IIBM BootCamp 2024 GitHub

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This course, both theoretical and practical, aims to equip students with essential programming skills and mathematical methods for addressing challenges in medicine and biology. The primary goal of this Bootcamp is to ready prospective postgraduate students of the Institute for Biological and Medical Engineering (IIBM) by providing them with the necessary tools for success in various program courses.

Participants will learn the fundamentals of Python and Matlab, programming languages widely used in scientific computing, along with basic concepts in calculus, linear algebra, and an introduction to image processing. Faculty and graduate students from the IIBM will guide students through interdisciplinary problem-solving, emphasizing the importance of programming and computational tools.

Learning objectives:

- Acquire basic programming skills
- Apply programming tools
- Design basic scripts
- Explain chosen methods and obtained results to an interdisciplinary and diverse audience
- Contrast the results critically and respectfully with different people

Day scheme:

The Bootcamp will be held from **January 15 to 19 from 09:00am to 17:00pm**. The scheme for most days is:

- **09:00 - 09:10** Lecture discussion
- **09:10 - 10:10** Hands-on Coding
- **10:10 - 10:30** Break
- **10:30 - 11:45** Hands-on Coding
- **11:45 - 12:00** Discussion
- **12:00 - 13:00** Guest professor
- **13:00 - 14:00** Lunch
- **14:00 - 16:30** Group project (pairs)
- **16:30 - 17:00** Results discussion

On the first day, we will meet at **08:45 AM** at the Institute for Biological and Medical Engineering, located on the 7th floor of the Ciencia y Tecnología Building at Campus San Joaquín UC. **A laptop with internet connection, Python and Matlab will be required for the Bootcamp.**

Bootcamp Topics:

Introduction

1. Overview of the course
   - Course description and objectives
   - State of the art in coding and IIBM project examples
2. Setting up Tools
   - Google Colab
   - Github

Programming skills

3. Basic data types: Strings, lists, numbers (int and float) and booleans
4. Control process:
   - Loops: for and while
   - Conditions and if statements
   - Control statements: break, continue and pass
5. Arithmetic operators and naming conventions
   - Arithmetics operators (/, //, %, **, + and -)
   - Naming conventions for variables and functions
6. Functions and scripts
7. Data reading
   - Reading from files (.txt and .csv)
   - Reading images
   - Common libraries for data reading
8. Introduction to Numpy and Matplotlib libraries
   - Numpy: Operating with Matrix and vectors
   - Matplotlib: Plots and parameters
9. Debugging: Python and Matlab

Calculus and Algebra

10. Calculus
    - Derivatives
    - Integrals
11. Algebra
    - Matrix operations
    - Vector operations

Image processing

12. Basic operations
    - Filter
    - Fourier transform

Week schedule:

Location: **Edificio de Ciencia y Tecnología. Campus San Joaquín, UC**

Monday	Tuesday	Wednesday	Thursday	Friday
room: K305	**room: K305**	**room: K305**	**room: K305**	**room: K305**
09:00 - 09:10 Welcome to the Bootcamp	**09:00 - 09:10** Discussion and content check	**09:00 - 09:10** Discussion and content check	**09:00 - 09:10** Discussion and content check	**09:00 - 09:10** Discussion and content check
09:10 - 10:10 Working with Google Colab	**09:10 - 10:10** Python arithmetics - Hands-on Coding	**09:10 - 10:10** Python Matrix and plots - Hands-on Coding	**09:10 - 10:10** Derivates part 1 - Hands-on Coding	**09:10 - 10:10** Linear Systems - Hands-on Coding
10:10 - 10:30 Break	**10:10 - 10:30** Break	**10:10 - 10:30** Break	**10:10 - 10:30** Break	**10:10 - 10:30** Break
10:30 - 12:15 Intro to variable types - Hands-on Coding	**10:30 - 12:15** Python Functions - Hands-on Coding	**10:30 - 12:45** Matlab introduction - Hands-on Coding	**10:30 - 11:45** Derivates part 2 - Hands-on Coding	**10:30 - 12:15** Matlab images - Hands-on Coding
12:15 - 12:30 Discussion and content check	**12:15 - 12:30** Discussion and content check	**12:45 - 13:00** Discussion and content check	**11:45 - 12:00** Discussion and content check	**12:15 - 12:30** Discussion and content check
12:30 - 13:30 Speaker - **Pablo Irarrázaval**	**12:30 - 13:30** Speaker - **René Botnar**	**13:00 - 14:00** Lunch	**12:00 - 13:00** Speaker - **Tobias Wenzel**	**12:30 - 13:30** Speaker - **César Ramírez**
13:30 - 14:30 Lunch	**13:30 - 14:30** Lunch	**14:00 - 15:00** Speaker - **Flavia Zacconi**	**13:00 - 14:00** Lunch	**13:30 - 14:30** Lunch
14:30 - 16:30 Control flow - Hands-on coding	**14:30 - 16:30** Group project	**15:00 - 16:30** Group project	**14:00 - 16:30** Group project	**14:30 - 16:30** Final Group project
16:30 - 17:00 Discussion and content check	**16:30 - 17:00** Group project presentation	**16:30 - 17:00** Group project presentation	**16:30 - 17:00** Group project presentation	**16:30 - 17:20** Group project presentation and final thoughts