

# Branimir Čačić

## CURRICULUM VITAE ET STUDIORUM

### *Contact*

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### *Research Interests*

Noncommutative differential geometry *via* spectral triples and unbounded *KK*-theory; applications of noncommutative geometry to mathematical physics, geometric group theory, and applied harmonic analysis.

### *Employment*

07/2019– *Associate Professor* (tenure-track), 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

- 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– *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 xvii<sup>th</sup> International Congress on Mathematical Physics.

## Publications & Preprints

### PUBLICATIONS

1. Branimir Ćaćić, *A reconstruction theorem for Connes–Landi deformations of commutative spectral triples*, J. Geom. Phys. 98 (2015), 82–109.
2. 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.
3. Branimir Ćaćić, *Real structures on almost-commutative spectral triples*, Lett. Math. Phys. 103 (2013), no. 7, 793–816.
4. Branimir Ćaćić, *A reconstruction theorem for almost-commutative spectral triples*, Lett. Math. Phys. 100 (2012), no. 2, 181–202.
5. 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.

### PREPRINTS

1. Branimir Ćaćić and Bram Mesland, *Gauge theory on noncommutative Riemannian principal bundles*, arXiv:1912.04179 [math-ph], submitted, 74 pp.

## Invited Talks

### CONFERENCE TALKS

- 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

- 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.

### DOCTORAL STUDENTS

- 09/2018– Timmavajjula Venkata Karthik, Mathematics and Statistics GAU, University of New Brunswick.

### HONOURS STUDENTS

- 01/2019–12/2019 Justin Furlotte, *Topology, measure theory, and analysis on fractals*, Department of Mathematics and Statistics, University of New Brunswick.

### NSERC USRA RECIPIENTS

- 05/2019–08/2019 Benjamin Chase (co-supervised with Eddy Campbell), *Vector invariants of permutation groups*, Department of Mathematics and Statistics, University of New Brunswick.
- 05/2018–08/2018 Benjamin Chase (co-supervised with Eddy Campbell), *Vector invariants of permutation groups*, Department of Mathematics and Statistics, University of New Brunswick.

## *Teaching*

DEPARTMENT OF MATHEMATICS & STATISTICS, UNIVERSITY OF NEW BRUNSWICK

Winter 2020 MATH 4153/6153, *Topology*, Section FRO1B.

Fall 2019 MATH 2003, *Intermediate Mathematics i*, Section FRO1A;  
MATH 3103, *Analysis i*, Section FRO1A.

Winter 2019	MATH 3063, <i>Geometry</i> , Section FRO1B.
Fall 2018	MATH 2513, <i>Multivariable Calculus for Engineers</i> , Section FRO2A; MATH 4473/6473, <i>Introduction to Differential Geometry</i> , Section FRO1A.
Winter 2018	MATH 2513, <i>Multivariable Calculus for Engineers</i> , Section FRO1B;
Fall 2017	MATH 1503, <i>Introduction to Linear Algebra</i> , Section FRO1A; MATH 3243, <i>Complex Analysis</i> , Section FRO1A.
Winter 2017	MATH 1063, <i>Enriched Calculus ii</i> , Section FRO1B; MATH 2513, <i>Multivariable Calculus for Engineers</i> , Section FRO1B;
Fall 2016	MATH 3243, <i>Complex Analysis</i> , Section FRO1A.

DEPARTMENT OF MATHEMATICS, TEXAS A&M UNIVERSITY

Spring 2016	MATH 311, <i>Topics in Applied Mathematics i</i> .
Fall 2015	MATH 304, <i>Linear Algebra</i> , Sections 506 and 508.
Spring 2015	MATH 304, <i>Linear Algebra</i> , Sections 501, 502, and 506.
Spring 2014	MATH 251, <i>Engineering Mathematics iii</i> , Sections 501 and 502.
Fall 2013	MATH 251, <i>Engineering Mathematics iii</i> , Section 501.

*Outreach & Professional Service*

OUTREACH TALKS

05/2019	<i>The Impossible Tribar</i> , UNB-CMS Spring Mathematics Camp, University of New Brunswick.
03/2019	<i>The Impossible Tribar</i> , UNB Mathematics Society, University of New Brunswick.
01/2019	<i>Alexander Grothendieck</i> , Fredericton Tertulias.
05/2018	<i>Gauß's Theorema Egregium</i> , AARMS-Girl Guides Camp "All SySTEMs Go", University of New Brunswick.
05/2018	<i>Gauß's Theorema Egregium</i> , UNB-CMS Spring Mathematics Camp, University of New Brunswick.
02/2017	<i>Noncommutativity for fun and profit</i> , UNB Mathematics Society, University of New Brunswick.
02/2016	<i>Noncommutative tori I have known</i> , Mathematics Graduate Student Organisation, Texas A&M University.

CONFERENCE & WORKSHOP ORGANISATION

06/2018	Co-organiser, <i>Session on Noncommutative Geometry and Topology</i> , 2018 CMS Summer Meeting, Fredericton, NB.
04/2014	Co-organiser, <i>Noncommutative Geometry Festival</i> , Department of Mathematics, Texas A&M University.

#### SEMINAR ORGANISATION

- 01/2018–05/2018      Organiser, *Noncommutative Geometry Seminar*, Department of Mathematics and Statistics, University of New Brunswick.
- 09/2015–06/2016      Founding co-organiser, *Working Seminar on Quantum Groups*, Department of Mathematics, Texas A&M University.
- 09/2013–06/2016      Co-organiser, *Noncommutative Geometry Seminar*, Department of Mathematics, Texas A&M University.
- 01/2012–06/2013      Founding co-organiser, *Graduate Student Seminar*, Mathematics Option, California Institute of Technology.

#### COMMITTEES

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