

# Curriculum Vitae of Kiumars Kaveh

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## 1. GENERAL INFORMATION

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Citizenship: Canada and Iran

## 2. ACADEMIC POSITIONS

- Research Associate, Department of Mathematics and Statistics, McMaster University, Hamilton, ON, Canada (July 2009 until present).
- CLTA Assistant Professor, Department of Mathematics, University of Toronto, Toronto, ON, Canada (July 2006 to June 2009).
- Postdoctoral Fellow, Department of Mathematics, University of British Columbia. Vancouver, B.C., Canada (September 2002 to August 2005).

## 3. RESEARCH INTERESTS

- Primary: Algebraic geometry and Lie theory; in particular: algebraic transformation groups, toric varieties, flag varieties, spherical varieties, equivariant cohomology, localization and GKM theory.
- Secondary: 1) Quantum computing and quantum information theory; 2) Algebraic geometric methods in cryptography, in particular Elliptic Curve Cryptography; 3) Algebraic number theory.

## 4. EDUCATION

- Ph.D., Department of Mathematics, University of Toronto (May 2002). Advisor: Prof. A. G. Khovanskii. Thesis title: *Morse theory and Euler characteristic of sections of spherical varieties*.
- Bachelor of Science (Mathematics), Department of Mathematical Sciences, Sharif University of Technology, Tehran, Iran (June 1996).
- Training camp for the International Olympiad in Informatics/Computer Science (Bonn, Germany) where I was a member of the Iranian team, Sharif University of Technology, Tehran, Iran (February to July 1992).
- High School Diploma, National Center for the Exceptional Talents, Tehran, Iran (June 1992).

## 5. RESEARCH ARTICLES AND PREPRINTS

**Articles:**

- Kaveh, K.; Khovanskii, A. G. *Convex bodies associated to actions of reductive groups*. Preprint (2009).
- Kaveh, K.; Khovanskii, A. G. *Newton-Okounkov bodies, semigroups of integral points, graded algebras and intersection theory*. arXiv:0904.3350. Submitted to Publications Mathematiques de l'IHES. (May 2009, 44 pages).
- Kaveh, K.; Khovanskii, A.G. *Algebraic equations and convex bodies*. (2009). arXiv:0812.4688. To appear in *Perspectives in Analysis, Topology and Geometry*, Birkhäuser series Progress in Mathematics (in honor of Oleg Viro). (16 pages).
- Kaveh, K.; Khovanskii, A. G. *Mixed volume and an analogue of intersection theory of divisors for non-complete varieties*. (2009). arXiv:0812.0433. To appear in *Moscow Mathematical Journal*. (34 pages).
- Carrell, J. B.; Kaveh, K. *On the equivariant cohomology of subvarieties of a  $\mathfrak{B}$ -regular variety*. *Transformation Groups* 13 (2008), no. 3-4, 495–505 (Volume in honor of Bertram Kostant).
- Kaveh, K.; Khovanskii, A. G. *Convex bodies and algebraic equations on affine varieties*. (2008). arXiv:0804.4095. (44 pages).
- Kaveh, K. *A note on the cohomology rings of spherical varieties and volume polynomial*. (2008). Under revision. arXiv:0312503. (24 pages).
- Carrell, J. B.; Kaveh, K.; Puppe, V. *Vector fields, torus actions and equivariant cohomology*. *Pacific Journal of Mathematics*, Vol. 232 (2007), No. 1, 61–76.
- Kaveh, K. *SAGBI bases and degeneration of spherical varieties to toric varieties*, *Michigan Math. J.* 53 (2005), No. 1, 109–121.
- Kaveh, K. *Vector fields and cohomology rings of toric varieties*, *Canadian Math. Bull.* 48 (2005), No. 3, 414–427.
- Guyot, C.; Kaveh, K.; Patankar, V. *Efficient algorithm for the arithmetic on the hyperelliptic Jacobians of genus 3*. *Journal of Ramanujan Mathematical Society*, 19 (2004), No. 2, 119–159.
- Kaveh, K. *Morse theory and Euler characteristic of sections of spherical varieties*. *Transformation Groups*, Vol. 9 (2003), No. 1, 47–63.

**Work in progress:**

- Kaveh, K. *Newton polytopes for flag varieties and spherical varieties*. (2009). Near completion.
- *Genus of complete intersections in flag varieties and spherical varieties*. With A. G. Khovanskii.
- *On cohomology of varieties with a  $\mathfrak{B}$ -action*. With J. B. Carrell and J. Kuttler.

**Other preprints:**

- Kaveh, K.; Love, P. *Random sampling of quantum operations*. D-wave systems. (June 2005).
- Kaveh, K.; Love, P. *Parametrization of quantum operations*. D-wave systems. (August 2005).

## 6. TALKS

**Invited one-hour talks:**

- **ICM Satellite Conference on Algebraic Geometry**, Hyderabad, India (19-27 August 2010)  
<http://www.icm2010.org.in/satcon.php> and <http://sites.google.com/site/cyclessite/icmag2010>
- **Workshop on Combinatorial, Enumerative and Toric Geometry**, (in honor of 70th birthday of William Fulton), MSRI, Berkeley, CA (23-27 March, 2009). Title: *Convex Bodies, Semigroups of Integral Points, Algebras of Finite Type, and Geometry of Linear Series on Varieties* For the video of the talk see:  
[http://www.msri.org/communications/vmath/VMathVideos/VideoInfo/4159/show\\_video](http://www.msri.org/communications/vmath/VMathVideos/VideoInfo/4159/show_video)
- **International Conference on Transformation Groups** (in honor of 70th birthday of Ernest Vinberg), Moscow, Russia (17-22 December 2007). Title: *Newton Polytopes for Flag and Spherical Varieties*.
- **BIRS Workshop on Group Embeddings: Geometry and Representations**, Banff International Research Station, Banff, AB (15-21 September 2007). Title: *String polytopes for Flag and Spherical Varieties*.
- **Invariant Theory Workshop**, Queens University, Kingston, ON (8-19 April 2002). Title: *Euler Characteristic of Sections of Spherical Varieties*.

