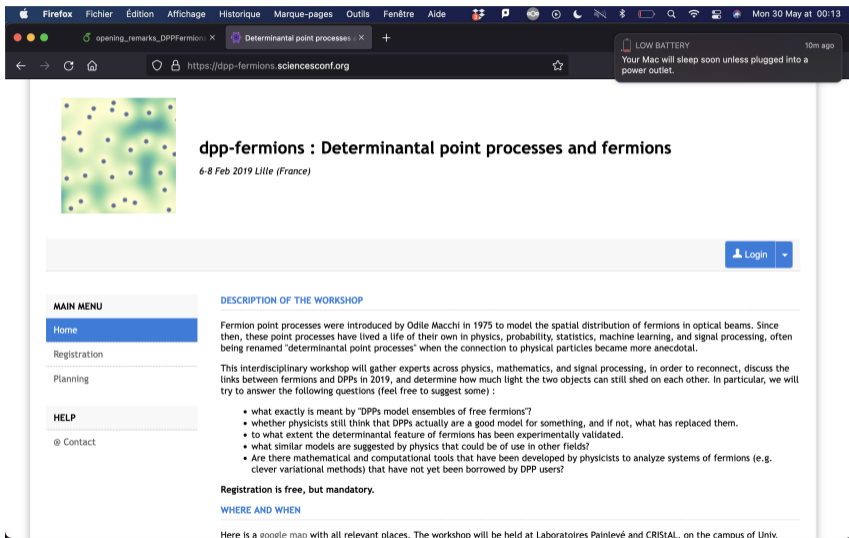


Determinantal and permanental point processes, quantum physics, and signal processing 2022

Week 1: tutorials

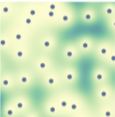
Rémi Bardenet, Jérémie Bouttier, Pascal Degiovanni, Patrick Flandrin, Adrien Hardy, Mylène Maïda, Grégory Schehr.

The 2019 Lille workshop on "DPPs and fermions"



The screenshot shows a Firefox browser window with the URL <https://dpp-fermions.sciencesconf.org>. The page features a header with a blue navigation bar containing a 'Login' button. Below the header, there is a main menu on the left and a central content area. The main menu includes 'Home', 'Registration', and 'Planning' under the 'MAIN MENU' section, and '@ Contact' under the 'HELP' section. The central content area has a title 'dpp-fermions : Determinantal point processes and fermions' and a subtitle '6-8 Feb 2019 Lille (France)'. A 'DESCRIPTION OF THE WORKSHOP' section follows, containing a paragraph about fermion point processes, a list of questions to be discussed, and a note that registration is free but mandatory. A 'WHERE AND WHEN' section is partially visible at the bottom.

LOW BATTERY
Your Mac will sleep soon unless plugged into a power outlet. 10m ago



dpp-fermions : Determinantal point processes and fermions

6-8 Feb 2019 Lille (France)

[Login](#)

MAIN MENU

- [Home](#)
- [Registration](#)
- [Planning](#)

HELP

- [@ Contact](#)

DESCRIPTION OF THE WORKSHOP

Fermion point processes were introduced by Odile Macchi in 1975 to model the spatial distribution of fermions in optical beams. Since then, these point processes have lived a life of their own in physics, probability, statistics, machine learning, and signal processing, often being renamed "determinantal point processes" when the connection to physical particles became more anecdotal.

This interdisciplinary workshop will gather experts across physics, mathematics, and signal processing, in order to reconnect, discuss the links between fermions and DPPs in 2019, and determine how much light the two objects can still shed on each other. In particular, we will try to answer the following questions (feel free to suggest some) :

- what exactly is meant by "DPPs model ensembles of free fermions"?
- whether physicists still think that DPPs actually are a good model for something, and if not, what has replaced them.
- to what extent the determinantal feature of fermions has been experimentally validated.
- what similar models are suggested by physics that could be of use in other fields?
- Are there mathematical and computational tools that have been developed by physicists to analyze systems of fermions (e.g. clever variational methods) that have not yet been borrowed by DPP users?

