RESEARCHER INFORMATION

Sergio Cruz Blázquez

Email:
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POSITIONS

January 2023 – January 2025

Postdoc Margarita Salas at University of Granada

- Project entitled: Nonlinear Analysis and Conformal PDEs from Geometry
- Dipartimento di Scienze di Base e Applicate per l'Ingegneria, University of Rome La Sapienza (January 2023 - January 2024). Supervisor: Prof.ssa Angela Pistoia.
- Department of Mathematical Analysis, University of Granada (January 2024 - January 2025). Supervisor: Prof. David Ruiz.

January 2022 – January 2023

Assegnista di Ricerca at University of Campania

- Project *Equazioni differenziali alle derivate parziali non lineari* funded in the field PRIN 2017 – JPCAP. Supervisor: Prof.ssa Giusi Vaira.
- Department of Physics and Mathematics.
- Ranked 1/4 in first call.

October 2021 – January 2022

Postdoc Researcher at University of Almería

- Funded by the *Department of Economic Transformation, Industry, Knowledge and Universities of the Regional Government of Andalusia under project P18-FR-667.*
- Department of Mathematics.

October 2017 – Present Day

Member of the Research Group GNAMPA

- *Gruppo Nazionale per l'Analisi Matematica, la Probabilità e le loro Applicazioni*, part of the INdAM.
- Equazioni differenziali e sistemi dinamici.

October 2017 – October 2020

Marie Sklodowska-Curie fellow of the Istituto Nazionale di Alta Matematica.

- PhD Student of the *INdAM Doctoral Programme fellowships in Mathematics and/or Applications Cofunded by Marie Skłodowska-Curie Actions* (INdAM-DP-COFUND-2015)
- Name of the project: *Liouville equations, geometry and physics*.
- Ranked 9/20 in first call.
- Grant no. 713485.

EDUCATION AND TRAINING

October 2017 – June 2021

Doctoral Program in Physics and Mathematics

International School for Postgraduate Studies, University of Granada.

- B04.56.1, RD 99/2011. Years 2017/18 – 2020/21.
- PhD Thesis in cotutelle with the Scuola Normale Superiore, entitled *Curvature Prescription Problems on Manifolds with Boundary*. Defended on 29/06/2021 obtaining the grade *Sobresaliente Cum Laude* and **International Doctorate Mention**.
- Thesis advisor from the University of Granada: Prof. David Ruiz.

October 2017 – June 2021

Corso di Perfezionamento in Matematica (PhD in Mathematics)

Classe di Scienze, Scuola Normale Superiore.

- INdAM-DP-COFUND 2015 Project.
- Ciclo XXXIII, years 2017/18 – 2019/20.
- Settore scientifico-disciplinare: MAT/05 – Analisi Matematica
- PhD Thesis in cotutelle with the University of Granada, entitled *Curvature Prescription Problems on Manifolds with Boundary*. Defended on 29/06/2021, obtaining the grade *Cum Laude*.
- Thesis advisor from the Scuola Normale Superiore: Prof. Andrea Malchiodi.
- Courses held with final exam: Geometric Flows (grade: 29/30), Riemannian Geometry (grade: 30/30 e lode), Conformal Geometry (grade: 30/30 e lode).
- Attendance to the following PhD courses: Initial Data Sets in General Relativity, Variational Methods, Elliptic Partial Differential Equations.

October 2016 – September 2017

Masters Degree in Physics and Mathematics

International School for Postgraduate Studies, University of Granada.

- Masters degree thesis entitled *El problema de las curvaturas gaussiana y geodésica prescritas en D^2*. Defended on September 2016 obtaining the grade *Sobresaliente 10/10*.
- Masters degree thesis advisor: Prof. David Ruiz.
- Overall Grade: *Sobresaliente 9.5 / 10*. One Cum Laude grade in Nonlinear Dispersive Differential Equations.
- Representative of the Masters Degree Students in the Consejo de Representantes de Máster (CRM). Member of the Communications and Social Networking Committee .

September 2012 – September 2016

Undergraduate Degree in Mathematics

University of Granada.

- Final thesis entitled *El Producto de Convolución y sus aplicaciones al Análisis Real, al Análisis de Fourier y al estudio de Ecuaciones en Derivadas Parciales.* Defended on September 2016 obtaining the grade *Sobresaliente (9.5/10).*
- Final thesis advisor: Prof. Rafael Payá.
- Overall Grade: *Sobresaliente 9.1 / 10*.
- 14 Cum Laude grades.

