James C. A. Main

PhD student in Mathematics

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https://alexandermain.github.io/

Research experience

October 2021–Present **PhD thesis**, *UMONS – Université de Mons*.
Title: *Controllers in Many-sided Reactive Synthesis: a Strategic Perspective*.
Supervisor: Mickael Randour.
F.R.S.-FNRS Research Fellow (expected duration: four years).

September 2020–June 2021 **Research internship**, *UMONS*.
Subject: Extending window objectives to timed automata and games.
Supervisors: Mickael Randour, Jeremy Sproston.

August 2019 **Research initiation internship**, *UMONS*.
Subject: Efficient algorithms for parity games with few colours.
Supervisor: Mickael Randour.

Education

2019–2021 **Master's degree in Mathematics**, *UMONS*, Belgium.
With highest honours. Received the Maurice Boffa Award from the Department of Mathematics.

2016–2019 **Bachelor's degree in Mathematics**, *UMONS*, Belgium.
Academic minor in Computer Science
With highest honours. Award of the Department of Mathematics.

Publications

Extended versions are available on arXiv and are linked on my website.

Invited contributions in international conference proceedings

[BGMR23] Thomas Brihaye, Aline Goeminne, James C. A. Main, Mickael Randour. **Reachability Games and Friends : A Journey through the Lens of Memory and Complexity**. *Keynote lecture given by Thomas Brihaye at FSTTCS'23*. 43rd IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science, FSTTCS 2023, LIPIcs 284, Schloss Dagstuhl, pages 1:1–1:26, 2023.

International peer-reviewed conference proceedings

[Mai24] James C. A. Main. **Arena-independent Memory Bounds for Nash Equilibria in Reachability Games**. 41st International Symposium on Theoretical Aspects of Computer Science, STACS 2024, LIPIcs 298, Schloss Dagstuhl, pages 50:1-50:18, 2024.

[MRS22] James C. A. Main, Mickael Randour, Jeremy Sproston. **Timed Games with Bounded Window Parity Objectives**. Formal Modeling and Analysis of Timed Systems - 20th International Conference, FORMATS 2022, LNCS 13465, pages 165–182, Springer, 2022.

[MR22] James C. A. Main, Mickael Randour. **Different strokes in randomised strategies: Revisiting Kuhn's theorem under finite-memory assumptions**. 33rd International Conference

on Concurrency Theory (CONCUR 2022), LIPIcs 243, Schloss Dagstuhl, pages 22:1–22:18, 2022.
[MRS21] James C. A. Main, Mickael Randour, Jeremy Sproston. **Time Flies When Looking out of the Window: Timed Games with Window Parity Objectives**. 32nd International Conference on Concurrency Theory (CONCUR 2021), LIPIcs 203, Schloss Dagstuhl, pages 25:1–25:16, 2021.

Talks

The slides of my talks are available on my website.

2024 *A Single Dice Roll to Satisfy All Goals: Randomisation Requirements for Strategies in Multi-Objective Markov Decision Processes*, Highlights of Logic, Games and Automata 2024, 19/09, Université de Bordeaux, Bordeaux, France.

Complexity and Representations of Controllers in Reactive Synthesis, Dagstuhl Seminar on Stochastic Games, 04/06, Dagstuhl, Germany.

Arena-independent Memory Bounds for Nash Equilibria in Reachability Games, MOVEP'24: 16th school on modelling and verification of parallel processes, 29/05, INRIA Rennes, Rennes, France.

Arena-independent Memory Bounds for Nash Equilibria in Reachability Games, STACS 2024: 41st International Symposium on Theoretical Aspects of Computer Science, 12/03, Université Clermont-Auvergne, Clermont-Ferrand, France.

Arena-independent Memory Bounds for Nash Equilibria in Reachability Games, CFV, 09/02, ULB, Bruxelles, Belgium.

2023 *Arena-independent Memory Bounds for Nash Equilibria in Reachability Games*, Journées Annuelles du GT Vérif 2023, 30/11, IRIF (Université Paris-Cité), Paris, France.

Different Strokes in Randomised Strategies: Revisiting Kuhn's Theorem under Finite-Memory Assumptions, LAMAS&SR 2023, 01/10, Jagiellonian University, Krakow, Poland.

Different Strokes in Randomised Strategies, Seminar given at Masaryk University, 12/06, Brno, Czech Republic.

