

# Souvik Roy

Assistant Professor,  
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SEIR 219

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## Professional Experience

- **University of Texas at Arlington (UTA)** Arlington, Texas, USA  
*Assistant Professor* Aug, 2018 – present
- **Tata Institute of Fundamental Research, Centre for Applicable Mathematics (TIFR-CAM)** Bangalore, India  
*Visiting fellow* Mar, 2018 – Jul, 2018
- **University of Würzburg** Würzburg, Germany  
*Postdoctoral fellow* Sep, 2016 – Sep, 2017
- **International Centre for Theoretical Sciences (ICTS)** Bangalore, India  
*Postdoctoral fellow* Jan, 2016 – August, 2016
- **University of Würzburg** Würzburg, Germany  
*Postdoctoral fellow* Jul, 2015 – Dec, 2015
- **University of Texas at Arlington** Texas, USA  
*Visiting scientist* Jan, 2015 – May, 2015
- **University of Würzburg** Würzburg, Germany  
*Deutscher Akademischer Austauschdienst (DAAD) visiting scientist* Oct, 2014 – Dec, 2014

## Education

- **Tata Institute of Fundamental Research, CAM** Bangalore, India  
*Ph.D. Mathematics* 2011 – 2015
  - Dissertation title: Reconstruction of a class of fluid flows by variational methods and inversion of integral transforms in tomography.
  - Advisors: A. S. Vasudeva Murthy, Praveen Chandrashekar and Venkateswaran P. Krishnan.
- **Tata Institute of Fundamental Research, CAM** Bangalore, India  
*M.Phil. Mathematics* 2010 – 2011
  - Thesis title: Optical Flows – Determination of 2D velocities of a moving fluid.
  - Advisors: A. S. Vasudeva Murthy and Praveen Chandrashekar.
- **Tata Institute of Fundamental Research, CAM** Bangalore, India  
*M.Sc. Mathematics* 2008 – 2010
  - Graduated with 1<sup>st</sup> rank and a 79.25% score.
- **Ramakrishna Mission Vidyamandira, Belur Math** West Bengal, India  
*University of Calcutta* 2005 – 2008  
*B.Sc. Mathematics*
  - Graduated with 4<sup>th</sup> rank and a 82.5% score.

## Current Research Interests

- Inverse problems in medical imaging and health sciences.
- Stochastic pharmacokinetic modeling and optimal control for disease assessment and treatments.
- Computational ordinary and partial differential equations
- Numerical methods for fluid flows.
- Shape optimization.
- Mathematical chromatography.

## Grants

### Awarded

1. **PI:**

*National Science Foundation, Division of Mathematical Sciences (NSF-DMS)*, Grant number: DMS-2212938, **Total Amount: \$214,766.**

Title: “LEAPS-MPS: Stochastic frameworks for control of a class of aberrant signaling pathways in esophageal cancer”.  
Sep, 2022 – Aug, 2024.

2. **PI (Co-PI: Suvra Pal):**

*National Science Foundation, Division of Mathematical Sciences (NSF-DMS)*, Grant number: 2309491, **Total Amount: \$190,000.** Sep, 2023 – Aug, 2026

Title: “A new computational framework for superior image reconstruction in limited data quantitative photoacoustic tomography”.

3. **Co-I (PI: Suvra Pal):**

*National Institute of General Medical Sciences-National Institutes of Health (NIGMS-NIH)*, Grant number: R15GM150091, **Total Amount: \$452,082.** Jun, 2023 – May, 2026

Title: “Using machine learning to improve the predictive accuracy of disease cure”.

4. **Co-PI (PI: Hristo Kojouharov):**

*National Science Foundation, Division of Mathematical Sciences (NSF-DMS)*, Grant number: 2230790, **Total Amount: \$1,099,857.** Sep, 2023 – Aug, 2028

Title: “RTG: Vertically integrated interdisciplinary training in mathematics for human health”.

5. **PI:**

*Research Enhancement Program, University of Texas at Arlington*, Grant number: 2022-605, **Total Amount: \$11,500.**

Title: “A U-Net based game-theoretic framework for superior reconstructions in quantitative photoacoustic tomography”.  
Jun, 2022 – Aug, 2024.

