SANDEEP KUMAR, PH.D.

CURRICULUM VITAE

EMPLOYMENT

11/21–PRESENT	Applied Mathematician
	Project: LIBATIO (a part of Conecta hubs program of the Galician Innovation agency.)
	Indominus Advanced Solutions, Vigo, Spain.
06/21–10/21	Research Scientist
	Project title: Controlling viral aerosols in COVID-19 and beyond (PORSAV)
	School of Medicine, University College Dublin, Ireland.
06/20–05/21	Postdoc fellow
	BCAM – Basque Center for Applied Mathematics, Bilbao, Spain
	Research line: Linear and Non-Linear Waves
	Advisor: Prof. Luis VEGA GONZÁLEZ.

EDUCATION

01/16–06/20	Doctor of Philosophy in MATHEMATICS AND STATISTICS
	BCAM, *Universidad del País Vasco (UPV/EHU)*, Spain.
	Thesis title: Vortex Filament Equation for some Regular Polygonal Curves.
	Advisors: Prof. Luis VEGA GONZÁLEZ, Prof. Francisco DE LA HOZ MÉNDEZ.
09/13–09/15	Master of Science in MATHEMATICAL MODELING IN ENGINEERING
	Erasmus Mundus MathMods joint degree program: *Università degli Studi dell'Aquila*, Italy, *Universität Hamburg*, Germany & *Universitat Autònoma de Barcelona*, Spain.
	Thesis title: Mathematical models and numerical methods for reaction-diffusion problems in composite media.
	Advisor: Dr. Giuseppe PONTRELLI.
06/11–04/13	Master of Science in MATHEMATICS (WITH A SPECIALIZATION IN COMPUTER SCIENCE)
	Sri Sathya Sai Institute of Higher Learning, Prasanthi Nilayam Campus, India.
	Advisor: Prof. Pallav K. BARUAH.
06/08–03/11	Bachelor of Science (Honours) in MATHEMATICS
	Sri Sathya Sai University, Brindavan Campus, India.

RESEARCH INTERESTS

Numerical and computational methods, Mathematical and computational modeling, Model predictive control, Schrödinger-type equations, Vortex filament equation, Wavelet-based methods.

PUBLICATIONS

Research articles, Preprints

1. The Frisch–Parisi formalism for fluctuations of the Schrödinger equation (with F. Ponce–Vanegas, L. Roncal and L. Vega), Preprint arXiv:2202.06645.

2. *On Lagrangian Coherent Structures in Laparoscopy*, (with C. Crowley, F. Khan, M. Bustamante, R. Cahill, K. Nolan), to be submitted, Preprint available upon request.

3. *Static and Dynamical, Fractional, Uncertainty Principles* (with F. Ponce-Vanegas and L. Vega), Transactions of the American Mathematical Society, Preprint, arXiv:2103.03794

4. *On the Schrödinger map for regular helical polygons in the hyperbolic space*, Nonlinearity, vol. 35, no. 1, pp. 84–109, 2021, Preprint, arXiv:2010.12045

5. *Recent Progress on the Vortex Filament Equation for Regular Polygons* TEMatmonográficos, 2 (2021): Proceedings of the 3rd BYMAT Conference, pp. 235–238. ISSN: 2660-6003.

6. *Vortex Filament Equation for a regular polygon in the hyperbolic plane* (with F. de la Hoz and L. Vega), Journal of Nonlinear Science, vol. 32, no. 9, 2022, Preprint, arXiv:2007.04944

7. *On the Evolution of the Vortex Filament Equation for regular M-polygons with nonzero torsion*, (with F. de la Hoz and L. Vega), SIAM Journal on Applied Mathematics, 80(2), 1034–1056, 2020.

8. *Vortex Filament Equation for a regular polygon in the Hyperbolic plane* (F. de la Hoz and L. Vega), Proceedings of the CEDYA + CMA 2017, Cartagena, Spain, 2017, pp. 379–384. ISBN 978-84-944402-1-2.

