GOBLET
Global Organisation for Bioinformatics Learning, Education & Training

ML4 MICROBIOME

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The Global Bioinformatics Network

ML4Microbiome Symposium

Grand Challenges of Data-Intensive Science in microbiome & metagenome data analysis and training

14 October 2021

GOBLET & EMBnet AGM 2021

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UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

DIPARTIMENTO DI INFORMATICA

MICROBIOME

https://www.cost.eu/actions/CA18131/

Statistical and machine learning techniques in human microbiome studies

Start of Action 22/02/2019
End of Action 21/02/2023

COST Action CA18131

WG4 Leader: Domenica D'Elia

ML4Microbiome Symposium – 14 October 2021

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

- Connect high-quality scientific communities across Europe (and beyond) on societal & scientific challenges

- Provide networking opportunities

- To increase research impact on:
  - policy makers
  - regulatory bodies
  - national decision makers
  - private sector

https://www.ml4microbiome.eu/about-us/

Aim

To first optimize and then standardize best practice of ML techniques for human microbiome research

Action Details

- **MoU** - 112/18
- **CSO Approval date** - 13/11/2018

	Start	Now
Countries	24	34
Participants	57	113
ITC*	54%	55%

*** COST** Inclusiveness Target Countries (**ITCs**): Albania, Bosnia and Herzegovina, Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Luxembourg, Malta, Moldova, Montenegro, Poland, Portugal, Romania, Slovenia, Slovakia, Republic of North Macedonia, Republic of Serbia and Turkey.

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Action CA18131 - COST

Action Leadership Positions

Action Chair	Dr Marcus CLAESSON
Action Vice Chair	Dr Randi J. BERTELSEN
WG 1 - State-of-the-art evaluation and update	Prof Jaak TRUU
WG 2 - Establishing benchmark datasets and ML DREAM Challenge	Dr Leo LAHTI
WG 3 - Optimisation and standardisation	Dr Magali BERLAND
WG 4 - Dissemination and training	Dr DOMENICA D'ELIA
Science Communication Coordinator	Dr Dimitrios VLACHAKIS
STSM Coordinator	Dr Tatjana LONČAR-TURUKALO
ITC Conference Manager	Dr Tatjana LONČAR-TURUKALO

Working Group 1: State-of-the-art evaluation and update

1 Aims & goal

- Monitor the state-of-the-art ML/statistics methods
- Evaluate methods
- Define priority areas of ML-Microbiome research

2 Acheivements

- Initial evaluation report on ML methods used in microbiome analysis at Action start in 2020
- Review paper 'Applications of Machine Learning in Human Microbiome Studies: A Review on Feature Selection, Biomarker Identification, Disease Prediction and Treatment' (https://doi.org/10.3389/FMICB.2021.634511)

3 Upcoming challenges

- Updated annual report on the application of ML in microbiome studies for 2021 will be provided soon

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WG Leader: Jaak Truu
Vice: Sanja Brdar

Working Group 2: Benchmark datasets & DREAM Challenge

1 Aims & goal

- Establish benchmark datasets for testing ML methods on
  - Agreed data types
  - Public benchmark
  - Repository
  - DREAM Challenge

2 Acheivements

- Released the Human Gut Microbiome Atlas: a versatile data resource for research & benchmarking
- Contributed ML techniques to the currently expanding R/Bioconductor miaverse framework on microbiome data science (microbiome.github.io)

3 Upcoming challenges

- Now preparing microbiome DREAM challenge

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WG Leader: Leo Lathi
Vice: Stres, Blaž

Working Group 3: Optimisation and standardisation

1 Aims & goal

- Optimise and standardize the use of state-of-the-art ML techniques
- Produce best practice SOPs specific to 16S and shotgun data to perform disease prediction
- Investigate opportunities for automating the established SOPs into pipelines for non-experts

2 Acheivements

- A joint work with WG1 has been conducted to identify and analyse relevant papers
- Several threads of research have been conducted by different groups
- Two main approaches adopted:
  - Classical explanatory approach
  - Automatic based on AutoML

3 Upcoming challenges

- Define a decision tree for SOP from:
  - Microbiome datasets provided by WG2
  - Standards steps from existing literature
  - Expertise of the WG3 members
- Output a report outlining areas suitable for automation

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WG Leader: Magali Berland
Vice: Michelangelo Ceci, Sonia Tarazona