6. **PI (Co-PI: Zui Pan):**

*Interdisciplinary Research Program, University of Texas at Arlington*, Grant number: 2021-772, **Total Amount: \$20,000..**

Title: “A data-driven computational pharmacokinetic framework for EGFR-targeting therapy in esophageal cancer”.  
Sep, 2021 – Dec, 2022

7. **Multi-PI (MPI) (MPIs: Suvra Pal and Leili Shahriyari):**  
*National Cancer Institute-National Institutes of Health (NCI-NIH)*, Grant number: R21CA242933,  
**Total Amount: \$386,767.**  
 Title: “Data-driven QSP software for personalized colon cancer treatment”. Sep, 2019 – Aug, 2022
8. **PI: H.C. Ørsted COFUND grant (under Marie Sklodowska-Curie Actions grant no. 609405 (FP7) and 713683 (H2020))** for postdoctoral studies at Denmark Technical University, **Approx. Total Amount: \$151,210.**  
 Title: “Optimization methods for hybrid inverse problems”. Oct, 2017 – Sep, 2019  
 (S. Roy declined the offer due to accepting the UTA assistant professor position).

## Pending

1. **Co-PI (PI: M. Farooq Wahab):**  
*National Science Foundation, Chemical Measurement and Imaging (NSF-CMI)*, **Total Amount: \$698,011.** Sep, 2024 – Aug, 2027  
 Title: “Enhancing sensitivity and selectivity of molecular rotational resonance spectrometric detectors”.

## Awards and Honors

- “Top Cited Article” in *Statistica Neerlandica* for 2021-2022. Feb, 2023
- “Best Paper Presentation” award in the Applied Mathematics Track, International Conference on Emerging Trends in Mathematical Sciences and Computing. Feb, 2022
- Selected as a member of the prestigious NCI Awardee Skills Development Consortium (NASDC) course “Utah Advanced Course on Mentoring, Leadership, and Cancer-related Health Disparities”. Jan, 2021 - Sep, 2021
- Selected as a member of the prestigious NCI-NIH Innovation Lab “Advancing Cancer Biology at the Frontiers of Machine Learning and Mechanistic Modeling”. Aug, 2020
- Certified Leader in Education, NRI Welfare Society of India and Association of Leaders in Education. Apr, 2019
- University of Texas at Arlington Freshman Leaders on Campus Honored Professor. Mar, 2019
- SIAM travel award for attending the Gene Golub SIAM Summer School, Austria. Aug, 2014
- Ranked 1<sup>st</sup> in the M.Sc exams at Tata Institute of Fundamental Research, CAM. 2008 – 2010
- Ranked 4<sup>th</sup> in the B.Sc. exams at University of Calcutta. 2005 – 2008
- Ranked 71<sup>st</sup> (out of more than 10000 participants) in the National Science Olympiad, India. 2004

## Fellowships

- Postdoctoral fellowship under Deutsche Forschungsgemeinschaft (DFG) grant at University of Würzburg, Germany. Sep, 2016 – Sep, 2017
- Indo-French Centre for Applied Mathematics (IFCAM) visiting scientist fellowship for postdoctoral studies at University of Nice, France. April, 2016 – June, 2016
- International Centre For Theoretical Sciences postdoctoral fellowship. Jan, 2016 – August, 2016
- Postdoctoral fellowship under the project “Multi-ITN Strike” at University of Würzburg, Germany. July, 2015 – Dec, 2015
- University of Texas at Arlington and AIRBUS fellowship for postdoctoral studies at University of Texas at Arlington Jan, 2015 – May, 2015
- Deutscher Akademischer Austauschdienst (DAAD) visiting scholar fellowship for research visit to University of Würzburg, Germany. Oct, 2014 – Dec, 2014
- Tata Institute of Fundamental Research, CAM doctoral fellowship. 2010 – 2015
- Tata Institute of Fundamental Research, CAM masters fellowship. 2008 – 2010

## Patents, Publications, Abstracts and Reports

### Provisional Patent

1. Daniel W. Armstrong, M. Farooq Wahab, Troy T. Handlovic, and **Souvik Roy**. Systems and methods for removal of extra-column band broadening in chromatographic peaks, ID:63/506,895, 2023.

### Submitted Publications

- (a) Mesfer Alajmi and **Souvik Roy**. A differential game framework for modeling and control of colon cancer, (*under review*), 2023.
- (b) Hussein Edduweh and **Souvik Roy**. A Liouville optimal control framework in prostate cancer, (*under review*), 2023.
- (c) **Souvik Roy** and Alfio Borzì. Numerical approximation of kinetic Fokker-Planck equations with specular reflection boundary conditions, (*under review*), 2023.
- (d) Deep Ray and **Souvik Roy**. Learning end-to-end inversion of circular Radon transforms in the partial radial setup, (*under review*), 2023.
- (e) Fawaz Alalhareth, Madhu Gupta, Hristo Kojouharov and **Souvik Roy**. Second-order modified nonstandard theta and Runge-Kutta methods for n-dimensional autonomous differential equations, (*under review*), 2022.
- (f) Anwesa Dey, Alfio Borzì and **Souvik Roy**. A new approach to high contrast and resolution reconstruction in quantitative photoacoustic tomography, (*under review*), 2022.

