

CV format

Personal Information

Name, date of birth, education, professional / research experience

Name: B. V. Rathish Kumar

Age: 57 Yrs.

Education: PhD

Designation: Professor (since Dec 2007)

Associate Professor (2002-2007)

Assistant Professor (1997-2002)

Lecturer (1994-1997)

Teaching

Courses (UG/PG) taught, new courses introduced

New courses introduced & taught:

- Finite Element Error Estimation
- Mathematical Foundations for Cardiac Electrophysiology
- PDE Based Image Processing
- Wavelet Methods for Elliptic PDEs
- PDE Based Computational Financial Mathematics
- Parallel Numerical Algorithms
- AI/ML Methods for Differential Equations
- Parallel Numerical Methods for PDEs
- Mathematical Modeling of Cardiovascular Fluid Dynamics
- Reduced Basis Methods for PDEs

Other courses taught:

- Basics of Computers & Programming Languages
- Linear Algebra & ODE
- Complex Analysis & PDE
- Continuum Mechanics
- Calculus of Variations & Integral Equations
- Computational Fluid Dynamics
- Basics and Applications of Finite Element Method
- Advanced Finite element Computations
- Parallel Numerical Algorithms
- Numerical Analysis / Principles of Numerical Computation
- Numerical solutions to Partial Differential Equations
- Parallel Numerical Methods for PDE s
- Data Structures
- Algorithms
- Mathematical Modelling of Cardio Vascular Dynamics
- MTH: 203 (ODE &PDE)
- Finite Element Method
- Mathematical Modeling
- Theory of ODE
- Computer Programming and Data Structures
- Fluid Dynamics
- Theory of Computation

Publications

List peer reviewed International journal papers (since 2015)

1. B.V.Rathish Kumar and Parul Pathak, Linear stability analysis of convection in a solid partitioned inhomogeneous multilayered porous structure, *Physics of Fluids* **34**, 076601 (2022); <https://doi.org/10.1063/5.0090512>
2. Sourabh P. Bhat, B. V. Rathish Kumar, Shainath Ramesh Kalamkar, Vinay Kumar, Sudhir Pathak and Walter Schneider, Modeling and simulation of the potential indoor airborne transmission of SARS-CoV-2 virus through respiratory droplets, *Physics of Fluids* **34**, 031909 (2022); <https://doi.org/10.1063/5.0085495>
3. Vinay Kumar, S. V. S. S. N. V. G. Krishna Murthy and B. V. Rathish Kumar, Entropy generation in a chemically and thermally reinforced doubly stratified porous enclosure in a magnetic field, *Physics of Fluids* **34**, 013307 (2022); <https://doi.org/10.1063/5.0077870>
4. B.V. Rathish Kumar and Manisha Chowdhury, Variational multiscale stabilized finite element analysis of non-Newtonian Casson fluid flow model fully coupled with Transport equation with variable diffusion coefficients, *Comput. Methods Appl. Mech. Engrg.* **388** (2022) 114272, www.elsevier.com/locate/cma.
5. Vinay Kumar, S.V.S.S.N.V.G. Krishna Murthy, B.V. Rathish Kumar, Multi-force effect on fluid flow, heat and mass transfer, and entropy generation in a stratified fluid-saturated porous enclosure, *Mathematics and Computers in Simulation* **203** (2023) 328–367 www.elsevier.com/locate/matcom
6. Sumit Kumar, Sanjay Kumar, B.V.Rathish Kumar, Om Shankar, The pulsatile 3D-Hemodynamics in a doubly afflicted human descending abdominal artery with iliac branching, *Computer Methods in Biomechanics and Biomedical Engineering* (2022) (<https://doi.org/10.1080/10255842.2022.2082839>).
7. Shweta Raturi and B. V. Rathish Kumar, Effect of insoluble surfactants on the motion of Reiner–Rivlin fluid sphere in a spherical container with Newtonian fluid, *Z. Angew. Math. Phys.* (2021) 72:172 c 2021 The Author(s), under exclusive licence to Springer Nature Switzerland AG 0044-2275/21/040001-16 published online August 11, 2021 <https://doi.org/10.1007/s00033-021-01600-z>
8. V. Kumar, Somanchi V. S. S. N. G. Krishna Murthy, and B V R. Kumar, “Entropy and multiphysics analysis in a viscous dissipative non-Darcian porous enclosure,” *The European Physical Journal Plus*, vol. 136, no. 7, 2021.
9. S. Mohapatra, P. Dutt, B.V.Rathish Kumar, Marc I. Gerritsima, Non-conforming least-squares spectral element method for Stokes equations on non-smooth domains *Journal of Computational and Applied Mathematics* Volume 372 July 2020 Article 112696
10. Abdul Halim and B.V. Rathish Kumar, An anisotropic PDE model for image inpainting *Computers & Mathematics with Applications* (In press) 2020
11. Manisha Chowdhury and B.V.Rathish Kumar, On subgrid multiscale stabilized finite element method for advection-diffusion-reaction equation with variable coefficients *Applied Numerical Mathematics* Volume 150 April 2020 Pages 576-586
12. Abdul Halim , B.V. Rathish Kumar, A TV – L2 – H–1 PDE model for effective denoising, *Computers and Mathematics with Applications* **80** (2020) 2176–2193
13. B. V. Rathish Kumar, Sunil Kumar, *Convergence of three-step Taylor Galerkin finite element scheme based monotone Schwarz iterative method for singularly perturbed differential-difference equation, Numerical Functional Analysis & Optimization*, **36:1029-1024**, 2015.
14. Sunil Kumar, B. V. Rathish Kumar, *A domain decomposition Taylor Galerkin finite element approximation of a singularly perturbed semilinear differential-difference equation, Numerical Mathematics and Advanced Applications ENUMATH*, 2015.
15. JHM ten Thije Boonkkamp, BVR Kumar, S Kumar, M Pargaei, “Complete flux

