# PHDS IN LOGIC XIV

## UNIVERSITY OF GRANADA
October 2023

| | Wesnesday 4th | Thursday 5th | Friday 6th |
|---|---|---|---|
| 8:30-9:00 | **Registration and Kick-Off** | | |
| 9:00-10:30 | *Logic in Mathematics* KS: María José Frapolli | *Fraïssé Banach spaces* KS: Jordi López Abad | *Inductive Inference and Epistemic Modal Logic* KS: Nina Gierasimczuk |
| 10:30-11:00 | *Carnap's Problem, Definability and Compositionality* Pedro del Valle-Inclán | *High analogs of Martin's Axiom* Curial Gallart | *Abduction as deductive saturation* Andrea Sabatini |
| 11:00-11:30 | Coffee break | | |
| 11:30-12:00 | *Universality properties of graph homomorphism* Salvatore Scamperti | *Hybrid Relevant Logic* Mina Young Pedersen | *Non-classical Reasoning with Update-based Implication* Pietro Vigiani |
| 12:00-12:30 | *Degrees of incompleteness of implicative logics* Damiano Fornasiere | *Locally Finite Bi-Intermediate Logics of Trees* Miguel Martins | *Paradoxical sets and the Axiom of Choice* Azul Fatalini |
| 12:30-13:00 | *Definability of henselian valuations in positive characteristic* Margarete Ketelsen and Simone Ramello | *Epsilon Modal Logics* Elio La Rosa | *From Abelian logic to Łukasiewicz unbound* Filip Jankovec |
| 13:00-14:00 | Lunch break | Lunch break | |
| 14:00-14:30 | | The Liar's Revenge KS: Julien Murzi | *An invitation to continuous (and affine) logic* KS: Tomás Ibarlucía |
| 14:30-15:00 | *Modal fuzzy logics: diverging paths* KS: Amanda Vidal | | |
| 15:00-15:30 | | Coffee break | |
| 15:30-16:00 | Coffee break | **Discussing problems together**: *Boolean logic in a system of absolute value equations* or create your own group of discussion! | **Community discussion:** *Role of Logic in Academic Research* |
| 16:00-16:30 | *Modal Logic in the Logic of Sentential Operators* John Lindqvist | | |
| 16:30-17:00 | *Deep Inference Sequent Calculi for Team-based Logics* Aleksi Anttila | | |
| 17:00-18:00 | Poster session 1 | Poster session 2 | **Visit to Arab neighborhoods of Granada** |
| 18:00-20:00 | | | |
| 19:30-21:00 | | **Conference Dinner** | |
| 21:30-22:30 | | **Flamenco concert** | |

If you have any questions or comments during the conference, please feel free to reach out to our organizing team:

Juanma Santiago Suárez

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# WEDNESDAY OCT 4

<u>8:30-9:00</u>         Registration and Kick-Off

<u>9:00-10:30</u>         Keynote speaker: **María José Frapolli**

*Logic in Mathematics*

The relationship between logic and mathematics is a subject of philosophical inquiry. It can be argued that logic and mathematics share a close connection, although they have different scopes. Logic, when viewed as the development of specific calculi and the analysis of their formal properties, can be considered a mathematical endeavour. However, when logic is understood as a discipline concerned with the assessment of the validity of arguments its scope is considerably broader. The ambiguity surrounding the overarching goal of logic has led to enduring debates within the philosophy of logic, with one fundamental question being the characterisation of logical constants and its implications for the analysis of validity. In my presentation, I will revisit Frege's proposal and argue that "logic", as presently employed, encompasses diverse theoretical projects that are only contingently interconnected.

<u>10:30-11:00</u>         **Pedro del Valle-Inclán:** *Carnap's Problem, Definability and Compositionality*

In his *Formalization of Logic* (1943), Carnap pointed out that there are non-normal interpretations of classical logic: non-standard interpretations of the connectives and quantifiers that are nevertheless consistent with the classical consequence relation of the appropriate language. Several solutions to the problem have been proposed. In a recent paper, Bonnay and Westerståhl (2016) argue that we should limit the space of possible interpretations by `universal semantic constraints'. According to Bonnay and Westerståhl, if we restrict attention to interpretations that are (a) compositional, (b) non-trivial and (c) in the case of the quantifiers, invariant under permutations of the domain, Carnap's Problem is avoided. In this talk I will show that Bonnay and Westerståhl's solution fails. Their main result, a characterisation of the interpretations of the quantifiers that are consistent with the classical consequence relation, only holds for *second-order* languages, for which categoricity is easier to achieve. Ultimately, the failure of their proposal (in the first-order case) can be traced back to the issues of compositionality and definability. Bonnay and Westerståhl's use of second-order languages is somewhat analogous to the appeal to `open-endedness' in other attempts at solving Carnap's Problem (e.g. McGee 2000, Murzi and Topey 2021). In the final part of the talk, I will discuss how their results relate to those approaches, and explore a way to amend their proposal.

