Raúl Ruiz Mora

PhD candidate in Mathematics · category theory, algebra and logic

Departament de Matemàtiques, Universitat de València, Dr. Moliner 50, 46100 Burjassot, Spain
raul.ruiz-mora@uv.es 0009-0004-3739-7811 www.uv.es/ruizmo5 ruizmoraraul

Research interests

Category theory and its interactions with algebra, logic and computer science: universal and categorical algebra, higher category theory, rewriting and the theory of computation, mathematical logic (proof theory, model theory, modal logics), formal languages and automata, and the formalisation of mathematics in proof assistants.

My current work focuses on higher-order rewriting systems, categorial algebras and Curry–Howard correspondences.

Education

2023–2027 **PhD in Mathematics**, Universitat de València.
Thesis: *Morphisms of higher-order rewriting systems.* Supervisor: Enric Cosme Llópez. Expected defence: June 2027.

2021–2023 **MSc in Logic**, ILLC, University of Amsterdam.
Thesis: *Team semantics for modal μ-calculus.* Supervisor: Bahareh Afshari (University of Gothenburg).

2017–2021 **BSc in Mathematics**, Universitat de València. Average grade 9.44/10.
Thesis on the isomorphism theorems in many-sorted universal algebra (10/10 with honours). Supervisor: Enric Cosme Llópez.

Awards and grants

2026 Research stay grant CIBEFP/2026/088 (NTNU, Trondheim), Generalitat Valenciana.

2023–2027 Predoctoral grant CIACIF/2022/489, Generalitat Valenciana, co-funded by the European Social Fund.

2021 Extraordinary Degree Award, BSc in Mathematics, Universitat de València (second-best academic record of the 2017–2021 class).

Preprints

[1] J. Climent Vidal, E. Cosme Llópez, **R. Ruiz Mora**, M. Vago Marzal. *Higher-order many-sorted categorial algebras via generalized hep-derivors.* arXiv:2611.03553 (2026). [preprint]
Introduces generalized hep-derivors between hierarchical equationally partial signatures to relate the homogeneous and heterogeneous presentations of higher-order many-sorted categorial algebras: in finite dimension they are equivalent, and in dimension ω the algebras are recovered as projective limits of their truncations.

[2] L. Gong, **R. Ruiz Mora**, N. Sanmartín Vich, E. Cosme Llópez. *A Kleene theorem for free many-sorted algebras.* arXiv:2606.29939 (2026). [under review, Logical Methods in Computer Science]
Generalizes Kleene's theorem from free single-sorted to free many-sorted algebras: under finitary assumptions, a language of a given sort is recognizable if and only if it is regular.

[3] J. Climent Vidal, E. Cosme Llópez, **R. Ruiz Mora**. *Riguet and generalized congruences on a category. Relationships and applications.* arXiv:2505.15767 (2025). [under review, Compositionality]
Studies how Riguet congruences and generalized congruences on a category are related, from the lattice-theoretic side (a directed-complete ordered set and an algebraic lattice, linked by a Scott continuous morphism) and the categorical side (relative adjunctions), with applications in several fields.

[4] J. Climent Vidal, E. Cosme Llópez, **R. Ruiz Mora**. *From higher-order rewriting systems to higher-order categorial algebras and higher-order Curry–Howard isomorphisms.* arXiv:2402.12051 (v1 2024, v2 2026). [preprint]
Ongoing project that defines higher-order many-sorted rewriting systems and categorial algebras and relates them through higher-order Curry–Howard isomorphisms, with the ultimate goal of building the category of towers.

Publications

[1] E. Cosme Llópez, **R. Ruiz Mora**, N. Tamarit. *A comic page for the first isomorphism theorem.* Journal of Mathematics and the Arts 16(1–2): 29–56 (2022). doi:10.1080/17513472.2022.2059645. Included in the *Reza Sarhangi Outstanding Paper Prize and Commended Paper Collection.*
Presents a comic page that uses the narrative and graphical resources of comics to illustrate the set-theoretic elements in the proof of the first isomorphism theorem, a fundamental result whose teaching is hindered by its abstraction.

Talks

Jan 2027 *Morphisms of higher-order rewriting systems.* RSME Young Researchers' Congress, parallel session *Lógica matemática*, Zaragoza. (upcoming)

Jan 2027 *Paths in term rewriting systems as terms of a free categorial algebra.* Iberian Model Theory Meeting, València. (invited, upcoming)

Sep 2026 *Higher-order rewriting systems, categorial algebras and Curry–Howard isomorphisms.* Participants' session, Autumn School "Proof and Computation", Fischbachau.

Jan 2026 *Morfismos de sistemas de reescritura.* XIII Congreso del Máster en Investigación Matemática y del Doctorado en Matemáticas, València.

Nov 2025 *Morphisms of rewriting systems.* 7th Bringing Young Mathematicians Together (BYMAT), Sevilla.

Sep 2025 *Free monoids and Riguet congruences.* XV Portuguese Category Theory Seminar, Aveiro.

May 2025 *Derivors and morphisms between rewriting systems.* PREDOC seminar, Facultat de Matemàtiques, València.

Jun 2024 *Team semantics for modal μ-calculus.* ASL European Summer Meeting, Gothenburg.

Jan 2024 *Álgebras de Hall y derivors entre álgebras homogéneas.* XI Congreso del Máster en Investigación Matemática y del Doctorado en Matemáticas, València.

Research visits

Jan–Apr 2026 Department of Mathematical Sciences, NTNU, Trondheim (Norway), hosted by Rune Haugseng. Three months, funded by grant CIBEFP/2026/088.

Research projects

current Participant in *Grupos, brazas con torsión y sistemas de derivación formal. Resolución de la ecuación de Yang–Baxter*, PID2024-159495NB-I00, Ministerio de Ciencia, Innovación y Universidades. PI: Adolfo Ballester Bolinches.

current Team member of *Propietats aritmètiques i estructurals dels grups, semigrups i brides* (GYBE), CIAICO/2023/007, Generalitat Valenciana. PI: Adolfo Ballester Bolinches.

Teaching

Universitat de València, authorised teaching collaboration (Departament de Matemàtiques), 213 h in total:

2024–2027 *Linear Algebra and Geometry I* (Álgebra Lineal y Geometría I). BSc in Mathematics; double degrees with Computer Engineering and Telematics Engineering.

2026/27 *Basic Mathematics* (Matemática Básica). BSc in Mathematics.

2025/26 *Linear Algebra and Geometry II* (Álgebra Lineal y Geometría II). Double degree in Physics and Mathematics.

2023–2026 *Algebraic Structures* (Estructuras Algebraicas). BSc in Mathematics.

2023/24 *Mathematics I* (Matemáticas I). BSc in Computer Engineering.

University of Amsterdam, teaching assistant:

2022/23 *Proof Theory* (64 h), *Model Theory* (36 h) and *Mathematical Proof Methods for Logic* (36 h). MSc in Logic.

2022/23 *Logic and the Human Factor in Forensic Reasoning* (86 h). MSc in Forensic Science.

Supervision: informal support to a bachelor's thesis on the formalisation of higher categories in Lean 4 (M. Vago Marzal, 2026; supervised by E. Cosme Llópez).

Service and organisation

Jan 2027 Co-organiser of the parallel session *Lógica matemática*, RSME Young Researchers' Congress, Zaragoza (with V. Navarro Arroyo and B. Sierra Miranda).

Skills

Formalisation	Lean 4 (since 2023)
Languages	Catalan and Spanish (native); English (C1, Cambridge Advanced)

Last updated: November 2026