Maciej Dołęga

Associate Professor

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Research interests

Algebraic, asymptotic, and enumerative combinatorics in the context of representation theory, enumerative geometry, probability and mathematical physics.

Degrees

2022	**Habilitation (mathematics)**, *Institue of Mathematics, Polish Academy of Sciences (IM PAN)*
title:	*Combinatorial structure of Jack and Macdonald symmetric functions through enumeration of graphs*
2013	**Ph.D. (mathematics)**, *Uniwersytet Wrocławski*, Summa cum laude
thesis:	*Combinatorics of asymptotic representation theory of symmetric groups*
advisor:	Prof. Piotr Śniady
2010	**M.Sc. (mathematics)**, *Uniwersytet Wrocławski*
thesis:	*Structure of Kerov polynomials*
advisor:	Prof. Piotr Śniady

Employment

III 2022–now	**Associate Professor**, *Institue of Mathematics, Polish Academy of Sciences (IM PAN)*
X 2018–II 2022	**Assistant Professor**, *Institue of Mathematics, Polish Academy of Sciences (IM PAN)*
X 2015–IX 2018	**NCN Postdoctoral Fellow**, *Adam Mickiewicz University*
XI 2013–X 2015	**CartaPlus Postdoctoral Fellow**, *Université Paris Diderot*

Grants (as PI)

III 2022 – – III 2026	**PI in grant** *One-parameter deformations in symmetric functions theory*, *2021/42/E/ST1/00162*, SONATA BIS, National Science Center
X 2018 – – III 2022	**PI in grant** *Combinatorics of symmetric functions*, *2017/26/D/ST1/00186*, SONATA, National Science Center
XI 2015 – – IX 2018	**PI in grant** *Combinatorics of maps*, *2015/16/S/ST1/00420*, FUGA, National Science Center
IX 2012 – – III 2014	**PI in grant** *Asymptotic representation theory*, *2011/03/N/ST1/00117*, PRELUDIUM, National Science Center

Awards and Honors

2023	**Fulbright STEM Impact Award**
2023	**Wacław Sierpiński Prize** for scientific achievements in the field of mathematics awarded by the *Faculty of Sciences and Earth Sciences of the PAS*
2018–2021	**Outstanding Young Scientist Fellowship** of the *Polish Minister of Science and Higher Education*
2016	**The Science Award** of the magazine *"Polityka"* in the category of Physical Sciences

2016	The **START** award of the *Foundation for Polish Science*
2014	Nomination for **The International Stefan Banach Prize** for a doctoral dissertation (*Polish Mathematical Society*)
2012–2013	**Hugo Steinhaus Memorial Fellowship** (*Wrocławskie Centrum Akademickie*)
2010	First award in the **Marcinkiewicz Memorial Contest**, (*Polish Mathematical Society*)
2008–2010	**Scholarship of the *Polish Minister of Science and Higher Education***