<u>11:00-11:30</u>         **Coffee break**

# WEDNESDAY OCT 4

> **Location:** Instituto de Matemáticas de la UGR (IMAG)
> C. Ventanilla, 11, 18001 Granada, Spain

<u>11:30-12:00</u>    **Salvatore Scamperti:** *Universality properties of graph homomorphism: one construction to prove them all*

It is well-known that graph homomorphism is one of the most complicated mathematical relations. Depending on the field one is working in, this meta-statement can be formalized in a mathematically meaningful way through a corresponding universality result. For example, in category theory this is formulated in terms of alg-universality: every concrete category can be fully embedded (in the categorical sense) into the category G whose class of objects is the collection of all undirected graphs, while arrows are given by homomorphisms. This e.g. implies that, combinatorially, every group is isomorphic to the automorphism group of some graph, every monoid is isomorphic to the endomorphism monoid of a graph, and so on. Moving to the literature on graph theory and combinatorics, a class of finite structure is called universal if every countable partial order can be embedded into its homomorphism order: it turns out that the class of finite graphs is universal in this sense as well. In descriptive set theory, and specifically within the theory of Borel reducibility, it is instead shown that the homomorphism relation on countable graphs is complete as an analytic quasi-order, namely, every analytic quasi-order is Borel reducible to it. In model theory, universality is expressed by the fact that the theory of graphs interprets any other countable first-order theory. And in theoretical computer science, it is shown that a quite large number of instances of the graph homomorphism problem are undecidable or NP-complete. Moving to the proofs of such universality results, one immediately notice a lack of uniformity: in most cases, the construction used in one setup cannot be used in the other ones.
We show that the natural operation of connected sum for graphs can be used to prove at once most of the universality results from the literature concerning graph homomorphism. In doing so, we significantly improve many existing theorems and we also solve some natural open problems.

<u>12:00-12:30</u>    **Damiano Fornasiere:** *Degrees of incompleteness of implicative logics: the trichotomy theorem*

The aim of this talk is to prove a trichotomy theorem for the degrees of incompleteness of the axiomatic extensions of the implicative fragment IPC$\to$ of the intuitionistic logic IPC.

<u>12:30-13:00</u>    **Margarete Ketelsen and Simone Ramello:** *Definability of henselian valuations in positive characteristic*

Many successful investigations around the existence and properties of solutions of polynomial equations over a field rely on enriching the field with a notion of size, called a valuation, which is encoded by a certain subring of the field, called the valuation ring. In many natural examples, the valuation is encoded by the sole field structure, i.e. the valuation ring is definable in the language of rings. Understanding this phenomenon is a classical topic of the model theory of valued fields that dates back to the work of Julia Robinson, and it has striking applications in the investigations around dividing lines for fields, see e.g. Johnson's spectacular classification of dp-finite fields. For a certain class of characteristic zero, Jahnke and Koenigsmann provided a complete characterization of when an henselian valuation is definable, in terms of algebraic properties of the so-called canonical henselian valuation of the field. We aim to proof similar results for positive characteristic fields, building on results by Kuhlmann on the model theory of tame valued field, and by Kuhlmann and Rzepka on defect extensions of perfect fields in positive characteristic. This is joint work with Piotr Szewczyk (TU Dresden). We offer to give two talks about this topic (one talk each).

# WEDNESDAY OCT 4

**13:00-14:30**     **Lunch break**

*We invite you to enjoy lunch at one of the bars or restaurants located around the IMAG. Please note that this lunch is self-funded and not included in the conference fees.*
*After lunch, we will be relocating for the next session of the conference. You can either meet us at 14:15 in front of the room where this morning's presentations took place or make your way to the new location independently:*

DIFFERENT LOCATION!