2022 *Different Strokes in Randomised Strategies: Revisiting Kuhn's Theorem under Finite-Memory Assumptions*, CONCUR 2022: The 33rd International Conference on Concurrency Theory, 14/09, University of Warsaw, Warsaw, Poland.

Timed Games with Bounded Window Parity Objectives, FORMATS 2022: 20th Conference on Formal Modeling and Analysis of Timed Systems, 14/09, University of Warsaw, Warsaw, Poland.

Different Strokes in Randomised Strategies: Revisiting Kuhn's Theorem under Finite-Memory Assumptions, Journées Nationales du GT Vérif 2022, 11/07, Université de Bordeaux, Bordeaux, France.

Different Strokes in Randomised Strategies: Revisiting Kuhn's Theorem under Finite-Memory Assumptions, Highlights 2022 of Logic, Games and Automata, 30/06, Université Paris-Cité, Paris, France.

Different Strokes in Randomised Strategies: Revisiting Kuhn's Theorem under Finite-Memory Assumptions, Seminar given at the University of Turin, 31/05, Turin, Italy.

Different Strokes in Randomised Strategies: Revisiting Kuhn's Theorem under Finite-Memory Assumptions, PhD Day (of the Belgian Mathematical Society), 13/05, Université de Liège, Liège, Belgium.

Different Strokes in Randomised Strategies: Revisiting Kuhn's Theorem under Finite-Memory Assumptions, Current Trends in Graph and Stochastic Games (GAMENET workshop), 07/04, Maastricht University, Maastricht, the Netherlands.

Les jeux à la rescousse de l'informatique, Mois du Doctorant, 10/03, UMONS, Mons, Belgium.

2021 *Timed Games with Window Parity Objectives*, Journées du GT Vérif, 18/11, ENS Paris-Saclay, Gif-sur-Yvette, France.

Time Flies When Looking Out of the Window: Timed Games with Window Parity Objectives, Highlights 2021 of Logic, Games and Automata, 16/08, Online.

Time Flies When Looking Out of the Window: Timed Games with Window Parity Objectives, CONCUR 2021: The 32nd International Conference on Concurrency Theory, 26/08, Online.

Teaching

Sept 2023 – Present **Formal methods for system design**, *Teaching assistant*, UMONS.
Exercice sessions and project supervision for the formal methods course given by Mickael Randour.

Sept 2021 – August 2023 **Mathématiques Effectives**, *Teaching assistant*, UMONS.
Exercice sessions for the course on game theory given by Thomas Brihaye.

Sept–Oct 2018, 2019, 2020 **Elementary Mathematics**, *Student teaching assistant*, UMONS.
Supervision of in-class and remote exercise sessions; test grading.

Attended research events

2024 Highlights of Logic, Games and Automata 2024, Université de Bordeaux, Bordeaux, France.

Dagstuhl Seminar on *Stochastic Games*, Dagstuhl, Germany.

MOVEP'24: 16th school on modelling and verification of parallel processes, INRIA Rennes, Rennes, France.

STACS 2024: 41st International Symposium on Theoretical Aspects of Computer Science, 12/03, Université Clermont-Auvergne, Clermont-Ferrand, France.

2023 Journées Annuelles du GT Vérif 2023, IRIF (Université Paris-Cité), Paris, France.

LAMAS&SR 2023, Jagiellonian University, Krakow, Poland.

2022 FORMATS 2022: 20th Conference on Formal Modeling and Analysis of Timed Systems, University of Warsaw, Warsaw, Poland.

CONCUR 2022: The 33rd International Conference on Concurrency Theory, University of Warsaw, Warsaw, Poland.

Journées Nationales du GT Vérif, Université de Bordeaux, Bordeaux, France.

Highlights of Logic, Games and Automata 2022, Université Paris-Cité, Paris, France.

PhD Day (Belgian Mathematical Society), Université de Liège, Liège, Belgium.

Current Trends in Graph and Stochastic Games (GAMENET workshop), Maastricht University, Maastricht, The Netherlands.

2021 Journées du GT Vérif, ENS Paris-Saclay, Gif-sur-Yvette, France.

Highlights of Logic, Games and Automata 2021, Online.

CONCUR 2021: The 32nd International Conference on Concurrency Theory, Online.

2020 MOVEP 2020: 14th Summer School on Modelling and Verification of Parallel Processes, Online.

Regional Days on Model Theory and Applications, Mons.

2019 CONCUR 2019: The 30th International Conference on Concurrency Theory, Amsterdam.

Languages

French (native), English (native).