

# Curriculum Vitae

Alejandro Luque Jiménez

## 1. Personal data:

Ph.D. Student at the Universitat Politècnica de Catalunya (UPC), Spain.

Advisor: **Jordi Villanueva Castelltort** (<http://www.ma1.upc.edu/~jordi/>).

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My **research interests** are concerned with KAM theory for Hamiltonian systems and symplectic maps, stability and numerical methods in Dynamical Systems. In particular, my work is concerned with the computation of frequency vectors and lower dimensional tori and applications to Molecular Dynamics. Recently, I have started to work in quantum trajectories that appear in the de Broglie-Bohm formulation of Quantum Mechanics.

## 2. Studies:

- [2006] DEA. Certificate in Research Capability (Candidacy exam in Spain). Programm of Applied Mathematics of the Universitat Politècnica de Catalunya.
- [1999-2004] Bachelor in Chemical Engineer, 5-year degree (Universitat Politècnica de Catalunya). Rank: 2nd out of 60.
- [2003-present] Bachelor in Mathematics. 4th year out of 5-year degree (Universitat Politècnica de Catalunya).

## 3. Scholarships and Grants:

- Organization: Government of Spain. Doctorate Fellowship FPU, 2006.
- Organization: Government of Catalonia. Doctorate Fellowship FI, 2005.
- Organization: Department of Applied Mathematics I (UPC). Collaboration in teaching activities, 2003.
- Organization: Center for Technological Risk Studies (CERTEC). Chemical Engineering Department (UPC). I worked in atmospheric dispersion studies of pollutants and hazardous materials, 2002.

## 4. Teaching experience

- Course “Infinitesimal Calculus II” (60 hours) for first year students in Industrial Engineering, first semester 2008. Departament de Matemàtica Aplicada I, Universitat Politècnica de Catalunya, Barcelona, Spain.
- Course “Infinitesimal Calculus II” (30 hours) for first year students in Industrial Engineering, first semester 2006. Departament de Matemàtica Aplicada I, Universitat Politècnica de Catalunya, Barcelona, Spain.

## 5. Contributions in Seminars, Congresses, Courses and other Events.

- *A Dynamical System approach to the study of Bohmian trajectories*. Invited communication presented in “QChaos08: Workshop on Quantum Chaos. Theory and Applications”. Joint work with Florentino Borondo, Jordi Villanueva and Diego A. Wisniacki. Madrid, February 13-15, 2007.
- *Sobre la teoría KAM de aplicaciones simplécticas planas y números de rotación*. Seminar given in “Colloquium del Departamento de Matemáticas”. Universidad Carlos III de Madrid, November 8, 2007, Madrid.
- *Numerical continuation of invariant curves using variational information of the rotation number*. Communication presented in “International Conference on Dynamical Methods and Mathematical Modelling”. Joint work with Jordi Villanueva, September 18-22, 2007, Valladolid.
- *Numerical study of rotation numbers and its variational for parametric families of circle diffeomorphisms*. Communication presented in “Cedya2007. XX Congreso de Ecuaciones Diferenciales y Aplicaciones”. Joint work with Jordi Villanueva, September 24-28, 2007 in Sevilla.
- *Cálculo numérico de números de rotación y sus variaciones*. Communication presented in “Nolineal2007. Nuevos retos y perspectivas de la dinámica no lineal y sus aplicaciones”. Joint work with Tere M. Seara and Jordi Villanueva, June 6th to June 9th 2007 in Ciudad Real.
- *Numerical computation of rotation numbers for quasi-periodic planar curves*. Poster presented in “Congress on Dynamical Systems on the occasion of Carles Simó 60th birthday”. Joint work with Jordi Villanueva, May 29th to June 3rd 2006 in S’Agaró.