**Location:**  Facultad de Traducción e Interpretación
C. Puentezuelas, 55, 18002 Granada, Spain

**14:30-15:30**      Keynote speaker: **Amanda Vidal**

*Modal fuzzy logics: diverging paths*

In this talk we will introduce modal fuzzy logics, a combination of two well known (families) of logics, namely modal logics and many-valued fuzzy logics. We will see how this results in an interesting framework in which many of the usual intuitions, methods and results potentially inheritable from either of the components fail. We will then focus on showing both one decidability and one undecidability result for two of these logics -that seemingly differ on a very simple rule, which affects the global or local definition of entailment-. We will see how we can manipulate them in order to obtain, respectively, a reduction to a decidable and to an undecidable question. If time allows, we will see how we can further elaborate to move from undecidability to non R.E. The previous exhibits either unexpected regularities (for the decidability case) or (too) powerful expressive power (for the non recursively enumerable one) in the studied logics.

**15:30-16:00**     **Coffee break**

**16:00-16:30**     **John Lindqvist:** *Modal Logic in the Logic of Sentential Operators*

The Logic of Sentential Operators (LSO) extends classical logic with sentential operators and quantifiers. The semantics of the logic is given by language graphs (digraphs based on the structure of the formulas of the language), and the reasoning by sequent calculus (LK in the case of first-order logic) extended with rules for sentence quantifiers. This gives rise to a two-valued yet non-explosive logic: semantic paradoxes can occur, giving rise to contradictions, without this leading to explosion. Our current research investigates the relationship between LSO and normal modal logic (usually defined on Kripke models), focusing on getting the behaviour of modal logic operators for sentential operators in LSO.

# WEDNESDAY OCT 4

<u>16:30-17:00</u>        **Aleksi Anttila:** *Deep Inference Sequent Calculi for Team-based Logics*

We present a sequent calculus for the team-based propositional logic with the connectives $\neg, \wedge, \vee$, ⓥ (essentially propositional dependence logic) which consists of a Gentzen-style system for the classical fragment of the logic, appended with two deep-inference style rules for the non-classical connective ⓥ. The resulting system is simple, and departs minimally from a Gentzen-style calculus. It is also a minimal cut-free modification of the sequent calculus-translation of the natural deduction system for this logic: we show that cuts cannot be eliminated in the translation-system, but that the addition of the deep-inference rules (which strengthen similar rules in the translation-system) suffice for cut-free completeness. We also derive some of the usual consequences of cut elimination, such as a constructive proof of interpolation. We are working on extending the approach to other similar logics such as inquisitive logic, intuitionistic inquisitive logic, and the logic of the non-emptiness atom NE, which is true in a team iff the team is non-empty.

<u>17:00-18:00</u>        **Poster session 1**

**Pedro del Valle-Inclán**                    *Check previous pages for info.*

**Salvatore Scamperti - Luca Motto Ros**      *Check previous pages for info.*

**Damiano Fornasiere**                        *Check previous pages for info.*

**John Lindqvist**                            *Check previous pages for info.*

**Aleksi Anttila - Rosalie Iemhoff - Fan Yang**    *Check info above on this page.*

**Catalina Torres Pachón**      *Hyperstationary subsets of $P\kappa\lambda$*
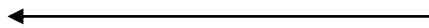
We explore the concept of n-stationarity and n-stationary reflection on $P\kappa(\lambda)$ as introduced by Hiroshi Sakai and a modified version of the same. We investigate which results from Bagaria's article "Derived Topologies on Ordinals and Stationary Reflection" can be translated to the context of $P\kappa\lambda$.

# WEDNESDAY OCT 4

<u>17:00-18:00</u>        **Poster session 1**

**Antonio Casares**    *The fruits of the full binary tree*

Since the publication of Gödel's incompleteness theorems, logicians have tried to understand what are the limits of decidability in logic. In this talk, I will discuss Rabin's theorem on the decidability of the monadic second order (MSO) theory of the full binary tree. By using the notion of interpretations, we will see how this theorem allows us to obtain the decidability of many other logics, such as Presburger arithmetic or the MSO theory of $(Q,<)$.

**Luis Felipe Bartolo Alegre**    *A Framework for Classifying and Understanding the Plurality of Inference Systems*

This poster presents a framework for understanding the plurality of inference systems, proposing three kinds classifications: cardinal, topical, and nomic. The cardinal classification organises inference systems based on the number of elements of a type it ranges over (e.g., sentential atoms, functions, etc.). The topical classification organises them based on the domains, subjects, contents, or topics to which they are applicable. Finally, the nomic classification organises them according to the rules, laws, or principles they enforce. Through this research, we aim to shed light on the circumstances in which such deviations are justified in relation to specific purposes.