## Publications

### Peer-reviewed journal publications

1. **Souvik Roy**, Zui Pan, Naif Abu Qarnayn, Mesfer Alajmi, Ali Alatwi, Asma Alghamdi, Ibrahim Alshaoosh, Zahra Asiri, Berlinda Batista, Shreshtha Chaturvedi, Olusola Dehinsilu Hussein Edduweh, Rodina El-Adawy, Emran Hossen, Bardia Mojra, Jashmon Rana. A robust optimal control framework for controlling aberrant RTK signaling pathways in esophageal cancer, *Journal of Mathematical Biology* (accepted), 2023.
2. **Souvik Roy**, Gihyeon Jeon and Sunghwan Moon. Radon transform with Gaussian beam: Theoretical and numerical reconstruction scheme, *Applied Mathematics and Computation*, 452:128024, 2023, <https://www.sciencedirect.com/science/article/abs/pii/S0096300323001935>.
3. Troy T. Handlovic, M. Farooq Wahab, **Souvik Roy**, Ronald E. Brown and Daniel W. Armstrong. Automated regularized deconvolution for eliminating extra-column effects in fast high-efficiency separations, *Analytical Chemistry*, 95(29):11028-11036, 2023, <https://pubs.acs.org/doi/10.1021/acs.analchem.3c01279>.
4. Munir Butt and **Souvik Roy**. A numerical scheme to solve Fokker-Planck control collective-motion problem, *Mathematics and Computers in Simulation*, (to appear), 2023, <https://www.sciencedirect.com/science/article/abs/pii/S0378475423004317>.
5. Fawaz Alalhareth, Madhu Gupta, **Souvik Roy** and Hristo Kojouharov. Second-order modified positive and elementary stable nonstandard numerical methods for n-dimensional autonomous differential equations, *Mathematical Methods in the Applied Sciences*, 2023, <https://onlinelibrary.wiley.com/doi/abs/10.1002/ma.9560>.
6. Suvra Pal and **Souvik Roy**. On the parameter estimation of Box-Cox transformation cure model, *Statistics in Medicine*, 1-19, 2023, <https://onlinelibrary.wiley.com/doi/10.1002/sim.9739>.
7. **Souvik Roy**. A new nonlinear sparse optimization framework for superior reconstructions in ultrasound-modulated optical tomography, *IEEE Transactions on Computational Imaging*, 8:1-11 2022, <https://doi.org/10.1109/TCI.2021.3137146>.
8. Purnendu Dasgupta, Enas N. Yousef, Seth A Horn, Phillip Shelor and **Souvik Roy**. Geometric characterization of polymeric capillaries, *Analytica Chimica Acta*, 1229:340345, 2022, <https://doi.org/10.1016/j.aca.2022.340345>.
9. **Souvik Roy**, Zui Pan and Suvra Pal. A Fokker-Planck feedback control framework for optimal personalized therapies in colon cancer-induced angiogenesis, *Journal of Mathematical Biology*, 84:23, 2022, <https://doi.org/10.1007/s00285-022-01725-3>.
10. Yan Chang, Marah Funk, **Souvik Roy**, Elizabeth Stephenson, Sangyong Choi, Hristo Kojouharov, Benito Chen and Zui Pan. Developing a mathematical model of intracellular calcium dynamics for evaluating combined anticancer effects of Afatinib and RP4010 in esophageal cancer, *International Journal of Molecular Sciences*, 23(3):1763, 2022, <https://doi.org/10.3390/ijms23031763>.
11. Madhu Gupta, John M. Slezak, Fawaz Alalhareth, **Souvik Roy** and Hristo Kojouharov. Second-order modified nonstandard Runge-Kutta and theta methods for one-dimensional autonomous differential equations, *Applications and Applied Mathematics*, 16(2):788-803, 2021, <https://digitalcommons.pvamu.edu/aam/vol16/iss2/1/>.