- scheme for conservation laws containing a linear source”, *Numerical Mathematics and Advanced Applications*, ENUMATH 2015, 112, 23-31.
16. S.V.S.S.N.V.G. Krishna Murthy, B. V. Rathish Kumar, *A Parallel Finite Element Study of 3D Mixed Convection in a Fluid Saturated Cubic Porous Enclosure under Injection / Suction Effect*, *Applied Mathematics and Computation*, 269: pp. 841 - 862, 2015.
 17. S.V.S.S.N.V.G. Krishna Murthy, B. V. Rathish Kumar, *A Parallel Finite Element Study of 3D Mixed Convection in a Fluid Saturated Cubic Porous Enclosure under Injection / Suction Effect*, *Applied Mathematics and Computation*, 269: pp. 841 - 862, 2015.
 18. J. H. M. ten Thije Boonkkamp, B. V. Rathish Kumar, Sunil Kumar, M. Pargaei, *Complete flux scheme for conservation laws containing a linear source*, *Numerical Mathematics & Advanced Applications ENUMATH-2015*, Springer, 112:23-31, 2016.
 19. Akash Anand, Ambuj Pandey B.V. Rathish Kumar and Jagabandhu Paul) *An efficient high-order Nystrom scheme for acoustic scattering by inhomogeneous penetrable media with discontinuous material interface*, *Journal of Computational Physics*, 311 (2016),
 20. Gopal Priyadarshi and B. V. Rathish Kumar, *An approximate solution of Fredholm integral equation of the second kind by band-limited scaling function*, *Int. J. Pure. Appl.Math.*, 107:23{34, 2016
 21. Sunil Kumar, B. V. Rathish Kumar, *A domain decomposition Taylor Galerkin finite element approximation of a parabolic singularly perturbed differential equation*, *Applied Mathematics & Computation*, 293:508-522, 2017.
 22. Sunil Kumar, B. V. Rathish Kumar, *A finite element domain decomposition approximation for a semilinear parabolic singularly perturbed differential equation*, *International Journal of Nonlinear Sciences & Numerical Simulation*, 18:41-55, 2017.
 23. Abdul Halim, B.V. Rathish Kumar, *Fourier Spectral Method for Image Denoising*, *Int. J. Image VideoProcess. Theor. App.* 2017.
 24. S. K. Murthy, F. Magoulès, B V R. Kumar, and V. Kumar, “*Double diffusive free convection along a vertical surface in a doubly stratified porous medium with Soret and Dufour effects under MHD forces*,” *Journal of Porous Media*, vol. 20, no. 10, 2017.
 25. Rowthu Vijayakrishna, B.V. Rathish Kumar, Abdul Halim, *A PDE Based Image Segmentation Using Fourier Spectral Method*, *Differential Equations and Dynamical Systems*, (March 2018) <https://doi.org/10.1007/s12591-018-0414-x>
 26. Gopal Priyadarshi and B. V. Rathish Kumar, *Wavelet Galerkin schemes for higher order time dependent partial differential equations*, *Numer. Meth. Partial. Di. Eqn.*, 34: 982-1008, 2018.
 27. Gopal Priyadarshi and B. V. Rathish Kumar, *Wavelet Galerkin method for fourth order linear and nonlinear differential equations*, *Appl. Math. Comput.*, 327:8{21, 2018.
 28. B. V. Rathish Kumar and Gopal Priyadarshi, *Wavelet Galerkin method for fourth order multidimensional elliptic partial differential equations*, *Accepted in Int. J. Wavelets Multiresolution*. 2018.
 29. Gopal Priyadarshi and B. V. Rathish Kumar, *On the existence and approximate solution of Fredholm integral equation of the first kind by band-limited scaling function*, *Diff. Eqn.Dyn. Sys*, doi.org/10.1007/s12591-018-0416-8, 2018.
 30. V. Kumar, S. K. Murthy, and B V R. Kumar, “*Influence of MHD forces on Bejan’s heatlines and masslines in a doubly stratified fluid saturated Darcy porous enclosure in the presence of Soret and Dufour effects—a numerical study*,” *International Journal of Heat and Mass Transfer*, vol. 117, pp. 1041–1062, 2018.
 31. V. Kumar, S. K. Murthy, and B V R. Kumar, “*Bejan’s heatline and massline visualization of multi-force effect on convection in a porous enclosure*,” *International Journal of Mechanical Sciences*, vol. 146, pp. 249–271, 2018.
 32. Shweta Raturi, Sunil Dutta and B.V.Rathishkumar, *Slow viscous flow past cylindrical particles with thin liquid layer: Cell model* *European Journal of Mechanics -B/Fluids*, Volume 71, September–October 2018, Pages 151-159

