

IIBM BootCamp 2023 GitHub**Instructors:** Carlos Valle (cgvalle@uc.cl) & Gabriela Vargas (givargas@uc.cl)

IIBM Bootcamp 2023

This theoretical and hands-on course will provide general programming tools and mathematical methods for solving problems in medicine and biology. The main objective of this Bootcamp is to prepare future students of the postgraduate programs of the Institute for Biological and Medical Engineering (IIBM) with tools that will be necessary to succeed in the different courses of the programs.

Students will be introduced to the basics of Python and Matlab programming languages for scientific computing, calculus, linear algebra and image processing intuitions. Professors and graduate students from the IIBM will focus on solving interdisciplinary problems with particular attention to the programming and computational tools needed.

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 16 to 20 from 09:00am to 17:00pm**. The scheme for each day 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

A laptop with internet connection, Python and Matlab will be required for the Bootcamp.

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's Building of Campus San Joaquín UC.

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: K307	room: K302	room: K302	room: K302	room: K302
<u>09:00 - 09:10</u> Welcome to the Bootcamp	<u>09:00 - 09:10</u> Discussion and content check	<u>09:00 - 09:10</u> Discussion and content check	<u>09:00 - 09:10</u> Discussion and content check	<u>09:00 - 09:10</u> Discussion and content check
<u>09:10 - 10:10</u> Working with Google Colab	<u>09:10 - 10:10</u> Python arithmetics - Hands-on Coding	<u>09:10 - 10:10</u> Python Matrix and plots - Hands-on Coding	<u>09:10 - 10:10</u> Derivates part 1 - Hands-on Coding	<u>09:10 - 10:10</u> Linear Systems - Hands-on Coding
<u>10:10 - 10:30</u> Break	<u>10:10 - 10:30</u> Break	<u>10:10 - 10:30</u> Break	<u>10:10 - 10:30</u> Break	<u>10:10 - 10:30</u> Break
<u>10:30 - 11:45</u> Intro to variable types - Hands-on Coding	<u>10:30 - 11:45</u> Python Functions - Hands-on Coding	<u>10:30 - 11:45</u> Matlab introduction - Hands-on Coding	<u>10:30 - 11:45</u> Derivates part 2 - Hands-on Coding	<u>10:30 - 11:45</u> Matlab images - Hands-on Coding
<u>11:45 - 12:00</u> Discussion and content check	<u>11:45 - 12:00</u> Discussion and content check	<u>11:45 - 12:00</u> Discussion and content check	<u>11:45 - 12:00</u> Discussion and content check	<u>11:45 - 12:00</u> Discussion and content check
<u>12:00 - 13:00</u> Speaker - René Botnar	<u>12:00 - 13:00</u> Speaker - Tobias Wenzel	<u>12:00 - 13:00</u> Speaker - César Ramírez	<u>12:00 - 13:00</u> Speaker - Francisco Sahli	<u>12:00 - 13:00</u> Speaker - María Rodríguez
<u>13:00 - 14:00</u> Lunch	<u>13:00 - 14:00</u> Lunch	<u>13:00 - 14:00</u> Lunch	<u>13:00 - 14:00</u> Lunch	<u>13:00 - 14:00</u> Lunch
<u>14:00 - 16:30</u> Control flow - Hands-on coding	<u>14:00 - 16:30</u> Group project	<u>14:00 - 16:30</u> Group project	<u>14:00 - 16:30</u> Group project	<u>14:00 - 16:30</u> Final Group project
<u>16:30 - 17:00</u> Discussion and content check	<u>16:30 - 17:00</u> Group project presentation	<u>16:30 - 17:00</u> Group project presentation	<u>16:30 - 17:00</u> Group project presentation	<u>16:30 - 17:20</u> Group project presentation and final thoughts