12. Jan Bartsch, Alfio Borzì, Francesco Fanelli and **Souvik Roy**. A numerical investigation of Brockett's ensemble optimal control problems. *Numerische Mathematik*, 149:1-42, 2021, <https://doi.org/10.1007/s00211-021-01223-6>.
13. Madhu Gupta, Rohit Kumar Mishra and **Souvik Roy**. Sparsity-based nonlinear reconstruction of optical parameters in two-photon photoacoustic computed tomography, *Inverse Problems*, 37:044001, 2021, <https://doi.org/10.1088/1361-6420/abdd0f>.
14. Rim Gouia-Zarrad, **Souvik Roy** and Sunghwan Moon. Numerical inversion and uniqueness of a spherical Radon transform restricted with a fixed angular span, *Applied Mathematics and Computation*, 408(1):126338, 2021, <https://doi.org/10.1016/j.amc.2021.126338>.
15. Yan Chang, **Souvik Roy** and Zui Pan. Store-operated calcium channels as drug target in gastroesophageal cancers, *Frontiers in Pharmacology*, 12:944, 2021, <https://doi.org/10.3389/fphar.2021.668730>.
16. Suvra Pal and **Souvik Roy**. On the estimation of destructive cure rate model: a new study with exponentially weighted Poisson competing risks, *Statistica Neerlandica*, 75(3): 324–342, 2021, <https://doi.org/10.1111/stan.12237>.
17. Madhu Gupta, Rohit Kumar Mishra and **Souvik Roy**. Sparse reconstruction of log-conductivity in current density impedance tomography, *Journal of Mathematical Imaging and Vision*, 62:189-205, 2020, <https://doi.org/10.1007/s10851-019-00929-5>.
18. Hristo Kojouharov, **Souvik Roy**, Madhu Gupta, Fawaz Alalhareth and John M. Slezak. A second-order nonstandard theta method for autonomous differential equations, *Applied Mathematics Letters*, 112:106775, 2020, <https://doi.org/10.1016/j.aml.2020.106775>.
19. Suvra Pal and **Souvik Roy**. A new non-linear conjugate gradient algorithm for destructive cure rate model and a simulation study: illustration with negative binomial competing risks, *Communications in Statistics - Simulation and Computation*, 2020, <https://doi.org/10.1080/03610918.2020.1819321>.
20. Anisa M.H. Chorwadwala and **Souvik Roy**. How to place an obstacle having a dihedral symmetry centered at a given point inside a disk so as to optimize the fundamental Dirichlet eigenvalue, *Journal of Optimization Theory and Applications*, 184(1):162-187, 2020, <https://doi.org/10.1007/s10957-019-01483-1>.
21. Jan Bartsch, Alfio Borzì, Francesco Fanelli and **Souvik Roy**. A theoretical investigation of Brockett's ensemble optimal control problems. *Calculus of Variation and Partial Differential Equations*, 58:162, 2019, <https://doi.org/10.1007/s00526-019-1604-2>.
22. **Souvik Roy**, Mario Annunziato, Alfio Borzì and Christian Klingenberg. A Fokker-Planck approach to control collective motion, *Computational Optimization and Applications*, 69(2):423–459, 2018, <https://doi.org/10.1007/s10589-017-9944-3>.
23. Gaik Ambartsoumian, Rim Gouia-Zarrad, Venkateswaran P. Krishnan and **Souvik Roy**. Image reconstruction from radially incomplete spherical Radon data, *European Journal of Applied Mathematics*, 29(3):470–493, 2018, <https://doi.org/10.1017/S0956792517000250>.
24. **Souvik Roy** and Alfio Borzì. A new optimisation approach to sparse reconstruction of log-conductivity in acousto-electric tomography, *SIAM Journal of Imaging Sciences*, 11(2):1759–1784, 2018, <https://doi.org/10.1137/17M1148451>.

25. Bolaji Adesokan, Kim Knudsen, Venkateswaran P. Krishnan and **Souvik Roy**. A fully non-linear optimization approach to acousto-electric tomography, *Inverse Problems*, 34:104004, 2018, <https://doi.org/10.1088/1361-6420/aad6b1>.
26. **Souvik Roy**, Alfio Borzì and Abderrahmane Habbal. Pedestrian motion constrained by FP-constrained Nash games, *Royal Society Open Science*, 4(9):170648, 2017, <https://doi.org/10.1098/rsos.170648>.
27. Praveen Chandrashekar, **Souvik Roy** and A. S. Vasudeva Murthy. A variational approach to estimate incompressible fluid flows, *Proceedings of Mathematical Sciences*, Springer, 127(1):175–201, 2017, <https://doi.org/10.1007/s12044-016-0317-0>.  
*Dissertation work*
28. **Souvik Roy** and Alfio Borzì. Numerical investigation of a class of Liouville control problems, *Journal of Scientific Computing*, 73(1):178–202, 2017, <https://doi.org/10.1007/s10915-017-0410-2>.
29. Gaik Ambartsoumian and **Souvik Roy**. Numerical inversion of a broken ray transform arising in single scattering optical tomography, *IEEE Transactions on Computational Imaging*, 2(2):166–173, 2016, <https://doi.org/10.1109/TCI.2016.2531581>.
30. **Souvik Roy**, Mario Annunziato and Alfio Borzì. A Fokker–Planck feedback control-constrained approach for modelling crowd motion, *Journal of Computational and Theoretical Transport*, 45(6):452–458, 2016, <https://doi.org/10.1080/23324309.2016.1189435>.
31. **Souvik Roy**, Venkateswaran P. Krishnan, Praveen Chandrasekhar and A. S. Vasudeva Murthy. An efficient numerical algorithm for Radon transform inversion with applications in ultrasound imaging, *Journal of Mathematical Imaging and Vision*, Springer, 53:78–91, 2015, <https://doi.org/10.1007/s10851-014-0550-z>.  
*Dissertation work*
32. **Souvik Roy**, Praveen Chandrashekar and A. S. Vasudeva Murthy. A variational approach to optical flow estimation of unsteady incompressible flows, *International Journal of Advances in Engineering Sciences and Applied Mathematics*, Springer, 7(3):149–167, 2015, <https://doi.org/10.1007/s12572-015-0147-9>.

