

Course Schedule BI8040

Logical Modelling for Experimental Design in Current and Future Biotechnology and Biomedicine

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Course period:

15 August 2022 - 26 August 2022

Course location: **EU2-145** - Mazemap: <https://bit.ly/3gKp5LI>

For off-site participants the lectures will be streamed on Teams: **see course schedule below**

Course lectures: The presentations from the 2022 edition are [here](#)

You can find the presentations from 2020 [here](#)

Course Models: [Here](#)

Your Course Report: [upload it here](#)

Teachers:

Martin Kuiper

Denis Thieffry

Åsmund Flobak

Hervé Isambert

Vincent Noël

Astrid Lægreid

Eirini Tsirvouli

Aurélien Naldi

Laurence Calzone

John Zobolas

Marco Fariñas

Pablo Rodríguez Mier

Students:

Ole Petter Nordbø

Stacy Ivanova

Vera Louvrou

Thea Johanna Hettasch

Veronica Venafra

Aslaug Angelsen

Erlend Kristiansen

Kristine Lippestad

Leah Gachao

Sara Perez Syltern

Mahmoud Hassaan

Karina Ovedal

Victoria Nilsen Gjøvaag

Course Schedule

Themes

1. Intro - Model-based Systems Biology.
2. Logical modelling of cellular networks.
3. GINsim and BioLQM: logical modelling tool and model analysis tutorial.
4. Model building approaches (top-down, bottom-up), modelling resources.
5. From molecular maps to logical models.
6. Stochastic logical modelling.
7. Multiscale logical modelling.
8. CoLoMoTo electronic notebook tutorial.
9. Reproducible science.
10. Student teams and project challenge selection.

Agenda

Mon 8/8	See TEAMS links below	
Preparation week	Required reading of background material for the course	Students
Mon 15/8	Click here to join the meeting	
09:00	Introduction, Get to know each other, Model-based Systems Biology	Martin Kuiper
10:15	Break	
10:30	Introduction to logical modelling of cellular networks	Denis Thieffry
12:00	Lunch break	
13:00	Tutorial on the use of the logical modelling software GINsim	Denis Thieffry
15:00	Break	
15:15	Student teams assignment, introduction of project ideas for presentation on 17.8	Denis/Martin/Eirini

16:00	close	
Tue 16/8	Click here to join the meeting	
09:00	Systems Medicine	Astrid Lægreid
10:00	Learning interpretable networks from large scale biological and clinical data	Hervé Isambert
10:45	Break	
11:00	Computation of attractors and of their reachability	Aurelien Naldi
12:30	Lunch break	
13:30	Temporal logical modelling of the cell cycle	Denis Thieffry
14:30	Break	
14:45	Discussions in teams on project work	Students
Wed 17/8	Click here to join the meeting	
09:00	Introduction to stochastic Boolean simulations with MaBoSS	Laurence Calzone
10:30	Break	
10:50	From maps to Boolean models, the case of COVID19	Marco Fernandez
11:50	Lunch break	
13:00	Introduction to multiscale modelling with UPMaBoSS and PhysiBoSS	Vincent Noël
14:30	Break	
14:45	Team presentation of project ideas, back-up projects for students if they don't have their own project idea	All
Thu 18/8	Click here to join the meeting	
09:00	Tutorial on CoLoMoTo Notebook	Aurélien Naldi
10:30	Break	
11:00	Application of logical modelling to T cell activation,	Denis Thieffry

	differentiation and reprogramming	
12:00	Lunch break	
13:00	Reproducible Science [slides link]	John Zobolas
14:15	Break	
NB: new Teams link!	Click here to join the meeting	Master defence
14:30	Master's project presentation Macrophage polarisation	Viviam Bermudez
Fri 19/8	Click here to join the meeting	
09:00	Extracting mechanistic knowledge from multiscale transcriptomics	Pablo Rodríguez Mier
10:00	Project work / grading / logistics rest of the course	Denis Thieffry and Martin Kuiper
10:30	Break	
11:00	Logical modelling of psoriatic keratinocytes - towards multiscale simulations	Eirini Tsirvouli
12:00	Lunch break	
13:00	Project work	Students
Mon 22/8	Click here to join the meeting	
09:00	The DrugLogics logical modelling pipeline	Åsmund Flobak
10:00	Project work	Students
10:45	break	
11:00	Project work	Students
12:00	Lunch break	
13:30	Project work	Students
14:30	Progress discussions with students	Denis / Martin / Eirini / Students
Tue 23/8	Click here to join the meeting	

