Activity Report 2019

Team LOGICA

Logic and Applications

D4 – Language and Software Engineering

1 Team composition

Researchers and faculty

Sophie Pinchinat, PR University of Rennes 1
François Schwarzentruber, MCF ENS Rennes
Tristan Charrier, ATER (until August 2019)

Associate members

Hans van Ditmarsch, CNRS, LORIA (Nancy), IMSc (Chennai)

Research engineers, technical staff

Didier Vojtisek, Engineer, INRIA (20%)

PhD students

Arthur Queffelec
Florence Wacheux
Sbastien L Cong (until mid-November 2019)

Administrative assistant

Fanny Banor (until April 2019)
Sophie Maupil (from May 2019)

2 Overall objectives

2.1 Overview

The LogicA team studies theoretical and practical aspects of *multi-agent systems* (MAS). A MAS is composed of agents that are autonomous entities deciding by themselves which actions to perform in order to meet their objectives.

The notion of multi-agent system is finding a wide range of applications: multi-robot systems (e.g. drones), web services, distributed systems, decentralized control, cyberphysical systems, games, etc. Therefore, an agent could be either a physical entity, a computer program, or a human being. Its behaviour can be cooperative, adverserial, or malicious.

Interestingly, agents in a MAS do not have in general perfect information about the world. Their decisions are taken on the basis on the current information they have; note that this information has a dynamics due to events occurring over time.

Reasoning about MAS requires their formal modeling and the development of theories. Such theories should support their deployment in practice, by providing guarantees and certification of their proper functioning. This can be achieved by different means: verification (model-checking), automated generation (synthesis), and coordination mechanisms between agents (control/orchestration/choregraphy/communication).

The LogicA group contributes to develoing innovative ideas in these lines. The focus is put on logical approaches where both the models of MAS and languages for the specification of their properties lead to effective methods.

Additionally to contributing to the foundations of MAS, the LogicA group investigates two application domains: multi-drone rescue missions (with plan synthesis) and risk analysis in MAS (with of attack tree specifications).

2.2 Scientific foundations

The LogicA project follows three main research lines.

Epistemic logics and logics of information change When agent interaction issues are concerned, ability to reason about knowledge is central. To this aim, epistemic logic has been extensively studied [FHMV95], and recent extensions that take dynamics into account draw the attention of a growing community of logicians and computer scientists (see for instance the very much cited book [vvK08] and the recent ERC grant on epistemic protocols coordinated by Hans van Ditmarsch (DR CNRS, LORIA). The LogicA project explores variants of epistemic logic that can easily mix with time, in order to reason about information change along time. As mixing knowledge and time easily yields to high complexity and even undecidability [HV89], the challenge is to identify settings

[FHMV95] R. Fagin, J. Halpern, Y. Moses, M. Vardi, *Reasoning about knowledge*, MIT Press, 1995.

[vvK08] H. van Ditmarsch, W. van der Hoek, B. Kooi, *Dynamic Epistemic Logic*, Springer, Dordecht, 2008.

[HV89] J. Y. Halpern, M. Y. Vardi, "The complexity of reasoning about knowledge and time. 1. Lower bounds", *Journal of Computer and System Sciences 38*, 1, 1989, p. 195–237.

where the formalism would enjoy good computational features while being expressive enough to capture useful properties.

Strategic reasoning and automata-theoretic approaches Modeling strategic abilities is central for reasoning about MAS. We plan to carry on with logical formalism that were already proved or are currently foreseen as powerful approaches in many exciting domains, including software tools for information system security, robot teams with sophisticated adaptive strategies, and automatic players capable of beating expert human adversary, just to cite a few. All these examples share the challenge of developing novel theories and tools for agent-based reasoning that take into account the likely behavior of "adversaries".

