UNIVERSITÀ DEGLI STUDI DI MILANO

TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO   **ID CODE 6673**

I the undersigned asks to participate in the public selection, for qualifications and examinations, for the awarding of a type B fellowship at **Dipartimento di Matematica Federigo Enriques dell'Università degli Studi di Milano.**

Scientist in charge: Prof. Ghilardi Silvio

Jérémie Marquès

CURRICULUM VITAE
PERSONAL INFORMATION

Surname	Marquès
Name	Jérémie

PRESENT OCCUPATION

Appointment	Structure
Post-doctoral Fellow	IRIF (Université Paris 7)

EDUCATION AND TRAINING

Degree	Course of studies	University	year of achievement of the degree
Bachelor's Degree (Laurea triennale)	Mathematics	Université Toulouse III (Toulouse, France)	2016
Master's Degree (Laurea Magistrale)	Mathematics	Université Côté d'Azur (Nice, France)	2020
PhD	Mathematics	Université Côté d'Azur (Nice, France)	2023

REGISTRATION IN PROFESSIONAL ASSOCIATIONS

Date of registration	Association	City
November 2023	GT DAAL (Working Group on Data, Automata, Algebra & Logic) GT LHC (Working Group on Logic, Homotopy & Categories) GT SCALP (Working Group on Formal Structures for Calculus and Proofs) These working groups are part of the GDR IFM (research group on theoretical computer science and its mathematics)	NA
July 2023	SMF (Société Mathématique de France), the main professional society of French mathematicians	NA

FOREIGN LANGUAGES

Languages	level of knowledge
French	Native
English	Fluent

TRAINING OR RESEARCH ACTIVITY

In the following, [M1], [M2], [M3] and [M4] refer to documents I have produced and that are listed near the end of this CV.

My work mainly focuses on categorical logic and Stone duality. More specifically, I study *polyadic spaces*, which are hyperdoctrines viewed through the lens of Stone duality. For instance, the Beck-Chevalley property becomes an *interpolation* property. By relaxing the zero-dimensionality condition of Stone, Priestley and Esakia spaces, one obtains a generalization of first-order logic based on compact ordered spaces. I adapted with Sam van Gool [M1] some parts of elementary model theory to these spaces, for instance Makkai conceptual completeness or Craig interpolation for intuitionistic logic.

Several algebraic interpretations of this generalization are possible. I explored mainly two [M4], based on the following dualities for compact ordered spaces:

1. The duality with stably continuous frames. In this case, we get special geometric hyperdoctrines and a connexion to topos theory.

2. The duality based on the unit interval [0,1] as developed among others by Abbadini and Reggio. We obtain a first-order logic very close to the continuous logic of model theorists such as Ben-Yaacov. A generalization of the Katetov-Tong interpolation theorem plays a crucial role there.

I also showed [M4, Chap. 1] that intuitionistic logic generalizes very well in this setting, in particular with respect to the second duality. As an example, Pitts' uniform interpolation holds in the form of an open mapping theorem like in [1]. Algebraically, this means that a certain functor is an S4 hyperdoctrine.

More recently, I have been working on atomic toposes [M3]. They are the classifying toposes of *polyadic sets* (= hyperdoctrines valued in CABA). I showed that a certain known example of pointless atomic topos (the so-called Malitz-Gregory topos) is a counter-example to the conjecture [2] that every locally finitely presentable topos has enough points.

Another source of motivation for me is automata theory. I found two places where polyadic spaces appear there: in the context of equidivisible pseudovarieties of semigroups [M2], and in Bojanczyk's "Monadic Monadic Second Order Logic". I also investigated the basics of finite monoid theory, up to the Krohn-Rhodes decomposition theorem, from a categorical point of view using the *image completion* of a category (chapter 6 of my thesis [M4]).

[1] *An open mapping theorem for finitely copresented Esakia spaces*, S. van Gool, L. Reggio, Topology and its Applications, 2018.

[2] *Topoi with enough points*, I. Di Liberti, M. Rogers, 2024. https://arxiv.org/abs/2403.15338

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PROJECT ACTIVITY

Year	Project
2020-2024	During my PhD I have been a project member in Mai Gehrke's ERC Advanced Grant "Duality in Formal Languages and Logic" (DuaLL). My post-doc with Sam van Gool is also financed by this project.

CONGRESSES AND SEMINARS

Date	Title	Place	Talk title
April 2024	GT DAAL (Data, Automata, Algebra, Logic)	Rennes, France	The Freyd-Schützenberger completion of a category
February 2024	LoVE Seminar	LIPN, Paris, France	Continuous intuitionistic logic
January 2024	Plume Seminar	Lyon, France	A duality between theories of linear orders and profinite monoids
July 2023	Workshop on Resources and Co-Resources	Cambridge, United Kingdom	The Freyd-Schützenberger completion of a category
July 2023	Category Theory 2023	Louvain-la-Neuve, Belgium	Intuitionistic compact ordered spaces (poster)
November 2022	DaLFI (Duality and Logic in the passage from the Finite to the Infinite)	IRIF, Paris, France	A duality between theories of linear orders and profinite monoids
Mai 2022	Workshop on Duality and More	Nice, France	Interpolation and openness in model theory
December 2021	19th International Conference on Relational and Algebraic Methods in Computer Science (RAMiCS 19)	CIRM, Marseille, France	Polyadic spaces and profinite monoids

PUBLICATIONS

Articles in peer-reviewed journals
[M1] *On duality and model theory for polyadic spaces*, Annals of Pure and Applied Logic, 2024, with Sam van Gool. DOI: 10.1016/j.apal.2023.103388

Conference proceedings
[M2] *Polyadic spaces and profinite monoids*, 19th International Conference on Relational and Algebraic Methods in Computer Science (RAMiCS), Marseille (France), 2021. DOI: 10.1007/978-3-030-88701-8_18

Prepublications and other works
[M3] *Atomic Toposes with Co-Well-Founded Categories of Atoms*, 2024, to be submitted to *Theory and Applications of Categories*. https://arxiv.org/abs/2406.14346

[M4] PhD thesis *Categorical logic from the perspective of duality and compact ordered spaces*, 2023, available at https://jeremie-marques.name/papers/thesis.pdf.

OTHER INFORMATION

In 2019, I passed the "Agrégation de mathématiques" in France. It is a French competitive exam for teachers in middle school, high school and the first years of university.

Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

Please note that CV WILL BE PUBLISHED on the University website and It is recommended that personal and sensitive data should not be included. This template is realized to satisfy the need of publication without personal and sensitive data.

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Place and date: Paris, June 20, 2024