

# Advanced Bioinformatics Workshop

**Date:** Monday, August 20<sup>th</sup> – Friday, August 24<sup>th</sup>, 2018

**Venue:** Adriatico Guest House - Denardo Lecture Hall

International Centre for Theoretical Physics

Trieste, Italy

**Course URL:** <http://www.codata.org/datatrieste2018>

**Material:** <https://codata-rda-advanced-bioinformatics-2018.readthedocs.io>

## Description

This advanced bioinformatics course will provide an overview of the current status of different NGS workflows (variant calling, RNA-Seq, ChIP-Seq, etc), and combine them with the appropriate Machine Learning and Data Mining approaches. The course will heavily rely on hand-on exercises and tutorials, and attempt to provide a strong foundation on the underlying theory.

## Instructors

- **Fotis Psomopoulos**, Institute of Applied Biosciences (INAB|CERTH) / ELIXIR GR
- **Amel Ghouila**, Institut Pasteur de Tunis / H3Bionet
- **Gabriele Schweikert**, Cyber Valley Initiative, University of Tuebingen, DE / Computational Biology, University of Dundee, UK

## Course Schedule

	Topic
<i>Day 1</i>	
<b>11:30 – 12:30</b>	Experiments: Design and Analysis
<b>14:00 – 15:00</b>	Components of an Experiment. What is a good experiment design?
<b>15:00 – 16:00</b>	Data Distributions and Multiple Hypotheses Adjustment Methods
<b>16:15 – 18:00</b>	Introduction to basic NGS pipelines
<i>Day 2</i>	
<b>09:00 – 10:00</b>	Introduction to Machine Learning and Data Mining
<b>10:00 – 11:00</b>	Taxonomy of Machine Learning algorithms
<b>11:30 – 12:30</b>	Taxonomy of Data Mining algorithms
<b>14:00 – 15:00</b>	Hands-on lab: NGS pipelines
<b>15:00 – 16:00</b>	Hands-on lab: NGS pipelines
<b>16:15 – 18:00</b>	Hands-on lab: NGS pipelines
<i>Day 3</i>	
<b>09:00 – 10:00</b>	Introduction to Supervised algorithms
<b>10:00 – 11:00</b>	Hands-on Application to supervised algorithms
<b>11:30 – 12:30</b>	Hands-on Practical Topics in ML/DM Part 1
<b>14:00 – 15:00</b>	Hands-on Clustering Part 1
<b>15:00 – 16:00</b>	Hands-on Clustering Part 2
<b>16:15 – 18:00</b>	Hands-on - Apply algorithms to own dataset

Day 4	
09:00 – 10:00	Introduction to ChIP-Seq, ATAC-Seq, BS-Seq
10:00 – 11:00	Hands-on application: ChIP-Seq workflow (part 1)
11:30 – 12:30	Hands-on application: ChIP-Seq workflow (part 2)
14:00 – 15:00	Hands-on application: ATAC-Seq
15:00 – 16:00	Hands-on – Apply algorithms to own dataset
16:15 – 18:00	Hands-on
Day 5	
09:00 – 10:00	Introduction to Regression
10:00 – 11:00	Evaluation of different regression algorithms: pros and cons
11:30 – 12:30	Hands-on application to categorical cases
14:00 – 15:00	Hands-on application to numerical cases
15:00 – 16:00	Discussion on Regression
16:15 – 18:00	Closing, Final Remarks, Post-workshop survey