### Peer-reviewed book chapters

33. Fawaz Alalhareth, Madhu Gupta, Hristo Kojouharov and **Souvik Roy**. Higher-order modified nonstandard finite difference methods for autonomous dynamical systems, *Contemporary Mathematics (CONM) book series: Mathematical and Computational Modeling of Phenomena Arising in Population Biology and Nonlinear Oscillations (in print)*, 2023.
34. **Souvik Roy** and Suvra Pal, Optimal personalized therapies in colon-cancer induced immune response using a Fokker-Planck framework, *Mathematics and Computer Science, Volume 2*, Sharmistha Ghosh, Niranjanamurthy M, Krishanu Deyasi, Biswadip Basu Mallik, Santanu Das Editors., Wiley-Scrivener, 33-48, 2023, <https://doi.org/10.1002/9781119896715.ch3>.
35. Anisa M. H. Chorwadwala and **Souvik Roy**, Placement of an obstacle for optimizing the fundamental eigenvalue of divergence form elliptic operators. *Variational Views in Mechanics*, P. M. Mariano Editors., series “Advances in Continuum Mechanics”, Birkhauser-Springer, Boston, 123:157-183, 2021, [https://doi.org/10.1007/978-3-030-90051-9\\_6](https://doi.org/10.1007/978-3-030-90051-9_6).

### Peer-reviewed conference proceedings and abstracts

36. Fawaz Alalhareth, Madhu Gupta, Hristo Kojouharov and **Souvik Roy**. Higher-order modified nonstandard finite difference methods for autonomous dynamical systems, *BIOMATH 2023*, 2023, <https://biomath.math.bas.bg/biomath/index.php/bmcs/article/view/1568>.
37. **Souvik Roy**, Suvra Pal, Achyuth Manoj, Susanth Kakarla, Juan Villegas and Mesfer Alajmi. A Fokker-Planck framework for parameter estimation and sensitivity analysis in colon cancer, *AIP Conference Proceedings*, 2522:070005, 2022, <https://doi.org/10.1063/5.0100741>.
38. **Souvik Roy**. A sparsity-based Fokker-Planck optimal control framework for modeling traffic flows, *AIP Conference Proceedings*, 2302:110007, 2020, <https://doi.org/10.1063/5.0033514>.
39. Madhu Gupta, Fawaz Alalhareth, John M. Slezak, **Souvik Roy** and Hristo Kojouharov. Second-order nonstandard explicit Euler method, *AIP Conference Proceedings*, 2302:110003, 2020, <https://doi.org/10.1063/5.0033534>.

### Technical reports, book reviews, and dissertations

40. Carlos Chan, Mahsa Dabagh, Dave Fuller, Sara Gosline and **Souvik Roy**. Personalized prediction of treatment response for peritoneal carcinomatosis via a hybrid mechanistic/AI approach, *Technical Report. Advancing Cancer Biology at the Frontiers of Machine Learning and Mechanistic Modeling*, NCI-NIH Innovation Lab, 2020.
41. **Souvik Roy**. Review of handbook of numerical methods for hyperbolic problems: basic and fundamental issues (Rémi Abgrall and Chi-Wang Shu), *SIAM Reviews*, 60(3):768-771, 2018, <https://doi.org/10.1137/18N974625>.
42. **Souvik Roy**. Reconstruction of a class of fluid flows by variational methods and inversion of integral transforms in tomography. *Doctoral Dissertation*, TIFR-CAM, 2015.
43. **Souvik Roy**. Optical Flows – Determination of 2D velocities of a moving fluid. *M.Phil Dissertation*, TIFR-CAM, 2011.