**Seminar or colloquium talks:**

- Algebra-Geometry Seminar, Queens University, Kingston, ON (March 2008). Title: *Convex Polytopes in Algebraic Geometry*.
- QuIGS (Quantum Information and Geometric Statistics group), Guelph University, Guelph, ON (26 February 2008). Title: *Geometry, Convex Polytopes and Entanglement*.
- Symplectic Geometry Seminar. University of Toronto (November 2007). Title: *G-C Polytopes, String polytopes and the Quantization of the Flag Varieties of Reductive Groups*.
- Algebra-Geometry Seminar, University of Toronto (November 2006). Mini course titled *Equivariant Cohomology and Localization Formula*.
- Geometry and Model Theory Seminar, Fields Institute for Mathematical Research, Toronto, ON (November 2003); also UBC Algebraic Geometry Seminar (October 2003). Title: *Vector Fields and the Cohomology Rings of Toric Varieties*.

- Algebra Seminar at University of Western Ontario, London, ON (February 2002). Title: *Geometry of Complete Intersections in Toric and Spherical Varieties*.
- Number theory and Lie groups seminar, University of Toronto (October 1997). Title: *Pointwise Conjugacy and Representations of Heisenberg Group*.

#### Meetings:

- Second joint meeting of the Canadian Mathematical Society and the Sociedad Matemática Mexicana. Vancouver, B.C. (13-15 August 2009). *Algebraic Geometry and Singularity Theory* session. Title: *Convex Bodies for Actions of Reductive Groups*.
- Canadian Mathematical Society Meeting, London, ON (8-10 December 2007). *Algebraic Stacks* session. Title: *Convex Bodies, Isoperimetric Inequality and Degree of Line Bundles*.
- Canadian Mathematical Society Meeting, Winnipeg, Manitoba, Canada (31 May - 3 June 2007). *Algebraic Varieties with Group Actions* session. Title: *String Polytopes, G-C Polytopes and Geometry of Flag and Spherical Varieties*.

#### 7. OTHER PROFESSIONAL ACTIVITIES

- Referee for the *Canadian Mathematical Bulletin* and the *Canadian Mathematical Journal*.
- Reviewer for MathSciNet (American Mathematics Society).

#### 8. OTHER RESEARCH EXPERIENCE

- Research mathematician at D-Wave Systems Inc. (Vancouver, Canada), September 2004 to January 2005. I was involved in a project on applications of Lie theory to quantum computation.

#### 9. AWARDS

- Recipient of the Daniel B. DeLury Teaching Award for the best teaching assistant of the Mathematics Department of the University of Toronto (November 1998).
- Medal winner, International Olympiad in Informatics, (Bonn, Germany, 1992).
- Winner of the National Olympiad in Informatics (Ahvaz, Iran, 1992).  
Finalist for the National Olympiad in Mathematics (Ahvaz, Iran, 1992).  
Finalist for the National Olympiad in Mathematics (Kerman, Iran, 1991).

#### 10. TEACHING AND EDUCATIONAL EXPERIENCE

##### McMaster University:

- 1LS3 (Calculus for Life Sciences). September to December 2009.
- 3X03 (Complex analysis). January to May 2010.

##### University of Toronto:

- MAT137 (Calculus for students of mathematics/computer science/statistics). September 2008 to May 2009. I was the course coordinator as well as a lecturer. Approximately 500 students enrolled.
- MAT301 (Groups and symmetry). January to May 2008.
- MAT1155 (Introduction to commutative algebra and algebraic geometry). September to December 2007 (graduate level course).
- MAT301 (Groups and symmetry). September to December 2007.
- MAT235 (Several variable calculus). September 2006 to April 2007.
- MAT186 (Calculus for engineering). September to December 2001.

#### University of British Columbia:

- MATH307 (Second course in linear algebra), Summer 2005.
- MATH100, MAT101, MAT180 (Differential and integral calculus for science students). September 2002 to May 2005.

#### Langara College:

- Calculus I (Differential calculus). Langara College, Vancouver, B.C., January to May 2005.

#### Other teaching and educational experience:

- Organizer and lecturer of the three week program *SOAR into Mathematical Sciences* (Summer Opportunity in Applied Research) for bright high school students. University of Toronto, Summer 2001.  
See: <http://www.math.utoronto.ca/mathnet/SOAR2001/>
- Instructor for the Iranian team for the International Olympiad in Informatics, Sharif University of Technology (January 1992 to July 1994). I taught different topics in discrete mathematics.
- Teaching assistant at the University of Toronto, September 1997 to May 2002. I taught several undergraduate courses.

### 11. EXTRA CURRICULAR ACTIVITIES

- I am interested in music especially Iranian (Persian) traditional music. I have been playing the instruments *tar*, *setar* and *tanboor* since 1994. These are guitar-type traditional Iranian instruments.
- I am also interested in comics and drawing cartoons as a hobby. Some of my comics have been published. I sometimes use my drawing skills during my teaching to make the atmosphere of the class more fun.
- I have a black belt in Karate (Kan-Zen-Rio), (1996).