PUBLICATIONS

- L. Battaglia, S. Cruz-Blázquez and A. Pistoia, Prescribing nearly constant curvatures on balls, accepted for publication in Proceedings of the Royal Society of Edinburgh. Arxiv version: https://arxiv.org/abs/2305.09622
- S. Cruz-Blázquez, A. Pistoia, *Non-degeneracy of critical points of the squared norm of the second fundamental form on manifolds with minimal boundary*, to appear in Journal of Geometric Analysis (2023). Arxiv version: https://arxiv.org/abs/2212.12748
- S. Cruz-Blázquez, A. De la Torre, D. Ruiz, *Qualitative Properties for Solutions of the Fractional Yamabe Problem*, to appear in Discrete and Continuous Dynamical Systems (2023). Arxiv version: https://arxiv.org/abs/2207.09886
- S. Cruz-Blázquez, G. Vaira, *Positive Blow-up Solutions for a Linearly Perturbed Boundary Yamabe Problem*, to appear in Advances in Differential Equations (2023). Arxiv version https://arxiv.org/abs/2301.07396
- S. Cruz-Blázquez, A. Malchiodi, D. Ruiz, *Conformal metrics with prescribed scalar and mean curvature*. J. Reine Angew. Math. 789 (2022), 211–251 DOI: 10.1515/crelle-2022-0026, ArXiv version: https://arxiv.org/pdf/2105.04185
- S. Cruz-Blázquez, D. Ruiz, *Prescribing Gaussian and geodesic curvatures on disks, Advanced Nonlinear Studies* 18 (2018), 453-468. Published Online: 2018-07-20. Quality Indicators: Impact Factor: 1.533, JCR Mathematics 2019 40/325 Q1 DOI: 10.1515/ans-2018-2021, ArXiv version: https://arxiv.org/pdf/1806.06292

PREPRINTS

- X. Cabré and S. Cruz-Blázquez, Michael-Simon type Sobolev inequality and applications to non-local mean curvature, preprint 2023.

- S. Cruz-Blázquez, A. Pistoia and G. Vaira, Clustering solutions for a boundary Yamabe problem, submitted (2022). Arxiv version: https://arxiv.org/abs/2211.08219

TEACHING

- Introduzione all'Analisi Matematica, held in Italian language at University of Bari during the Academic Year 2021-2022. Duration of 24+16 hours. Lecture notes in Italian are available through the link:

  https://www.dm.uniba.it/it/didattica/precorsi/2022-2023-primo-semestre/introduzione-allanalisi

PARTICIPATION IN PROJECTS

- INdAM-GNAMPA Project - CUP_E53C22001930001. Proprieta qualitative delle soluzioni di equazioni ellittiche, Istituto di Alta Matematica - Gruppo Nazionale per l'Analisi Matematica, la Probabilità e le loro Applicazioni, PI: Luca Battaglia (University of Roma Tre), Call 2023, Project Duration: 05/2023 - 05/2024, Amount Granted: 3500€.

  Role: Researcher. Research line: Curvature Prescription Problems on Surfaces with Boundary and Concentration Phenomena for Equations in Two Dimensions.

- PRIN 2017 – JPCAP, Quantitative and qualitative aspects of nonlinear PDEs, MIUR, PI 1: Berardino Sciunzi (University of Calabria), Local PI: Giusi Vaira (University of Bari), Call 2017, Project Duration: 08/2019 - 02/2023, Amount Granted: 133500€.

  Role: Assegnista di Ricerca. Research line: Nonlinear Partial Differential Equations.

- INdAM-GNAMPA Project - CUP_E55F22000270001. Fenomeni di Blow-up per Equazioni non Lineari, Istituto di Alta Matematica - Gruppo Nazionale per l'Analisi Matematica, la Probabilità e le loro Applicazioni, PI: Gabriele Mancini (University of Bari), Call 2022, Project Duration: 05/2022 - 05/2023, Amount Granted: 4500€.

  Role: Researcher. Research line: Curvature Prescription Problems on Surfaces with Boundary.

- P18-FR-667, Nonlinear Analysis and PDEs from Physics and Geometry, Consejería de Transformación Económica, Industria, Conocimiento y Universidades. PI 1: José Carmona (Universidad de Almería), PI 2: Salvador Villegas (University of Granada), Call 2019, Project Duration: 01/2020 - 12/2022. Amount Granted: 94800 €.

  Role: Researcher. Research line: Singular Solutions of the Nonlocal Yamabe Problem.

