

Advanced Bioinformatics Workshop

Date: Monday, August 20th – Friday, August 24th, 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
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- **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> | |
| 11:30 – 12:30 | Experiments: Design and Analysis |
| 14:00 – 15:00 | Components of an Experiment. What is a good experiment design? |
| 15:00 – 16:00 | Data Distributions and Multiple Hypotheses Adjustment Methods |
| 16:15 – 18:00 | Introduction to basic NGS pipelines |
| <i>Day 2</i> | |
| 09:00 – 10:00 | Introduction to Machine Learning and Data Mining |
| 10:00 – 11:00 | Taxonomy of Machine Learning algorithms |
| 11:30 – 12:30 | Taxonomy of Data Mining algorithms |
| 14:00 – 15:00 | Hands-on lab: NGS pipelines |
| 15:00 – 16:00 | Hands-on lab: NGS pipelines |
| 16:15 – 18:00 | Hands-on lab: NGS pipelines |
| <i>Day 3</i> | |
| 09:00 – 10:00 | Introduction to Supervised algorithms |
| 10:00 – 11:00 | Hands-on Application to supervised algorithms |
| 11:30 – 12:30 | Hands-on Practical Topics in ML/DM Part 1 |
| 14:00 – 15:00 | Hands-on Clustering Part 1 |
| 15:00 – 16:00 | Hands-on Clustering Part 2 |
| 16:15 – 18:00 | Hands-on - Apply algorithms to own dataset |

| <i>Day 4</i> | |
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| 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 |
| <i>Day 5</i> | |
| 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 |