The natural setting for strategic reasoning is not surprisingly the one of multi-player games with imperfect information. Although discouraging results from the literature shows that three-player games with safety objectives are undecidable [PRA01], there are however promising results which show that some classes may be manageable. Basically, undecidability comes from the ability for some players to form a coalition: the resulting binary indistinguishability relation of the coalition would correspond to the intersection of the relations of its respective members. Now, it is well-known that intersection of binary relations yields more complex relations that may exit decidable classes (e.g. for membership or emptiness), like e.g., rational relations. Note that such phenomenon cannot arise in two-player games where safety objectives can be solved by a simple (although costly) power-set construction [Rei84]. Also, undecidability becomes even "stronger" when dealing with more realistic objectives for epistemic properties, such as seeking a strategy of agent A such eventuallty "agent B does know Property P until agent C knows it".

The LogicA group contributes in the development of logics that make a trade-off between expressiveness and decidability/tractability.

Formal approaches for the design of attack trees Whether it is physical security, environmental security, or information technology environments, ensuring security requires preliminary investigations to identify and evaluate risks that threaten the system under consideration. This is what the *risk analysis* [ISO05,ISO13,Sch07] discipline is about.

While many approaches to risk assessment and analysis exist, and the methodologies differ from country to country, from industry to academia, and from organization to organization, some security modelling approaches applied in risk analysis are being adopted across these boundaries. For example, the 2008 NATO Improving Common

[PRA01] G. Peterson, J. Reif, S. Azhar, "Lower bounds for multiplayer noncooperative games of incomplete information", *Computers & Mathematics with Applications 41*, 7, 2001, p. 957–992.

[Rei84] J. H. Reif, "The complexity of two-player games of incomplete information", *Journal of computer and system sciences 29*, 2, 1984, p. 274–301.

[ISO05] ISO, Geneva, Switzerland, *Norm ISO/IEC 27002 - Information Technology - Security Techniques - Code of Practice for Information Security Management*, edition ISO/IEC 27002:2005, 2005, Section 9.

[ISO13] ISO, Geneva, Switzerland, *Norm ISO/IEC 27002 2013 - Information Technology - Security Techniques - Code of Practice for Information Security Management*, edition ISO/IEC 27002:2013, 2013, Section 11 "Physical Security Management".

[Sch07] E. E. Schultz, "Risks due to the Convergence of Physical Security and Information Technology Environments", *Inf. Secur. Tech. Rep. 12*, 2007, p. 80–84.

Security Risk Analysis report [RR08] and the 2013 OWASP CISO Application Security Guide [OWA13] recommend the use of *attack trees* to handle the threat assessment task. DARPA has applied attack trees in their Information Assurance live experiments [Lev03, KB01]. Recently, an excellent state-of-art survey by Kordy et al. [KPCS14] has shown that attack trees have been extensively studied by the scientific community and are widely accepted within the industry.

Indeed, attack trees [Sch99] provide a systematic way of describing the vulnerability of a system, taking various types of attacks into account. Strengths of attack trees combine two aspects: first, an *intuitive representation of possible attacks* and second, *formal mathematical frameworks for analyzing them* in a qualitative or a quantitative manner [MO06,KMRS14].

This research line contributes to the development of mathematical foundations for attack trees and of a tool to assist security experts in their design.

2.3 Application domains

2.3.1 Assistance on Attack tree design

Participants: Sbastien L Cong, Sophie Pinchinat, François Schwarzentruber, Florence Wacheux.

Attack trees (see Figure 1) are convenient graphical models for experts that gather possible attacks against a system, and perform many sorts of reasoning about the vulnerabilites of the system. Their design is a critical step when the considered system is complex, for being tedious and error-prone. Proposal towards a (semi)automation of the process if therefore very welcome.

Our work in this area focuses on formal methods dedicated to the design and or the analysis of attack trees.

[RR08] N. Research, T. O. (RTO), "Improving Common Security Risk Analysis", *research report number AC/323(ISP-049)TP/193*, North Atlantic Treaty Organisation, University of California, Berkeley, 2008.

[OWA13] OWASP, "CISO AppSec Guide: Criteria for Managing Application Security Risks", 2013.

[Lev03] D. Levin, "Lessons Learned in Using Live Red Teams in IA Experiments", *in : 3rd DARPA Information Survivability Conference and Exposition (DISCEX-III 2003)*, p. 110–119, 2003.

