



# David Martínez Carpena

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## Work Experience

### Adjunct lecturer

Sep. 2021 – Present

FACULTY OF MATHEMATICS AND COMPUTER SCIENCE, UNIVERSITY OF BARCELONA

Barcelona, Spain

- Imparting exercise sessions of the Degree in Computer Science (*Data Structures, Software Design, and Distributed Systems*)

### Collaboration scholarship Master+UB

Sep. 2020 – Jun. 2021

RESEARCH GROUP IN ALGEBRAIC TOPOLOGY, UNIVERSITY OF BARCELONA

Barcelona, Spain

- Research about models of  $\infty$ -categories and  $\infty$ -groupoids under the supervision of Carles Casacuberta
- Join the research project *Homotopical methods in geometry* (2021-2024) with principal investigators Joana Cirici and Javier J. Gutiérrez
- Participation in the seminars organized by the research group

### Software Engineer & Data Scientist

Oct. 2019 – Sep. 2020

COLORSENSING

Barcelona, Spain

- Start-up born from the MIND Research Group in the University of Barcelona, which does reliable image color digitalization
- Developing and designing the software infrastructure of the company API, using AGILE team practices, a Domain Driven Design structure, Python as the programming language, and Google Cloud Platform as a cloud provider
- Evaluating the limits of the proprietary technology of ColorSensing in new use-cases and datasets

### Software Developer & Mathematician researcher

Mar. 2017 – Sep. 2019

MIND RESEARCH GROUP, BOSCH I GIMPERA FOUNDATION

Remote

- Join the Micro and Nanotechnology and nanoscopies for Electronic and Electrophotonic devices (MIND) research group to help with the research line of Color QR Codes for colorimetric applications
- Developing and designing reusable Python libraries that allow the fine-grained customization of the coding and decoding of QR Codes
- Researching models for better colorimetric corrections based on Thin Plate Splines

## Education

### Master in Advanced Mathematics

2020 – 2021

UNIVERSITY OF BARCELONA

Barcelona, Spain

- Specializing in algebra, geometry and topology, with a grade of 9.2 out of 10
- Master thesis *Infinity groupoids as models for homotopy types* supervised by Carles Casacuberta, with a grade of 10 out of 10

### Degree in Mathematics

2014 – 2020

UNIVERSITY OF BARCELONA

Barcelona, Spain

- Inside a double degree program of Mathematics and Computer Science, with a grade of 8,1 out of 10
- Bachelors thesis *Teoria homotòpica de tipus* supervised by Carles Casacuberta, with a grade of 10 out of 10 with honors

### Degree in Computer Science

2014 – 2020

UNIVERSITY OF BARCELONA

Barcelona, Spain

- Inside a double degree program of Mathematics and Computer Science, with a grade of 8,8 out of 10
- Bachelors thesis *Reading QR codes on challenging surfaces* supervised by Ismael Benito Altamirano and Juan Daniel Prades with a grade of 9,7 out of 10

### Scientific High School Degree

2012 – 2014

IES SANTA EULÀLIA

Hospitalet de Llobregat, Spain

- Graduated with honors, and obtained an honorable mention in the Poincaré awards of the Universitat Politècnica de Catalunya for the research thesis *matesLliure: més que un llibre digital*, co-authored by Gerard Finol and supervised by Fernando García Vélchez

# Articles, Talks and Conferences

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## ARTICLES

### Reading QR Codes on challenging surfaces using thin-plate splines

Oct. 2021

ISMAEL BENITO ALTAMIRANO, DAVID MARTÍNEZ CARPENA, HAMID LATIF MARTÍNEZ AND JOAN DANIEL PRADES

- Article in review at the journal Pattern Recognition (Elsevier)
- The article proposes a method to improve the readability of QR Codes placed on challenging surfaces, using thin-plate splines

### Back-compatible Color QR Codes for colorimetric applications

Jul. 2021

ISMAEL BENITO ALTAMIRANO, DAVID MARTÍNEZ CARPENA, O. CASALS, C. FÀBREGA, A. WAAG AND JOAN DANIEL PRADES

- Article in review at the journal Pattern Recognition (Elsevier)
- The article proposes using a novel fully compatible modification of QR Codes to use them as compact color correction charts

## TALKS

### Topological models of $\infty$ -groupoids

Nov. 2021

PRESENTED AT "SIMBA SEMINAR: SEMINARI INFORMAL DE MATEMÀTIQUES DE BARCELONA"

Barcelona, Spain

- A survey of two different models of  $\infty$ -categories: simplicial sets and topological categories.

### Grothendieck's homotopy hypothesis

Oct. 2021

PRESENTED AT THE SEMINAR OF FALL 2021 ORGANIZED BY THE RESEARCH GROUP IN ALGEBRAIC TOPOLOGY

Barcelona, Spain

- The talk was a survey of Grothendieck's homotopy hypothesis, followed by the particular case of the model of topological categories.

