison Wesley

Didactic material provided on the e-learning platform

Semester

First semester, Academic Year 2021-2022

Assessment method

Written and oral examination, exercises performed during the lab.

The oral exam consists of a discussion on the written exam, as well as some questions on the contents of the course.

The score is defined at the oral exam.

During the Covid-19 emergency, the oral exams will be online either on Cisco WebEx or on Google Meet. The written exam will be substituted by some exercises performed during the oral exam.

Office hours

On appointment