[KB01] D. L. Kewley, J. F. Bouchard, "DARPA Information Assurance Program dynamic defense experiment summary", *Systems, Man and Cybernetics, Part A: Systems and Humans, IEEE Transactions on 31*, 4, 2001, p. 331–336.

[KPCS14] B. Kordy, L. Piètre-Cambacédès, P. Schweitzer, "DAG-Based Attack and Defense Modeling: Don't Miss the Forest for the Attack Trees", *Computer Science Review*, 2014, DOI: 10.1016/j.cosrev.2014.07.001.

[Sch99] B. Schneier, "Attack Trees", *Dr. Dobb's Journal of Software Tools 24*, 12, 1999, p. 21–29, `http://www.ddj.com/security/184414879`.

[MO06] S. Mauw, M. Oostdijk, "Foundations of Attack Trees", *in : ICISC'05*, D. Won, S. Kim (editors), *LNCS*, *3935*, Springer, p. 186–198, 2006, `http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.97.1056`.

[KMRS14] B. Kordy, S. Mauw, S. Radomirović, P. Schweitzer, "Attack–Defense Trees", *Journal of Logic and Computation 24*, 1, 2014, p. 55–87.

2.3.2 Drones

Participants: François Schwarzentruber, Ocan Sankur and Arthur Queffelec.

A number of use cases of planning rose in information-gathering missions from the development of unmanned autonomous vehicles (UAVs). For instance, in search and rescue missions, a fleet of drones can cover a lot of ground in a short amount of time and report any finding to a mission supervisor to narrow the search for the rescue team. Other examples are the analysis of terrain for smart farms and in hazardous locations. For this kind of missions, the information gathered is used for decision making at a supervising station. Thus, the drones need to be constantly in communication with the station to report the gathered information during the mission. The use of multiple UAVs to cover an area not only reduces the time required to complete the mission but can also enable reaching locations which would not be reachable with a single drone due to connection constraints.

3 Scientific achievements

3.1 Epistemic reasoning in multi-agent systems

3.1.1 Symbolic model checking of public announcement protocols

Participants: Tristan Charrier, Sophie Pinchinat, Franois Schwarzentruber.

Published in the Journal of Logic and Computation, Volume 29

We study the symbolic model checking problem against public announcement protocol logic (PAPL), featuring protocols with public announcements, arbitrary public announcements and group announcements. Technically, symbolic models are Kripke models whose accessibility relations are presented as programs described in a dynamic logic style with propositional assignments. We highlight the relevance of such symbolic models and show that the symbolic model checking problem against PAPL is Apol-Exptime-complete as soon as announcement protocols allow for either arbitrary announcements or iteration of public announcements. However, when both options are discarded, the complexity drops to Pspace-complete.

3.1.2 Reachability Games in Dynamic Epistemic Logic

Participants: Bastien Maubert, Sophie Pinchinat, Franois Schwarzentruber.

Presented at 28th International Joint Conference on Artificial Intelligence (IJCAI 2019)

We define reachability games based on Dynamic Epistemic Logic (DEL), where the players? actions are finely described as DEL action models. We first consider the setting where a controller with perfect information interacts with an environment and aims at reaching some desired state of knowledge regarding the observers of the system. We

study the problem of existence of a strategy for the controller, which generalises the classic epistemic planning problem, and we solve it for several types of actions such as public announcements and public actions. We then consider a yet richer setting where observers themselves are players, whose strategies must be based on their observations. We establish several decidability and undecidability results for the problem of existence of a distributed strategy, depending on the type of actions the players can use, and relate them to results from the literature on multiplayer games with imperfect information.

3.1.3 A roadmap of decidability and complexity results for DEL-based epistemic planning

Participants: Thomas Bolander, Tristan Charrier, Sophie Pinchinat, Franois Schwarzentruber.

Epistemic planning can be used for decision making in multi-agent systems with distributed knowledge and capabilities. Dynamic Epistemic Logic (DEL) has been shown to provide a very natural and expressive framework for epistemic planning. In this paper, we present a systematic overview of known complexity and decidability results for epistemic planning based on DEL, as well as provide some new results and improved proofs of existing results based on reductions between the problems.

