SEAMS School 2026 — Programme Schedule

Ho Chi Minh City University of Science, VNU-HCM | 4–11 September 2026

Week 1

Time	Fri Sep 4	Sat Sep 5	Sun Sep 6
09:00–09:30	Opening (09:00–09:20) + Course 1 — T. Lê (09:20–10:00)	Course 1 — T. Lê 09:00–10:00	
09:30–10:00			
10:00–10:30	Tea break	Tea break	
10:30–11:00	Course 2 — T. Myers 10:30–11:30	Course 2 — T. Myers 10:30–11:30	
11:00–11:30			
11:30–12:00	Lunch break	Lunch break	
12:00–12:30			
12:30–13:00			
13:00–13:30			
13:30–14:00			
14:00–14:30	Course 3 — J. Correia 14:00–15:00	Course 3 — J. Correia 14:00–15:30 (1h30)	
14:30–15:00			
15:00–15:30	Tea break		
15:30–16:00	Mini projects presentation 15:30–16:30	— ends 15:30 —	

Legend:

- Course 1 — T. Lê
- Course 2 — T. Myers
- Course 3 — J. Correia
- Course 4 — G. Raoul
- Mini projects / Talk / Round table
- Tea break

16:00–16:30					

Week 2

Time	Mon Sep 7	Tue Sep 8	Wed Sep 9	Thu Sep 10	Fri Sep 11
09:00–09:30	Course 1 — T. Lê 09:00–10:30 (1h30)	Course 4 — G. Raoul 09:00–10:30 (1h30)	Course 1 — T. Lê 09:00–10:00	Course 4 — G. Raoul 09:00–10:30 (1h30)	Mini projects restitution 09:00–12:00
09:30–10:00					
10:00–10:30			Tea break		
10:30–11:00	Tea break	Tea break	Course 2 — T. Myers 10:30–12:00 (1h30)	Tea break	
11:00–11:30	Course 2 — T. Myers 11:00–12:00	Mini projects 11:00 – 12:00		Course 3 — J. Correia 11:00–12:00	
11:30–12:00					
12:00–12:30	Lunch break	Lunch break	Lunch break	Lunch break	Lunch break
12:30–13:00					
13:00–13:30					
13:30–14:00					
14:00–14:30	Course 3 — J. Correia 14:00–15:00	Talk 1 – H. Lê 14:00–14:45	Talk 2 14:00–14:45 (45’)	Course 4 — G. Raoul 14:00–15:30 (1h30)	Mini projects restitution 14:00 - 15:00
14:30–15:00					
15:00–15:30	Tea break	Tea break	Tea break	Tea break	Tea break
15:30–16:00	Mini projects 15:30–16:30	Round table 15:30–16:30	Mini projects 15:30–16:30	Mini projects 15:30–16:30	Closing 15:30 - 16:00
16:00–16:30					

Courses & lecturers

Course 1 — Thi Minh Thao Lê

Center for Computational and Stochastic Mathematics, Instituto Superior Técnico, Lisbon, Portugal

Modeling and Data-Driven Inference in Infectious Disease

This lecture presents an integrated framework for modeling infection dynamics by linking coinfection SIS models, replicator equations, and data-driven inference methods. It covers: quasi-neutral dynamics in coinfection systems and their equivalence to replicator equations; applications to Streptococcus pneumoniae, including inference of pairwise strain interactions from frequency data and analysis of context-dependent mutual invasibility; vaccination work, including bottleneck-size estimation and selection tests based on biological diversity data; selection models and data-driven inference (from exponential and logistic models to Lotka-Volterra and replicator dynamics); and applications to Escherichia coli, focusing on how species frequencies modulate selection coefficients between strains, and how machine-learning and multi-objective optimization can predict relative fitness, steer selection, and design strategies to reduce antimicrobial resistance in microbiomes.

Course 2 — Timothy G. Myers

Centre de Recerca Matemàtica, Barcelona, Spain

Practical Applications of Moving Boundary Problems

Moving boundary problems (MBPs) are a class of mathematical problems where the domain changes with time and is initially unknown — consequently it must be determined as part of the solution process. This dynamic nature makes them complex, but they are crucial for modelling a vast array of real-world phenomena such as phase change (melting, evaporation, etc.), crystal growth, clogging of arteries, tissue growth, pollutant transport, crack propagation and even mathematical finance. The course starts from the basic formulation, develops the modelling and techniques, and then applies the knowledge to problems of current industrial interest.