**Thibaut Kouptchinsky**    *The limits of determinacy in third-order arithmetic*

This poster is about the foundations of mathematics, studying determinacy axioms derived from game theory, with a reverse mathematics point of view. It exposes their relationship with second-order and third-order arithmetic, examining a significant paper in the field by Montalbán and Shore.

**Hrafn Valtyr Oddsson**    *Algebra-Valued Models for Paraconsistent and Paracomplete Set Theory*

In this poster, we will generalize the construction of Boolean-valued models to get algebra-valued models for a set theory that are both paraconsistent and paracomplete. The proposed models validate Leibniz's law and allow for non-classical interpretations of equality. Moreover, these models provide a unified method for handling both inconsistent and incomplete sets.

# THURSDAY OCT 5

<u>9:00-10:30</u>        Keynote speaker: **Jordi  López Abad**

*Fraïssé Banach spaces*

We believe that the study of Fraïssé Banach spaces is a good example of a topic when Banach space theory, metric model theory, and set theory play an important role. We will discuss why by presenting some examples and their main properties.

<u>10:30-11:00</u>        **Curial Gallart Rodríguez:** *High analogs of Martin's Axiom and combinatorics on $\omega_2$*

The ZFC axioms of set theory are commonly accepted as the standard foundation for (most of) Mathematics. Due to the limitations imposed by Gödel's Incompleteness Theorems, one of the major concerns in set theory for the last 50 years has been the search for statements independent from the ZFC axioms. Since one of the consequences of Gödel's Theorems is that one cannot prove the existence of a model of ZFC working in ZFC, set theorists have been studying the problem of building new models of ZFC from pre-existing ones (assuming that such models exist), by restricting them (inner models) or by extending them (generic extensions). Cohen's technique of forcing goes in the later direction, and since its discovery in 1963 it has been the main source of independent statements in set theory. By incorporating Neeman's ideas in Asperó and Mota's setting, we were able to get the consistency of high versions of Martin's Axiom together with arbitrarily large values of the continuum. These can be seen as generalization of Asperó-Mota's forcing axioms, the Finitely Proper Forcing Axiom and the Forcing Axiom for the class of $N_{1.5}$-chain condition forcings. Moreover, apart from the proof of the consistency of high forcing axioms, our set-up should be flexible enough to allow us to study interesting combinatorics at the level of $\omega_2$.

<u>11:00-11:30</u>        **Coffee break**

# THURSDAY OCT 5

> **Location:** Instituto de Matemáticas de la UGR (IMAG)
> C. Ventanilla, 11, 18001 Granada, Spain

**11:30-12:00**      **Mina Young Pedersen:** *Hybrid Relevant Logic*

In this work, we explore the addition of nominals and the operator @i from hybrid logic to the language of modal relevant logic. Hybrid logic is a modal logic including a set of propositional atoms, called nominals, that are true at only one state in the model. In effect, nominals let us name individual states and refer to them by @iφ, which is read "φ holds at the state called i".

**12:00-12:30**      **Miguel Martins:** *Locally Finite Bi-Intermediate Logics of Trees*

*The natural symmetric extension of intuitionistic logic IPC is called bi-intuitionistic logic, denoted by bi-IPC. Its extensions are called bi-intermediate logics, and the bi-intermediate logic of co-trees is denoted by bi-LC. In this talk, we will present the intrinsic connection between the concept of local finiteness (when restricted to the setting of co-trees) and a particular extension of bi-LC, Log(FC). In particular, we will show that: if L is an extension of bi-LC, then L is locally finite iff L is not a sublogic of Log(FC); Log(FC) can be finitely axiomatized. It follows from these two conditions, together with the fact that Log(FC) has the finite model property, that the problem of determining if a recursively axiomatizable extension of bi-LC is locally finite is decidable.*

**12:30-13:00**      **Elio La Rosa:** *Epsilon Modal Logics*

In this talk, I develop a class of modal logics inspired by Epsilon Calculus and based on what I call 'epsilon modalities'. Syntactically, these modalities consist in connectives indexed by formulas. Semantically, they isolate a world (if any) satisfying the formula index through an arbitrary choice function. The obtained 'Epsilon Modal' logics can be reduced to the original Epsilon Calculus by a straightforward extension of the standard translation. Beside the presentation of a semantics for Epsilon Modal Logics, I will sketch some philosophical applications. In particular, I will show how epsilon modalities can be read as antecedents of conditionals whose semantic interpretation differs from well-known accounts based on selection functions.

