



Keith Yuan Patarroyo

*Research Engineer in Chemical Computing
at the University of Glasgow*

Personal Information

Born on January 16, 1997 in Bogotá D.C. (Colombia).

Interests

Chemical Computing, Assembly Theory, Chemical Evolution, Computational Fabrication, Numerical Analysis

Academic Training

2018–2021 **M.Sc. in Computer Science**, *Université de Montréal*, Quebec, Canada.

I worked on physically based computer graphics and digital fabrication at [LIGUM](#) under the supervision of Bernhard Thomaszewski.

- Selected CourseWork: Machine Learning at [Mila/UdeM](#), Realistic Image Synthesis, Geometric Modeling and Shape Analysis, Computational Design for Digital Fabrication

2013–2018 **B.Sc. in Physics (Honorary Degree)**, *Universidad Nacional de Colombia*, Bogotá.

Universidad Nacional de Colombia is one of Colombia's leading university for high-level scientific training. Academic Average: 4.4/5.0.

1999–2010 **High School Degree**, *Liceo V.A.L.*, Bogotá.

Intensive preparation for Colombia's National Standardized Test for High Schools, *ICFES, Saber 11*, I ranked 11th out of 1,000 test takers in an indiscriminate group of 1,000.

Appointments

2022– **Research Associate in Chemical Computation**, *Complex Chemistry Lab, Advanced Research Center at the University of Glasgow*, Scotland, UK.

I work on several projects related to the development of Assembly Theory. Helped develop the website [molecular-assembly.com](#). Currently work on two projects, first the development of causal computing using Assembly Theory. Second, I help on the inference of assembly information from mass spectrometry data.

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- 2021- **Research Affiliate**, *Wolfram Physics Project*, Exploration of MetaModeling and MultiComputation in several kind of systems..
I work on two projects: the first is about writing a library for Geometry Processing algorithms on graphs and hypergraphs. The second correspond to the exploration of connections between molecular assembly and multicomputation. This is particularly relevant in the context of meta-modeling in chemistry and combinatorial evolution.
- 2021-2022 **Web Developer**, *Freelance*, Montréal, QC - Bogotá, Co..
I worked on the development of websites for real state market, construction and architecture. Some of the clients are: [BGR Asociados](#) and [BGR Constructora](#). For the last project I helped construct a full-stack scheduling platform for truck trip management. The platform allows scheduling over a hundred truck trips per week, moreover, it is capable of assisting truck drivers, building site administrative and office administrative to both approve trips and change the relevant parameters of the trips. The platform was constructed on Django as a back-end, HTML+CSS+Javascript as Front-End and it was deployed using Heroku.
- 2018-2021 **Research Assistant**, *Université de Montréal*, LIGUM, Physically based Computer Graphics supervised by professor Bernhard Thomaszewski.
I worked on several algorithms to improve the physical modeling and interaction of slender mechanical structures. Wrote over 5000 lines of C++ code to simulate the behavior of rods, shells and solids. The project goal was to obtain an accurate and efficient method for simulating the anisotropy of thin elastic rods with several mechanical techniques. Some of the applications of these works lie in artistic and industrial manufacturing.
- 2017-2018 **Tutor Level: One**, *Tutor.comTM via LatinHire*, Live online tutoring platform for students and professionals, (Written and Spoken tutoring).
I tutored in the subjects: Pre-Calculus, Calculus(AB and BC), Physics(Algebra based and Calculus based). I've done over 100 tutoring sessions with a current average rating of 4.5/5.0 counting all the previous subjects.
<https://www.tutor.com/tutor-search/tutor/keith-p--3395394>
- 2017 **Visiting Researcher**, *Department of Mathematics, Purdue University*, West Lafayette, USA, supervised by professor Xiangxiong Zhang, Date: 6th June – 6th December 2017.
I studied the Discontinuous Galerkin (DG) method to solve Partial Differential Equations. My focus was to construct a weak-positivity interpolation considering some ideas of electrostatic optimization problems. This interpolation may be suitable to implement in a positivity-preserving DG scheme for the compressible Navier-Stokes Equations.

