Branimir Ćaćić

CURRICULUM VITAE ET STUDIORUM

Contact

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Research Interests

Foundations of noncommutative differential and Riemannian geometry; applications of noncommutative geometry to mathematical physics and applied harmonic analysis.

Employment

07/2022–	*Associate Professor* (with tenure), Department of Mathematics and Statistics, University of New Brunswick, Fredericton.
07/2019–06/2022	*Associate Professor*, Department of Mathematics and Statistics, University of New Brunswick, Fredericton.
07/2016–06/2019	*Assistant Professor*, Department of Mathematics and Statistics, University of New Brunswick, Fredericton.
08/2013–06/2016	*Visiting Assistant Professor*, Department of Mathematics, Texas A&M University. POSTDOCTORAL MENTOR: Guoliang Yu.

Visiting Positions

10/2014–12/2014	*Visitor*, Institut des Hautes Études Scientifiques.
09/2014	*Visitor*, Hausdorff Research Institute for Mathematics, University of Bonn.

Education

09/2009–06/2013	*Doctor of Philosophy*, Mathematics Option, California Institute of Technology. THESIS: *On reconstruction theorems in noncommutative Riemannian geometry.* ADVISOR: Matilde Marcolli.
09/2007–08/2009	Doctoral studies, International Max Planck Research School in Moduli Spaces, Max Planck Institute for Mathematics. ADVISOR: Matilde Marcolli.
09/2007–07/2008	Qualifying year, Bonn International Graduate School in Mathematics, University of Bonn.
09/2003–06/2007	*Honours Bachelor of Science* (with High Distinction), Mathematics and Physics Specialist, St. Michael's College, University of Toronto.

Grants & Awards

04/2024–	*Classical Abelian gauge theory on noncommutative manifolds*, Discovery Grant, Natural Sciences and Engineering Research Council of Canada.
05/2021–06/2022	*Classical physics on quantum spaces*, Harrison McCain Foundation (Young Scholars Award), University of New Brunswick.
01/2018–12/2018	*CMS Summer 2018 Session on Noncommutative Geometry and Topology*, Conferences and Workshops Funding, Atlantic Association for Research in the Mathematical Sciences.
05/2017–12/2018	*Principal bundles in noncommutative differential geometry*, University Research Fund (New Faculty), University of New Brunswick.
04/2017–03/2024	*Principal bundles in noncommutative differential geometry*, Discovery Grant, Natural Sciences and Engineering Research Council of Canada.
04/2014–03/2015	*Noncommutative Geometry Festival, April 30–May 3, 2014* (co-PI with Guoliang Yu, lead co-PI, and Zhizhang Xie, co-PI), Standard Grant (Conferences and Workshops in the Mathematical Sciences), National Science Foundation.
07/2013–06/2015	*AMS–Simons Travel Grant*, American Mathematical Society.
05/2013	*Apostol Award for Excellence in Teaching*, Mathematics Option, California Institute of Technology.
01/2013	*Graduate Student Travel Grant* for attendance at the 2013 Joint Mathematics Meetings, American Mathematical Society.
08/2012	*NSF Travel Grant* for attendance at the 27th International Congress on Mathematical Physics.

Publications & Manuscripts

PUBLICATIONS

1. Branimir Ćaćić, *Geometric foundations for classical $U(1)$-gauge theory on noncommutative manifolds*, Comm. Math. Phys. 405 (2024), article no. 209.
2. Branimir Ćaćić and Bram Mesland, *Gauge theory on noncommutative Riemannian principal bundles*, Comm. Math. Phys. 388 (2021), 107–198.
3. Branimir Ćaćić, *A reconstruction theorem for Connes–Landi deformations of commutative spectral triples*, J. Geom. Phys. 98 (2015), 82–109.
4. Branimir Ćaćić, Matilde Marcolli, and Kevin Teh, *Coupling of gravity to matter, spectral action and cosmic topology*, J. Noncommut. Geom. 8 (2014), no. 2, 473–504.
5. Branimir Ćaćić, *Real structures on almost-commutative spectral triples*, Lett. Math. Phys. 103 (2013), no. 7, 793–816.
6. Branimir Ćaćić, *A reconstruction theorem for almost-commutative spectral triples*, Lett. Math. Phys. 100 (2012), no. 2, 181–202.
7. Branimir Ćaćić, *Moduli spaces of Dirac operators for finite spectral triples*, in *Quantum groups and noncommutative spaces: perspectives on quantum geometry*, eds. M. Marcolli and D. Parashar, Vieweg Verlag, 2011, 9–68.

