

Festum Pi MATH-Summer School Schedule

Conference Room : Pythagoras

Tuesday July 9	Wednesday July 10	Thursday July 11	Friday July 12	Saturday July 13
9:00-9:15 REGISTRATION	9:00 – 10:45 Alikakos	9:00 – 10:45 Mouhot	9:00 – 10:45 Tertikas	9:00 – 10:45 Mouhot
9:15 – 10:45 Villani	10:45-11:15 Coffee Break	10:45-11:15 Coffee Break	10:45-11:15 Coffee Break	10:45-11:15 Coffee Break
10:45-11:15 Coffee Break	11:15-13:00 Villani	11:15-13:00 Alikakos	11:15-13:00 Santambrogio	11:15-13:00 Tertikas
11:15-13:00 Santambrogio	13:00-14:00 Lunch	13:00-14:00 Lunch	13:00-14:00 Lunch	13:00-14:00 Lunch
13:00-14:00 Lunch	14 :00-14 :30 Coffee Break	14 :00-14 :30 Coffee Break	14 :30-16 :00 Villani	14 :00-14 :30 Coffee Break
14:30-16:00 Mouhot	14:30-16:00 Santambrogio	15:00-16:00 Franck Jedrzejewsky, conference « Microtones, 31-TET and Just Intonation »	16 :00-16 :30 Coffee Break	
16 :00-16 :30 Coffee Break			16:30-18:00 Alikakos	
16:30-18:00 Tertikas				

Festum Pi Conference Schedule

Monday July 15	Tuesday July 16	Wednesday July 17	Thursday July 18	Friday July 19
9:15-10:15 Rousset			9:15-10:15 Grillakis	
10:30-11:30 Imbert	10:30-11:30 Schratz	10:30-11:30 Silvestre	10:30-11:30 Tertikas	10:30-11:30 Villani
11:30-12:00 Coffee Break	11:30-12:00 Coffee Break	11:30-12:00 Coffee Break	11:30-12:00 Coffee Break	11:30-12:00 Coffee Break
12:00-13:00 Menegaki	12:00-13:00 Dafermos	12:00-13:00 Gianniotis	12:00-13:00 Grandmont	12:00-13:00 Alikakos
13:00-14:00 Lunch	13:00-14:00 Lunch	13:00-14:00 Lunch	13:00-14:00 Lunch	13:00-14:00 Lunch
14 :00-14 :30 Coffee Break	14 :00-14 :30 Coffee Break	14 :00-14 :30 Coffee Break	14 :00-14 :30 Coffee Break	14 :00-14 :30 Coffee Break
14:30-15:30 Maury	14:30-15:30 Ayi		14:30-15:30 Mouhot	
16:00-17:30 Room : Poseidon Round table climate change : Anna Daskalaki, Chariton Kalaitzidis, Petros Lymberakis, Cédric Villani, modération : George Baourakis			15:45 Conference Claude Abromont “Pierre Boulez : a new theory for an inspired music”	

Program Festum Pi (not complete)

July 9, 2024

1 First week (minicourses)

Nicholas Alikakos

Title: An introduction to the mathematical theory of phase transitions

Clément Mouhot

Title: De Giorgi-Nash-Moser theory for kinetic equations

Filippo Santambrogio

Title: Optimal transport methods for parabolic diffusion equations : the JKO scheme

Achilles Tertikas

Title: On Functional inequalities with sharp constants

Cédric Villani

Title: Fischer information and kinetic theory

2 Second week

Monday 15

Frédéric Rousset

Title: Well-posedness and derivation of a degenerate Vlasov equation

Abstract: In this talk we shall study the well-posedness of a degenerate Vlasov equation where the force field is given by the gradient of the density. We shall also present the rigorous derivation of this equation in two cases:

- the quasineutral limit of the Vlasov-Poisson system for ions
- the semiclassical limit of cubic type Nonlinear Schrödinger Equations.