3.2 Reachability and Coverage Planning for Connected Agents

Participants: Tristan Charrier, Arthur Queffelec, Ocan Sankur, Franois Schwarzentruber.

Presented at 18th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2019) (short paper) and the 28th International Joint Conference on Artificial Intelligence (IJCAI 2019)

Motivated by the increasing appeal of robots in information-gathering missions, we study multi-agent path planning problems in which the agents must remain interconnected. We model an area by a topological graph specifying the movement and the connectivity constraints of the agents. We study the theoretical complexity of the reachability and the coverage problems of a fleet of connected agents on various classes of topological graphs. We establish the complexity of these problems on known classes, and introduce a new class called sight-moveable graphs which admit efficient algorithms.

3.3 Security

3.3.1 Attack Trees: A Notion of Missing Attacks

Participants: Sophie Pinchinat, Florence Wacheux, Yann Thierry-Mieg, Barbara Fila.

Presented at the 6th International Workshop on Graphical Models for Security

Attack trees (see Figure 1) are widely used for security modeling and riskanalysis. Classically, an attack tree combines possible actions of the attacker into attacks. In most existing approaches, an attack tree represents generic ways of attacking a system, but without taking any specific system or its configuration into account. This means that such a generic attack tree may contain attacks that are not applicable to the analyzed system, and also that a given system could enable some attacks that the attack tree did not capture.To overcome this problem, we extend the attack tree setting with a model of the analyzed system, allowing us to introduce precise path semantics of an attack tree and to define missing attacks. We investigate the missing attack existence problem and show how to solve it by calls to the NP oracle that answers thetrace attack tree membership problem; thelatter problem has been implemented and is available as an open sourceprototype.

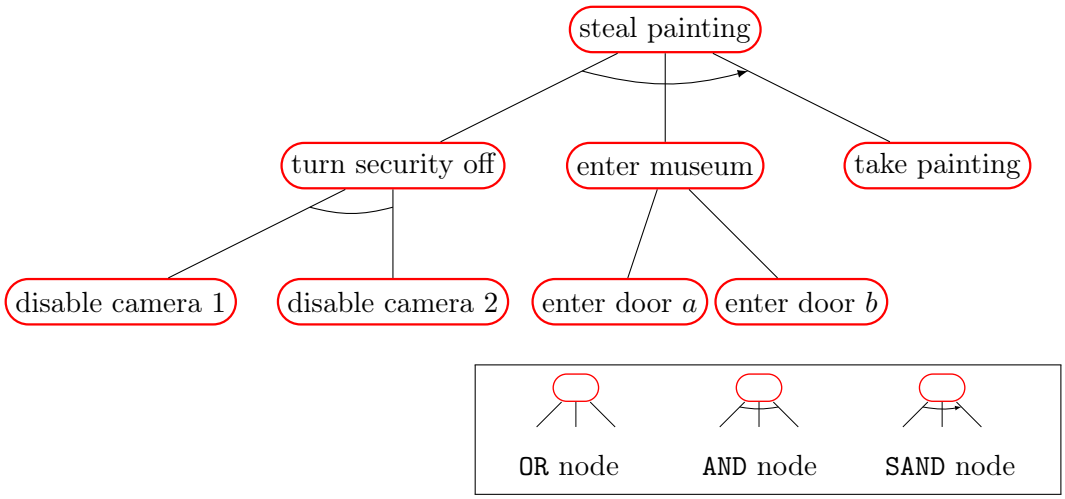

Figure 1: Toy example of an attack tree for stealing a painting in a museum with two doors, protected by two security cameras.

3.3.2 Library-based Attack Tree Synthesis

Participants: Sbastien L Cong , Sophie Pinchinat, Franois Schwarzentruber.