Selected Invited Talks

IX 2024	*TBA*, **10th Polish Combinatorial Conference**, Będlewo, Poland
VI 2024	*Asymptotic results in enumerative and algebraic combinatorics (series of lectures)*, **GRADISCO**, SIAF, Volterra, Italy
IV 2024	*Global asymptotics of Jack-deformed random Young diagrams via Łukasiewicz paths*, **Integrability and Algebraic Combinatorics**, IPAM, USA
IV 2023	*Jack-deformed (weighted) Hurwitz numbers and their combinatorial interpretation*, **Invitation to Recursion, Resurgence and Combinatorics**, Okinawa Institute of Science and Technology, Japan
XII 2022	*b-Hurwitz numbers and enumeration of maps*, **Enumerative Combinatorics**, MFO Oberwolfach, Germany
V 2022	*b-deformed weighted Hurwitz numbers*, **Combinatorial and Algebraic Enumeration**, University of Waterloo, Canada
I 2022	*Bijections for maps on non-oriented surfaces*, **Random Geometry**, CIRM, Luminy, France
IX 2021	*Signed reflection functions – positive definiteness and applications*, **Combinatorics and Representation Theory in Lausanne**, EPFL, Switzerland
II 2020	*Random Young diagrams and the approximate factorization property*, **Asymptotic Algebraic Combinatorics**, UCLA, USA
III 2019	*Jack–deformed random Young diagrams*, **Asymptotic Algebraic Combinatorics**, BIRS Banff, Canada
II 2017	*Gaussian fluctuations of Jack-deformed random Young diagrams*, **Workshop on Asymptotic Representation Theory**, IHP, Paris, France
VI 2015	*When orientability makes a difference?*, **Séminaire Philippe Flajolet**, IHP, Paris, France
III 2015	*A bijection for rooted maps on general surfaces*, **Journées ALEA 2015**, CIRM, Luminy, France
VI 2014	*A bijection for rooted maps on non-orientable surfaces*, **2014 SIAM Conference on Discrete Mathematics**, Minneapolis, USA
II 2011	*Colorings of bipartite graphs and polynomial functions on the set of Young diagrams*, **Bialgebras in Free Probability**, Erwin Schrödinger Institute, Vienna, Austria
XII 2010	*Polynomial functions on the set of Young diagrams and coloring of bipartite graphs*, **Workshop on Free Probability and Random Combinatorial Structures**, Universität Bielefeld, Germany

Research Visits and Internships

II–III 2024	**research visit**, *UCSD*, Visiting Scholar (Fulbright Award), five weeks
IV 2023	**research visit**, *The University of Tokyo*, work with Kento Osuga, one week
II 2022–III 2022	**research visit**, *Harvard University*, work with Cesar Cuenca, two weeks
II 2020	**research visit**, *Université Paris VII*, work with Guillaume Chapuy, one week
VI 2019	**research visit**, *UCSD*, work with Jonathan Novak, one week
II 2018	**research visit**, *Université Paris VII*, work with Guillaume Chapuy, one week

XI 2014	**research visit**, *Universität Zürich*, work with Valentin Féray, one week
X 2011–XI 2011	**research visit**, *Université de Bordeaux*, work with Valentin Féray, two weeks
X 2010–II 2011	**PhD internship**, *Adam Mickiewicz University*
II 2009–VI 2009	**Erasmus internship**, *University of Copenhagen*

Memberships and Institutional Responsabilities

2023–2026	Member of the **Scientific Council of the Institute of Mathematics of the Polish Academy of Sciences**
2023–now	Member of the **Polish Mathematical Society**
2021–2024	Jury member of the **Kazimierz Kuratowski Award**
2018–now	Member of several hiring committees for postdoc and PhD positions at the *Institute of Mathematics, Polish Academy of Sciences*

Supervision

2023–now	**Hans Höngesberg**, *Postdoc at IM PAN*
2023–now	**Victor Nador**, *Postdoc at IM PAN*
2018–now	**Maciej Kowalski**, *PhD student at IM PAN*
2015–2018	**Adam Burchardt**, *PhD at the Adam Mickiewicz University*, secondary supervisor Principal supervisor: Piotr Śniady, Thesis title: *Structure constants of Jack characters*

Organization of Scientific Meetings and Seminars

Fall 2023	Organizer of the Working Group on **Integrable Combinatorics** at *IM PAN*
VIII 2023	Co-organizer of the **Summer School in Algebraic, Asymptotic and Enumerative Combinatorics**, *Mathematical Conference Center in Będlewo*
VI 2022	Co-organizer of the **Summer School in Algebraic Combinatorics**, *Jagiellonian University*
2019–2022	Co-organizer of the **Kraków Combinatorics Seminar** (cooperation of *IM PAN, Jagiellonian University & AGH*)
Fall 2019	Organizer of the Working Group on **Combinatorial Representation Theory** at *IM PAN*
Spring 2019	Organizer of the Working Group on **Symmetric Functions** at the *Jagiellonian University*
2014–2015	Co-organizer of the **Seminar on Enumerative and Algebraic Combinatorics** in *LIAFA* at the *Université Paris Diderot*

