

# Martin Helmer

## Education

- 2011–Present **Ph.D Applied Mathematics**, *University of Western Ontario*, Canada.  
-Supervisor: Eric Schost  
-Computer Algebra and Computational Algebraic Geometry  
- Expected in fall 2015.
- 2009–2011 **M.Sc Mathematics**, *Queen's University*, Canada.  
-Thesis: *The Maslov Index and  $\omega$  Index Applied to Questions of Stability of Periodic Solutions to Hamiltonian Systems*
- 2005–2009 **B.Sc Applied Mathematics**, *University of Ontario Institute of Technology*, Canada.  
-Undergraduate Thesis: *An Exploration of Lie Algebras and Their Representations with Applications in Biology*

## Scholarships

- 2012–2013 **Ontario Graduate Scholarship**, University of Western Ontario, Canada.
- 2011–2012 **Ontario Graduate Scholarship**, University of Western Ontario, Canada.
- 2010–2011 **Ontario Graduate Scholarship**, Queen's University, Canada.
- 2009–2010 **Ontario Graduate Scholarship**, Queen's University, Canada.
- 2008 **NSERC USRA**, University of Ontario Institute of Technology, Canada.
- 2007 **UOIT STAR Award**, University of Ontario Institute of Technology, Canada.

## Preprints

M Helmer. A Direct Algorithm to Compute the Topological Euler Characteristic and Chern-Schwartz-MacPherson Class of Projective Complete Intersection Varieties. (2014). arXiv preprint [arXiv:1410.4113](https://arxiv.org/abs/1410.4113).

M Helmer. An Algorithm to Compute the Topological Euler Characteristic, Chern-Schwartz-MacPherson Class and Segre Class of Projective Varieties. (2014). arXiv preprint [arXiv:1402.2930](https://arxiv.org/abs/1402.2930).

## Publications

PL Buono, M Helmer, and Jeroen SW Lamb. On the zero set of  $g$ -equivariant maps. In *Mathematical Proceedings of the Cambridge Philosophical Society*, volume 147, page 735. Cambridge Univ Press, 2009.

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## Talks

- July 30, 2014 **Symbolic-Numeric Computation Conference (SNC) 2014**, *East China Normal University. Shanghai, China.*  
An Algorithm to Compute Certain Euler Characteristics and Chern-Schwartz-MacPherson Classes
- July 9, 2014 **Applications of Computer Algebra Conference (ACA) 2014**, *Fordham University. Bronx, New York.*  
Algorithms to Compute Chern-Schwartz-Macpherson and Segre Classes and the Euler Characteristic

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## Posters

- April 26, 2014 **East Coast Computer Algebra Day (ECCAD) 2014**, *Duke University. Durham, NC.*  
Algorithms to Compute Chern-Schwartz-Macpherson and Segre Classes and the Euler Characteristic

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## Software

- A Sage program to compute the Segre class, Chern-Schwartz-MacPherson class and Euler characteristic of a projective variety. The program can be downloaded from <http://publish.uwo.ca/~mhelmer2>.
- A Macaulay2 program to compute the Segre class, Chern-Schwartz-MacPherson class and Euler characteristic of a projective variety including an improved algorithm for the special case of complete intersections. The package can be downloaded from <http://publish.uwo.ca/~mhelmer2>.
- A module for the Macaulay2 built in package CharacteristicClasses, available on github, see <https://github.com/Macaulay2/M2/tree/master/M2/Macaulay2/packages>, the module can be accessed using the option `Algorithm=>ProjectiveDegree`. For usage instructions see the package documentation in the M2 package file. The CharacteristicClasses package computes the Segre class, Chern-Schwartz-MacPherson class and Euler characteristic of a projective variety.

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## Research Experience

- 2012–Present **Ph.D Research**, *Department of Applied Math, UWO.*  
-Surveyed relevant work on the computation of Chern-Schwartz-MacPherson classes and Euler characteristics  
-Surveyed work related to Bézout's theorem in multi-projective space  
-Studied modern intersection theory and scheme theory
- 2011 **Research Assistant**, *Department of Math and Stats, Queen's.*  
-Math education research, developed and evaluated electronic teaching tools for APSC 172, <http://www.mast.queensu.ca/~apsc172/demos.html>
- 2009–2011 **M.Sc. Research**, *Department of Math and Stats, Queen's.*  
-Studied use of the Maslov index and the  $\omega$ -index functions in the analysis of systems of Hamiltonian differential equations with certain symmetry properties.
- 2009 **Research Assistant**, *Faculty of Science, UOIT.*  
-Morse and Maslov index calculations

- 2008 **Research Assistant** , *Faculty of Science , UOIT.*  
-Mathematics Research on finite group representation theory
- 2007 **Research Assistant** , *Faculty of Engineering and Applied Sci. , UOIT.*  
-Development of software for a wireless sensor network to be used in vineculture

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## Teaching Experience

- 2014–Present **Teaching Assistant**, *Department of Applied Math, UWO.*  
- Tutorials for AM2415.  
-Created a blog for tutorial materials <http://am2415tutorials.blogspot.ca/>
- 2013–2014 **Teaching Assistant**, *Department of Applied Math, UWO.*  
- Tutorials for AM2413.  
-Created a blog for tutorial materials <http://am2413tutorialsectionthree2013.blogspot.ca/>
- 2013 **Teaching Assistant**, *Department of Applied Math, UWO.*  
- Tutorials for AM1413.  
-Created a blog for tutorial materials <http://am1413tutorial2013.blogspot.ca/>
- 2012 **Teaching Assistant**, *Department of Applied Math, UWO.*  
- Tutorials for AM1411.
- 2010–2011 **Teaching Assistant**, *Department of Math and Stats, Queen's.*  
- Tutorials for Math 224.

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## Mathematical Interests

- Algebraic Geometry
- Computer Algebra
- Intersection Theory
- Polynomial Systems