Course 3 — Joaquim M. C. Correia

Universidade de Évora, Évora, Portugal

Modelling with Hyperbolic Systems of Conservation Laws

Real-world problems provide the motivation for the mathematical concepts and theory of hyperbolic systems of conservation laws, drawing on examples presented at European Study Groups with Industry (ESGI) meetings. Topics under consideration include: Euler's compressible gas dynamics (first-order conservation laws) — shock waves, the Rankine-Hugoniot condition, hyperbolicity and entropy criteria; pollutant effects on stone monuments (convective, diffusive and capillary mechanisms) in porous-capillary media; image processing (denoising and segmentation) via nonlinear diffusions; and reacting gas flows or coagulation-fragmentation theory, with approximations and the viscosity-capillary vanishing method.

Course 4 — Gaël Raoul

CMAP, École Polytechnique, France

"Wasserstein Distances and Convergence of Stochastic Processes"

This short course introduces Wasserstein distances and their use in studying the convergence of stochastic processes. We will present the basic ideas of optimal transport and coupling, and show how Wasserstein contraction estimates can provide quantitative convergence to equilibrium for Markov processes and some partial differential equations. Several coupling strategies will be discussed, from synchronous coupling to more sophisticated constructions. We will also introduce related approaches to convergence and ergodicity, including the Harris ergodic theorem and Eberle's reflection coupling argument, and discuss how they relate to Wasserstein methods. Applications and examples will be drawn from machine learning and from models in biology.

Invited talks

Two invited talks broaden the school's scope towards applied and industrial mathematics. They are scheduled on Tuesday 8 September and Wednesday 9 September at 14:00.

Talk 1 — Tuesday 8 September, 14:00

Manh Hung Le

Faculty of Mathematics and Computer Science, University of Science, VNU-HCM, Vietnam

Why Accelerate? From Gradient Descent to FISTA and Image Restoration

First-order optimization methods are attractive for large-scale problems because of their low computational cost and modest memory requirements. However, classical gradient descent achieves only an O(1/k) convergence rate for smooth convex minimization, naturally raising the question of whether faster convergence is possible without increasing the cost of each iteration substantially. This question led to Nesterov's accelerated methods, which attain the optimal worst-case rate within the standard first-order framework.

In this talk, we trace the development from gradient descent to accelerated schemes and discuss the role of momentum, Lyapunov functions, and continuous-time dynamical systems in understanding acceleration. We then turn to composite optimization problems

arising in image restoration, where nonsmooth regularization is used to address ill-posed inverse problems such as image deblurring and inpainting. Proximal-gradient methods and ISTA provide a natural algorithmic framework for these problems, while FISTA brings Nesterov-type acceleration to the nonsmooth setting.

The talk aims to connect the theory of accelerated first-order methods with their practical role in large-scale image restoration, while highlighting the broader interplay between optimization algorithms, dynamical systems, and applications.

Talk 2 — Wednesday 9 September, 14:00

Phuc-Loi Luu

Institute for Applied Research in Health Sciences and Aging, Thong Nhat Hospital, Ho Chi Minh City, Vietnam

Mathematical and Computational Innovations in Clinical Genomics: From Statistical Modeling to AI-Driven Variant Interpretation

The rapid advancement of Next-Generation Sequencing (NGS) has transformed precision medicine, yet it introduces complex data challenges that require robust mathematical and computational solutions. This talk explores concrete industrial applications of theoretical mathematics, statistical modeling, simulation and artificial intelligence in developing cost-effective, highly accurate genomic screening pipelines. It demonstrates how distinct branches of mathematics are integrated to solve real-world clinical problems, focusing on Non-Invasive Prenatal Testing (NIPT), Pre-implantation Genetic Testing for Aneuploidy (PGT-A) and downstream variant classification.

Highlights include: statistical modeling in NIPT (depth z-scores and Z-tests to classify genomic bins and detect rare chromosomal microdeletions); computational simulation for rare syndromes (using ART-Illumina to generate training data for Klinefelter syndrome and higher-grade variations); Hidden Markov Models in embryo screening (HMM-based segmentation to call copy number variants at very low sequencing depths); and AI-agentic systems for variant classification (LLM-based agents automating literature mining and evidence evaluation aligned with ClinGen specifications).

Lecture notes

Please see here: Lecture notes