

## Journée GAMoC 2026



Château les Muids, 1er juillet 2026

### Programme

- 9H : Départ du LIFO
- 9h30-12h30, pause comprise
  - **Florent Becker:** Everybody wants to be a seed: arbitrary single-tile seeds in the abstract Tile Assembly Model
  - **Joanne Dumont:** On the Parameterized Complexity of Broadcast Independence and Broadcast Packing
  - **Varad Joshi:** Polynomial Delay Enumeration of Maximal Induced Subgraphs with Fixed Parameters
  - **Nicolas Ollinger:** Discrete Derivatives of Recognizable Series
- 12h30-14h30 : déjeuner
- 14h30 - 16h30, pause comprise
  - **Caroline Brosse et Mathieu Liedloff:** Décider, compter, énumérer
  - **Sylvain Gay:** Informative Trains: A Memory-Efficient Journey to a Self-Stabilizing Leader Election Algorithm in Anonymous Graphs
- 16h30 - 17h : réunion d'équipe
- 17h30 : retour LIFO

### Résumés

#### **Florent Becker: Everybody wants to be a seed: arbitrary single-tile seeds in the abstract Tile Assembly Model**

Joint work with Marie de Sainte Marie

Winfree's abstract Tile Assembly Model (aTAM) is one of the most popular abstract model for DNA nano-computing. This papers presents a seedless version of the aTAM. Instead of a designated seed assembly, any single isolated tile can initiate the assembly. This paper shows that such system can simulate any aTAM system at constant scale and it presents a tile set to do so. All systems can be simulated at scale at most 10 and most of them can be simulated at scale 5, provided that their seeds are large enough.

Removing the need for seed in self-assembly is a new way of solving the nucleation problem, that is, the problem of controlling the initialisation of any self-assembly process. It also allows for a convergence of the aTAM towards other classical tiling models, such as Wang's.

The systems presented work with a *pseudo-seed* and *modular* macrotiles. The pseudo-seed self-assembles from any isolated tile and it represents the seed of the simulated system with an Hamiltonian cycle along the borders of the corresponding macrotiles. The modules of the “regular” macrotiles depend on each other to self-assemble. Careful design of the construction ensures that a macrotile self-assembles only when interacting either with the pseudo-seed or with previously completed macrotiles.

### **Joanne Dumont: On the Parameterized Complexity of Broadcast Independence and Broadcast Packing**

Joint work with Edouard Némery, Anthony Perez and Florian Sikora

A broadcast on graphs models is a natural and well-studied way to capture limited-range transmissions.

Formally, a broadcast on a connected graph  $G = (V, E)$  is a function  $f$  that assigns each vertex  $v$  an integer  $f(v)$  with  $f(v)$  in  $[0, \text{ecc}(v)]$  where  $\text{ecc}(v)$  denotes the eccentricity of  $v$ . A vertex  $u$  hears a broadcasting vertex  $v$  (with  $f(v) > 0$ ) if  $u$  is at distance at most  $f(v)$  from  $v$ .

Beyond the classical broadcast domination problem, where every vertex is required to hear at least one vertex, two variants

raise intriguing combinatorial and algorithmic questions. In an independent broadcast, no broadcasting vertex hears another broadcasting vertex, while a broadcast packing requires that every vertex hears at most one broadcasting vertex.

The corresponding problems Broadcast Independence and Broadcast Packing ask for broadcasts of value at least  $k$  under these constraints, where the value is the sum of the broadcast values.

In our paper, we initiate a systematic study of the parameterized complexity of such problems. This presentation will overview most of our main results, which are both positive, with algorithms, and negative, with proofs of  $W[1]$ -hardness, and detail one of them: a constant-factor approximation algorithm parameterized by treewidth for Broadcast Independence.

### **Nicolas Ollinger: Discrete Derivatives of Recognizable Series**

We introduce a discrete derivative  $\Delta_0 f$  for recognizable series  $f$  over a free monoid, defined with respect to the letter 0.

For a series  $f$  given by a linear representation  $(\lambda, \mu, \gamma)$  of dimension  $n$ , the series  $\Delta_0 f$  associates to every word  $w$  a linearly recurrent sequence whose recurrence polynomial is the minimal polynomial of  $\mu(0)$ . We give an explicit construction of a linear representation for  $\Delta_0 f$  with output matrix of size  $n \times 2n$ , and show that the class of recognizable series is closed under  $\Delta_0$  and its inverse  $I_0$ . In the setting of (mostly prefix-closed) abstract numeration systems (ANS), these results yield closure of ANS-regular sequences under discrete derivation and integration. We use this machinery to characterize sequence automata and extend the effective combinatorics on words exploration tools in the realm of regular sequences. As a concrete application, we derive the factor complexity of a substitutive sequence by composing Walnut and elementary ANS operations.

