Curriculum Vitae

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Philippe Gaucher

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Personal Details

Gender: He/Him
Date of birth: February 5th, 1967
Place of birth: Amiens, France
Present Citizenship: French

Research area

Homotopy theory and applications in computer science (concurrency theory)

The main geometric models I am interested in are several variants of Grandis' d-spaces (multipointed or not), trace spaces giving rise to semicategorical variants called flows, Moore variants or these notions, and several improvements of the notion of precubical set (non-symmetric and symmetric transverse set, partial precubical set).

Education

09/1984–06/1987	Undergraduate courses (L1, L2) to prepare nationwide competitive exams, Mathematics, Physics, Computer Science at the Classe Préparatoire du Lycée Corneille (Rouen, France)
10/1987–06/1988	Undergraduate and graduate studies (L3, M1) at the Ecole Normale Supérieure de la rue d'Ulm (Paris, France)
1988	L3 and M1 degrees in mathematics and computer science (Magistère Ecole Normale Supérieure de la rue d'Ulm et Université Paris 7 Denis-Diderot) Title: *A propos de l'homologie des algèbres de Lie*

09/1988–06/1989	Graduate studies (M2) at the Institut de Recherche Mathématique Avancée (Université Louis Pasteur, Strasbourg, France)
1989	M2 degree in pure mathematics (algebraic topology, Université Louis Pasteur, Strasbourg) Supervisor: Daniel Guin Title: *On the general linear group and Hochschild homology*
1992	Ph.D. degree in mathematics (algebraic topology, Université Louis Pasteur, Strasbourg) Jury: Jean-Louis Loday (supervisor), Henri Carayol (rapporteur), Christophe Soulé (rapporteur), Daniel Guin, Hubert Rubenthaler Title: *Opérations sur l'homologie d'algèbres de matrices et homologie cyclique*
2002	Habilitation degree in mathematics (algebraic topology and application in computer science, Université Louis Pasteur, Strasbourg) Jury: Jean-Louis Loday (supervisor), Jeremy Gunawardena (rapporteur), Hans-Werner Henn (rapporteur), Michael Johnson (rapporteur), Pierre-Louis Curien, Jean-Yves Girard, Daniel Guin Title: *Déformation des Flots de Chemins Continus : Théorie et Applications*

Employment

10/1987–08/1991	Student at the Ecole Normale Supérieure de la rue d'Ulm (Paris)
09/1991–08/1992	Math Teacher at the Université Louis Pasteur (Strasbourg) Allocataire Moniteur Normalien
09/1992–08/1993	Military service at the ONERA (Toulouse) Supervisor: Gérard Eizenberg
09/1993–09/2003	CNRS researcher at the Institut de Recherche Mathématique Avancée (IRMA, Strasbourg)
10/2003–12/2015	CNRS researcher at Preuve Programme Système (PPS, Paris)
01/2016–Now	CNRS researcher at the Institut de Recherche en Informatique Fondamentale (IRIF, Paris)

Academic awards

1984	Lauréat du Concours Général de Mathématiques

Professional service

1989–1992	Teaching (French: colleur en math sup) at the lycée Kleber de Strasbourg
1994–1995	Webmaster of IRMA Strasbourg
2001–2002	Teaching in L1 and L2 math (130 h, algebra, analysis, logic)
2002–2003	Teaching in L1 math and L3 geography (96 h, algebra, analysis)
2003–2007	Local coordinator for ANR project (INVAL)
2006–Now	Reviewer for Math Reviews
2007–Now	Reviewer for zbMATH
2022–Now	Member of the Editorial Board of Extracta Mathematicae
2003–Now	Reviewer for mathematical and computer-scientific journals (Compositionality, Electronic Notes in Computer Science, Fundamenta Mathematicae, Mathematical Structures in Computer Science, New-York Journal of Mathematics, Springer Lecture Notes in Mathematics, Topology and Applications)
2003–Now	Project reviewer (NSERC Canada, Israel Science Foundation)

References

[1] P. Gaucher. Lambda-opérations et homologie des matrices. *C. R. Acad. Sci. Paris Sér. I Math.*, 313(10):663–666, 1991.

[2] P. Gaucher. Produit tensoriel de matrices et homologie cyclique. *C. R. Acad. Sci. Paris Sér. I Math.*, 312(1):13–16, 1991.

[3] P. Gaucher. Produit tensoriel de matrices, homologie cyclique, homologie des algèbres de Lie. *Ann. Inst. Fourier (Grenoble)*, 44(2):413–431, 1994. https://doi.org/10.5802/aif.1404.