COMMUNICATIONS

Talks, seminars and posters

- Invited talk: Oscillating Singular Solutions to the Fractional Yamabe Problem. Chiaccherate Nonlineari in Alghero (Italy). October 2023.
- Given seminar entitled *Clustering Solutions for a Boundary Yamabe Problem. Department of Mathematics*, University of Pisa. 29/11/2022.
- Invited talk: *Clustering Solutions for a Boundary Yamabe Problem*, in the conference *Qualitative and quantitative aspects of nonlinear PDEs,* held at University of Bari Aldo Moro (Italy). 05/09/2022 - 09/09/2022.
- Given seminar entitled *The Scalar-Mean Curvature Prescription Problem on Compact Manifolds with Boundary*. Sapienza - Università di Roma. 24/02/2022
- Given seminar entitled *Conformal Metrics with Prescribed Scalar and Mean Curvatures*. Department of Mathematics, Università degli Studi di Bari. 11/02/2022
- Given seminar entitled *Conformal Metrics with Prescribed Scalar and Mean Curvatures,* as part of the Differential Equations Seminar of the University of Granada. 15/12/2021
- Given seminar entitled Métricas conformes con curvaturas escalar y media prescritas, as part of the Seminar of Young Researchers of the University of Granada. 4/11/2021
- Invited Talk: *Curvature Prescription Problems on Manifolds with Boundary*, in the session of Non-linear and Non-local Partial Differential Equations during the 5th. Congress of young researchers RSME, held at Universitat Jaume I, Castelló (Spain). 30/01/2020
- Given seminar entitled *Curvature Prescription Problems on Manifolds with Boundary* in the Séminare Jeunes Chercheurs of the University of Cergy-Pontoise (University of Cergy-Pontoise), Pontoise (France). 11/06/2019 – 13/06/2019.
- Given seminar entitled *Problemas de curvatura prescrita en variedades con borde*, as part of the Seminar of Young Researchers of the University of Granada. IEMath-GR (University of Granada), Granada (Spain). 28/05/2019.
- Presentation of the poster *Prescribing Gaussian and geodesic curvature on Disks*. Bienal congress of the Royal Spanish Mathematical Society. Faculty of Education (University of Cantabria), Santander (Spain). 07/02/2019 – 09/02/2019.

ADDITIONAL TRAINING

Courses

- *Toward a geometric theory of fractional Laplacians,* given by Prof. Rafe Mazzeo at the conference International Doctoral Summer School in Conformal Geometry and Non-Local Operators, held at IMAG - University of Granada, from 19/6 2023 to 30/6 20223. Duration of 4.5 hours.
- *Exterior value problems and regularity for nonlocal operators,* given by Prof. Moritz Kassmann at the conference International Doctoral Summer School in Conformal Geometry and Non-Local Operators, held at IMAG - University of Granada, from 19/6 2023 to 30/6 20223. Duration of 4.5 hours.
- *On the nonlocal mean curvature,* given by Prof. Xavier Cabré at the conference International Doctoral Summer School in Conformal Geometry and Non-Local Operators, held at IMAG - University of Granada, from 19/6 2023 to 30/6 20223. Duration of 4.5 hours.
- *Fractional GJMS operators and applications* given by Prof. Sun-Yung Alice Chang at the conference International Doctoral Summer School in Conformal Geometry and Non-Local Operators, held at IMAG - University of Granada, from 19/6 2023 to 30/6 20223. Duration of 4.5 hours.
- *An introduction to Liouville Equations and applications*. Online course held at the Department of Mathematics of the University of Rome “Tor Vergata” from 8/11 2021 to 2/12 2021. Duration of 20 hours.
- *Geometric Flows.* PhD Course given by prof. Andrea Malchiodi in the Scuola Normale Superiore during the academic course 2017/18. Duration of 40 hours. Final exam grade: 29/30.
- *Riemannian Geometry.* PhD Course given by prof. Luciano Mari in the Scuola Normale Superiore during the academic course 2017/18. Duration of 40 hours. Final exam grade: 30/30 e lode.

- *Elliptic Partial Differential Equations*. PhD Course given by Prof. Luigi Ambrosio in the Scuola Normale Superiore during the academic course 2017/18. Duration of 40 hours.
- *Initial Data Sets in General Relativity*. PhD Course given by prof. Alessandro Carlotto in the Scuola Normale Superiore during the academic course 2017/18. 20 horas de duración.
- *Metodi Variazionali.* PhD Course given by prof. Andrea Malchiodi in the Scuola Normale Superiore during the academic course 2018/19. Duration of 40 hours.
- *Conformal Geometry.* PhD Course given by prof. Andrea Malchiodi in the Scuola Normale Superiore during the academic course 2019/20. Duration of 40 hours. Final exam grade: 30/30 e lode.
- Summer school: CIME - Geometric Analysis (Centro Internazionale Matematico Estivo, 18/6 - 22/6)
- *Some classical properties of minimal surfaces.* Laurent Mazet, Université Paris-Est-Créteil. Duration: 5 hours. 4 - 5 March, 2017. Course held in the IE-Math, University of Granada.