MANUSCRIPTS

1. Branimir Ćaćić and Timmavajjula Venkata Karthik, *Maxwell's equations on noncommutative oriented Riemannian manifolds*, to appear.
2. Branimir Ćaćić and Gaia Noseworthy, *The noncommutative Riemannian geometry of fuzzy tori*, in preparation.
3. Branimir Ćaćić, *Classification of $U(1)$-instantons on higher-dimensional noncommutative tori*, in preparation.
4. Branimir Ćaćić, *Classical gauge theory on quantum principal bundles*, `arXiv:2108.13789 [math-ph]` (85 pp.), under revision.

Invited Talks

CONFERENCE TALKS

12/2025	*Revisiting the differential topology of higher-dimensional noncommutative tori*, Session on Horizons in Operator Algebras, 2025 CMS Winter Meeting, Toronto.
12/2023	*Quantum principal $U(1)$-bundles: differential, Riemannian, and metric geometry*, Workshop on Noncommutative Geometry and its Applications, Fields Institute.
05/2023	*Quantum principle $U(1)$-bundles: differential, Riemannian, and metric geometry*, 51st Canadian Annual Symposium on Operator Algebras and Their Applications, University of Western Ontario.
06/2020	*Principal bundles in noncommutative Riemannian geometry*, Zagreb Workshop on Operator Theory, University of Zagreb; online.
09/2019	*Principal bundles in noncommutative Riemannian geometry*, Quantum Flag Manifolds in Prague, Charles University.
08/2019	*Gauge theory on noncommutative Riemannian principal bundles*, Workshop on New Geometry of Quantum Dynamics, Fields Institute.
08/2017	*Spectral triples for discrete groups*, MCA 2017 Satellite Conference on Operator Algebras, Fields Institute.
06/2017	*Riemannian principal bundles in unbounded KK-theory*, Workshop on Analysis, Noncommutative Geometry, and Operator Algebras, Department of Mathematical Sciences, Chalmers University of Technology–University of Gothenburg.
10/2016	*Spectral triples for discrete groups*, Conference on Noncommutative Index Theory, Stefan Banach International Mathematical Centre.
09/2015	*Good quotients of noncommutative Riemannian manifolds*, Wabash Modern Analysis Miniconference, Indiana University–Purdue University Indianapolis.
07/2015	*Principal bundles in unbounded KK-theory*, Workshop on Noncommutative Geometry and Spectral Invariants, Université de Québec à Montréal.
03/2015	*Splitting homomorphisms in strict deformation quantisation*, Workshop on the Geometry of Noncommutative Manifolds, Fields Institute.
09/2014	*A reconstruction theorem for Connes–Landi deformations of commutative spectral triples*, Workshop on Quantum Physics and Noncommutative Geometry, Hausdorff Research Institute for Mathematics.

06/2013 *A reconstruction theorem for toric noncommutative manifolds*, Conference on Noncommutative Geometry and Quantum Groups (in honour of Marc Rieffel), Fields Institute.

10/2012 *Reconstruction theorems in noncommutative Riemannian geometry*, West Coast Operator Algebra Seminar 2012, University of Oregon.

07/2012 *A reconstruction theorem for (real) almost-commutative spectral triples*, Final Workshop, ESI Programme on K-Theory and Quantum Fields, Erwin Schrödinger Institute.

SEMINAR TALKS

04/2024 *Quantum principal $U(1)$-bundles: analysis and synthesis*, Seminar on Cartan Geometry, Noncommutative Geometry, and Quantum Groups, University of Bologna; online.

03/2022 *Differentiable Cuntz–Pimsner constructions for Hermitian line modules with connection*, Noncommutative Geometry and Topology Seminar, Charles University and Institute of Mathematics of the Czech Academy of Sciences; online.

11/2021 *Classical gauge theory on quantum principal bundles*, Quantum Field Theory Seminar, Mathematical Institute, University of Oxford; online.

10/2021 *Classical gauge theory on quantum principal bundles*, Global NCG Seminar (Europe); online.

01/2021 *Building blocks for gauge theory on quantum principal bundles*, Noncommutative Geometry and Topology Seminar, Charles University and Institute of Mathematics of the Czech Academy of Sciences; online.

05/2020 *Gauge theory on quantum principal bundles*, NYC Noncommutative Geometry Seminar, St. John's University; online.

11/2018 *Noncommutative principal bundles in unbounded KK-theory*, Thematic Programme on Bivariant K-Theory in Geometry and Physics, Erwin Schrödinger International Institute for Mathematics and Physics.

03/2016 *Spectral triples for discrete groups*, Analysis Seminar, Department of Mathematics, University of Houston.

