MATLAB for Biologists Course (m4b) 2013

Description

This course aim is to introduce programming as a tool for exploratory data analysis and automation of your daily biological work. **m4b** course requires neither prior knowledge of MATLAB nor any other programming language. **m4b** course was designed by a tandem of a biologist and a software engineer. The course focuses on the hands-on experience in the MATLAB Environment through working on examples. It starts from very basic level to the level of day-to-day research problems. Finally the course gives you an overview of MATLABs fields of application with a more extended introduction into the field of image analysis.

Structure:

Day 1 (full day): A practical introduction into the basics of programming using MATLAB

1. Introduction: *40 min*
    a. Why do you need to program? – *20 min*
    b. Practical: Your First Program: how to say “Hello World” using MATLAB – *15 min*
    c. Break – 15 min.
2. MATLAB Environment: *1h*
    a. What is where in the MATLAB Environment? – *25 min*
    b. Efficient work with MATLAB Environment and online help – 20 min
    c. Break – *15 min*.
3. MATLAB Basic Concepts part 1: *1:20 h*
    a. Compute with MATLAB’s operators, constants and functions, – 20 min.
    b. Practical: - 10 min
    c. MATLAB Expressions – *20 min*.
    d. MATLAB Variables and assignment – 20 min
    e. Practical: - *10 min*
4. Lunch break – *1h*
5. MATLAB Basic Concepts part 2: *2:15h*
    a. What have we learned so far? – *15 min*
    b. Data types – 30 *min*
    c. Practical: - 15 min
    d. Break – 15 min.
    e. Vector and matrix arithmetics – *30 min*
    f. Practical: - 15 min

   g. Break – 15 min.
6. MATLAB Programming part 2: Code organization – *1 h*
   a. Visibility and MATLAB path- *10 min*
   b. Comments - *10 min*
   c. Scripts - *25 min*
      i. Practical
   d. Functions - *15 min*
      i. Practical
7. Summary Day 1 and what will you learn tomorrow – *15 min*

Day 2 (full day): MATLAB Programming, Exploratory Data Analysis and Visualization

8. Summary Day 1 – *15 min*
9. Data Visualization with MATLAB – *30 min*
   a. Plotting in MATLAB
      i. Practical
10. MATLAB Programming part 2 – *1 h*
   a. Input / Output – *30 min*
      i. Saving and Loading data
      ii. Interacting with File system
      iii. Practical – *15 min*
11. Break – *15 min* MATLAB Programming part 3: Control flow part 1 – *1 h*
   a. if statement - *15 min*
      i. Practical
   b. for statement - *15 min*
      i. Practical
   c. while statement - *15 min*
      i. Practical
   d. Break - *15 min*
12. MATLAB Programming part 3: Control flow part 2 – *1 h*
   a. Switch statement - 15 min
      i. Practical
   b. Try/catch statement - 15 min
      i. Practical
   c. Break, continue, return - 15 min
      i. Practical
   d. Break - 15 min
13. Lunch break – *1h*
14. MATLAB Programming part 4 – *1 h*
   a. What have we learned so far? – 15 min
   b. Strings and Cell Arrays – 30 min
      i. Practical

    c. Break – 15 min
15. MATLAB ProgramminImage Analizg Exercises Session– *1 h*
16. MATLAB Toolboxes Concept and Overview– *30 min*
17. Summary Day 2 and what will you learn tomorrow – *15 min*

Day 3 (half day): Basics of image analysis using MATLAB and MATLAB code life cycle

18. Summary Day 2 – *15 min*
19. Basics of image analysis using MATLAB – *1:30 h*
    a. Basic concepts of Computer Vision - *15 min*
    b. Working with Images in MATLAB - *15 min*
        i. Practical
    c. Overview of Computer Vision toolbox - *15 min*
    d. Exercise – *30 min*
    e. Break – 15 min
20. MATLAB Code Life Cycle – 2 h
    a. What to consider when you move from “one line of code” to the development and maintenance of a complex software - 15 min
    b. Refactoring your code - 15 min
        i. Practical
    c. Testing your code – 15 min
        i. Practical
    d. Break 15 min
    e. Versioning your code – 15 min
    f. Overview of the version control systems - 15 min
        i. Example using GIT – 15 min
    g. Open source alternatives to MATLAB – 15 min