### Not peer-reviewed

44. Gaik Ambartsoumian, **Souvik Roy**, Gaurav Khatri and Phillippe Zimmern. Automatic segmentation and 3D visualization of pelvic mesh using mathematical modelling and machine learning techniques in MRI, *Journal of Urology*, 203 (Supplement 4):e605-e605, 2020, <https://doi.org/10.1097/JU.0000000000000891.05>.
45. Gaik Ambartsoumian, **Souvik Roy**, Gaurav Khatri and Phillippe Zimmern. Automatic segmentation and 3D visualization of pelvic mesh using mathematical modelling and machine learning techniques in MRI, *Neurology and Urodynamics, ICS 49<sup>th</sup> Annual Meeting*, 38:S54-S55, 2019, <https://www.ics.org/2019/abstract/27>.
46. Gaurav Sharma and **Souvik Roy**. Bubble drag coefficient formulation and stability analysis for multiphase-turbomachinery problems (Shear flow/breakup GE2), *Modeling week and study group meeting on industrial problems*, Supercomputer Education Research Center, Indian Institute of Science, Bangalore, India, 58-73, 2011.
47. Andrew A. Lacey, A. S. Vasudeva Murthy, **Souvik Roy** and Arnab Jyoti Dasgupta. Fish feeding. *Modeling week and study group meeting on industrial problems*, Supercomputer Education Research Center, Indian Institute of Science, Bangalore, India, 32-55, 2011.



## Selected List of Invited Presentations

- 1. Control of stochastic signaling pathways in esophageal cancer (30 min)**  
*Mini-symposium talk at SIAM Texas-Louisiana Section, University of Houston, USA* Nov, 2022
- 2. Nonlinear sparse optimization framework in ultrasound modulated optical tomography (30 min)**  
*Mini-symposium talk at AMS Fall Western Sectional Meeting, University of Utah, USA* Oct, 2022
- 3. A projected non-linear conjugate gradient algorithm for parameter estimation in a cure rate model (15 min)**  
*Mini-symposium talk at International E-Conference on Mathematical and Statistical Sciences: A Selcuk Meeting (Online)* Oct, 2022
- 4. A Fokker-Planck control framework for personalized therapies in esophageal cancer (30 min)**  
*Mini-symposium talk at International Conference on Recent Advances in Engineering, Technology and Science, India* Aug, 2022
- 5. A Fokker-Planck control framework for personalized therapies in esophageal cancer (30 min)**  
*Mini-symposium talk at National Conference on Advanced research on Science, Engineering and Technology, India* Jul, 2022
- 6. A Fokker-Planck feedback control framework for optimal personalized therapies in colon cancer-induced angiogenesis (30 min)**  
*Mini-symposium talk at Conference on PDE and Numerical Analysis- TIFR CAM (in the memory of Prof. A. S. Vasudeva Murthy) (online)* Apr, 2022
- 7. A new nonlinear sparse optimization framework for ultrasound-modulated optical tomography (30 min)**  
*Mini-symposium talk at SIAM Conference on Imaging Science (online)* Mar, 2022
- 8. A Fokker-Planck control framework for personalized therapies in colon cancer-induced immune response (30 min) (Best Paper Award in Applied Mathematics Track)**  
*Mini-symposium talk at International Conference on Emerging Trends in Mathematical Sciences and Computing (online)* Feb, 2022
- 9. A Fokker-Planck feedback control framework for optimal personalized therapies in colon cancer-induced angiogenesis (30 min)**  
*Mini-symposium talk at International Conference on Advances in Mathematics, Physics and Applied Science (online)* Feb, 2022
- 10. A Fokker-Planck feedback control framework for optimal personalized therapies in colon cancer-induced angiogenesis (30 min)**  
*Mini-symposium talk at World Conference on Mathematical Sciences and Applications (online)* Feb, 2022
- 11. A new nonlinear sparse optimization framework for ultrasound-modulated optical tomography (30 min)**  
*Mini-symposium talk at SIAM Texas-Louisiana Conference* Nov, 2021

12. **A projected non-linear conjugate gradient algorithm for parameter estimation in a cure rate model (30 min)**  
*Mini-symposium talk at International Conference on Advances in Interdisciplinary Statistics and Combinatorics (online)* *Oct, 2021*
  
13. **A new nonlinear sparse optimization framework for two-photon photoacoustic computed tomography (30 min)**  
*Mini-symposium talk at SIAM Southeastern Atlantic Section Conference, Auburn University (online)* *Sep, 2021*
  