[4] P. Gaucher. Lambda-opérations sur l'homologie d'une algèbre de Lie de matrices. *K-Theory*, 13(2):151–167, 1998. https://doi.org/10.1023/A:1007719230240.

[5] P. Gaucher. From concurrency to algebraic topology. In *Electronic Notes in Theoretical Computer Science*, volume 39, pages 1–19, 2000. https://doi.org/10.1016/s1571-0661(05)01149-7.

[6] P. Gaucher. Homotopy invariants of higher dimensional categories and concurrency in computer science. *Mathematical Structures in Computer Science*, 10(4):481–524, 2000. Geometry and concurrency. https://doi.org/10.1017/S0960129500003182.

[7] P. Gaucher. Combinatorics of branchings in higher dimensional automata. *Theory Appl. Categ.*, 8:No. 12, 324–376 (electronic), 2001.

[8] P. Gaucher. About the globular homology of higher dimensional automata. *Cah. Topol. Géom. Différ. Catég.*, 43(2):107–156, 2002.

[9] P. Gaucher. Investigating the algebraic structure of dihomotopy types. In *Electronic Notes in Theoretical Computer Science*, volume 52, page 25pp. Elsevier Science Publishers, 2002. https://doi.org/10.1016/S1571-0661(04)00221-X.

[10] P. Gaucher. Automate parallèle à homotopie près. I. *C. R. Math. Acad. Sci. Paris*, 336(7):593–596, 2003. https://doi.org/10.1016/S1631-073X(03)00118-3.

[11] P. Gaucher. Automate parallèle à homotopie près. II. *C. R. Math. Acad. Sci. Paris*, 336(8):647–650, 2003. https://doi.org/10.1016/S1631-073X(03)00119-5.

[12] P. Gaucher. The branching nerve of HDA and the Kan condition. *Theory Appl. Categ.*, 11:No. 3, 75–106 (electronic), 2003.

[13] P. Gaucher and E. Goubault. Topological deformation of higher dimensional automata. *Homology Homotopy Appl.*, 5(2):39–82, 2003. https://doi.org/10.4310/HHA.2003.v5.n2.a3.

[14] P. Gaucher. A model category for the homotopy theory of concurrency. *Homology, Homotopy and Applications*, 5(1):p.549–599, 2003. https://doi.org/10.4310/hha.2003.v5.n1.a20.

[15] P. Gaucher. The homotopy branching space of a flow. In *Electronic Notes in Theoretical Computer Science*, volume 100, pages 95–109. Elsevier Science Publishers, 2004. https://doi.org/10.1016/j.entcs.2004.08.015.

[16] P. Gaucher. Comparing globular complex and flow. *New York J. Math.*, 11:97–150 (electronic), 2005.

[17] P. Gaucher. Flow does not model flows up to weak dihomotopy. *Appl. Categ. Structures*, 13(5-6):371–388, 2005. https://doi.org/10.1007/s10485-005-8176-3.

[18] P. Gaucher. Homological properties of non-deterministic branchings of mergings in higher dimensional automata. *Homology Homotopy Appl.*, 7(1):51–76 (electronic), 2005. https://doi.org/10.4310/hha.2005.v7.n1.a4.

[19] P. Gaucher. Inverting weak dihomotopy equivalence using homotopy continuous flow. *Theory Appl. Categ.*, 16:No. 3, 59–83 (electronic), 2006.

[20] P. Gaucher. T-homotopy and refinement of observation (III) : Invariance of the branching and merging homologies. *New York J. Math.*, 12:319–348 (electronic), 2006.

[21] P. Gaucher. T-homotopy and refinement of observation (IV) : Invariance of the underlying homotopy type. *New York J. Math.*, 12:63–95 (electronic), 2006.

[22] P. Gaucher. T-homotopy and refinement of observation, part II: Adding new T-homotopy equivalences. *Internat. J. Math. Math. Sci.*, 2007:Article ID 87404, 20 pages, 2007. https://doi.org/10.1155/2007/87404.

[23] P. Gaucher. Globular realization and cubical underlying homotopy type of time flow of process algebra. *New York J. Math.*, 14:101–137 (electronic), 2008.

[24] P. Gaucher. Towards a homotopy theory of process algebra. *Homology, Homotopy and Applications*, 10(1):353–388, 2008. https://doi.org/10.4310/HHA.2008.v10.n1.a16.

[25] P. Gaucher. Homotopical interpretation of globular complex by multi-pointed d-space. *Theory Appl. Categ.*, 22:No. 22, 588–621 (electronic), 2009.