Cyril Imbert

Title: Partial regularity in time for the space-homogeneous Boltzmann equation with very soft potentials

Angeliki Menegaki

Title: Stabilities and Instabilities of Rayleigh-Jeans Equilibria for the 4-waves kinetic equation

Bertrand Maury

Title: Evolution problems on networks

Tuesday 16

Katharina Schratz

Title: Resonances as a computational tool

Abstract: A large toolbox of numerical schemes for dispersive equations has been established, based on different discretization techniques such as discretizing the variation-of-constants formula (e.g., exponential integrators) or splitting the full equation into a series of simpler subproblems (e.g., splitting methods). In many situations these classical schemes allow a precise and efficient approximation. This, however, drastically changes whenever non-smooth phenomena enter the scene such as for problems at low regularity and high oscillations. Classical schemes fail to capture the oscillatory nature of the solution, and this may lead to severe instabilities and loss of convergence. In this talk I present a new class of resonance based schemes. The key idea in the construction of the new schemes is to tackle and deeply embed the underlying nonlinear structure of resonances into the numerical discretization. As in the continuous case, these terms are central to structure preservation and offer the new schemes strong geometric properties at low regularity.

Mihalis Dafermos

Title: TBA

Nathalie Ayi

Title: Large Population Limit for Interacting Particle Systems on Weighted Graphs

Abstract: When studying interacting particle systems, two distinct categories emerge: indistinguishable systems, where particle identity does not influence system dynamics, and non-exchangeable systems, where particle identity plays a significant role. One way to conceptualize these second systems is to see them as particle systems on weighted graphs. In this talk, we focus on the latter category. Recent developments in graph theory have raised renewed interest in understanding large population limits in these systems. Two main approaches have emerged: graph limits and mean-field limits. While mean-field limits were traditionally introduced for indistinguishable particles, they have been extended to the case of non-exchangeable particles recently. In this presentation, we introduce several models, mainly from the field of opinion

dynamics, for which rigorous convergence results as N tends to infinity have been obtained. We also clarify the connection between the graph limit approach and the mean-field limit one. The works discussed draw from several papers, some co-authored with Nastassia Pouradier Duteil and David Poyato.

Wednesday 17

Luis Silvestre

Title: The Landau equation does not blow up.

Abstract: The Landau equation models the evolution of the density of particles when they are assumed to repel each other by Coulomb potentials. It is one of the main equations in plasma physics and kinetic theory. It is a limit case of the Boltzmann equation with very soft potentials. In the space-homogeneous case, we show that the Fisher information is monotone decreasing in time. As a consequence, we deduce that for any initial data the solutions stay smooth and never blow up.

Manoussos Grillakis

Title: On the evolution of interacting Bosons

Abstract: The purpose is to consider a large number of interacting Bosons and study their evolution. It is known that the evolution of the mean field approximation is governed by the Gross Pitaevskii equation (cubic NLS). I will explain how to introduce particle pairs that interact with the mean field. This leads to a better approximation of the exact evolution once the analysis of the coupled system is in place.

Thursday 18

Panagiotis Gianniotis

Title: Splitting maps in Type I Ricci flows

Abstract: Harmonic almost splitting maps are an indispensable tool in the study of the singularity structure of non-collapsed Ricci limit spaces. In fact, by recent work of Cheeger-Jiang-Naber the singular stratification is rectifiable, and almost splitting maps can be used to construct bi-Lipschitz charts of the singular strata. For this, it is crucial to understand how a splitting map may degenerate at small scales, and when it doesn't.

In this talk we will discuss similar issues for a parabolic analogue of almost splitting maps, in the context of the Ricci Flow, and present some new results regarding the existence and small scale behaviour of almost splitting maps in a Ricci flow with Type I curvature bounds. It turns out that, as in the case of harmonic almost splitting maps, an almost splitting map at a given scale remains an almost splitting map even at smaller scales, modulo linear transformations, provided that the flow remains sufficiently selfsimilar. Moreover, we will see that the possible degeneration of these linear transformations is controlled in a certain way by a pointed version of Perelman's W -entropy. We will also discuss how this relates to a conjecture of Perelman on the boundedness of the diameter of a 3d Ricci flow developing a finite time singularity, as we approach the singular time.

Achilles Tertikas

Title: Liouville results for weighted anisotropic elliptic equations

Céline Grandmont

Title: Some existence results for fluid-structure interaction problems

Friday 19

Nicholas Alikakos

Title: On the triple junction problem without symmetry hypotheses

Cédric Villani

Title: TBA