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Learning and training 2024

computational course

Computational Systems Biology for Complex Human Disease

21-26 April 2024

Wellcome Genome Campus, UK

Interactive training for functional analysis and interpretation of disease data using computational modelling tools

Lead Instructor - Dr. Anna Niarakis – UT3 & INRIA, France

Full Professor, HDR
CBI-CMD, University of Toulouse III – Paul Sabatier &

Lifeware, INRIA, Saclay

https://cbi-toulouse.fr/fr/equipe-niarakis

anna.niaraki@univ-tlse3.fr
Anna Niarakis

Research Focus

- Computational Systems Biology for complex human disease
- Disease maps construction and analysis
- Large scale Boolean modeling of signaling networks
- Curation and Annotation of Logical Models in biology
- Digital twins in healthcare

Lifeware Inria informatics mathematics
Computational Systems Biology and Optimization

CBI Toulouse Centre de Biologie Intégrative

Building Immune Digital Twins

Université Paul Sabatier TOULOUSE III

GENOPOLE VIVRE L'INNOVATION

Université Paris-Saclay

systems medicine disease maps

Lead Instructor - Dr. Ben Hall– Medical Physics and Biomedical Engi

University College London

B.hall@ucl.ac.uk
Benjamin A Hall

Current:
UCL, Co-chair Computational Cancer Collaboratorium

Previous:
Royal Society Research Fellow/ MRC Investigator
University of Oxford, Microsoft Research

Research Focus

- Computational modelling of the early stages of carcinogenesis
- Executable modelling of cancer networks (ion channels, signalling, epigenetics)
- Spatial models of clone competition and expansion
- Molecular modelling of protein mutations in cancer

https://www.hall-lab.com

Welcome!

- Wellcome Genome Campus course on discrete modelling in biology, focusing on network biology & human disease -4 edition!
- Second time in person!

- **Our goal:**
  - Provide a grounding in diverse set of tools from across the field of network biology and discrete dynamic modelling

  - Back tools and approaches with a series of lectures and seminars showcasing success stories from leaders in the field

Systems biology and biomedicine

- Multiple challenges and opportunities
  - Expansive databases derived from patient data
  - Detailed interaction maps available
  - CRISPR makes genetic manipulation easier and more routine
- Underlying mechanisms remain elusive
  - Necessary for translation and understanding
  - Identify fundamental organisational principles to understand wider systems

Executable modelling

- Approach building on logical modelling and computer science in formal verification
- Driven by high level abstractions focused on functional activity

- Simplified relationships
- Model checking

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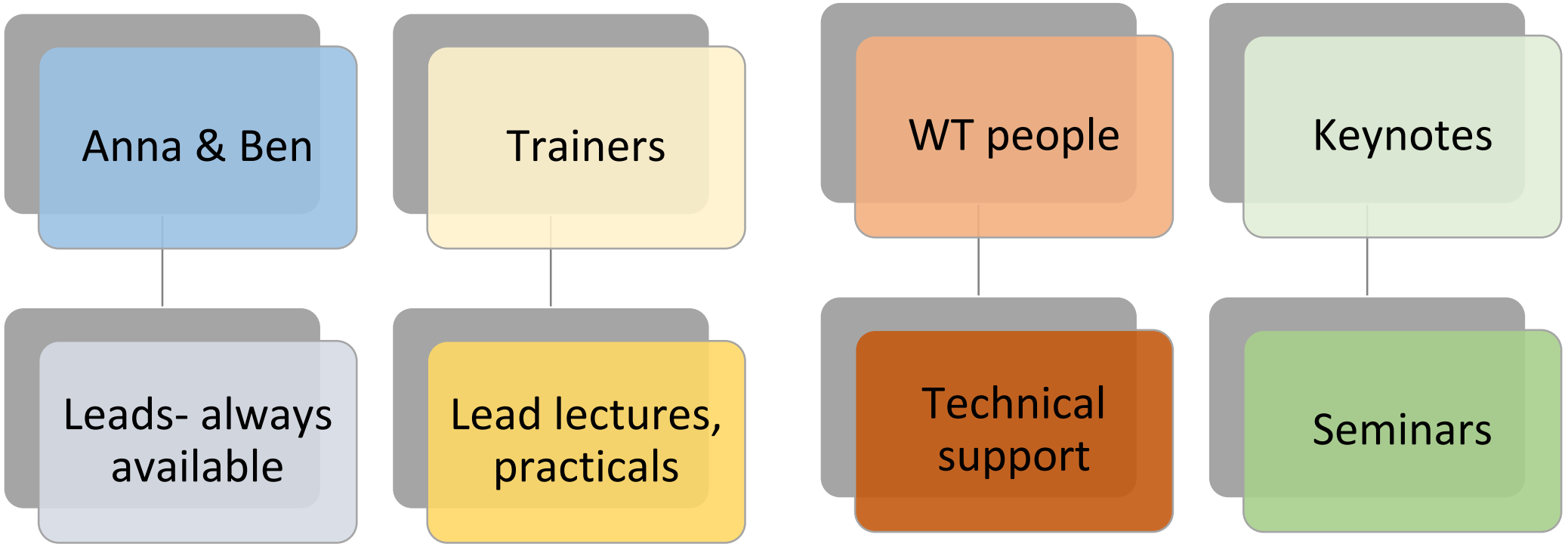
Structure

Keynote Seminars	Flagship successes in the field
Lectures	Introduction and background theory
Practicals and demos	Hands on learning/ introducing tools
Projects	Application of tools and concepts from the course

Organisation



Keynote speakers

Dr Julio Saez Rodriguez

Prof. Medical Bioinformatics + Director Institute Comp. Biomedicine @ Heidelberg University. EMBL-MMPU group leader. Codirector of DREAM Challenges

Dr Liesbet Geris

Collen-Francqui Research Professor in Biomechanics and Computational Tissue Engineering at the university of Liège and KU Leuven in Belgium.
European Virtual Human Twin coordinator

Dr Henning Hermjakob

Head of Molecular Systems services at EMBL-EBI, which provide worldwide reference data resources in interactomics (IntAct), pathways (Reactome), and systems biology models (BioModels).

