

# RAGINI SINGHAL

Curriculum Vitae

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## Employment

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September 2023-2024      Research associate, **Université Libre de Bruxelles**  
Mentor - [Joel Fine](#)

March-July 2023      Visiting researcher, **Humboldt-Universität zu Berlin**  
Mentor - [Thomas Walpuski](#)

Nov 2021-2022      Research Associate, **King's College London**  
(funded by the [Simons Collaboration on Special Holonomy](#)).  
Mentor - [Simon Salamon](#)

## Education

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2017-2021      Ph.D. in Mathematics, **University of Waterloo**, Waterloo, Canada.  
Advisors - [Benoit Charbonneau](#)  
[Spiro Karigiannis](#)

2015-2016      M.Sc. in Pure Mathematics, **Imperial College London**, UK.  
M.Sc. Thesis - Stable minimal cones in Euclidean space.  
M.Sc. Thesis Advisor - [André Arroja Neves](#)

2011-2015      BS in Mathematics, **Indian Institute of Technology, Kanpur**, India.  
Undergraduate Thesis - Application of knot theory to detect chirality of molecules.  
Undergraduate Thesis Advisor - [Aparna Dar](#)

## Research Interests

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Riemannian geometry, Geometric analysis, Gauge theory, Deformation theory, Metrics with special holonomy.

## Research Articles

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- (3) R. Singhal, *Nearly half-flat structures on  $S^3 \times S^3$* , [preprint](#).
- (2) R. Singhal, *Deformations of  $G_2$  instantons on nearly  $G_2$  manifolds*, **Annals of Global Analysis and Geometry** 62, pages 329–366 (2022) [arXiv:2101.02151](#), [Journal](#).
- (1) S. Dwivedi and R. Singhal, *Deformation theory of nearly  $G_2$  manifolds*, to appear in **Communications in Analysis and Geometry**, [arXiv:2007.02497](#).

## In preparation Articles

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- (1) Simon Salamon, R. Singhal *Cohomogeneity-one  $SO(4)$ -invariant  $G_2$ -structures on the Berger space*.

## Invited Short-Term Visits

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March-June 2024	CRM-Simons Research Visitor, <b>CRM, Montreal, Canada</b>
May-June 2014	Summer Research Visitor, <b>Simon Fraser University, Canada</b>
May-July 2013	Fellow, Student Research Fellowship Program 2013, <b>Indian Statistical Institute, New Delhi, India</b>

## Invited Talks

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- "Deformation theory of  $G_2$ -structures and instantons", Young Scholar day, 20 December 2023, Belgian Math Society.
- "Nearly half-flat structures on  $S^3 \times S^3$ ", Oberseminar, November 27, 2023, Universität Münster.
- "Deformation theory of nearly  $G_2$  manifolds", ULB Differential Geometry Seminar, May 2, 2023, Université Libre de Bruxelles.
- "Deformations of  $G_2$  instantons on nearly  $G_2$  manifolds", Oxford-London Gauge assembly, November 11, 2022 (online).
- "Deformations of  $G_2$  instantons on nearly  $G_2$  manifolds", Leeds geometry seminar, September 21 2022, University of Leeds.
- "Deformations of  $G_2$  instantons on nearly  $G_2$  manifolds", UCL geometry seminar, February 16 2022, UCL.
- "Deformations of  $G_2$  instantons on nearly  $G_2$  manifolds", Simons collaboration workshop "Connections between String Theory and Special Holonomy", January 10-14 2022, Oxford.
- "Deformation theory of nearly  $G_2$  manifolds", Differential Geometry Seminar 2020-2021, UC Santa Barbara.
- "Deformation of instantons on nearly  $G_2$  manifolds", AMS Fall Eastern Virtual Sectional meeting, 2020.
- "Deformation of instantons on nearly  $G_2$  manifolds", Ottawa Mathematics Conference 2020, Ottawa.
- "Deformation theory of nearly  $G_2$  manifolds", KCL/UCL Junior Geometry Seminar, 2020.
- "Deformation of instantons on nearly  $G_2$  manifolds" **IIT Kanpur, India**; 11/11/2019
- "[Deformations of  \$G\_2\$  instantons on nearly  \$G\_2\$  manifolds](#)",  $G_2$  geometry and related topics, **CMO-BIRS, Oaxaca, Mexico**; 07/05/2019
- "Minimal and Willmore surfaces", Graduate Student Colloquium, **University of Waterloo**, Canada; 26/03/2019

## Talks in Seminars

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- 2021 February - Talk on six dimensional nearly Kähler manifolds of cohomogeneity one, Geometry Working Seminar, University of Waterloo.
- 2021 January - Talk on new  $G_2$ -holonomy cones and exotic nearly Kähler structures on  $S^6$  and  $S^3 \times S^3$ , Geometry Working Seminar, University of Waterloo.
- 2020 January - Talk on the deformation theory of nearly  $G_2$  manifolds, Geometry Working Seminar, University of Waterloo.
- 2019 June - Series of talks on "Self-dual Yang–Mills connections on non-self-dual 4-manifolds", Geometry Working Seminar, University of Waterloo.
- 2019 March - Series of talks on "Deformation of nearly  $G_2$  instantons", Geometry Working Seminar, University of Waterloo.
- 2018 September - Stability and isolation phenomena for Yang–Mills fields, Geometry Working Seminar, University of Waterloo
- 2018 April - Series of talks on " $SU(2)^2$  invariant  $G_2$  instantons", Geometry Working Seminar, University of Waterloo.
- 2017 September - Stability of minimal cones in Euclidean space, Geometry Working Seminar, University of Waterloo.