12/2015 *Sketches of noncommutative geometry*, Functional Analysis Seminar, Department of Mathematics, University of Zagreb.

11/2015 *Good quotients of spectral triples*, Noncommutative Geometry Seminar, Mathematics Option, California Institute of Technology.

10/2015 *Good quotients of noncommutative manifolds*, Colloquium, Department of Mathematics, Washington University in St. Louis.

07/2015 *Principal bundles in unbounded KK-theory*, Oberseminar Analysis und Theoretische Physik, Institut für Angewandte Mathematik, Gottfried Wilhelm Leibniz Universität Hannover.

12/2014 *A reconstruction theorem for Connes–Landi deformations of commutative spectral triples*, Operator Algebras Seminar, Institut de Mathématiques de Jussieu.

10/2014 *A reconstruction theorem for Connes–Landi deformations of commutative spectral triples*, Operator Algebras Seminar, Department of Mathematical Sciences, Norwegian University of Science and Technology.

06/2014 — *An introduction to strict deformation quantisation*, *A reconstruction theorem for noncommutative G-manifolds*, Noncommutative Geometry Seminar, Department of Mathematics, University of Western Ontario.

03/2014 — *Twisted group algebras and strict deformation quantisation*, Noncommutative Geometry Seminar, Mathematics Option, California Institute of Technology.

Mentoring & Thesis Supervision

POSTDOCTORAL SCHOLARS

05/2017–04/2018 — Fereshteh Yazdani (co-mentored with Bahram Rangipour), Department of Mathematics and Statistics, University of New Brunswick, Fredericton.

DOCTORAL STUDENTS

01/2022– — Derrick Kirby (co-supervised with Nicholas Touikan).

09/2018–05/2025 — Timmavajjula Venkata Karthik.

01/2018–09/2019 — Yavar Abdolmaleki (co-supervised with Dan Kučerovský).

MASTERS STUDENTS SUPERVISED

09/2020–06/2024 — Cole Dunphy (co-supervised with Nicholas Touikan).

HONOURS STUDENTS SUPERVISED

09/2023–04/2024 — Jaden Monk, *The Theorema Egregium and surfaces of constant Gaußian curvature.*

01/2019–12/2019 — Justin Furlotte, *Topology, measure theory, and analysis on fractals.*

NSERC USRA RECIPIENTS

05/2022–08/2022 — Gaia Noseworthy, *Geodesics in noncommutative Riemannian geometry.*

05/2021–08/2021 — Gaia Noseworthy, *Geodesics in noncommutative Riemannian geometry.*

05/2019–08/2019 — Benjamin Chase (co-mentored with Eddy Campbell), *Vector invariants of permutation groups.*

05/2018–08/2018 — Benjamin Chase (co-mentored with Eddy Campbell and Jianjun Chuai), *Vector invariants of permutation groups.*

Teaching

DEPARTMENT OF MATHEMATICS & STATISTICS, UNIVERSITY OF NEW BRUNSWICK

Fall 2025 — MATH 3103, *Analysis i*;
MATH 4103/6103, *Measure Theory.*

Winter 2025 — MATH 1063, *Enriched Introduction to Calculus ii.*

Fall 2024 — MATH 3103, *Analysis i*;
MATH 3213, *Linear Algebra ii.*

Winter 2024 — MATH 1013, *Introduction to Calculus ii* (course coordinator);
Intermediate Mathematics ii.

Fall 2023	MATH 3103, *Analysis i.*
Winter 2023	MATH 1013, *Introduction to Calculus ii* (course coordinator); MATH 2013, *Intermediate Mathematics ii.*
Fall 2023	MATH 3103, *Analysis i.*
Winter 2023	MATH 1013, *Introduction to Calculus ii*; MATH 2013, *Intermediate Mathematics ii.*
Fall 2021	MATH 3213, *Linear Algebra ii*; MATH 3243, *Complex Analysis.*
Winter 2021	MATH 3113, *Analysis ii.*
Fall 2020	MATH 3213, *Linear Algebra ii*; MATH 6151, *Advanced Topology.*
Winter 2020	MATH 4153/6153, *Topology.*
Fall 2019	MATH 2003, *Intermediate Mathematics i*; MATH 3103, *Analysis i.*
Winter 2019	MATH 3063, *Geometry.*
Fall 2018	MATH 2513, *Multivariable Calculus for Engineers*; MATH 4473/6473, *Introduction to Differential Geometry.*
Winter 2018	MATH 2513, *Multivariable Calculus for Engineers.*
Fall 2017	MATH 1503, *Introduction to Linear Algebra*; MATH 3243, *Complex Analysis.*
Winter 2017	MATH 1063, *Enriched Calculus ii*; MATH 2513, *Multivariable Calculus for Engineers.*
Fall 2016	MATH 3243, *Complex Analysis.*