33. B.V.Rathish Kumar and Manisha A priori and a posteriori error estimation for finite element approximation of advection-diffusion-reaction equation with spatially variable coefficients (accepted and to appear in in *Journal of Applied & Computational Mathematics*, 2020)
34. Sunil Kumar, B. V. Rathish Kumar, J. H. M. ten Thije Boonkkamp, Complete flux scheme for parabolic singularly perturbed differential-difference equations, *Numerical Methods for Partial Differential Equations*, 35:790-804, 2019.
35. Sunil Kumar, B. V. Rathish Kumar, J. H. M. ten Thije Boonkkamp, Complete flux scheme for elliptic singularly perturbed differential-difference equations, *Mathematics & Computers in Simulation*, 165:255-270, 2019.
36. Meena Pargei, B.V.Rathish Kumar, Luca Pavarino, Modeling and simulation of cardiac electric activity in a human cardiac tissue with multiple ischemic zones, *J. Math. Biology, Springer*, 2019.(<https://doi.org/10.1007/s00285-019-01403-x>)
37. B.V. Rathish Kumar, Abdul Halim, A Linear Fourth Order PDE Based Gray Scale Image inpainting Model, *Computational and Applied Mathematics* <https://doi.org/10.1007/s40314-019-0768-x> (2019)
38. Meena pargei and B.V.Rathish Kumar, On the Existence-Uniqueness and Computation of Solution of a Class of Cardiac Electric Models, *International Journal of Advances in Engineering Sciences and Applied Mathematics*, 2019.
39. Alpesh Kumar, Akansha Bhardwaj and B.V.Rathish kumar, A meshless local collocation method for time fractional diffusion wave equation, *Computers & Mathematics with Applications*, Volume 78, Issue 6, 15 September 2019, Pages 1851-1861
40. Abdul Halim and B.V.Rathish Kumar, Higher Oder PDE based Model for Segmenting Noisy Image, *IET Image Processing Journal*, Jan 2020 (Accepted)
41. S. Mohapatra, P. Dutt, B.V.Rathish Kumar, Marc I. Gerritsima, Non-conforming least-squares spectral element method for Stokes equations on non-smooth domains *Journal of Computational and Applied Mathematics* Volume 372 July 2020 Article 112696
42. Abdul Halim and B.V. Rathish Kumar, An anisotropic PDE model for image inpainting *Computers & Mathematics with Applications* (In press) 2020
43. Manisha Chowdhury and B.V.Rathish Kumar, On subgrid multiscale stabilized finite element method for advection-diffusion-reaction equation with variable coefficients *Applied Numerical Mathematics* Volume 150 April 2020 Pages 576-586
44. Gopal Priyadarshi and B.V.Rathish Kumar, Haar Wavelet method for 2D Parabolic Inverse problem with a control parameter, *Rendiconti del circolo di Palermo Series*, 69(3), 2020
45. Gopal Priyadarshi and B.V.Rathis Kumar, Reconstruction of the Parameter in Parabolic Partial Differential Equations using Haar Wavelet Method, *Engineering Computations*, 2020 (in press).
46. Abdul Halim and B.V.Rathish Kumar, A TV-L2-H⁽⁻¹⁾ method for effective denoising of images, *Computers and Mathematics with Applications*, 2020
47. Shweta Raturi and B.V.Rathish Kumar, The Effect of Surfactant on the Drag and Wall Correction Factor of a drop in a bounded medium, *ZAMM* , 2020