Working Group 4: Dissemination & Training

1 Aims & goal

- Bridging existing gaps between ML and microbiome experts by fostering the sharing of knowledge and experience
- Disseminate the results of the Action in peer-reviewed journals, on the web-portal, at international conferences and through end-user workshops
- Organise training & share educational material both in the form of text and videos

2 Acheivements

- Several Papers already published
- Publication of a Topic Issue in Frontiers
- 2 Training Schools (2019& 2021), today Symposium and tomorrow Workshop
- Active & complete Website available
- LinkedIn & Twitter

3 Upcoming challenges

- YouTube Channel
- Publication of events reports
- Stakeholders Meeting (2022)
- Continue with dissemination at any level.....

WG Leader: Domenica D'Elia
Vice: Aldert Zomer

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frontiers in Microbiology

Research Topic

Microbiome and Machine Learning

Submission closed.

Overview | Articles 8 | Authors 86 | Impact

VIEWS 37,837

Articles

By Views By Type By Date

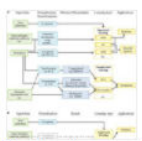
DeepT3_4: A Hybrid Deep Neural Network Model for the Distinction Between Bacterial Type III and IV Secreted Effectors

Lezheng Yu , Fengjuan Liu, Yizhou Li, Jiesi Luo and Runyu Jing

Original Research Gram-negative bacteria can deliver secreted proteins (also known as secreted effectors) directly into host cells through type III secretion system (T3SS), type IV secretion system (T4SS), and type VI secretion system (T6SS) and cause various ...

Published on 21 January 2021
Front. Microbiol. doi: 10.3389/fmicb.2021.605782

1,302 total views Altmetric 2



kernInt: A Kernel Framework for Integrating Supervised and Unsupervised Analyses in Spatio-Temporal Metagenomic Datasets

Elies Ramon , Lluís Belanche-Muñoz, Francesc Molist, Raquel Quintanilla , Miguel Perez-Enciso and Yuliaxis Ramayo-Caldas

Technology and Code The advent of next-generation sequencing technologies allowed relative quantification of microbiome communities and their spatial and temporal variation. In recent years, supervised learning (i.e., prediction of a phenotype of interest) from ...

Published on 28 January 2021
Front. Microbiol. doi: 10.3389/fmicb.2021.609048

1,635 total views Altmetric 4

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Isabel Moreno Indias
Instituto de Investigaciones Biomédicas de Málaga, Universidad de Málaga
Málaga, Spain

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NavarraBiomed
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frontiers in Microbiology

Statistical and Machine Learning Techniques in Human Microbiome Studies: Contemporary Challenges and Solutions

Isabel Moreno-Indias , Leo Lahti , Miroslava Nedyalkova, Ilze Elbere , Gennady Roshchupkin , Muhamed Adilovic , Onder Aydemir , Burcu Bakir-Gungor , Enrique Carrillo-de Santa Pau , Domenica D'Elia , Mahesh S. Desai , Laurent Falquet , Aycan Gundogdu , Karel Hron , Thomas Klammsteiner , Marta B. Lopes , Laura Judith Marcos-Zambrano , Cláudia Marques, Michael Mason , Patrick May , Lejla Pašić , Gianvito Pio , Sándor Pongor, Vasilis J. Promponas , Piotr Przymus , Julio Saez-Rodriguez, Alexia Sampri , Rajesh Shigdel , Blaz Stres , Ramona Suharoschi , Jaak Truu , Ciprian-Octavian Truică , Baiba Vilne, Dimitrios Vlachakis , Ercument Yilmaz , Georg Zeller , Aldert L. Zomer , David Gómez-Cabrero and Marcus J. Claesson

Perspective The human microbiome has emerged as a central research topic in human biology and biomedicine. Current microbiome studies generate high-throughput omics data across different body sites, populations, and life stages. Many of the challenges in ...

Published on 22 February 2021
Front. Microbiol. doi: 10.3389/fmicb.2021.635781

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STSM – USEFUL LINKS

- COST STSM submission site https://e-services.cost.eu/stsm
- COST Vademecum at https://https://www.cost.eu/wp-content/uploads/2020/06/Vademecum-V8-1-May-20202.pdf
- contact turukalo@uns.ac.rs
- contact your local Management Committee member: https://www.cost.eu/actions/CA18131/#tabs|Name:management-committee

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Participation

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