Attack trees are useful for experts to depict possible attacks against a system, whether physical or virtual. There design is tedious and error-prone so that proposal towards a (semi)automation of the process if very welcome. Here, we consider the most standard formalism for attack trees with disjunction (OR), conjunction (AND), and sequential conjunction (SAND) and build upon (1) an established trace language semantics, and (2) a reasonable formal notion of attack pattern library to define the attack tree synthesis problem. That is, the existence of an attack tree stemming from a given library and explaning a given trace. We show that this synthesis problem is NP-complete. The NP membership relies on an involved adaptation of the so-called Cocke-Younger-Kasami parsing algorithm, The NP hardness is established via a reduction from a recent covering problem. Finally, we show that the addressed synthesis problem collapses down to P for bounded-AND-arity libraries. Finally, we develop a

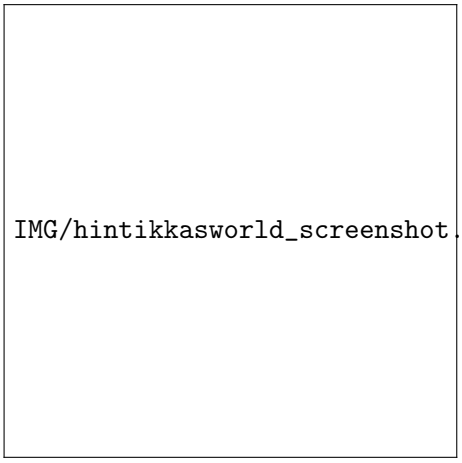

Figure 2: Screenshot of the pedagogical tool *Hintikka's World*, that was used in tutorials at AAMAS 2019 and IJCAI 2019.

SAT-based approach to implement an attack tree synthesis procedure and discuss conducted experiments.

4 Software development

4.1 Hintikka's World: Scalable Higher-order Knowledge

Participants: Tristan Charrier, Sbastien Gamblin, Alexandre Niveau, Franois Schwarzentruber.

Presented at the demo track at the 28th International Joint Conference on Artificial Intelligence (IJCAI 2019)

Hintikka's World (see Figure 2) is a graphical and pedagogical tool that shows how artificial agents can reason about higher-order knowledge. In this demonstration paper, we present the implementation of symbolic models in Hintikka's World. They enable the tool to scale, by helping it to face the state explosion, which makes it possible to provide examples featuring real card games, such as Hanabi.

4.2 Abat: Attack tree trace membership checking

Participants: Yann Thierry-Mieg, Sophie Pinchinat.

Available at https://github.com/yanntm/Abat

This prototype Abat (see Figure 3) aims at checking whether a given trace is an attack described by a given attack tree. It paves the way towards another tool that exhibits attacks that are missing in an attack tree for a given system, as described in the publication [9].

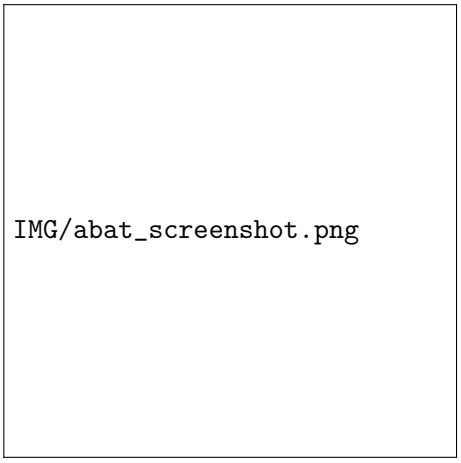

Figure 3: Screenshot of the tool *Abat*, that was used in [].

5 Contracts and collaborations

5.1 International Initiatives

5.1.1 Project EIT Digital UAV-RETINA

Participants: Sophie Pinchinat, Arthur Queffelec, François Schwarzentruber.

- Project type: EIT Digital
- Dates: 2018–2019
- PI institution: Universit de Rennes 1
- Main investigator: Franois Bodin (Universit de Rennes 1)
- Other partners: IRISA,Bruno Kessler Fondation (Trento, Italy), Bright Cape (Netherlands) and PME JCP Connect (France)

UAV-Retina aims at providing search and rescue teams an automated drone platform to gather video in the infra-red and visible spectrum. The developed platform provides long range communications, automated flights computation, image analysis as well as drone-to-cloud connections. The resulting product is commercialised by the Eole-Eyes startup (`http://eole-eyes.irisa.fr/`).