**13:00-14:00**      **Lunch break**

*We invite you to enjoy lunch at one of the bars or restaurants located around the IMAG. Please note that this lunch is self-funded and not included in the conference fees.*
*After lunch, we will be relocating for the next session of the conference. Make sure to leave the lunch place by 13:50 to arrive at Faculty of Translation and Interpretation on time.*

# THURSDAY OCT 5

**Location:** Facultad de Traducción e Interpretación
C. Puentezuelas, 55, 18002 Granada, Spain

<u>14:00-15:00</u>        Keynote speaker: **Julien Murzi**

*The Liar's Revenge*

The semantic paradoxes rely on exceedingly minimal resources: basic principles for the use of the truth predicate, such as the interderivability of A and 'A' is true, and a modicum of logic and syntax (already available in very weak theories of arithmetic). Since it seems extremely difficult to argue that the semantic values of A and 'A' is true can ever come apart, a large number of philosophers and logicians have recently followed Kripke (1975) and sought to block the paradoxes by invalidating some classically valid principle instead. But, I argue, this general strategy does not work, irrespective of which classical principles are actually given up. I introduce a general revenge argument aimed at showing that any attempt to block the semantic paradoxes by invalidating certain classical principles gives rise to new Liar-like paradoxes that do not rely on those principles. More precisely, I present a recipe for generating revenge arguments against any non-classical theory that can recapture classical logic for a set of sentences if such a set is closed under certain classical-recapturing principles (Murzi & Rossi, 2020). Lucas Rosenblatt ('Paradoxicality without Paradox') and Luca Incurvati & Julian Schlöder (Reasoning with Attitude, OUP) have recently argued against such a revenge strategy. After briefly rehearsing Murzi & Rossi's results, I introduce Rosenblatt's and Incurvati & J. Schlöder's recent objections, together with other possible objections, and explain why I don't find these objections convincing.

<u>15:00-15:30</u>        **Coffee break**

<u>15:30-17:00</u>        **Problem discussion session**

One of the most exciting aspects of a conference is engaging in discussions about our research challenges with new colleagues or brainstorming about others' issues. That's why we've dedicated specific time for this activity. During this session, you have three options to participate:

**1.Celestine Lawrence** will present his problem *Boolean logic in a system of absolute value equations*. The aim of the problem is to understand the nature of Boolean logic in a system of absolute value equations at higher dimensions and compare it to threshold logic and completely monotonic logic. Following his presentation, you're welcome to join him for a discussion on this problem.

2.If you're already acquainted with fellow conference attendees and would like to engage in discussions with them, we'll provide dedicated space in the room where you can collaborate on your research problems.

3.If you wish to discuss your research problem with other attendees but haven't yet connected with anyone at the conference, please send us a single slide before the previous day of the session. Include the title of your problem and some pertinent questions. You'll have the opportunity to express your interest in forming a discussion group around your problem following Lawrence's presentation.

# THURSDAY OCT 5

<u>17:00-18:00</u>        **Poster session 2**

**Curial Gallart**            *Check previous pages for info.*

**Elio La Rosa**            *Check previous pages for info.*

**Andrea Sabatini**          *Check next pages for info.*

**Pietro Vigiani**           *Check next pages for info.*

**Azul Fatalini**            *Check next pages for info.*

**Filip Jankovec**           *Check next pages for info.*


**Alexander De Klerck**        *Categories of Aristotelian Diagrams: increasing infomorphisms*

The present paper fits within this research line of categorifying logical geometry. However, we will not be concerned with studying Vignero's category of Aristotelian diagrams in more detail, exploring further category-theoretical constructions, etc. Rather, our aim is to take a step back and reflect on the fundamental building blocks that are required for this categorification project. After all, a category is not just determined by its objects (in casu: Aristotelian diagrams), but also by the arrows between those objects. Vignero proposed one specific notion of morphism, but there exist others as well. So far it is not obvious whether one of these qualifies as the uniquely `correct' or canonical notion of morphism between Aristotelian diagrams. In this paper we will study various kinds of morphisms and their corresponding categories, while keeping two theoretical desiderata in mind. On the one hand, we want to obtain categories that are richly structured and well-behaved from a categorical point of view. On the other hand, we want to achieve a conservative generalization of previous work in logical geometry.