- B.Keshav Rao, "Numerical Simulation of haemodynamics in arterial bifurcations"
- Jakkula Mounica, "On Adomain Decomposition Method and Its Application in Heat & Fluid Flow Analysis"
- Maneesh Kanav, "Mathematical Modeling and Simulation of influence drug on blood vessels in pathological conditions"
- Mayank Raj, "A fast and efficient PDE Solver on GPU with Application to Incompressible Flow Studies"
- Piyush Vyas, "A Compact Multigrid FD Solver on GPUs for Coupled Nonlinear Elliptic PDEs"
- Piyush Garg, "Modeling and Simulation of Convection in Porous Media saturated with Nano-Fluid"
- Pankaj Ranjan, "On Fraction Differential Equations: Theory and Application"
- Sushil Kumar Goar, "On Analytical and Numerical studies related to Solar Energy Harvesting"
- Prakhar, "Numerical Modeling and Simulation of PDE Based Models in Financial Mathematics"
- Abhinav Gupta, "Introduction to PDE based numerical Modeling of pattern formations on surfaces"
- Abhishek Singh, MRI Flow Studies With Applications to Cerebrospinal Fluid
- Prashanth Gupta, Two Dimensional and Three Dimensional NPZ Model with Extension of Complete Flux Scheme.
- Abhishek Kumar, Homotopy Analysis Method and Application.
- Amitanshu Gupta, Modeling Brain Neural Activity
- Sourabh, Modeling and simulation of thermotherapy
- Shantanu, A Brain Mapping Investigation of Autism and Alzheimer's disease
- Bhaskar Singh, Stability analysis with application to convection in porous media
- Abhinav Mehta, Complete Flux for Option Pricing
- Dhwanit Aggarwal, Error Estimation in Finite Element Computation
- Shivyansh, Computational Topology: theory and application
- Lakshya Kandelwal, Finite Difference Method for option pricing
- Pankaj Gupta, Sketch based video retrieval (jointly with Dr. Vinay Namboodri)
- Pankaj Bhati, Modeling and simulation of suspicious bank transactions
- Pradhyum, TCPC flow simulation studies
- Rammoorthy, Analysis of Spatial Geometry for Femur Head's Motion of Human
- Sathyam Kumar Shivam, PDE for computer vision
- Tapas Aggarwal, Parallelization of Machine Learning Algorithms using Hadoop Mapreduce
- Shah Saumya Shrenik, Mapreduced based Parallel SVM and application
- Ishita Ankita, Descriptive Image captioning (jointly with Dr. Vinay Namboodri)
- Arun, Cuda Programming in heat transfer application
- Vimal, Genetic Algorithms in heat transfer analysis studies
- Masood, ML and Optimization techniques in Image Processing
- Mukesh Delu, PDE based Pandemic modeling and simulation
- Dipankar Gupta, A new High order ADI method for Fractional Black-Scholes Equation.
- Hari Madhavan, AI/ML based solution to PDEs – a PINNs implementation
- Hari Mahdavan, AI/ML solution to Optical Flow Problem
- Aditya Rai, CFD analysis of flow in multiply constricted vessels (Joint student with Prof. S.K.Misra, BSBE, IITK)
- Manoj Burdak, AI/ML based Image Classification
- Akshay Bhatia, Hierarchical Attention Networks for Text Sentiment

