

# Curriculum Vitae: Carlos Vargas

## Personal Information

Date and place of Birth: 14 August, 1986, Zapopan, México  
Nationality: Mexican.  
E-mail: [ei.turbomath@gmail.com](mailto:ei.turbomath@gmail.com)  
Personal Webpage: <https://carlos-vargas-math.github.io/>

## Post-graduate positions

10.2020-present. Private Tutor.

10.2015-08.2020. CONACYT-CIMAT.  
Description: Research and teaching position from CONACYT at CIMAT, Guanajuato.  
Project Title: “TDA for Mathematics and its Applications”

02.2015-06.2015. TU Graz,  
Description: Project assistant of Prof. Dr. Franz Lehner (postdoc).

## Education

2010-2015. Doktor der Naturwissenschaften.  
Universität des Saarlandes.

Thesis: “Free probability: Deterministic Equivalents and Combinatorics”  
Advisor: Prof. Dr. Roland Speicher.  
Honors: Magna Cum Laude.  
Date of Colloquium: 05.05.2015.

2009-2010. Master of Science  
Mathematics and Statistics.  
Queen's University, Canada.

2004-2009. Bachelor's Degree in Mathematics (Licenciado en Matemáticas)  
Universidad de Guanajuato. Gto. Mexico

## Research Interests

Non-commutative probability, free probability, large random matrices, cumulants, boolean probability, non-commutative conditional expectations.

Algebraic combinatorics, posets, lattices, incidence algebras, Möbius inversions.

Large random graphs, large random topological spaces, topological and geometrical data analysis.

## Organization of Events

- 01.2020      6<sup>th</sup> School and Winter Workshop on Geometric and Topological Data Analysis  
(with A. Martín del Campo and A. Rieser)
- 11.2018      5<sup>th</sup>. School on Topological Data Analysis  
(with A. Martín del Campo and A. Rieser)  
CIMAT, Guanajuato, Mexico.
- 12.2017      Simposio de Probabilidad y Procesos Estocásticos  
(with S. López and A. Rocha-Arteaga).  
Faculty of Science, UNAM. CDMX.
- 09.2017      Homotopy Probability Theory (ERC Mini-workshop).  
(with R. Friedrich).  
Universität des Saarlandes.
- 03.2017      XV School on Probability and Statistics  
(with E. Diaz-Francés and J.C. Pardo)  
CIMAT

## List of main publications

- Free Deterministic Equivalents, rectangular random matrix models and operator-valued free probability (with R. Speicher) Random Matrices: Theory and Applications, 1, (2012)
- Products of free random variables and k-divisible non-crossing partitions (with O. Arizmendi) Electronic Communications in Probability, 17, (2012)
- Analytic subordination theory of operator-valued free multiplicative convolutions and applications to random matrix theory (with S. Belinschi, R. Speicher and J. Treilhard). International Mathematical Research Notices. (2014)
- Relations between cumulants in non-commutative probability (with O. Arizmendi, T. Hasebe, and F. Lehner). Advances in Mathematics, vol. 282, 10, (2015).
- Norm convergence in Non-Commutative Central Limit Theorems: Combinatorial Approach. (with O. Arizmendi). Contemporary Mathematics (AMS), vol. 657, (2016).
- On the asymptotic distribution of block-modified random matrices. (with O. Arizmendi and I. Nechita) Journal of Math. Phys. 57, (2016).
- A general solution to (free) deterministic equivalents. Contemporary Mathematics (AMS) vol. 701, pp 28, (2018).
- Subordination methods for free deconvolutions (with O. Arizmendi and P. Tarrago). Annales de l'Institut Henri Poincaré, Probabilités et Statistiques, Vol 56, 4, pp 2565-2594 (2020).
- Combinatorics of NC-probability spaces with independent constants (with C. Díaz-Aguilera, T. Gaxiola and J. Santos) Inf. Dim. An. Quantum Prob. Rel. Top. pp 20 (2022)

## Thesis supervision

Marcos Torres Vivanco (MSc. CIMAT).  
Jorge Luis Santos Silva (MSc. CIMAT).  
Saúl Rogelio Mendoza Jacobo (MSc. CIMAT).  
Carlos Eduardo Díaz Aguilera (MSc. CIMAT).  
Gustavo Adolfo García Gutiérrez (Bsc. Universidad de Guanajuato).  
Saúl Rogelio Mendoza Jacobo (Bsc. Universidad de Sinaloa).

## Mathematical Olympiads

Bronze Medal (IMO 2004)  
Bronze Medal (Iberoamerican Mathematical Olympiad, 2003)  
Gold Medal (Centro-Caribbean Mathematical Olympiad, 2002)

## Language Proficiency

Spanish (native).  
English (fluent).  
German (fluent).