Theses

1. *Vortex Filament Equation for some Regular Polygonal Curves*, PhD thesis.

2. *Mathematical models and numerical methods for reaction-diffusion problems in composite media*, master's thesis.

Other works

1. *Safe trajectory of a piece moved by a robot* (ESGI-158, Barcelona, Technical report).

2. *Discovering Lagrangian Coherent Structures in the Human Abdomen*, (13th Conference on Dynamical Systems Applied to Biology and Natural Sciences, ISBN: 978-989-98750-9-8, Book of abstract).

RESEARCH STAY AND VISITS

Oct 2021	Department of Mathematics, University College Dublin
	Host: Prof. Miguel Bustamante.
Jun–Jul 2021	BCAM – Basque Center for Applied Mathematics, Bilbao, Spain
	Host: Dr. Luz Roncal.
Winter 2019	University of California, Santa Barbara, USA
	Host: Prof. Carlos García-Cervera.
Dec 2–4, 2019	Indian Institute of Technology, Kanpur, India
	Host: Prof. B.V. Ratish Kumar.
Dec 5–6, 2019	Indian Institute of Science, Education and Research, Mohali, India
	Host: Dr. Jotsaroop Kaur.

RESEARCH PROJECTS

11/21–Present	LIBATIO (Barrel monitoring platform), a part of Conecta hubs 2021.
	Funded by: Axencia Gallega de Innovación (Project ref. IN852C 2021/3).
06/21–10/21	Controlling viral aerosols in COVID-19 and beyond (PORSAV)
	Funded by: EU Horizon 2020 research and innovation programme. PI: Prof. Ronan Cahill.
06/20–05/21	Project title: Harmonic Analysis and Differential Equations: New Challenges
	Funded by: ERCEA - Advanced Grants 2014. PI: Prof. Luis Vega.
07/18–05/21	Project title: Centre of Excellence "Severo Ochoa" SEV-2017-0718
	Funded by: Government of Spain. PI: Prof. Luis Vega.
06/18–05/21	Project title: BERC Programme 2018-2021
	Funded by: Basque Government, Spain. PI: Prof. Luis Vega.
01/16–06/18	Project title: Centre of Excellence "Severo Ochoa" SEV-2013-0323.
	Funded by: Government of Spain. PI: Prof. Luis Vega.

SCHOLARSHIPS AND AWARDS

2019   Travel grant (accommodation, travel, food) for the 9th International Congress on Industrial and Applied Mathematics (ICIAM 2019) held at Universitat de València, Spain.

2017   Travel grant (accommodation) for the XXV *Congreso de Ecuacinoes Diferenciales Y Aplicaciones, XV Congreso de Matemtica Aplicada (CEDYA-CMA 2017)* held at *Universidad Politcnica de Cartagena (UPCT)*, Cartagena, Spain.

2015   Doctoral grant from Spanish Ministry of Economy and Competitiveness MINECO.

2015   Doctoral grant at Pierre and Marie Curie University (Sorbonne University), France (declined).

2013   Erasmus Mundus Category 'A' Scholarship for the MathMods program.

2013   All India Rank 231 (top 3 %) in GATE (Graduate Aptitude Test in Engineering) in Mathematics.

2013   Travel grant for the the International Centre for Pure and Applied Mathematics (CIMPA) research school "Current trends in Computation methods for PDEs" held at Indian Institute of Science, Bangalore, India.

2013   Financial support (accommodation, travel, food) from "National Program on Differential Equations: Theory, Computation & Applications (NPDE-TCA)" for summer internship programme at the Indian Institute of Technology, Bombay, India.

2012   Financial support (accommodation, travel, food) from NPDE-TCA to attend the "Postgraduate level training program.ªt the Indian Institute of Technology, Delhi, India.

TEACHING EXPERIENCE

Nov 2020   *A Short Introduction to Pseudo-Spectral Methods–Part 1*
Course for masters and Ph.D. students, BCAM & UPV/EHU, Spain.

