Date: 15 décembre 2022

Lieu: Salle Gilles Kahn, Bâtiment Turing, LIX

Programme:

8h45: Pause café et acceuil

9h15: Présentation du laboratoire

Présentation du laboratoire et de ses équipes (20').

9h35: Exposé scientifique:

Sami Zhioua, **"Causality to address ethical issues in AI"**, (*équipe Comete*) (20')

9h55: Pause café (15')

10h10: Démos:

Démos (en sous-groupes)

- de l'équipe Cosynus 2* 1/2 groupe
- de l'équipe Cedar 2* 1/2 groupes

* **ConnectionLens: intégration de données hétérogènes pour le journalisme d'investigation**
* **StatCheck: vérification d'affirmation statistiques**

11h10: Exposés de doctorant(e)s

Exposé d'anciens éleves et étudiant(e)s de l'ENS Paris-Saclay:

- Quentin Canu, **"Formalisation de Calculs Polyédraux"** (15')
- Manon Blanc, **"Calculabilité et complexité sur les réels: un aperçu"**, (15')

11h40: Repas

Repas au Magnan (restaurant de l'Ecole polytechnique)

13h05: Présentation de la recherche en informatique graphique

Présentation de la recherche en informatique graphique au LIX: un aperçu,
par:
Pooran Memari (*équipe Geomerix*)
Damien Rohmer (*équipe VISTA*) (30' au total)

13h35: Exposés scientifiques:

- Yanlei Diao (12') **"Big data and cloud computing for the common good"** (*équipe Cedar*)
- Oana Goga (12') **"Can we safeguard the micro-targeting of political ads?"** (*équipe Cedar*)

14h00: Exposé scientifique:

Daniel Augot, **"A gentle introduction of verifiable computation and its use in blockchains."**
(*équipe Grace*) (25')

14h25: Pause café

14h35: Exposé scientifique:

Jérémie Bettinelli, **"Du monde discret au monde continu"** (*équipe Combi*) (25')

15h00: Exposé scientifique:

Joris van der Hoeven, **"Sparse polynomial interpolation"** (*équipe Max*, résumé plus bas, 25')

15h25: Exposé scientifique:

Sergio Mover, **"Hierarchical Reinforcement Learning via Set-Based Reachability Analysis"** (*équipe Cosynus*)
(résumé plus bas, 25')

15h50: Pause café

16h00: Séminaire du laboratoire:

> LIX seminar: Martin Krejca, **"Infectious Diseases in the SIRS Model Are Epidemic on Expanders"** (*équipe AlCo*)
> Séminaire du laboratoire LIX.
> (résumé plus bas, 1h)

17h00: fin

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Quelques résumés des exposés / abstracts of the talks

- **Talk of Sergio Mover**:
  - Title: Hierarchical Reinforcement Learning via Set-Based Reachability Analysis
  - Abstract:
    Hierarchical Reinforcement Learning (HRL) allows autonomous agents (e.g., robots, drones) to achieve complex tasks without any human intervention. However, HRL still fails to learns how to accomplish complex tasks requiring to execute a long sequence of actions. A main reason for the failure is due to the difficulty of learning, automatically, a hierarchical representation coherent with the agent “primitive” actions (e.g., apply an acceleration to move). In this talk, we describe how algorithms that reason on sets of states, usually employed in formal verification, allow to learn a hierarchy of tasks that can solve complex problems efficiently.
  - Joint work with Mehdi Zadem, Sao Mai Nguyen, and Sylvie Putot.

- **Talk of Martin Krejka**:
  - Title Infectious Diseases in the SIRS Model Are Epidemic on Expanders
  - Abstract
    The SIRS model is an abstract representation of an infectious disease on a graph in which susceptible (S) vertices become infected (I) when adjacent to an infected vertex, infected vertices become recovered (R) and are immune to becoming infected, and recovered vertices become susceptible again. Each transition occurs at a certain (random) rate.

    An important question for such models is for which topologies and rates the respective disease is epidemic, that is, it survives for a long time in expectation. The rate of infection for which a process is epidemic is known as the epidemic threshold (for a given graph). For a reduced variant of the SIRS model, which removes the recovered state from the

process, known as the SIS model, epidemic thresholds on various graph classes are known. Most strikingly, stars have a very low epidemic threshold for the SIS model. Surprisingly, for the SIRS model, no such mathematical guarantees existed so far.

In this talk, I present the very first rigorous results for the epidemic threshold of the SIRS model. Our focus are the high-level ideas of our proofs. We show that, in stark contrast to the SIS model, the SIRS model has, for a large regime of the recovery rate, an expected polynomial survival time on stars, regardless of the infection rate. However, on expander graphs, the epidemic threshold is similar to that of the SIS model and thus very low. This result even holds if the expander is a subgraph, which is far from trivial in the SIRS model.

- **Joris van der Hoeven** (MAX team, computer algebra)
  - **Title:** *Sparse polynomial interpolation*
  - **Abstract:**
    Computer algebra deals with exact computations with mathematical formulas. Often, these formulas are very large and often they can be rewritten as polynomials or rational functions in well chosen variables. Direct computations with such expressions can be very expensive and may lead to a further explosion of the size of intermediate expressions. Another approach is to systematically work with evaluations. For a given problem, like inverting a matrix with polynomial coefficients, evaluations of the solution might be relatively cheap to compute. Sparse interpolation is a device that can then be used to recover the result in symbolic form from sufficiently many evaluations.
    In our talk, we will survey some classical results on this technique.