Pablo Balmaceda Rescia

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# EDUCATION

## **Universidad de Costa Rica (UCR)** St Pedro, CR

*Bachelor of Science in Physics* Mar 2012 - Sep 2017

*Bachelor of Science in Mathematics* Mar 2015 -unfinished

## **Università di Pisa (UNIPI)** Pisa, IT

*Master of Science in Physics*  Sep 2019 – present

# EXPERIENCE

**Physics Research** Sep 2020 –present

*Physics Department* | UNIPI Pisa, IT

* Investigation of the topological invariants in Quantum Field Theory, with special interest in knot theory, looking for applications on topological quantum computing technology, a market that will grow at a CAGR of 56.0% for the next 10 years.

## **Research Assistant** Jul 2015 – Nov 2016

*Materials Science and Engineering Research Center (CICIMA Spanish acronym)* | UCR | [CICIMA-UCR](http://www.cicima.ucr.ac.cr/index.php/en/) St Pedro, CR

* Performed adjustments for the thin films spectrometer that allowed more precise measurements, in a teamwork with two researchers, improved it in that way the wavelength range and thickness range, using a Deuterium and Tungsten-Halogen light source, by up to 25% more.
* Implemented on C the Levenberg-Marquart algorithm ([GitHub-LMA](https://github.com/Pablichenco/Levenberg-Marquardt)) for non-linear optimization problems, achieved a better curve fitting for refractive index, applied a reduced error criterion, was obtained that the fit error is of the same order as the measurement error as desired χ2 ≅ 1,obtaining a robust method applicable to many other cases of optimization.

**Mathematics Assistant** Mar 2014 – Nov 2015

*Mathematics Department* | UCR St Pedro, CR

* Supported to freshman students, outside of regular lessons with examples, problems, clarify doubts and score quick tests, with an increase in the success fee near of 9% compared to previous years. Acquired the capacity of communicating mathematical concepts to people without experience in mathematics.

# VOLUNTEER EXPERIENCE

**Volunteer Teacher** | *logic-math teacher for deaf high school students* Sep 2016 – Sep 2017

* Endorsed deaf students in the final year of high school in logic and mathematics, 4 of the 6 students achieve better university admission grades, and all improved their final high school exams.
* Developed a strong interpersonal skill and the ability to collaborate eﬀectively on a interdisciplinary team of 5 professionals.

# RESEARCH

**Undergraduate final year Research Project**| *Dielectric function of Zr in terms of hydrogen* Sep 2016 – Sep 2017

* Created a zirconium and palladium multi-layer thin film in terms of concentration of hydrogen, to study optical properties, obtaining a reflectance of near the 80% in the infrared spectrum.
* Implemented the LAPACK library on the Levenberg-Marquart algorithm, using a parametric approach, in order to obtain a numerical model more robust, with a successful comparation of the experimental measurements with an error estimated of the order of 10-3 (plots: [plot.ly](https://chart-studio.plotly.com/~pablichenco#/)).

**Quantum Mechanics review paper** | [*Density Operator*](https://www.academia.edu/31593881/Density_matrix_notes) UCR, Physics

* Explored the basics applications in quantum computing (Bloch sphere), expectation values, statistical physics and presented the 3 modified axioms for quantum mechanics, all in a didactical way.

# TECHNICAL SKILLS

**Programming Languages**: C, FORTRAN, Wolfram Mathematica, R (learning), LaTeX, Bash, basic level of: *Python, FullStack Dev course:[ Java, PL/SQL, HTML, CSS, JavaScript, Angular]*.

**Languages**: Spanish, Italian (Upper Intermediate), English (Upper Intermediate), German (starting to learn).

**Developer Tools**: Xcode, Atom, Eclipse, RStudio, Texpad, TexMaker, Mathematica, Visual Studio.

**Libraries**: LAPACK, gnuplot, git, plotly API.

**Interest**: Numerical Methods, Data analysis, Quantum Computing, knot theory, TQFT, [digital-art](https://www.behance.net/pabalres), hiking.

# PROJECTS

[**Particle on a Magnetic field**](https://github.com/Pablichenco/ParticleMagnetic): Develop a numerical model using Runge-Kutta 4, to solve a LDE. (C, [plot.ly](https://chart-studio.plotly.com/~pablichenco/123/#/))

[**Wave equation**](https://github.com/Pablichenco/Crank-Nicolson-Method-PDE): Performed a Crank-Nicolson finite diﬀerence method to solve a PDE. (FORTRAN)