### **Caroline Brosse et Mathieu Liedloff: Décider, compter, énumérer**

### **Varad Joshi: Polynomial Delay Enumeration of Maximal Induced Subgraphs with Fixed Parameters**

Joint work with Caroline Brosse and Ioan Todinca

Given a graph, finding a maximum induced subgraph with some property is often NP-hard. However, for many properties, finding one maximal induced subgraph satisfying the property is easy and efficient. A natural extension is to find all maximal induced subgraphs with the property efficiently. Since there could be exponentially many such maximal induced subgraphs, the complexity of enumeration is measured by the delay between two outputs.

We prove that for some parameters, enumerating maximal induced subgraphs with some small parameters can be done efficiently, with polynomial delay between two outputs.

## **Ioan Todinca: What Can Be Computed Locally Revisited: First-Order Logic on Sparse Graphs in Distributed Computing**

(Annulé faute de temps, mais disponible en visio en version séminaire du GT graphes du GRD Informatique fondamentale et ses mathématiques)

Joint work with Lélia Blin, Fedor V. Fomin, Pierre Fraigniaud, Sylvain Gay, Petr A. Golovach, Pedro Montealegre and Ivan Rapaport

Algorithmic meta-theorems are results of the form “every computational problem that can be formalised in a given logic  $L$  can be solved efficiently on every class  $C$  of [graphs] satisfying certain conditions” [Kreutzer 2011]. They have become central to classical (sequential) graph theory since Courcelle’s theorem in the 1990s, with numerous recent developments, particularly on first-order logic. We are currently witnessing the gradual introduction of algorithmic meta-theorems into distributed computing, initiated by [Feuilleloy, Bousquet, Pierron, PODC 2022].

My presentation will begin with an easily accessible introduction to distributed computing, in particular to the CONGEST model, in which the nodes of a network communicate in synchronous rounds by exchanging “small” messages (of logarithmic size) with their neighbours. The aim is to collectively solve a task in a small number of rounds. We shall see that, in distributed computing, even the decision of simple properties such as “the graph has no 4-vertex cycle” or “the graph has at most one vertex of degree 3” encounters barriers of congestion or (non-)locality. Both problems are expressible in on first-order logic (FO).

In the second part, I will discuss the decision of FO problems in graph classes of bounded expansion. We shall see that sequential FO model-checking extends to the CONGEST model, in  $O(\text{Diameter} + \log n)$  rounds, notably thanks to the low tree-depth colouring tools for these classes. For local FO formulas  $\varphi(x)$  (whose truth depends only on a ball of constant radius around  $x$ , such as “ $x$  has a twin”), we have shown that all vertices satisfying the formula can be marked in  $O(\log n)$  rounds, answering a question posed by [Nešetřil, Ossona de Mendez, Distributed Computing 2016].

## **Sylvain Gay: Informative Trains: A Memory-Efficient Journey to a Self-Stabilizing Leader Election Algorithm in Anonymous Graphs**

Joint work with Lélia Blin and Isabella Ziccardi

We study the self-stabilizing leader election problem in anonymous  $n$ -nodes networks. Achieving self-stabilization with low space memory complexity is particularly challenging, and designing space-optimal leader election algorithms remains an open problem for general graphs. In deterministic settings, it is known that  $\Omega(\log \log n)$  bits of memory per node are necessary [Blin et al., Disc. Math. & Theor. Comput. Sci., 2023], while in probabilistic settings the same lower bound holds for some values of  $n$ , but only for an unfair scheduler [Beauquier et al., PODC 1999]. Several deterministic and probabilistic protocols have been proposed in models ranging from the state model to the population protocols. However, to the best of our knowledge, existing solutions either require  $\Omega(\log n)$  bits of memory per node for general worst case graphs, or achieve low state complexity only under restricted network topologies such as rings, trees, or bounded-degree graphs.

In this paper, we present a probabilistic self-stabilizing leader election algorithm for arbitrary anonymous networks that uses  $\Omega(\log \log n)$  bits of memory per node. Our algorithm operates in the state model under a synchronous scheduler and assumes knowledge of a global parameter  $N = \Theta(\log n)$ . We show that, under our protocol, the system converges almost surely to a stable configuration with a unique leader and stabilizes within  $O(\text{poly}(n))$  rounds with high probability. To achieve  $O(\log \log n)$  bits of memory, our algorithm keeps transmitting information after convergence, i.e. it does not verify the silence property. Moreover, like most works in the field, our algorithm does not provide explicit termination detection (i.e., nodes do not detect when the algorithm has converged).