Awards and Honors

- 2018-2019 **Scholarship Bourse C (Bourse d'exemption des droits de scolarité supplémentaires)**, *Faculté des études supérieures et postdoctorales, Université de Montréal*, 21,000\$ per year.
- 2018 **Honorary Degree & Graduate Scholarship**, *Consejo Campus Sede Bogotá, Universidad Nacional de Colombia* .
The award is given to the graduates that were granted the Tuition Payment Exemption during the whole course of the degree.
- 2013–2018 **Tuition Payment Exemption**, *Consejo Facultad de Ciencias, Universidad Nacional de Colombia* , Obtained every academic term during my studies: 2013-2018.
The award is given each term to the top 15 GPA of current B.S. Physics students

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- 2017 **XXI Colombian University Mathematical Olympiad Finalist**, *Olimpiadas Colombianas de Matemáticas, Universidad Antonio Nariño.*
- 2017 **6-Month Research Grant UREP–C 2017–II (Undergraduate Research Experience Purdue Colombia)**, *Universidad Nacional de Colombia and Purdue University, 5000\$.*
- 2016 **6-Week DAAD German Winter Course in a University Scholarship (DAAD-Hochschulwinterkursstipendium)**, *DAAD, 3000€.*

Published Articles

- 2019 **Preserving data moments in density estimation via diffusion using the finite element method**, *Boletín de Matemáticas 25(2), 101-121*, Juan Galvis, Keith Y. Patarroyo, Francisco A. Gomez, Mathematics Department, National University of Colombia. Département d'Informatique et de Recherche Opérationnelle, Université de Montréal.
- 2017 **Mean conservation for density estimation via diffusion using the finite element method**, *Boletín de Matemáticas 24(1), 91-99.*, Keith Y. Patarroyo, Physics Department. Universidad Nacional de Colombia, [arXiv:1702.07962](https://arxiv.org/abs/1702.07962).

Unpublished Articles

- 2019 **A digression on Hermite polynomials**, Keith Y. Patarroyo, Departamento de Física, Universidad Nacional de Colombia & Département d'informatique et de recherche opérationnelle, Université de Montréal, [arXiv:1901.01648](https://arxiv.org/abs/1901.01648).
- 2017 **Pronunciation recognition of English phonemes /ə/, /æ/, /ɑ:/ and /ʌ/ using Formants and Mel Frequency Cepstral Coefficients**, Keith Y. Patarroyo and Vladimir Vargas-Calderón, Physics Department. Universidad Nacional de Colombia, [arXiv:1702.0707](https://arxiv.org/abs/1702.0707).

Oral Presentations

- 2020 **Physical Sound Synthesis and Connections with Neural Audio Synthesis**, Keith Y. Patarroyo, Music AI Reading Group with Guillaume Alain and Maxime Chevalier-Boisvert, MILA Québec, Montréal, Canada, March 2020.
- 2019 **Discrete Differential Geometry-DDG (A link between the continuous and the computational universe)**, Keith Y. Patarroyo, Conference, Math Department, Universidad Nacional de Colombia, Bogotá, Colombia, August 2019.
- 2018 **Discrete Elastic Rods with Arbitrary Cross Sections**, Keith Y. Patarroyo, *Motograph18 Conference*, Département d'informatique et de recherche opérationnelle (DIRO), Université de Montréal, Montréal, QC, Canada, November 2018.
- 2018 **High-order accurate DG(Discontinuous Galerkin) methods for conservation laws(Invited Talk)**, Keith Y. Patarroyo, *First Colombian Conference in Industrial and Applied Math*, Bogotá, Colombia, August 2018.