### Modelos topológicos de infinito grupoides

Oct. 2021

PRESENTED AT THE "IX ENCUESTRO DE JÓVENES TOPÓLOGOS"

Sevilla, Spain

- An introduction to the model of infinity categories as topological categories, and a review of an alternative model of the fundamental infinity groupoid based on Moore path categories.

### $p$ -adic model structure on simplicial sets

May 2021

PRESENTED AT THE SEMINAR OF SPRING 2021 ORGANIZED BY THE RESEARCH GROUP IN ALGEBRAIC TOPOLOGY

Barcelona, Spain

- An introduction to left Bousfield localizations, and then presented the  $p$ -adic model structure on simplicial sets

### WebAssembly: Características e implicaciones en cuanto a seguridad y portabilidad

Apr. 2020

PRESENTED AT "OVERDRIVE 2020: HOME EDITION"

Remote

- An introduction to the new Web Standard language, WebAssembly, with a focus on its history and the features that make it unique

### Fonaments de la teoria homotòpica de tipus

Mar. 2020

PRESENTED AT THE SEMINAR OF SPRING 2020 ORGANIZED BY THE RESEARCH GROUP IN ALGEBRAIC TOPOLOGY

Barcelona, Spain

- The goals of this talk was to familiarize with basics of homotopy type theory

### Desmitificant els virus informàtics

Oct. 2018

PRESENTED AT THE FACULTY OF MATHEMATICS AND COMPUTER SCIENCE, UNIVERSITY OF BARCELONA

Barcelona, Spain

- Presented at a lightning talks session organized by the Hacking Lliure association

### Hacking Tokens

Mar. 2018

PRESENTED AT "ROOTEDCON 2018"

Madrid, Spain

- Joint project of the associations Hacking Lliure and Fisitrónica, with the goal of developing a PoC embedded system

### Passwords I: Users

Oct. 2017

PRESENTED AT THE FACULTY OF MATHEMATICS AND COMPUTER SCIENCE, UNIVERSITY OF BARCELONA

Barcelona, Spain

- Presented by Enric Florit & me, in an event organized by Hacking Lliure
- The talk tackles the usual privacy and security problems found by regular users when choosing passwords to any online account

## POSTERS

### Recubridores en teoría homotópica de tipos

Oct. 2021

PRESENTED AT "XXVII ENCUESTRO DE TOPOLOGÍA"

Sevilla, Spain

- The poster outlines the construction of a double covering, equivalent to the torus, of the Klein bottle as higher inductive type.

## SELECTED ATTENDED CONFERENCES

### IRP Higher Homotopical Structures – Higher Structures and Operadic Calculus

CENTRE DE RECERCA MATEMÀTICA

Jun. 2021

Remote

### EPIT 2020 – Spring School on Homotopy Type Theory

NATIONAL INSTITUTE FOR RESEARCH IN COMPUTER SCIENCE AND AUTOMATION (INRIA)

Apr. 2021

Remote

### IRP Higher Homotopical Structures – Opening Workshop

CENTRE DE RECERCA MATEMÀTICA

Feb. 2021

Remote

### PyConES 2019: The Python language Spanish conference

PYTHON SOFTWARE FOUNDATION

Oct. 2019

Alicante, Spain

### STNB - Seminario de Teoría de Números de Barcelona, 33ª edición

UNIVERSITY OF BARCELONA & UNIVERSITAT AUTÒNOMA DE BARCELONA & UNIVERSITAT POLITÈCNICA DE CATALUNYA

Jan. 2019

Barcelona, Spain

### Rooted 2018 – The Spanish computer security conference

ROOTED CON ASSOCIATION

Mar. 2018

Madrid, Spain

### XVIII ENEM - Encuentro Nacional de Estudiantes de Matemáticas

ASOCIACIÓN NACIONAL DE ESTUDIANTES DE MATEMÁTICAS (ANEM) & UNIVERSIDAD DE SEVILLA

Jul. 2017

Sevilla, Spain

### Rooted 2017 – The Spanish computer security conference

ROOTED CON ASSOCIATION

Mar. 2017

Madrid, Spain

## Extracurricular Activity

### Organizing committee member

SIMBA SEMINAR: SEMINARI INFORMAL DE MATEMÀTIQUES DE BARCELONA

2019 – Present

- Young mathematics seminar, in collaboration with M.Sc. and PhD students of three universities in Barcelona

### Co-founder & Spokesperson

HACKING LLIURE: ASSOCIACIÓ DE HACKING ÈTIC I SEGURETAT INFORMÀTICA

2016 – Present

- Catalan non-profit association of ethical hacking and computer security

## Programming languages

### Proof assistants

Agda · Coq

### Mathematical

Sage · Wolfram Mathematica · R

### General

Python · C · C++ · Rust · Java · Haskell

### Web

HTML · CSS · JavaScript · WebAssembly

### Typography

LaTeX · Markdown

## Languages

**Spanish** Mother tongue

**Catalan** Mother tongue

**English** Upper-intermediate level (B2) with Cambridge First Certificate