14. **A Nash games framework to control pedestrian behavior (30 min)**  
*Mini-symposium talk at SIAM Conference on Optimization (online)* *Jul, 2021*
  
15. **A projected non-linear conjugate gradient algorithm for parameter estimation in a cure rate model (30 min)**  
*Mini-symposium talk at Statistics' 21. Concordia University (online)* *Jul, 2021*
  
16. **A Data-driven stochastic framework for treatment assessment in colon cancer (30 min)**  
*Mini-symposium talk at 13<sup>th</sup> conference of the Euro-American consortium AMiTaNS'21 (online)*  
*Jun, 2021*
  
17. **A Fokker-Planck stochastic framework for treatment assessment in colon cancer (60 min)**  
*Department of Mathematics Seminar, Texas A&M Corpus Christi (Online)* *Apr, 2021*
  
18. **Parameter estimation and uncertainty quantification in colon cancer-induced angiogenesis using a Fokker-Planck stochastic framework (60 min)**  
*Applied Mathematics Seminar, University of Texas at Arlington (Online)* *Apr, 2021*
  
19. **An introduction to linear ordinary differential equations and some numerical methods (60 min)**  
*Mathematics Department Seminar, Mediterranean Institute of Technology (Online)* *Feb, 2021*
  
20. **A new nonlinear sparse optimization framework for ultrasound-modulated optical tomography (30 min)**  
*Mini-symposium talk at DMV Annual Meeting (Online)* *Sep, 2020*
  
21. **Personalized prediction of treatment response for peritoneal carcinomatosis via a hybrid mechanistic/AI approach (10 min)**  
*Group report presentation at NCI-NIH Innovation Lab (Online)* *Aug, 2020*
  
22. **Reconstruction of sparse log-conductivity in current density impedance imaging (15 min).**  
*SIAM Conference on Imaging Sciences (IS20) (Online)* *Jul, 2020*
  
23. **A Pontryagin maximum principle based Fokker-Planck approach to control traffic motion. (30 min)**  
*Mini-symposium talk at 12<sup>th</sup> conference of the Euro-American consortium AMiTaNS'20 (online)*  
*Jun, 2020*
  
24. **A Fokker-Planck approach to control crowd motion (30 min)**  
*Mini-symposium talk at TX-LA SIAM Section Meeting, Southern Methodist University, USA* *Nov, 2019*

25. **Developing data-driven models for obtaining personalized cancer treatments (15 min)**  
*National Institutes of Health, Informatics Technology for Cancer Research (NIH ITCR)*  
*Teleconference, USA* *Nov, 2019*
26. **A Nash games framework to control pedestrian behavior (30 min)**  
*Mini-symposium talk at French-German-Swiss conference on Optimization, Nice, France* *Sep, 2019*
27. **A new non-linear optimization framework for acousto-electric tomography (30 min)**  
*Mini-symposium talk at the conference Applied Inverse Problems, Grenoble, France* *Jul, 2019*
28. **A Fokker-Planck approach to control crowd motion (30 min)**  
*Collaborative Conference on Math-Finance and Statistics, Hawaii, USA* *Mar, 2019*
29. **Controlling pedestrian motion through a Nash games framework (50 min)**  
*Guest Speaker, Mathematical Association of America,*  
*University of Texas at Arlington, USA* *Mar 2019*
30. **A fully non-linear optimization approach for acousto-electric tomography (50 min)**  
*Computational Science Seminar, University of Texas, Dallas, USA* *Feb, 2019*
31. **Math: A boon or a curse (50 min)**  
*Guest Speaker at a faculty program for student residents,*  
*University of Texas at Arlington, USA* *Nov, 2018*
32. **Inverse problems and PDE-constrained optimization (50 min)**  
*SIAM Student Chapter, University of Texas at Arlington, USA* *Oct, 2018*
33. **Non-linear optimization methods for acousto-electric tomography (45 min)**  
*Departmental Seminar, TIFR-CAM, India* *May, 2018*
34. **An introduction to linear ordinary differential equations and some numerical methods (50 min)**  
*Mathematics Department Seminar, American University of Sharjah, UAE* *Apr, 2018*
35. **A Fokker-Planck Nash differential game to model crowd motion with avoidance (50 min)** *Mathematics Department Colloquium, American University of Sharjah, UAE* *Apr, 2018*
36. **A Fokker-Planck Nash differential game to model crowd motion with avoidance (50 min)**  
*Mathematics Department Seminar, Denmark Technical University, Denmark* *Aug, 2017*
37. **A novel numerical method for a class of Liouville control problems (30 min)**  
*Workshop on Numerical Methods for Optimal Control and Inverse Problems,*  
*Technical University of Munich, Germany* *Apr, 2017*
38. **Numerical inversion of a broken ray transform arising in single scattering optical tomography (30 min)**  
*Mini-symposium talk at the conference "100 Years of the Radon Transform", The Radon Institute*  
*of Computational and Applied Mathematics, Linz, Austria* *Mar, 2017*
39. **Numerical investigation of a class of Liouville control problems (50 min)**  
*Mathematics Department Seminar, University of Nice, France* *Mar, 2017*
40. **Inversion of a spherical Radon transform in a spherical shell (50 min)**  
*Mathematics Department Seminar, Denmark Technical University, Denmark* *Oct, 2016*