Attendance to conferences

- *XV Conference of Teaching and Learning the Mathematics*, Sociedad Andaluza de Educación Matemática THALES, Baeza, 2014.
- *Workshop IEMath-Gr / RSME about Mathematical Research,* IEMath-Gr, Real Sociedad Matemática Española, University of Granada. Granada, 28/04/2017.
- Conference *New trends in Partial Differential Equations*, Department of Mathematical Analysis, University of Granada, Granada. 24/05/2017 - 26/05/2017.
- Conference *Two days of Geometric Analysis at IEMath-Gr*, IEMath-Gr, University of Granada, Granada, 01/06/2017 - 02/06/2017.
- Conference Geometric Aspects of Partial Differential Equations (Università degli studi di Firenze, 10/11– 11/11)
- Conference Simposio di Analisi Matematica in Onore di Ferruccio Colombini (Universitá di Pisa, 30/11- 1/12)
- Conference Variational Methods in Analysis, Geometry and Physics (Scuola Normale Superiore, 12/2 – 16/2)
- Conference with mini-courses INDAM - Nonlinear PDEs in Geometry and Physics (Palazzone di Cortona, 11/6 – 15/6)
- Conference Recent advances in Geometric Analysis (Scuola Normale Superiore, 4/6 - 8/6)
- Conference Geometry and PDE in front of the Alhambra. Carmen de la Victoria (University of Granada), Granada (Spain). 22/01/2019 – 25/01/2019.
- Conference Bienal congress of the Royal Spanish Mathematical Society. Faculty of Education and Auditorium of the University of Cantabria (University of Cantabria), Santander (Spain). 04/02/2019 - 08/02/2019.
- Conference Recent trends in Geometric Analysis and Applications. Centro Ennio De Giorgi, Pisa (Italy). 25/11/2019 – 28/11/2019.
- Conference Incontro su Variational methods, with applications to problems in mathematical physics and geometry, held in Istituto Canossiano San Trovaso, Venezia (Italy) on the occasion of the 75th birthday of Antonio Ambrosetti. 30/11/2019 – 01/12/2019.
- Conference 5th. Congress of young researchers RSME, held at Universitat Jaume I, Castelló (Spain). 27/01/2020 – 31/01/2020.
- Online Workshop on Nonlocal PDEs and Applications. See https://www.icmat.es/Conferences/2020/ENLA/index.php 10/12/2020 – 11/12/2020.
- Conference Online ICMC Summer Meeting on Differential Equations – 2021. See http://summer.icmc.usp.br/summers/summer21/index.php 01/02/2021 – 03/02/2021.
- Online Hausdorff School - *Trending Tools for the Solvability of Nonlocal Elliptic and Parabolic Equation,* see https://www.hcm.uni-bonn.de/events/eventpages/hausdorff-school/hausdorff-schools-2021/trending-tools-2021/. 28/06/2021 – 02/07/2021.

- Geom&tric PDEs@Caserta, Department of Mathematics and Physics of the University of Campania L. Vanvitelli, Caserta (Italy). 13/09/2021-16/09/2021.
- Conference IV - One Day Workshop on Applied Mathematics 2022. University of Bari Aldo Moro, Bari (Italy). 30/05/2022.
- Modern Aspects of PDE in Memory of Professor Enrico Jannelli. University of Bari Aldo Moro, Bari (Italy). 23/06/2022 - 24/06/2022.
- *Qualitative and quantitative aspects of nonlinear PDEs.* University of Bari Aldo Moro (Italy). 05/09/2022 - 09/09/2022.
- Nonlinear Analysis in the Court of General Relativity, on the occasion of Antonio Masiello's 60th Birthday. Politecnico di Bari, Bari (Italy). 9/2/2023 - 10/2/2023.
- Nonlinear PDEs in Cosenza. Università della Calabria, Cosenza (Italy). 16/5/2023 - 19/5/2023.
- International Doctoral Summer School in Conformal Geometry and Nonlocal Operators. IMAG - University of Granada, Granada (Spain). 19/6/2023 - 30/6/2023.
- Three Days of Nonlinear PDEs. Terme di Sorano (Italy). 17/09/2023–20/09/2023.