In the logicA team, we formalize the planning problem for drones, study its mathematical properties, and design efficient algorithms that synthesize plans for agents that stay connected.

5.2 National Initiatives

5.2.1 Information Systems and Natural Language Processing

Participants: Sophie Pinchinat, Arthur Queffelec, François Schwarzentruber.

- Project type: Action Exploratoire du Labex Cominlabs
- Dates: February to November 2019
- PI institution: Universit de Rennes 1
- Main investigator: Annie Fort (Universit de Rennes 1)
- Website: `http://www.irisa.fr/prive/foret/ISNLP/`

The project ISNLP is about Artificial Intelligence for education. Its aim is to explore how to help learners by enriching pedagogical texts or softwares. One of the selected field of the project is learning computer science, with a focus on formal topics such as logic, or query languages.

5.3 Bilateral industry grants

Sophie Pinchinat collaborates with the DGA (French Defense Ministry) on Physical Security, supervising the PhD student Florence Wacheux, with Ple d'Excellence Cyber grant fundings. In this context, she collaborates with:

- Yann Thierry-Mieg, LIP6 laboratory in Paris, as a partner in the development of the ATSyRA plate-form (see the section on software),
- Didier Vojtisek, Inria Rennes, and
- Lionel van Aertryck, DGA Matrise de l'information, Bruz.

Since Spetember 2019, she develops a collaboration with the French Start-up SYA, under creation, in order to apply the techniques on attack trees developed in LogicA to cybersecurity. This collaboration is on its way and a contract between the start-up and the University of Rennes should soon be proposed.

5.4 Collaborations

5.4.1 Universit degli Studi di Napoli Federico II

We have a stable collaboration with the research group "Automated Strategic Reasoning (ASTREA) Laboratory" of Aniello Murano at Universit degli Studi di Napoli Federico II. Our common scientific interest is Strategic Reasoning in AI with logical approaches.

The core participants of the project are the following.

- LogicA team, IRISA/Universit de Rennes.
  - Sophie Pinchinat, Full Professor University of Rennes 1/head of LogicA;
  - Franois Schwarzentruber, Lecturer at ENS Rennes/member of LogicA;
- ASTREA team, Dipartimento di Ingegneria Elettrica e Tecnologie dell'Informazione, Universit degli Studi di Napoli Federico II.
  - Aniello Murano, Associate Professor/head of ASTREA;
  - Sasha Rubin, postdoctoral researcher ASTREA;

– Bastien Maubert, postdoctoral fellow/Marie Sklodowska-Curie fellow ASTREA.

The collaboration was supported by University of Rennes 1 with a grant of 3k€(Appel projets communs DRI/DARI), to visit Italian colleagues in Naples and/or to invite them:

Visits to Italy		**Italian visitors**	
Researcher	**Duration**	**Researcher**	**Duration**
Sophie Pinchinat	26-30 dcembre 2019	Bastien Maubert	9-13 dcembre 2019

5.4.2 Hans van Ditmarsch, DR CNRS, CELLO LORIA, Nancy

Collaborateur extrieur (10%) depuis septembre 2019 et pour 2 ans, pour travailler sur des logiques dynamiques pistmiques permettant de raisonner sur le changement d'information des agents d'un systme multi-agent.

Le premier sjour a t programm en janvier 2020.

6 Dissemination

6.1 Promoting scientific activities

6.1.1 Scientific Events Organisation

General Chair, Scientific Chair

- Sophie Pinchinat: Organizer of Second Workshop on Formal Methods and AI (FMAI 2019), 7th International Workshop on Strategic Reasoning at IJCAI 2019
- François Schwarzentruber: Organizer of Second Workshop on Formal Methods and AI (FMAI 2019), 7th International Workshop on Strategic Reasoning at IJCAI 2019

Member of the Organizing Committees

- Sophie Pinchinat: Organizer of Second Workshop on Formal Methods and AI (FMAI 2019)
- François Schwarzentruber: Organizer of Second Workshop on Formal Methods and AI (FMAI 2019)

6.1.2 Scientific Events Selection

Chair of Conference Program Committees

- Sophie Pinchinat: co-Chair of the 26th International Symposium on Temporal Representation and Reasoning (TIME 2019).