**Thomas Randriamahazaka**        *Truthmaker semantics on the Australian plan*

We present a sound and complete semantics for AC, first with a Routley star and then with an incompatibility relation. We discuss the differences between our proposal and Fine's, highlighting both general virtues of the Australian plan and specific benefits of our semantics linked to the project of truthmaker semantics. Finally, we provide an application of our framework to subject-matter, arguing for the superiority of an Australian negation in this context.

> **Location:** Facultad de Traducción e Interpretación
> C. Puentezuelas, 55, 18002 Granada, Spain

← *List starts on previous page*

<u>17:00-18:00</u>  **Poster session 2**

**Grigorii Stepanov**  *Strong completeness of GL with uncountable language*

Provability logic GL is known to be complete for the set of finite, converse well-founded, irreflexive trees. Strong completeness doesn't hold, though. To obtain it, one needs to consider a slight modification of the Kripke semantic (ω-bouquets), with the help of which one can also establish strong completeness of GL for the order topology on ordinals $\leq \omega^\omega + 1$. GL with uncountably many variables is strongly complete neither for countable bouquets  nor for countable ordinals. We show that for each infinite cardinal κ, GL with κ variables is strongly complete for bouquets of size κ, also for κ = ω1 we show strong completeness for the interval topology.

**Ludovico Fusco and Francesco Paoli**  *Multi-relation Agassiz sums of algebras*

After allowing Agassiz systems to be multi-relation—i.e., to have multiple relations defined from the same naming functor—we show that Płonka sums correspond to constructions over mono-relation versions of these systems and determine the conditions under which P-algebras are representable as sums over multi-relation Agassiz systems of Boolean algebras. Finally, we characterize the identities preserved in the Polin case.

**Johan Girardot**

Infinite time Turing machines have been introduced by Hamkins and Lewis. Their definition and potency rest on the choice of a limit rule. In turn, many of the important proofs on ITTMs rest on the existence of a universal ITTM that simulates in parallel some or all ITTMs. Through the scrutiny of the rule proposed in and of the universal ITTM, we devise four constraints for a limit rule to yield a model of infinite machine in which we can define a universal machine. To this we add a fifth constraint acting as a safeguard and we show how any rule definable in set theory that meets those constraints produces a model of infinite machine with strong structural equalities. Among those, the fact that the supremum of the writable ordinal matches that of the clockable ordinal. That is, with the usual notations, the equality $\lambda = \gamma$ holds for any of those limit rules. Eventually, we provide a counter-example to show that this fifth constraint is necessary, showing that the main result is tight with respect to this constraint.

DINNER LOCATION

> **Location:** Pcta. de Toqueros, 7, 18010 Granada, Spain

<u>19:30-21:00</u>  **Dinner at *La Platería***

Menu: €32 (€28 vegetarian). Pay cash (if possible) at restaurant. Possible reimbursement post-conference, not guaranteed.

<u>19:30-21:00</u>  **Flamenco concert at *La Platería***

Ticket: €15. Pay cash (if possible) at restaurant.

# FRIDAY OCT 6

9:00-10:30        Keynote speaker: **Nina Gierasimczuk**

*Inductive Inference and Epistemic Modal Logic*

This overview talk is concerned with a link between inductive inference and dynamic epistemic logic. I will present a synthetic view on several contributions: inductive truth-tracking properties of belief revision policies seen as belief upgrade methods; topological interpretation and characterization of inductive inference; discussion of the adequacy of the topological semantics of modal logic for characterizing inductive inference. I will briefly present the topological Dynamic Logic for Learning Theory. Finally, I will discuss several surprising results obtained in computational inductive inference that challenge the usual understanding of certainty, and of rational inquiry as consistent and conservative learning.