## 6. Preprints

- A. Luque and J. Villanueva. *Computation of derivatives of the rotation number for parametric families of circle diffeomorphisms*, first version 24th July 2007, revised version 22th February 2008. Available electronically at:  
[http://www.mal.upc.edu/~luque/index\\_archivos/derivatives.pdf](http://www.mal.upc.edu/~luque/index_archivos/derivatives.pdf)

## 7. Publications

- A. Luque and J. Villanueva. *Numerical study of rotation numbers and its variational for parametric families of circle diffeomorphisms*. Actas del congreso “Cedya07: XX Congreso de Ecuaciones Diferenciales y Aplicaciones y X Congreso de Matemática Aplicada”, ISBN: 978-84-690-7182-3. Sevilla, 2007.

- A. Luque. *Aplicación de la Teoría de Sistemas Dinámicos en el estudio cuantitativo y cualitativo de la evolución de del ozono estratosférico y troposférico*. Universitat Politècnica de Catalunya, 2004. Final Project of Studies. Advisors: Prof. Juan Jesús Pérez (UPC) and Prof. Jordi Villanueva, (UPC).

## 8. Visits

- Departamento de Química, Universidad Autónoma de Madrid (UAM). Madrid, España. From September 15 to December 15, 2007.
- Département de Mathématiques, Université de Montréal, Montreal, Canada, June 18-29, 2007.
- Wolfgang Pauli Institute, Vienna, Austria, October 30 - November 10, 2006 and January 7-14, 2007.

## 9. Participation in Research Projects:

- “Dinámica asociada a conexiones entre objetos invariantes, astrodinámica y otras aplicaciones”. MCyT-FEDER Grant MTM2006-00478. Resp. Amadeu Delshams, 2006.
- “Grup de recerca consolidat”. CIRIT nº 2005SGR-986. Resp: Amadeu Delshams, 2005.
- “Dinámica, Atractores y No linealidad: Caos y Estabilidad”. Red temática nº MTM2005-23973-E. Resp. Amadeu Delshams, Lluís Alsedà, 2006.

## 10. Attended conferences, courses and workshops.

- *QChaos08: Workshop on Quantum Chaos. Theory and Applications*. Organizing Committee: F. Borondo, R. M. Benito, F. J. Arranz, J. C. Losada and L. Seidel. Madrid, February 13-15, 2007.
- Fifth Dance’s Winter School: Recent Trends in Nonlinear Science. Attending three courses: *Introduction to holomorphic dynamics* by Prof. Mikhail Lyubich, *Chaos in infinite dimensional linear systems*, by Prof. Karl-Goswin Grosse-Erdmann and *Rafael de la Llave*, by Prof. Rafael de la Llave. Cullera, January 28 - February 1, 2008.
- Workshop on *The Structure of Phase Space in Chemical Reaction Dynamics: PhaSChem07*. Organizing Committee: F. Borondo, R. M. Benito, F. J. Arranz, J. C. Losada and L. Seidel. Madrid, November 28 to December 1, 2007.
- “Cedya2007. XX Congreso de Ecuaciones Diferenciales y Aplicaciones”. September 24-28, 2007 in Sevilla.
- International Conference on Dynamical Methods and Mathematical Modelling. Joint work with Jordi Villanueva, September 18-22, 2007, Valladolid.
- Séminaire de mathématiques supérieures. SMS 2007: NATO’s Summer School. *Hamiltonian Dynamical Systems and applications*. Organizing Committee: Dario Bambusi, Walter Craig, Sergei Kuksin and Anatoly I. Neistadt. June 18-29, 2007, Montreal, Canada.