DEPARTMENT OF MATHEMATICS, TEXAS A&M UNIVERSITY

Spring 2016	MATH 311, *Topics in Applied Mathematics i.*
Fall 2015	MATH 304, *Linear Algebra* (2 sections).
Spring 2015	MATH 304, *Linear Algebra* (3 sections).
Spring 2014	MATH 251, *Engineering Mathematics iii* (2 sections).
Fall 2013	MATH 251, *Engineering Mathematics iii.*

Outreach & Professional Service

OUTREACH TALKS

05/2019	*The Impossible Tribar*, UNB–CMS Spring Mathematics Camp, University of New Brunswick, Fredericton.
03/2019	*The Impossible Tribar*, UNB Mathematics Society, University of New Brunswick, Fredericton.
01/2019	*Alexander Grothendieck*, Fredericton Tertulias.

05/2018 — *Gauß's Theorema Egregium*, AARMS–Girl Guides Camp "All SySTEMs Go", University of New Brunswick, Fredericton.

05/2018 — *Gauß's Theorema Egregium*, UNB–CMS Spring Mathematics Camp, University of New Brunswick, Fredericton.

02/2017 — *Noncommutativity for fun and profit*, UNB Mathematics Society, University of New Brunswick, Fredericton.

02/2016 — *Noncommutative tori I have known*, Mathematics Graduate Student Organisation, Texas A&M University.

CONFERENCE & WORKSHOP ORGANISATION

06/2021 — Co-organiser, *Session on Noncommutative Geometry and Mathematical Physics*, 2021 CMS Summer Meeting (online, postponed from 2020 because of COVID-19).

06/2020 — Co-organiser, *Zagreb Workshop on Operator Theory*, University of Zagreb (online).

04/2019 — Co-organiser, *2019 Inter-Campus Seminar Day*, Mathematics and Statistics GAU, University of New Brunswick.

06/2018 — Co-organiser, *Session on Noncommutative Geometry and Topology*, 2018 CMS Summer Meeting, Fredericton, NB.

04/2014 — Co-organiser, *Noncommutative Geometry Festival*, Department of Mathematics, Texas A&M University.

INSTITUTIONAL COLLABORATIONS

01/2023– — UNB node coordinator, *Operator algebras that one can see* (PI: Piotr Hajac, IMPAN), Horizon MSCA Staff Exchange, European Research Council.

PEER REVIEW

JOURNALS: — Annales Henri Poincaré; Journal of Geometry and Physics; Journal of Operator Theory; Journal of Topology and Analysis; Mathematical Physics, Analysis, and Geometry; Münster Journal of Mathematics; Journal of Noncommutative Geometry.

PROCEEDINGS: — *Quanta of Maths*, eds. E. Blanchard, D. Ellwood, M. Khalkhali, M. Marcolli, H. Moscovici and S. Popa, Clay Math. Proc. 11, Amer. Math. Soc., 2010.

EXTERNAL SERVICE

11/2017–06/2018 — Scientific Organising Committee, *2018 CMS Summer Meeting*, Canadian Mathematical Society.

University Service

DEPARTMENTAL OF MATHEMATICS & STATISTICS

12/2017–04/2018 — Search Committee (continuing position in algebra/combinatorics).

04/2018–05/2018 — Department Chair Search Committee.

10/2019–12/2020 — Search Committee (continuing position in data science).

FACULTY OF SCIENCE

07/2019–06/2020	Faculty Curriculum Committee (*sabbatical replacement*).
02/2020–06/2022	SCI 1001/1002 Review Committee.
01/2023–06/2024	Priestman Lecture Committee.

FREDERICTON CAMPUS

07/2018–12/2025	*Faculty of Science Representative*, Senate.
07/2018–12/2025	Senate Library Committee.
07/2019–06/2021	Senate Nominating Committee (*alternate*).
11/2019–06/2020	Search Committee (Associate Dean of Engineering).
01/2020–12/2025	Senate Review Committee.
07/2021–12/2021	Review Committee (Dean of Computer Science).
07/2023–06/2024	Senate Nominating Committee (*primary*).

UNIVERSITY OF NEW BRUNSWICK

09/2019–04/2020	Fredericton Senate Representative, Dean of Libraries Review Advisory Committee.
01/2020–05/2020	Collective Bargaining Team (Full-Time Group), Association of University of New Brunswick Teachers.
03/2021–06/2021	Collective Bargaining Team (Full-Time Group), Association of University of New Brunswick Teachers.