Member of Conference Program Committees

- Sophie Pinchinat:
  - (Books) "Temporal Logics in Computer Science: Finite-State Systems Series Number" by Demri, Goranko and Lange (Springer Nature SharedIt Initiative `https://rdcu.be/bQPuV`).
  - (International top conferences)
    - 18th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2019 `http://aamas2019.encs.concordia.ca/index.html`),
    - 28th International Joint Conference on Artificial Intelligence (IJCAI 2019 `https://www.ijcai19.org/`),
    - 34th-Fourth Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2019 `https://lics.siglog.org/lics19/`)
  - (International workshops) 2nd Workshop on Recent Advances in Concurrency and Logic (RADICAL 2019 `https://sites.google.com/site/radicalconcur/`), 6th International Workshop on Graphical Models for Security (GraMSec 2019 `https://www.gramsec.uni.lu/2019/`).
  - (National workshops) 13mes Journes d'Intelligence Artificielle Fondamentale (JFIA 2019 `https://www.irit.fr/pfia2019/jiaf/`).
- François Schwarzentruber:
  - (Article in books) Festschrift for Catuscia Palamidessi
  - (International top conferences)
    - International Conference on Autonomous agents and multiagent systems (AAMAS 2019 `http://aamas2019.encs.concordia.ca/index.html`),
    - International Joint Conferences on Artificial Intelligence (IJCAI 2019 `https://www.ijcai19.org/`) and demonstration track at IJCAI 2019,
    - 33th Advancement of Artificial Intelligence Conference (AAAI 2019 `https://aaai.org/Conferences/AAAI-19/`),
    - Principles and Practice of Multi-Agent Systems (PRIMA 2019 `https://prima2019.di.unito.it/`).

Reviewer

- Sophie Pinchinat: 32nd IEEE Computer Security Foundations Symposium (CSF 2019), 39th Foundations of Software Technology and Theoretical Computer Science conference (FSTTCS 2019), 29th International Conference on Automated Planning and Scheduling (ICAPS 2019), 16th International Colloquium on Theoretical Aspects of Computing (ICTAC 2019).
- François Schwarzentruber: 26th International Symposium on Temporal Representation and Reasoning (TIME 2019), 30th International Conference on Automated

Planning and Scheduling (ICAPS 2019), Thirty-Fourth Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2019), International Conference on Logic, Rationality and Interaction (LORI 2019), Seventeenth conference on Theoretical Aspects of Rationality and Knowledge (TARK 2019)

- Arthur Queffelec: International Joint Conferences on Artifical Intelligence (IJCAI 2019), International Conference on Logic, Rationality and Interaction (LORI 2019), Journes d?Intelligence Artificielle Fondamentale (JIAF 2019), 22nd International Conference on Principles and Practice of Multi-Agent Systems (PRIMA 2019), 26th International Symposium on Temporal Representation and Reasoning (TIME 2019)

6.1.3 Journal

Member of the Editorial Boards

- Sophie Pinchinat: Discrete-event Dynamic Systems `https://www.springer.com/journal/10626`: the focus of this journal is on general theories and methodologies of discrete event dynamic systems (DEDS) and their applications, as well as on practical problems from which some generally applicable theories or methodologies can be formulated. The scope of the journal is defined by its emphasis on the modeling of discrete events by dynamic systems, and on problems of their control and optimization. All papers are peer-reviewed.

  2 assignements in 2019.

Reviewer - Reviewing Activities

- Sophie Pinchinat: IEEE Transaction on Automatic Control (1 article)
- François Schwarzentruber: Artificial Intelligence Journal (1 article)

6.1.4 Invited Talks

- Sophie Pinchinat: "Model checking over infinite structures: Automatic Structures and Regular Automatic Trees", May 31, 2019 at the Centre Fdr en Vrification(working group financed since 2002 by the Belgian National Scientific Research Fund).