## Honours and Awards

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- 2023 CRM-Simons Scholar at Centre de Recherches Mathématiques, March-June 2024.
- 2021 Doctoral Thesis Completion Award, University of Waterloo, Canada
- 2019 Graduate Studies Research Travel, University of Waterloo, Canada
- 2017-present Graduate Research Scholarship, University of Waterloo, Waterloo, Canada
- 2017-present International Doctoral Student Award, University of Waterloo, Canada
- 2017-present Provost Doctoral Entrance Award for Women, University of Waterloo, Canada
- 2015-2016 Imperial India Foundation Scholarship, Imperial College London, UK
- 2013 Summer Research Fellowship, Indian Academy of Sciences/ Indian National Science Academy/National Academy of Sciences, India
- 2011-2015 Kishor Vaigyanik Protsahan Yojana (KVPY) scholarship, Indian Academy of Sciences, Government of India

## Teaching

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### Instructor & Coordinator

Spring 2020 MATH 117 - Calculus I for Engineers

### Teaching Assistant

Winter 2021 PMATH 450/650 Lebesgue integration and Fourier analysis  
 PMATH 365/465 Differential geometry

Fall 2020 PMATH 331 Applied Real Analysis  
 MATH 127 Calculus 1 for the Sciences

Winter 2020 PMATH 450/650 Lebesgue integration and Fourier analysis  
 MATH 235 Linear Algebra (tutorial center)

Fall 2019 PMATH 365/465 Differential geometry  
 MMT 647 Foundations of Calculus I

Spring 2019 PMATH 321 Non Euclidean geometry  
 PMATH 351 Real Analysis

Winter 2019 PMATH 333 Introduction to real analysis  
 MATH 118 Calculus 2 for Engineering

Fall 2018 MATH 235 Linear Algebra  
 PMATH 331 Applied real analysis

Spring 2018 MMT 648 Foundations of Calculus II

Winter 2018 PMATH 365/465 Differential geometry  
 MATH 235 Linear Algebra

Fall 2017 PMATH 365/465 Differential geometry  
 MATH 147 Calculus I (Advanced level)

## Conference and Workshop participation

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- Special Holonomy: Progress and Open Problems 2022, 11-14 Sep 2022, Simons Center, Stony Brook University. (Organizer: Robert Bryant)
- Sixth Annual Meeting, 8-9 Sep 2022, Simons Foundation, NY.
- Geometry, Topology and Singular Special Holonomy Spaces, 6-10 June 2022, Freiburg University (Freiburg, Germany).
- Workshop on special geometries and gauge theory, originally scheduled for Universite de Bretagne Occidentale, France, 2020 (moved to online).
- CMS Winter meeting, Toronto, Canada; 2019.
- British Isles Graduate Workshop on Gauge theory in higher dimensions, Jersey, UK; 2019.
- Special Holonomy and Calibrated Geometry, Imperial College, London, UK; 2019
- Séminaire de Mathématiques Supérieures 2018: Derived Geometry and Higher Categorical Structures in Geometry and Physics, Fields Institute, Canada; 2018

- Geometry and Physics Conference, Fields Institute, Canada; 2017
- Workshop on Mean Curvature Flow and Ricci Flow, Fields Institute, Canada; 2017
- Minischool on Mean Curvature Flow and Ricci Flow, Fields Institute, Toronto, Canada; 2017
- Workshop on General Relativity & AdS/CFT, Fields Institute, Toronto, Canada; 2017
- Mini-School and Conference on  $G_2$  manifolds, Fields Institute, Toronto, Canada; 2017
- Summer School in Geometric Analysis, Fields Institute, Toronto, Canada; 2017
- RTG Workshop on the Geometry and Physics of Higgs Bundles II, November 11-12, University of Illinois at Chicago; 2017
- Conference in Differential Geometry, LeBrun Fest 2016, 5-9 July, Centre de Recherches Mathématiques, Canada; 2016
- Warwick Imperial Autumn Meeting, 28 November, University of Warwick, UK; 2015

## Services

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- Referee, Journal of Differential Geometry (International press).
- Referee, Quarterly Journal of Mathematics (Oxford University Press).
- Organizer, Workshop: Special Riemannian metrics in dimensions 6,7,8, Centre de Recherches Mathématiques, Montreal, 22-26 April 2024.
- Organizer, British Isles Graduate Workshop, Inverness, 3-7 July 2023.
- Organizer, Junior Special Geometers Meeting, King's College London, 6-8 January 2022.
- Volunteer, Mathematica Centrum Contest tutor, [K-W Bilingual School](#), Waterloo.
- Judge, Science Fair, [K-W Bilingual School](#), Waterloo.
- Co-organizer, Pure Mathematics Graduate Student Colloquium, University of Waterloo.
- Graduate Volunteer, The Great Polytope Barn-Raising Project, University of Waterloo. Trained and coordinated undergraduate volunteers in building a model of a 4D-polytope.
- Grader, CEMC Math contest, University of Waterloo.

## References

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- Joel Fine, Université Libre de Bruxelles, ([joel.fine@ulb.be](mailto:joel.fine@ulb.be))
- Simon Salamon, King's College London, ([simon.salamon@kcl.ac.uk](mailto:simon.salamon@kcl.ac.uk))
- Derek Harland, University of Leeds, ([d.g.harland@leeds.ac.uk](mailto:d.g.harland@leeds.ac.uk))
- Benoit Charbonneau, University of Waterloo ([bcharbon@uwaterloo.ca](mailto:bcharbon@uwaterloo.ca))
- Spiro Karigiannis, University of Waterloo ([karigiannis@uwaterloo.ca](mailto:karigiannis@uwaterloo.ca))