Teaching and Outreach

September 2023	**"Asymptotic representation theory"** - series of lectures, *XXIV International Workshop for Young Mathematicians*, Jagiellonian University
December 2022	**Series of lectures**, *University of Wrocław*, Polish Children's Funds
Fall 2022	**Combinatorics of symmetric functions**, *advanced course*, IM PAN
2016–2017	**Series of lectures**, *"Math Festival", the "Mathematical Meetings" and the "Power of Mathematics", events aimed to exceptional high-school students interested in mathematics*, Poznań Mathematical Foundation
Fall semesters in 2011–2013	**Combinatorics**, *course*, University of Wrocław
2008–2013	**Mathematics faculty**, *Stefan Żeromski High School (for exceptional high-school students interested in mathematic)*, Jelenia Góra
2005–2010	**Series of lectures**, *Mathematical camps aimed to exceptional high-school students interested in mathematics*, Wrocław Mathematical Foundation

Refereeing service

Journal papers and preprints

2024 K. Nitin Chidambaram, Maciej Dołęga, and Kento Osuga. "b-Hurwitz numbers from Whittaker vectors for $\mathcal{W}$-algebras". arXiv: `2401.12814`.

2023 Houcine Ben Dali and Maciej Dołęga. "Positive formula for Jack polynomials, Jack characters and proof of Lassalle's conjecture". arXiv: `2305.07966`.

2023 Valentin Bonzom, Guillaume Chapuy, and Maciej Dołęga. "b-monotone Hurwitz numbers: Virasoro constraints, BKP hierarchy, and $O(N)$-BGW integral". In: *Int. Math. Res. Not. IMRN* 14, pp. 12172–12230.

2023 Marek Bożejko, Maciej Dołęga, Wiktor Ejsmont, and Światosław R. Gal. "Reflection length with two parameters in the asymptotic representation theory of type B/C and applications". In: *J. Funct. Anal.* 284.5, Paper No. 109797.

2023 Cesar Cuenca, Maciej Dołęga, and Alexander Moll. "Universality of global asymptotics of Jack-deformed random Young diagrams at varying temperatures". arXiv: `2304.04089`.

2022 Valentin Bonzom, Guillaume Chapuy, and Maciej Dołęga. "Enumeration of non-oriented maps via integrability". In: *Algebr. Comb.* 5.6, pp. 1363–1390.

2022 Guillaume Chapuy and Maciej Dołęga. "Non-orientable branched coverings, b-Hurwitz numbers, and positivity for multiparametric Jack expansions". In: *Adv. Math.* 409.part A, Paper No. 108645, 72.

2022 Maciej Dołęga and Maciej Kowalski. "LLT Cumulants and Graph Coloring". In: *Electron. J. Combin.* 29.4, Paper No. 4.5–.

2022 Maciej Dołęga and Mathias Lepoutre. "Blossoming bijection for bipartite pointed maps and parametric rationality of general maps of any surface". In: *Adv. in Appl. Math.* 141, Paper No. 102408.

2022 Maciej Dołęga and Jonathan Novak. "Procesi's Conjecture on the Formanek-Weingarten Function is False". In: *C. R. Math. Acad. Sci. Paris* 360, pp. 1169–1172.

2021 Alexander Hock, Raimar Wulkenhaar, and Maciej Dołęga. "Blobbed topological recursion of the quartic Kontsevich model II: Genus=0". arXiv: `2103.13271`.

2020   Maciej Dołęga, Thomas Gerber, and Jacinta Torres. "A positive combinatorial formula for symplectic Kostka-Foulkes polynomials I: Rows". In: *J. Algebra* 560, pp. 1253–1296.

2019   Maciej Dołęga. "Macdonald cumulants, G-inversion polynomials and G-parking functions". In: *European J. Combin.* 75, pp. 172–194.

2019   Maciej Dołęga and Piotr Śniady. "Gaussian fluctuations of Jack-deformed random Young diagrams". In: *Probab. Theory Related Fields* 174.1-2, pp. 133–176.

2017   Guillaume Chapuy and Maciej Dołęga. "A bijection for rooted maps on general surfaces". In: *J. Combin. Theory Ser. A* 145, pp. 252–307.