6.1.5 Scientific Expertise

- Sophie Pinchinat: Evaluation of a 215k€-budget proposal for the German Israeli Foundation for Scientific Research and Development.

6.1.6 Research Administration

- Sophie Pinchinat is the scientific consultant for the IRISA international affairs.

- Sophie Pinchinat: 4 “Comits de Suivi Individuel du Doctorant” for the Doctoral School Mathstic at University of Rennes 1.
- Sophie Pinchinat: Appointed by the director of IRISA directeur as the PhD student mediator.
- François Schwarzentruber: CSID (Conseil Suivi Individuel Doctorant) de Sbastien Gamblin (universit de Caen), runion le 27 juin 2019. Prsents : Meroua Bouzid et Alexandre Niveau (encadrants), Etienne Grandjean.

6.2 Teaching, supervision

6.2.1 Teaching

- IJCAI2019 tutorial: Tristan Charrier and François Schwarzentruber: Epistemic reasoning in AI
- AAMAS2019 tutorial: Tristan Charrier and François Schwarzentruber: Epistemic reasoning in MAS
- PhD students: Sophie Pinchinat: Scientific mediation, 3h, cole Doctoral MathStic, Rennes
- Agrgation de mathmatiques: François Schwarzentruber, Computability, complexity and logic - 14h, ENS Rennes
- Agrgation SCIF: François Schwarzentruber, Algorithms and data structures - 6h, ENS Rennes, France
- Master 1: François Schwarzentruber, Complexity theory, 24h, ENS Rennes
- Master 1: Sophie Pinchinat, Model-checking, 20h, ENS Rennes
- Master 1: Sophie Pinchinat, Scientific writing, 20h, ENS Rennes
- Master 1: Sophie Pinchinat Advanced Algorithmics, 20h, Universit de Rennes 1
- Bachelor degree: Arthur Queffelec, Object-Oriented Programming, 20h, L2, UR1, France

6.2.2 Supervision

- PhD stopped: Sbastien L Cong, starting October 2017, aborted November 19, 2019, Sophie Pinchinat and François Schwarzentruber.
- PhD in progress: Florence Wacheux, starting October 2018, Sophie Pinchinat and Yann Thierry-Mieg (LIP6).
- PhD in progress: Arthur Queffelec (funded by the project UAV-RETINA), starting September 2018, Ocan Sankur and François Schwarzentruber
- Master 1 Intern: Hai Trung Pham (funded by the project ISNLP), Hintikka's World, Tristan Charrier and François Schwarzentruber
- Master 1 Intern: Adrien Weyl (funded by the project UAV-RETINA), Algorithms for Connected MAPF, Arthur Queffelec and François Schwarzentruber

6.2.3 Juries

- Sophie Pinchinat:

  - Member of the PhD committee of Cody Christopher, entitled "Critical Observations for Model Based Diagnosis: Theory and Practice", Australian National University, Canberra, July 6, 2019.
  - President of the PhD committee of Wojciech Widel, entitled "Formal modelling and quantitative analysis of security using attack-defense trees", Universit de Rennes 1, December 3, 2019.
  - Member of the Habilitation Diriger les recherches de Franois Schwarzentruber, May 5, 2019.
  - 2 oral tests for "Agrgation de mathmatiques", ENS Rennes.

- François Schwarzentruber:
  - Member of the PhD committee of Christopher Leturc, entitled " Raisonner sur la manipulation dans les systmes multi-agents : une approche fonde sur les logiques modales", Universit de Caen, December 2, 2019.
  - 2 oral tests for "Agrgation de mathmatiques", ENS Rennes.

6.3 Popularization

- Sophie Pinchinat contributed indirectly to teaching computer science for 12-year young girl students: she gave a course on Scientific Mediation to IRISA PhD students who took action in middle school.

7 Bibliography

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Doctoral dissertations and "Habilitation" theses

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