Spring 2014   *Gewöhnliche Differentialgleichungen und Dynamische Systeme*
(Ordinary Differential Equations and Dynamical Systems)
Teaching assistant for the undergraduate students, *Universität Hamburg*, Germany.

TECHNICAL SKILLS

Programming Languages	Python, C, C++, Fortran
Operating Systems	MacOS, Linux, Windows
Tools	OpenFOAM, Pyomo, MATLAB, SciLab, LaTeX, VMD

TALKS

Feb 8, 2022   *Discovering Lagrangian Coherent Structures in the Human Abdomen*
13th Conference on Dynamical Systems Applied to Biology and Natural Sciences.
BCAM, Spain.

Oct 4, 2021   *Schrödinger map and Multifractality*
School of Mathematics and Statistics, University College Dublin, Dublin, Ireland.

Dec 1, 2020   *Recent progress on the vortex filament equation for regular polygons*
3rd BYMAT - Brining Young Mathematicians Together Conference,
Universitat de València, Spain.

May 14, 2020   *On the Vortex Filament Equation for a regular polygon in the hyperbolic plane*
Bilbao Analysis and PDE (Webinar), BCAM, UPV/EHU, Spain.

Dec 3, 2019   *Evolution of Vortex Filament Equation for regular polygons*
Indian Institute of Technology, Kanpur, India.

Dec 6, 2019   *Evolution of Vortex Filament Equation for some regular polygonal curves*
Indian Institute of Science Education and Research, Mohali, India.

Mar 11, 2019   *Evolution of the Vortex Filament Equation for some Polygonal curves*
University of California, Santa Barbara, USA.

Nov 13, 2018   *Evolution of the Vortex Filament Equation for some Polygonal curves*
LIGHT seminar, BCAM.

Nov 4, 2017	*Vortex Filament Equation for a regular polygon*
	Sri Sathya Sai Institute of Higher Learning, Puttaparthi, India.
Jun 30, 2017	*Vortex Filament Equation for a regular polygon in the Hyperbolic plane*
	CEDYA+CMA 2017, Cartagena, Spain.

Poster presentation

Jul 15–16, 2019	*On the evolution of the Vortex Filament Equation for regular M-polygons with nonzero torsion*
	ICIAM-2019, Valencia, Spain.
Apr 4, 2019	*On the evolution of the Vortex Filament Equation for regular M-polygons with nonzero torsion*
	EiTIC Doctoral Workshop, Barcelona, Spain.

WORKSHOPS, CONFERENCES, SUMMER SCHOOLS ATTENDED

Apr 6–8, 2022	Artificial Intelligence for the Fight Against COVID-19 Workshop.
	BCAM, Bilbao, Spain.
Feb 8–11, 2022	13th Conference on Dynamical Systems Applied to Biology and Natural Sciences.
	BCAM, Bilbao, Spain.
April 20–22, 2021	Autonomous Discovery in Science and Engineering
	CAMERA - The Center for Advanced Mathematics for Energy Research
	Applications, Berkeley Lab, USA.
Jan 21, 2021	Joint meeting APDE - Machine Learning
	Universidad de La Rioja, Logroño, and BCAM, Bilbao, Spain.
Dec 1–3, 2020	3rd BYMAT - Brining Young Mathematicians Together Conference
	Universitat de València, Spain
	Invited Chairman for the parallel session "Mathematical Physics".
Jan 27–31, 2020	158th European Study Group with Industry (ESGI)
	Centre de Recerca Matemàtica, Barcelona, Spain.
Nov 4–8, 2019	The vortex filament equation, the Talbot effect and non-circular jets
	BCAM & UPV/EHU course by Prof. Luis Vega, Bilbao, Spain.
Jun 17–21, 2019	Pointwise convergence of solutions of the Schrdinger equation to the initial datum
	BCAM course by Dr. Renato Lucà (Universität Basel, Switzerland).
May 12–16, 2019	Courses in PDE/Fluids Mechanics
	University of Warwick, Coventry, England.
May 28–31, 2018	Summer School on Fractional and other non-local models
	BCAM, Bilbao, Spain.
Jan 8–10, 2018	Ninth Itinerant Workshop in PDEs
	University of Bordeaux 1, Science and Technology, Bordeaux, France.
Nov 26–30, 2018	Unique Continuation & Uncertainty Principles
	BCAM course by Dr. Aingeru Fernndez Bertolin (UPV/EHU)
	and Dr. Diana Stan (University of Cantabria, Spain).
Oct 22–26, 2018	Introduction to Statistical Modelling in R
	BCAM & UPV/EHU course by Dr. Dae-Jin Lee (BCAM).
May 28–31, 2018	Summer School on Fractional and other non-local models
	BCAM, UPV/EHU course, Bilbao, Spain.
Jul 4–5, 2017	BCAM Workshop Populations in epidemics and ecology Modeling
	and numerical simulations
	Workshop, Bilbao, Spain.
Jun 25–30, 2017	CEDYA+CMA 2017: XXV *Congreso de Ecuacinoes Diferenciales*
	Y Aplicaciones, XV Congreso de Matemtica Aplicada
	UPCT, Cartagena, Spain.