2017   Maciej Dołęga. "Strong factorization property of Macdonald polynomials and higher-order Macdonald's positivity conjecture". In: *J. Algebraic Combin.* 46.1, pp. 135–163.

2017   Maciej Dołęga. "Top degree part in b-conjecture for unicellular bipartite maps". In: *Electron. J. Combin.* 24.3, Paper No. 3.24, 39.

2017   Maciej Dołęga and Valentin Féray. "Cumulants of Jack symmetric functions and the b-conjecture". In: *Trans. Amer. Math. Soc.* 369.12, pp. 9015–9039.

2016   Maciej Dołęga and Valentin Féray. "Gaussian fluctuations of Young diagrams and structure constants of Jack characters". In: *Duke Math. J.* 165.7, pp. 1193–1282.

2014   Maciej Dołęga, Valentin Féray, and Piotr Śniady. "Jack polynomials and orientability generating series of maps". In: *Sém. Lothar. Combin.* 70, Art. B70j, 50.

2012   Maciej Dołęga and Piotr Śniady. "Asymptotics of characters of symmetric groups: structure of Kerov character polynomials". In: *J. Combin. Theory Ser. A* 119.6, pp. 1174–1193.

2010   Maciej Dołęga, Valentin Féray, and Piotr Śniady. "Explicit combinatorial interpretation of Kerov character polynomials as numbers of permutation factorizations". In: *Adv. Math.* 225.1, pp. 81–120.

Conference papers

2023   Houcine Ben Dali and Maciej Dołęga. "Jack characters as generating series of bipartite maps and proof of Lassalle's conjecture". In: *Sém. Lothar. Combin.* 89B, Art. 34, 12.

2022   Maciej Dołęga. *b-Hurwitz numbers and enumeration of maps.* Oberwolfach Rep. 57/2022.

2021   Guillaume Chapuy and Maciej Dołęga. "Non-orientable branched coverings, b-Hurwitz numbers, and positivity for multiparametric Jack expansions (extended abstract)". In: *Sém. Lothar. Combin.* 85B, Art. 32, 13.

2020   Maciej Dołęga, Thomas Gerber, and Jacinta Torres. "A positive combinatorial formula for symplectic Kostka-Foulkes polynomials I: Rows". In: *Sém. Lothar. Combin.* 84B, Art. 42, 12 pp.–11.

2018   Maciej Dołęga. "A combinatorial formula for Macdonald cumulants". In: *Sém. Lothar. Combin.* 80B, Art. 41, 12.

2016   Maciej Dołęga and Valentin Féray. "Cumulants of Jack symmetric functions and b-conjecture (extended abstract)". In: *28th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2016)*. Discrete Math. Theor. Comput. Sci. Proc., BC. Assoc. Discrete Math. Theor. Comput. Sci., Nancy, pp. 395–406.

2015   Guillaume Chapuy and Maciej Dołęga. "A bijection for rooted maps on general surfaces (extended abstract)". In: *27th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2015)*. Discrete Math. Theor. Comput. Sci. Proc., FPSAC'15. Assoc. Discrete Math. Theor. Comput. Sci., Nancy, pp. 181–192.

2013   Maciej Dołęga and Valentin Féray. "On Kerov polynomials for Jack characters." In: *25th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2013)*. Discrete Math. Theor. Comput. Sci. Proc., AS. Assoc. Discrete Math. Theor. Comput. Sci., Nancy, pp. 539–550.

2011 Maciej Dołęga and Piotr Śniady. "Polynomial functions on Young diagrams arising from bipartite graphs". In: *23rd International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2011)*. Discrete Math. Theor. Comput. Sci. Proc., AO. Assoc. Discrete Math. Theor. Comput. Sci., Nancy, pp. 257–268.

2009 Maciej Dołęga, Valentin Féray, and Piotr Śniady. "Characters of symmetric groups in terms of free cumulants and Frobenius coordinates". In: *21st International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2009)*. Discrete Math. Theor. Comput. Sci. Proc., AK. Assoc. Discrete Math. Theor. Comput. Sci., Nancy, pp. 337–348.