- VI Jornades d'Introducció als Sistemes Dinàmics i les EDP (JISD2007). Attending two courses: *Normal form for Hamiltonian PDEs* by Prof. Dario Bambusi and *Introduction to the properties of extended systems* by Prof. Rafael de la LLave, Universitat Politècnica de Catalunya, Barcelona, June 11 - 15, 2007.
- *Advanced Course on Computer Assisted Proofs in Dynamics* by Prof. Zgliczynski. Supported by Consolider Mathematica. Barcelona, February 12 - 23, 2007.
- Workshop on Semi-classical Long-time Evolution. Part I and II. Attending six courses: *From quantum to classical with coherent states with emphasis on long time propagation* by Prof. Thierry Paul, *Invariant manifolds and long time behavior of dynamical systems* by Prof. Rafael de la LLave, *Non-linear dynamics and chaos in molecular vibrations* by Profs. Florentino Borondo and Rosa M. Benito, *Quantum oscillations in systems of cold fermionic atoms* by Prof. Benoit Doucot, *Properties of Low Dimensional Dynamical Systems in the Large* by Prof. Carles Simó and *Resurgence and exponentially small phenomena* by Prof. Tere M-Seara. Wolfgang Pauli Institute, Vienna, Austria, October 30 - November 10, 2006 and January 7-14, 2007.
- Dynamical days 2006. Sevilla, October 18-21, 2006.
- V Jornades d'Introducció als Sistemes Dinàmics i les EDP (JISD2006). Attending two courses: *Mathematical Aspects and Prospectives of quantum chaos* by Prof. Mirko Degli Esposti and *Infinite dimensional dynamical systems and the Navier-Stokes equation* by Prof. C. Eugene Wayne. Facultat de Matemàtiques i Estadística, Universitat Politècnica de Catalunya, Barcelona, June 10 - 13 and July 10-14, 2006.
- "Congress on Dynamical Systems on the occasion of Carles Simó 60th birthday". May 29th to June 3rd 2006 in S'Agaró.
- Third Dance's Winter School: Recent Trends in Nonlinear Science. Attending three courses: *Lattice differential equations* by Prof. Shui-Nee Chow and John Mallet-Paret, *Topology of the plane and periodic differential equations*, by Rafael Ortega and *Finite dimensional long-term dynamics of infinite dimensional dissipative evolution equations and their numerical reduction methods*, by Edriss S. Titi. Universidad de Oviedo, Gijón, February 6-10, 2006.
- EMS-SCM Joint Mathematical Weekend. Barcelona, September 25 - October 2, 2005.
- IV Jornades d'Introducció als Sistemes Dinàmics (JISD2005). Attending two courses by Prof. John Rinzel and Prof. David Terman. Facultat de Matemàtiques i Estadística, Universitat Politècnica de Catalunya, Barcelona, June 27 - July 1, 2005.
- Second Dance's Winter School: Recent Trends in Nonlinear Science. Attending three courses: *Distortions in Lattice Actions on Surfaces* by Prof. John Franks, *Numerical method for invariant objects*, by Àngel Jorba and *Lyapunov exponents*, by Marcelona Viana. Universitat Jaume I, Castellón, February 24-28, 2005.
- III Jornades d'Introducció als Sistemes Dinàmics (JISD2004). Attending two courses by Prof. Alain Chenciner and Prof. Luigi Chierchia. Facultat de Matemàtiques i Estadística, Universitat Politècnica de Catalunya, Barcelona, June 28 - July 2, 2004.
- II Jornades d'Introducció als Sistemes Dinàmics (JISD2003). Attending a course by Prof. George Haller. Facultat de Matemàtiques i Estadística, Universitat Politècnica de Catalunya, Barcelona, June 23-28, 2003.

## 11. Others

- Courses followed by the graduate programs of Applied Mathematics of Universitat Politècnica de Catalunya and Universitat de Barcelona: *Introduction to Dynamical Systems and Chaos* (UB) by Prof. Carles Simó, Nuria Fagella and Pere Mumbrú; *Numerical solution of differential equations and related problems* (UB) by Prof. Carles Simó; *Asymptotic methods in Dynamical Systems* (UPC) by Prof. Tere M-Seara; *Functional Analysis* (UPC) by Prof. Xavier Cabré; *Mecànica Celest* (UPC) by Prof. Josep Masdemont and *Algebraic methods in Dynamical Systems* by Prof. Juan José Morales-Ruíz. From 2004 to 2006.
- Two months (August 2003 and August 2004) in Zeithain (Germany). Participation in International Workcamps with the Organization “Volksbund Deutsche Kriegsgräber-fürsorge”.