09:00	Logical middle-out model construction using 'big' data	Eirini Tsirvouli
10:00	Project work	Students
10:45	Break	
11:00	Project work	Students
12:00	Lunch break	
13:30	Project work	Students
18:00	Joint dinner @ Frati , 18:00	Teachers and students
Wed 24/8	Click here to join the meeting	
09:00	Prior Knowledge for Modelling	Martin Kuiper
10:00	Project work	Students
12:00	Lunch break	
13:30	Q&A students	Students
15:00	Break	
15:15	Project work	Students
Thu 25/8	Click here to join the meeting	
09:00	Project work	Students
11:00	Q&A Course-survey hand-out	
12:00	Lunch break	
13:30	Project work	Students
Fri 26/8	Click here to join the meeting	
09:30	Q&A	
11:00	Project work	Students
12:00	Lunch break	

13:00	Project reports - 20 min. presentations	Student teams
15:00	Close of the course	
Mon 29/8	And until 10/9:	
	Writing report	Students
7/9/22	Submitting report - deadline 23:59	

Reading material

To read before the course

[Concepts in Boolean network modelling: What do they all mean?](#)

[Logical Modelling and Dynamical Analysis of Cellular Networks](#)

[Logical Modelling and Analysis of Cellular Regulatory Networks With GINsim 3.0](#)

[The CoLoMoTo Interactive Notebook: Accessible and Reproducible Computational Analyses for Qualitative Biological Networks](#)

[MaBoSS 2.0: an environment for stochastic Boolean modelling](#)

[The Minimum Information about a Molecular Interaction CAusal Statement \(MI2CAST\)](#)

[Silencing trust: confidence and familiarity in re-engineering knowledge infrastructures](#)

To read before or during the course

<https://www.frontiersin.org/articles/10.3389/fphys.2018.00787/full>

<https://academic.oup.com/bioinformatics/article/32/17/i772/2450787>

<http://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1000702>

<https://www.frontiersin.org/articles/10.3389/fbioe.2014.00086/full>

<https://academic.oup.com/bioinformatics/article/33/14/2226/3059141>

<https://academic.oup.com/bioinformatics/article/doi/10.1093/bioinformatics/btaa484/5836892>

<https://www.frontiersin.org/articles/10.3389/fphys.2020.590479/full>

<https://cancerres.aacrjournals.org/content/80/11/2407>

<https://www.frontiersin.org/articles/10.3389/fphys.2018.01965/full>

<https://www.liebertpub.com/doi/full/10.1089/nsm.2020.0004>

CoLoMoTo tutorial
Model checking/Cell cycle
Modelling Apoptosis
T Helper cells
MaBoSS
CaSQ tool
UPMaBoSS
Cancer/EMT transitions
Model-based Patient stratification
Network and Systems Medicine

More background literature, not mandatory but for the interested student:

Boolean modelling for systems medicine:

<https://www.sciencedirect.com/science/article/pii/S2001037022002495#s0010>

Phosphoproteomics:

<https://www.sciencedirect.com/science/article/pii/S2001037014000129?via%3Dihub>

Network Medicine:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3140052/>

Deeper into Boolean model principles:

<https://aip.scitation.org/doi/10.1063/1.4809783>

<https://www.sciencedirect.com/science/article/pii/S0304397510005839?via%3Dihub>

Suggested reading on Reproducibility (Lecture JZ)

- Intro paper: [Reproducible Research in Computational Science](#)
- Fun paper (what to avoid doing): [Top Tips to Make Your Research Irreproducible](#)
- Irreproducibility crisis on systems biology modelling: [Reproducibility on Systems Biology Modeling](#)
- A statistical perspective on the subject: [Why Most Published Research Findings Are False](#) (quick read of the corollaries, don't need to read the statistics part)
- What to do to improve the situation?
 - [A manifesto for reproducible science](#) (Table 1 and Boxes give a fairly good overview)
 - [How to Make More Published Research True](#) (Summary points and Box 1)
 - 10 rules on what to do: [Ten Simple Rules for Reproducible Computational Research](#)

Suggested reading for Prior Knowledge (Lecture MK):

<https://link.springer.com/article/10.1007/s11019-020-09957-0>

Foundational Practices of Research Data Management:

<https://riojournal.com/article/56508/element/17/45556/>