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Conferences, Workshops & Schools

- 2020-2021 **Wolfram Physics Winter School**, *Wolfram Research*, Remote Assistance with Jonathan Gorard, Max Piskunov and Xerxes Arsiwalla, Date: 28th December 2020–15th January 2021.
- 2019 **Motograph19 Conference**, *Computational Motion Group, David R. Cheriton School of Computer Science*, University of Waterloo, Waterloo, ON, Canada, Date: 7th – 8th December 2019.
- 2018 **Motograph18 Conference**, *LIGUM(Laboratoire d'Informatique Graphique de l'Université de Montréal)*, Université de Montréal, Montréal, QC, Canada, Date: 17th – 18th November 2018.
- 2018 **First Colombian Conference on Industrial and Applied Math**, *Sociedad Colombiana de Matemáticas*, Universidad Nacional de Colombia – Universidad de los Andes, Bogotá, Colombia, Date: 10th February – 11th August 2018.
- 2018 **Course: Preparatory Course for the LPIC-1 Certification**, *Ubuntu Colombia and Fundación Correlibre*, Bogotá, Colombia with Alexander Sandoval and Diego Armando Forigua, Date: 6th February – 10th March 2018.
- 2017 **Course: First Workshop in Lattice Boltzmann Methods**, *Facultad de Ciencias, Universidad Nacional de Colombia*, Bogotá, Colombia with Jose Munoz and Miller Mendoza, Date: 11th December – 15th December 2017.
- 2017 **International Conference on Current Trends and Challenges in Numerical Solution of Partial Differential Equations**, *Purdue University, Department of Mathematics*, West Lafayette, IN, USA., Date: 7th February – 8th July 2017.
- 2016 **Course: Introduction to Scientific Programming and Symbolic Calculation using Python**, *Facultad de Matemática e Ingeniería, Fundación Universitaria Konrad Lorenz*, Bogotá, Colombia with Alejandro Cárdenas-Avenidaño, Date: 27th June – 1st July 2016.
- 2016 **Seminar about Neutrino Physics**, *Departamento de Física, Universidad Nacional de Colombia*, Bogotá, Colombia with Roberto Martínez Martínez, Date: 5th June – 29th June 2016.

Languages

Spanish **Native Speaker**

English **Bilingual (TOEFL: 106/120)**

R:28, L:29, S:24, W:25

German **Intermediate (Goethe Zertifikat B1)**

French **Elementary Proficiency (B1)**

Computer skills

Wolfram Language Knowledge in pattern matching, symbolic computation, specially in rewrite systems.

python Knowledge and experience in object oriented programming, specially for Machine Learning (NumPy, scikit-learn, PyTorch)

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JavaScript Vast experience in web technologies specially 3D applications. C++ Knowledge and experience in object oriented programming
Other Java, \LaTeX , Linux, MATLAB ,GNUPlot, HTML5, CSS, LibIGL, Three.js, Django, Flask, SQL.

Other Skills

Website **Administrator**, *A Sudden Burst of Beauty*.
Personal Website with some popularization, technical and other Articles mainly about Math, Physics and Computer Science: <https://keithpatarroyo.wordpress.com/>
Communities I was part of the [Mila](#) reading group on AI and Music lead by [Guillaume Alain](#) and [Maxime Chevalier-Boisvert](#)
Extra Amateur Piano and FreeDrums Player, Enthusiast about Air-devices (Drones, Boomerangs, Frisbee, Xzylo, Planes, etc.)

References

Gabriel Patron, *Assistant Research Scientist in ADAO*, Ann Arbor, Michigan, US.
Email: gapatronh@gmail.com
Taliesin Beynon, *Resarch Associate to the Wolfram Physics Project, Former Lead Developer of Wolfram Research Deep Learning Group*, Cape Town, South Africa.
Email: contact@taliesin.ai
Bernhard Thomaszewski , *Computational Robotics Lab (CRL), Department of Computer Science, ETH, Zürich,Switzerland*.
Email: bthomasz@inf.ethz.ch
Juan Galvis-Arrieta , *Departamento de Matemáticas, Facultad de Ciencias, Universidad Nacional de Colombia, Bogota, Colombia*.
Email: jcgalvisa@unal.edu.co

Date: September 04, 2022
Place: Glasgow, Scotland, UK

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