MAY 8–12, 2017	A glimpse of vectorial Calculus of Variations in L^∞ and fully nonlinear PDE systems through the non-expert's keyhole BCAM course by Nikos Katzourakis (University of Reading, UK).
MAR 6–10, 2017	An Introduction to Operator Semigroup BCAM Course by Sébastien Breteaux (BCAM).
JAN 11–13, 2017	Eighth itinerant workshop in PDEs BCAM, Bilbao, Spain.
NOV 28–DEC 2, 2016	Population dynamics: Theory and approximation BCAM & UPV/EHU course by Prof. Fabio Augusto Milner (ASU, USA).
OCT 17–21, 2016	Layer Potential method BCAM & UPV/EHU course by Dr. Pedro Caro (BCAM).
JUL 4–8, 2016	Second Summer School on Harmonic Analysis and PDEs BCAM, Bilbao, Spain.
JUN 25–30, 2016	Bilbao meeting on analysis and PDEs BCAM, Bilbao, Spain.
MAY 12–16, 2016	Introduction to the Mathematical Theory of the Navier–Stokes equations BCAM course by Prof. Gregory Seregin (University of Oxford, UK).
APR 4, 2016	Geometrical Aspects of Spectral Theory Workshop, Bilbao, Spain.
JUN 1–5, 2015	Collective dynamics in gradient flows and entropy driven structures Gran Sasso Science Institute (GSSI), Italy.
APR 22–24, 2015	Control of Partial Differential Equations Gran Sasso Science Institute (GSSI), Italy.
JUL 8–19, 2013	Current trends in Computation methods for PDEs, CIMPA research school Indian Institute of Science, Bangalore, India.
MAY–JUN, 2012	Postgraduate Level Training Program under "National Program on Differential Equations - Theory, Computation and Analysis" Indian Institute of Technology, Delhi, India.

EXTRACURRICULAR ACTIVITIES

VOLUNTEER WORK	Volunteer for SAMI - Supporting African Maths Initiatives Part of Virtual Maths Camps, Ghana organized by SAMI, November 2020 and December 2021.
CULTURAL ACTIVITIES	Part of many drama events at SSSIHL, India, in various spheres including writing songs, acting, and dancing.
COMMUNITY SERVICE	Administering computer facilities at the University Hostel Part of the hostel library management team Participated in the Sri Sathya Sai Village Service Program entitled *Grama Seva*, a humanitarian project for the needy in over 300 villages in Andhra Pradesh, India, for 5 successive years between 2008-12.

LANGUAGES

HINDI	Native
ENGLISH	Advanced
SPANISH	Intermediate
PUNJABI	Intermediate
ITALIAN	Beginner
GERMAN	Beginner