Dr Jasmin Fischer

Professor of Computational Biology at UCL Cancer Institute

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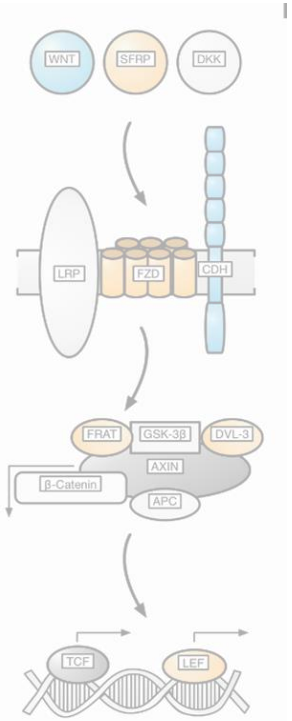
Trainer - Dr. David Shorthouse – University College London, School of Pharmacy

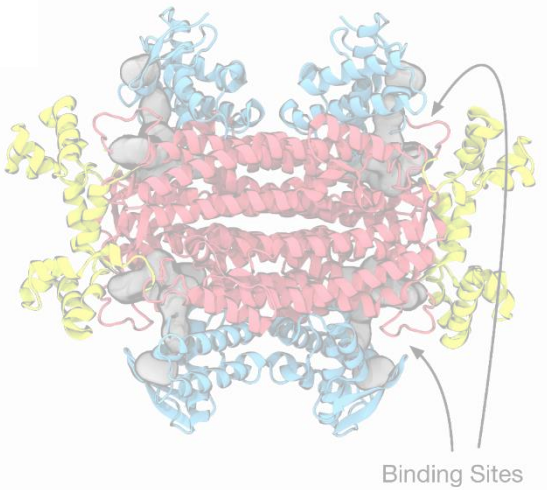
Lecturer in Pharmaceutics
UCL School of Pharmacy



Research Interests

- Inter-patient heterogeneity in cancer
- Targeting of drug formulations to specific cells
- Modelling of drug delivery
- High throughput screening using robotics
- AI methods in pharmaceutical science

d.shorthouse@ucl.ac.uk
David Shorthouse



Trainer - Dr. Sylvain Soliman INRIA-Saclay

Computer Science Researcher (CR)
Lifeware Team
INRIA, Saclay

Sylvain.Soliman@inria.fr
https://lifeware.inria.fr/~soliman/

Research Focus

- Computational Systems Biology
- Formal methods and Petri nets
- Boolean and continuous models
- Constraint Programming

Lifeware
Computational Systems Biology and Optimization

informatics mathematics

Trainer - Dr. Tomas Helikar – University of Nebraska - Lincoln

Associate Professor
Department of
Biochemistry

Research Focus

- Multi-scale modeling of the human immune system
- Software development (e.g., Cell Collective, ccNetViz)
- Hands-on modeling as a method (instead of memorization) to learn about biology in life sciences courses

http://helikarlab.org

https://cellcolective.org

e: thelikar2@unl.edu

@helikarlab @tomashelikar

Trainer - Dr. Pedro Monteiro – IST – Universidade de Lisboa

Associate Professor
Department of
Computer Science and
Engineering

Research Focus

- Logical modeling of regulatory networks
- Boolean functions & Formal model revision
- Integration of regulatory / metabolic models
- Software development (e.g., EpiLog, GINsim)

http://pedromonteiro.org

Pedro.Tiago.Monteiro@tecnico.ulisboa.pt

@ptgmonteiro

http://ginsim.org

http://epilog-tool.org

http://colomoto.org

Trainer - Dr. Vincent Noël – Institut Curie, Paris

Institut Curie

Computational Systems Biology of Cancer

CBIO - Mines ParisTech
INSERM U900
PSL Research University

vincent.noel@curie.fr
Vincent Noël
@vincentnoel72

Research Focus

- Modeling of Biological Systems
- Boolean modeling
- Multiscale modeling
- MaBoSS, PhysiBoSS developper
- High Performance Computing

https://curie.fr/personne/vincent-noel, https://vincent-noel.fr

And the WTAC dream team!

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Our events About us

Nicola Stevens

Course and Event Organiser

Nicola has been an Event Organiser since 2007. She has previously worked in the audit and risk management department of a large NHS Trust, and prior to that worked in the banking industry for 13 years.

Martin Aslett

IT Manager

Martin joined the team as IT Manager in 2016. Prior to this, Martin worked in the Pathogen Informatics team at the Wellcome Sanger Institute for 14 years, providing software support for both internal and external users. He has a BSc (Hons) degree in Zoology from Leeds University, and an MSc in Biological Computation from York University.

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Vaishnavi Gangadhar

Informatics Technical Officer at Wellcome Connecting Science