Classification

- Ranjan Kumar, Numerical Solution to time-fractional Black-Scholes PDE.
- Alok Kumar, Centralised and Distributed Bayesian Learning Algorithms for 5G+ Cellular Systems (joint student with Prof. Rohit Bhudiraja, EE, IITK)
- Amisha, AI/ML based Superresolution of Biomedical Images
- P. Sudha, SRCNN based downscaling of weather data
- P. Pooja, AI/ML based image segmentation
- Prakhar, AI/ML techniques in Stock Price Prediction

PhD Supervision (since 2016)

<i>Name of student</i>	<i>Year of graduation</i>	<i>Current employment</i>
<i>Ambuj Pandey</i>	<i>2016</i>	<i>Assistant Professor, IISER, Bhopal</i>
<i>Jagabanhu Paul</i>	<i>2017</i>	<i>Postdoctoral Fellow, CalTech, USA</i>
<i>Parul Sharma</i>	<i>2022</i>	<i>CEO, Publishing Company, N.Delhi</i>
<i>Sunil Kumar</i>	<i>2017</i>	<i>Assistant Professor, Delhi Univeristy</i>
<i>Gopal Priyadarshi</i>	<i>2018</i>	<i>Assistant Professor, Patna University</i>
<i>Ayan Chatterjee</i>	<i>2019</i>	<i>Postdoctoral Fellow, Germany</i>
<i>Halim</i>	<i>2019</i>	<i>Assistant Professor, Patna University</i>
<i>Meena, P</i>	<i>2019</i>	<i>Assistant Professor, University of Uttarkhand</i>
<i>Manisha Chowdhury</i>	<i>2022</i>	<i>Visiting Researcher, IIT Johdpur</i>
<i>D. Sangita</i>	<i>Likely to submit very soon</i>	<i>IITK</i>
<i>Kedarnath</i>	<i>Finished SOTA</i>	<i>(part time research student – working in Odisha)</i>
<i>Dipak Kumar Sahoo</i>	<i>Finished SOTA</i>	<i>IITK (Just Returned from home after surgery)</i>
<i>Anil Rathi</i>	<i>Finished SOTA</i>	<i>IITK</i>
<i>Rakesh Kumar</i>	<i>Finished comprehensive And preparing for SOTA</i>	<i>IITK</i>
<i>Rajendra Kumar</i>	<i>Finished SOTA</i>	<i>IITK-NTU JDP student – currently in NTU</i>

Knowledge Dissemination (since 2016)