Registration is free, but mandatory.

WHERE AND WHEN

Here is a [google map](#) with all relevant places. The workshop will be held at Laboratoires Painlevé and CRISTAL, on the campus of Univ.

The 2019 Lille workshop on "DPPs and fermions"



GUEST SPEAKERS

[Odile Macchi](#), Académie des Sciences, France. [Slides](#)

[Hans Zessin](#), Univ. Bielefeld, Germany

[Luis Daniel Abreu](#), Acoustics research institute Vienna, Austria

[Douglas Lundholm](#), Dept. of mathematics, KTH Stockholm, Sweden. [Slides](#)

[Grégory Schehr](#), CNRS & Lab. de physique et modèles statistiques, Univ. Paris-Saclay, France. [Slides](#)

[Pascal Degiovanni](#), CNRS & Lab. de physique, ENS Lyon, France. [Slides](#)

[Chris Westbrook](#), CNRS & Lab. Fabry, Institut d'Optique, Paris, France. [Slides](#)

[Jérémié Bouttier](#), Institut de physique théorique, CEA Saclay, France & Lab. de physique, ENS Lyon, France. [Slides](#)

Titles and abstracts can be [downloaded here](#).

SCHEDULE

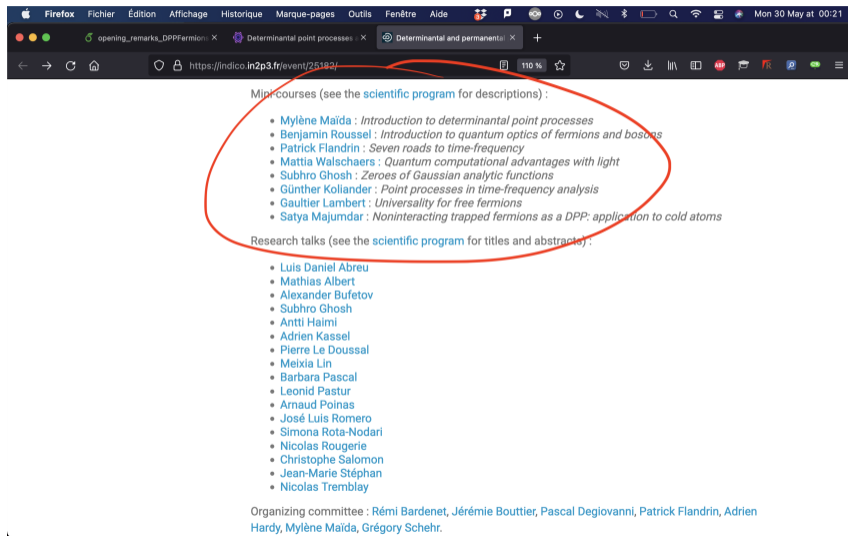
Please see the online [schedule](#). **Beware that some last minute changes have been done.**

BACKGROUND MATERIAL AND OUTPUT

One of the challenges of interdisciplinary meetings is to determine a common vocabulary. [Here](#) is a document that introduces notation, and gives suggestions of topics to discuss at the workshop. Depending on the outcome of the workshop, the document can be a basis for a note that we collectively write to report our discussions.

FOOD AND DRINKS

This workshop: overview



Firefox Fichier Édition Affichage Historique Marque-pages Outils Fenêtre Aide

opening_remarks_DPPFermion x Determinantal point processes x Determinantal and permanental x +

https://indico.in2p3.fr/event/25182/

110 %

Mini-courses (see the [scientific program](#) for descriptions) :

- Mylène Maïda : *Introduction to determinantal point processes*
- Benjamin Roussel : *Introduction to quantum optics of fermions and bosons*
- Patrick Flandrin : *Seven roads to time-frequency*
- Mattia Walschaers : *Quantum computational advantages with light*
- Subhro Ghosh : *Zeros of Gaussian analytic functions*
- Günther Koliander : *Point processes in time-frequency analysis*
- Gaultier Lambert : *Universality for free fermions*
- Satya Majumdar : *Noninteracting trapped fermions as a DPP: application to cold atoms*