[26] P. Gaucher. T-homotopy and refinement of observation (I) : Introduction. *Electronic Notes in Theoretical Computer Science*, 230:103–110, 2009. http://dx.doi.org/10.1016/j.entcs.2009.02.019.

[27] P. Gaucher. Combinatorics of labelling in higher dimensional automata. *Theoretical Computer Science*, 411(11-13):1452–1483, 2010. https://doi.org/10.1016/j.tcs.2009.11.013.

[28] P. Gaucher. Directed algebraic topology and higher dimensional transition systems. *New York J. Math.*, 16:409–461 (electronic), 2010.

[29] P. Gaucher. Towards a homotopy theory of higher dimensional transition systems. *Theory Appl. Categ.*, 25:No. 25, 295–341 (electronic), 2011.

[30] P. Gaucher. Erratum to "towards a homotopy theory of higher dimensional transition systems". *Theory Appl. Categ.*, 29:No. 2, 17–20 (electronic), 2014.

[31] P. Gaucher. Homotopy theory of labelled symmetric precubical sets. *New York J. Math.*, 20:93–131 (electronic), 2014.

[32] P. Gaucher. The choice of cofibrations of higher dimensional transition systems. *New York J. Math.*, 21:1117–1151 (electronic), 2015.

[33] P. Gaucher. The geometry of cubical and regular transition systems. *Cah. Topol. Géom. Différ. Catég.*, LVI-4, 2015.

[34] P. Gaucher. Left determined model categories. *New York J. Math.*, 21:1093–1115 (electronic), 2015.

[35] P. Gaucher. Combinatorics of past-similarity in higher dimensional transition systems. *Theory Appl. Categ.*, 32:No. 33, 1107–1164 (electronic), 2017.

[36] P. Gaucher. Enriched diagrams of topological spaces over locally contractible enriched categories. *New York J. Math.*, 25:1485–1510 (electronic), 2019.

[37] P. Gaucher. Flows revisited: the model category structure and its left determinedness. *Cah. Topol. Géom. Différ. Catég.*, LXI-2:208–226, 2020.

[38] P. Gaucher. Homotopy theory of Moore flows (I). *Compositionality*, 3(3), 2021. https://doi.org/10.32408/compositionality-3-3.

[39] P. Gaucher. Homotopy theory of Moore flows (II). *Extr. Math.*, 36(2):157–239, 2021. https://doi.org/10.17398/2605-5686.36.2.157.

[40] P. Gaucher. Left properness of flows. *Theory and Applications of Categories*, 37(19):562–612, 2021.

[41] P. Gaucher. Six model categories for directed homotopy. *Categories and General Algebraic Structures with Applications*, 15(1):145–181, 2021. https://doi.org/10.52547/cgasa.15.1.145.

[42] P. Gaucher. Comparing cubical and globular directed paths. *Fundamenta Mathematicae*, 2023. https://doi.org/10.4064/fm219-3-2023.

[43] P. Gaucher. Comparing the non-unital and unital settings for directed homotopy. *Cah. Topol. Géom. Différ. Catég.*, LXIV-2:176–197, 2023.

[44] P. Gaucher. Regular directed path and Moore flow. *Rend. Mat. Appl., VII. Ser.*, 45:111–151, 2024.

[45] P. Gaucher. Directed degeneracy maps for precubical sets. *Theory Appl. Categ.*, 41(7):194–237, 2024.

[46] P. Gaucher. Homotopy theory of Moore flows (III). *North-West. Eur. J. Math.*, (10):55–113, 2024.

Preprints

[1] P. Gaucher. Globular subdivisions are dihomotopy equivalences, 2025. https://doi.org/10.48550/arXiv.2502.11773.

[2] P. Gaucher. Natural homotopy of multipointed d-spaces, 2024. https://doi.org/10.48550/arXiv.2404.18693.

[3] P. Gaucher. Towards a theory of natural directed paths, 2023. https://doi.org/10.48550/arXiv.2306.02792.

Non-published

[1] P. Gaucher. Closed symmetric monoidal structure and flow. 2003. https://doi.org/10.48550/arXiv.math/0308064.

[2] P. Gaucher. Homotopical equivalence of combinatorial and categorical semantics of process algebra. 2007. https://doi.org/10.48550/arXiv:0711.1330.

[3] P. Gaucher. About transfinite compositions of weak equivalences of higher dimensional transition systems.

[4] P. Gaucher. Erratum to "Homotopy theory of Moore flows I", 2022. https://doi.org/10.48550/arXiv.2207.01366.