10:30-11:00        **Andrea Sabatini:** *Abduction as deductive saturation*

Abductive reasoning involves finding the missing premise of an "unsaturated" deductive inference, thereby selecting a possible explanans for a conclusion based on a set of previously accepted premises. In this paper, we explore abductive reasoning from a structural prooftheory perspective. We present a hybrid sequent calculus for classical propositional logic that uses sequents and antisequents to define a procedure for identifying the set of analytic hypotheses that a rational agent would be expected to select as explanans when presented with an abductive problem. Specifically, we show that this set may not include the deductively minimal hypothesis due to the presence of redundant information. We also establish that the set of all analytic hypotheses exhausts all possible solutions to the given problem. Moreover, we propose a deductive criterion for differentiating between the best explanans candidates and other hypotheses. Finally, we extend our framework by replacing classical logic with (prerequisite-free) default logic.

11:00-11:30        **Coffee break**

# FRIDAY OCT 6

<u>11:30-12:00</u>      **Pietro Vigiani:** *Non-classical Reasoning with Update-based Implication*

We present an epistemic logic extending First Degree Entailment with an update-based implication, defined in terms of a conditional epistemic modality, a relevant conditional and a dynamic modality. In this way, we are able to express the dynamic nature of implication, that is the fact that an implication is supported if and only if the consequent is supported by the agent's epistemic state, when epistemically updated with the antecedent. Moreover, we show how to axiomatise the logic of update-based implication and how to use it as an epistemic model of agents who collect information within a classical world and reason non-classically about such information, through epistemic updates.

<u>12:00-12:30</u>      **Azul Lihuen Fatalini:** *Paradoxical sets and the Axiom of Choice*

A paradoxical set is a subset of Rn that can be constructed using the Axiom of Choice (usually only using a well-order on the reals) and its existence is somehow counterintuitive. We focus on one example of paradoxical set, which has a geometrical flavor: partitions of $R^3$ in unit circles (PUC), i.e., a collection of circles with radii one which cover the three-dimensional space and are pairwise disjoint. This led us to deal with some geometrically combinatorial problems, while looking at these objects in different models of set theory.

<u>12:30-13:00</u>      **Filip Jankovec:** *From Abelian logic to Łukasiewicz unbound*

In this talk, we investigate connections between the family of comparative logics including Abelian logic, and some generalizations of Łukasiewicz logic.
We provide axiomatizations for some extensions of pointed Abelian logic including unbound Łukasiewicz logic.

<u>13:00-14:00</u>      **Lunch break**

*Today we will stay in the IMAG, so let's meet at 14:00 in the same room as this morning!*

NOT CHANGE LOCATION!

# FRIDAY OCT 6

Location: Instituto de Matemáticas de la UGR (IMAG)
C. Ventanilla, 11, 18001 Granada, Spain

14:00-15:00        Keynote speaker: **Tomás Ibarlucía**

*An invitation to continuous (and affine) logic*

I will review the basics of continuous logic and the model theory of metric structures, and gently discuss some of its applications to the dynamics of Polish groups coming from my own research. I will then introduce affine logic, a natural fragment of continuous logic, and explain why it is remarkably well-suited for a model-theoretic approach to ergodic theory.

15:00-15:30        **Coffee break**

15:30-17:00        **Community discussion:** *Role of Logic in Academic Research*

As we near the conclusion of our conference, the organizing team believes it is essential to provide a dedicated forum for our community of young researchers in Logic. We aim to foster open dialogues addressing questions such as how the interdisciplinary nature of logic influences our roles, the place of logic in academic curricula, and its potential impact on society. This session invites us to connect, share insights, and collectively shape the course for the future of logic research. It's a chance to reflect on our present reality, share expectations for the future, and engage with these questions as a united community of emerging logicians.

17:00-18:00        **Visit to Arab neighborhoods of Granada**

It is time to say goodbye, but don't pack yet! Before we wrap up this event, come with us to explore the captivating Arab neighborhoods of the city and discover their charm, if you haven't already.

We'll depart together from the IMAG after the last activity. To ensure you don't miss this visit, please be in front of the IMAG room at 17:00.

# SEE YOU SOON

We say goodbye for now, but it is only until the next PhD's in Logic edition!

As you may know, this conference is organized by PhD students, and we are on the lookout for the next team to carry the torch for next year's event. Your involvement is crucial in maintaining the unity of our community, so we invite you to consider submitting your application to host the conference next year. Please ensure your application reaches us by November 15th via this email address: **phdsinlogic@gmail.com.**

For those in need of guidance, you will discover our own application details on our website once the conference wraps up. We want to express our sincere gratitude for your incredible contributions that have made this conference a great success. We can't wait to see you again next year!

All the best,

Juanma, Catalina, José and Daira