Research talks (see the [scientific program](#) for titles and abstracts) :

- Luis Daniel Abreu
- Mathias Albert
- Alexander Bufetov
- Subhro Ghosh
- Antti Haimi
- Adrien Kassel
- Pierre Le Doussal
- Meixia Lin
- Barbara Pascal
- Leonid Pastur
- Arnaud Poinas
- José Luis Romero
- Simona Rota-Nodari
- Nicolas Rougerie
- Christophe Salomon
- Jean-Marie Stéphan
- Nicolas Tremblay

Organizing committee : Rémi Bardenet, Jérémie Bouttier, Pascal Degiovanni, Patrick Flandrin, Adrien Hardy, Mylène Maïda, Grégory Schehr.

Acknowledgments

We acknowledge support from

- ▶ LABEX MILYON,
- ▶ ERC BlackJack,
- ▶ ANR Dimers and QuSig4QuSense,
- ▶ Laboratoire de Physique (ENS Lyon),
- ▶ Institut de Physique Théorique (Saclay).



Special thanks to...

- ▶ our administrators Carine Sevestre, Laurence Mauduit (Lyon), Sonia Waskowiak (Lille), and to all the support staff from ENS Lyon and Labex Milyon.
- ▶ Maxime Leroy for the recording and diffusion (IPhT Saclay).

week 1 programme

lundi 30 mai 2022	mardi 31 mai 2022	mercredi 1 juin 2022	jeudi 2 juin 2022	vendredi 3 juin 2022	samedi 4 juin 2022	dimanche 5 juin 2022
	09:00 Mylène Maida : Introduction to determinantal point processes (2/2)	09:00 Benjamin Roussel : Introduction to quantum optics of electrons and photons (2/2)	09:00 Patrick Flandrin : Seven roads to time-frequency (1/2)	09:00 Patrick Flandrin : Seven roads to time-frequency (2/2)		
10:45 Introduction	10:30 Coffee break	10:30 Coffee break	10:30 Coffee break	10:30 Coffee break		
11:00 Mylène Maida : Introduction to determinantal point processes (1/2)	11:00 Subhro Ghosh : Gaussian analytic functions, their zeros and applications (1/2)	11:00 Matthia Walschaers : Quantum computational advantages with light (1/2)	11:00 Günther Koliander : Point Processes in Time-Frequency Analysis (1/2)	11:00 Matthia Walschaers : Quantum computational advantages with light (2/2)		
12:30 Lunch	12:30 Lunch	12:30 Lunch	12:30 Lunch	12:30 Lunch		
				14:00 Günther Koliander : Point Processes In Time-Frequency Analysis (2/2)		
14:30 Satya Majumdar : Noninteracting Trapped Fermions as a DPP: Application to cold atoms (1/2)	14:30 Satya Majumdar : Noninteracting Trapped Fermions as a DPP: Application to cold atoms (2/2)		14:30 Gaultier Lambert : Universality for free fermions (2/2)			
16:00 Coffee break	16:00 Coffee break		16:00 Coffee break			
16:30 Benjamin Roussel : Introduction to quantum optics of electrons and photons (1/2)	16:30 Gaultier Lambert : Universality for free fermions (1/2)		16:30 Subhro Ghosh : Gaussian analytic functions, their zeros and applications (2/2)			
19:00 Cocktail						

Miscellanea

- ▶ we will put the slides online.
- ▶ during breaks, you can use Amphi A, Passerelle, or room M7.101 on first floor.
- ▶ there is a whatsapp group for organizing drinks, dinners, games, sport, work sessions, or whatever social event you want to advertise.

<https://chat.whatsapp.com/HRJCY15f0h12V3zD8cwKkT>