Books, monographs, NPTEL (or similar) courses

- 1) GIAN Course on Variational Multiscale Finite Element Method for Fluid Flows
- 2) GIAN Course on Mathematical Modeling of Blood Flow in humans
- 3) GIAN Course on Computational Cardiovascular Flow studies (jointly with IITMadras)
- 4) GIAN Course on Mathematical modeling and simulation of Cardiac Electro Physiology
- 5) SPARC course on Advance Neuroimaging and clinical applications (Jointly with IITMandi)
- 6) QIP course on Finite Element Method: Analysis & Applications
- 7) DEAL-II course under IITK-Heidelberg University collaboration
- 8) Analytical and numerical methods for Singularly Perturbed Partial Differential Equations under IAMMS
- 9) Special session on Biomechanics under IMS (to take place in Dec, 2020)
- 10) Modeling and Simulation of convection in Porous Media under INSA (jointly with IIT(ISM)Dhanbad
- 11) National Science Academy course on CFD and Applications under INSA(jointly with IIT(ISM)Dhanbad.
- 12) Advanced course on Stability of Fluid Flows under NPDE, SERB

- 13) NPDE-PG-course on Differential Equations: Theory, Computation and Application
- 14) Short Course on Complete Flux Schemes for ADR Equations with application (jointly with TU/e, Netherland)
- 15) Short course on Biomedical Imaging and clinical applications under NNMBC
- 16) National Science Academy Workshop on Mathematical Biology at PGRDMATH, HCE, Coimbatore, Tamilnadu
- 17) National Science Academy Workshop on Computational Fluid Mechancis and Applications at PGRDMATH, HCE, Coimbatore, Tamilnadu
- 18) Challenges and Opportunities before Youth with Technical Education and Present and Post Covid Situations, IIT Kanpur (2021).
- 19) Recent Trends in Numerical Methods for PDEs and Applications, IIT Kanpur (2022).
- 20) Introduction to Futuristic Research and Innovations: Brief and basics in areas such as air monitoring, urban development, online education etc. IITK (2022).
- 21) Data Science and Machine Learning, IITK, 2022.
- 22) AI/ML Methods in Climate and Weather Modeling and Simulations, IITK, 2022.
- 23) NSM India Weather and Climate GPU, IITK, 2022.

Peer Recognition

Awards, Fellowships, other recognitions

<i>Pradip Sindhu Chair Professorship, IITK</i>	2014-17
<i>President, Indian Society Of Theoretical and Applied Mechanics (ISTAM)</i>	2016
<i>General Secretary, Indian Academy of Mathematical Modeling and Simulation (IAMMS)</i>	2015-2018
<i>Vice-President, Indian Association of Biomedical Engineers and Scientists, (IABMES)</i>	2014-till date
<i>Adjunct Professor, SSSIHL, Prasanthinilayam</i>	2019-2022
<i>DST-SERB Co-opted PAC member for Mathematical Sciences</i>	2016-2020
<i>A.S.Gupta Memorial Speaker in ISTAM, IIT Bhubaneswar</i>	2019
<i>CIJK-Math Biology Plenary speaker, Beijing, China</i>	2019
<i>China-India-Japan-Korea Math-Biology executive council member</i>	2015-till date
<i>Member of Editorial Board of Contemporary Mathematics & Statistics</i>	2012-till date
<i>Member of the Editorial Board of Int. J. Applied Mathematics</i>	2010-2012
<i>Member of the National Advisory Committee for National Programme for Differential Equations: Theory, Computation & Application, IIT Bombay under the aegis of DST, Govt. of India</i>	2011-2016
<i>Member of the Steering Committee for National Network for Mathematical and Computational Biology</i>	2013-2016
<i>Board Member of Academic Committee for Applied Mathematics & Scientific Computing of Baroda University</i>	2012-Till date
<i>BOS member for Mathematical sciences of a) SRM University, b) SSSIHL, Prasanthinilayam, c) HBTI, Kanpur, d) DIAT, Pune</i>	2017-till date (a) 2019-till date (b) 2018-till date(c) 2018-till date(d)
<i>DST-SERB-NNMBC Regional Coordinator</i>	2014-2017
<i>Plenary Speaker ICCPDE-2022</i>	2022
<i>Best Mathematical Modeler</i>	2021