41. **Numerical inversion of a broken ray transform arising in single scattering optical tomography (50 min)**  
*Mathematics Department Seminar, ICTS, Bangalore, India* *Jul, 2016*
42. **Inversion of a spherical Radon transform in a spherical shell (30 min)**  
*Mini-symposium talk at the conference*  
*"Inverse Problems: Modeling and Simulation", Turkey* *May, 2016*
43. **A Fokker-Planck approach to control collective motion (45 min)**  
*Mathematics Department Seminar, ICTS, Bangalore, India* *Oct, 2015*
44. **Inverse problems in imaging (50 min)**  
*Inverse Problem Seminar Series, University of Texas at Arlington, USA* *Mar, 2015*
45. **A variational approach to flow estimation of unsteady incompressible flows (45 min)**  
*Finite Element Meet, TIFR-CAM, Bangalore, India* *Dec, 2014*
46. **A discontinuous Galerkin vorticity-velocity formulation for incompressible 2D Euler flow (50 min)**  
*Mathematics Department Seminar, Indian Institute of Science Education and Research, Pune, India* *Jun, 2014*
47. **Optimal control approach for estimation of incompressible fluid flows (30 min)**  
*28th Annual Conference Of Ramanujam Mathematical Society,*  
*Ramaiah Institute of Technology, Bangalore, India* *Jun, 2013*

## Students Supervised

### Supervised postdoctoral fellows

1. **Rohit Kumar Mishra** UTA  
*Postdoctoral fellow* Sep, 2019 – Oct, 2020

### Supervised Ph.D. Students

1. **Madhu Gupta** UTA  
*Ph.D. Mathematics* Sep, 2019 – Aug, 2022
  - Dissertation title: On some problems in sparse hybrid imaging, nonstandard finite difference methods, and Fokker-Planck frameworks in esophageal cancer.
  - Position after Ph.D.: *Postdoctoral fellow*, George Mason University, USA.
2. **Hussein Said Ed Duweh** UTA  
*Ph.D. Mathematics* Sep, 2020 – Aug, 2023
  - Dissertation title: Optimal control frameworks for modeling dynamics and androgen deprivation therapies in prostate cancer.
3. **John Montalbo (Co-supervisor)** UTA  
*Ph.D. Mathematics* Sep, 2018 – Jul, 2020
  - Dissertation title: Inverse problems and forward propagation of optical flow.
  - Supervisor: Gaik Ambartsoumian.
  - Position after Ph.D.: *Data Analyst*, Tarrant County HIV Administrative Agency, USA.
4. **Asma Ali Alghamdi** UTA  
*Ph.D. Mathematics* Jul, 2020 – present
  - Tentative dissertation title: Modeling of HIV dynamics and associated antiretroviral therapies using optimal control frameworks.
  - Expected to graduate by May, 2024.
5. **Mesfer Alajmi** UTA  
*Ph.D. Mathematics* Sep, 2020 – present
  - Tentative dissertation title: A game theoretic approach for modeling and assessing virotherapy-based treatments in hematologic cancers.
  - Expected to graduate by May, 2024.
6. **Naif Qarnayn** UTA  
*Ph.D. Mathematics* Sep, 2022 – present
  - Tentative dissertation title: Inverse problems in limited data optical tomography.
  - Expected to graduate by August, 2025.
7. **Olusola Dehinsilu** UTA  
*Ph.D. Mathematics* April, 2023 – present
  - Tentative dissertation title: Stochastic frameworks in esophageal cancer modeling and control.
  - Expected to graduate by August, 2026.

## Supervised Master Students

### 1. Jan Bartsch

(co-supervised with Alfio Borzi and Francesco Fanelli) University of Würzburg, Germany  
*M.S. Mathematics* Mar, 2017 – Apr, 2018

- Dissertation title: Optimal control problems governed by Liouville models - Mathematical analysis and implementation.
- Position after M.S.: *Ph.D. student*, University of Würzburg, Germany.

## Supervised Undergraduate Students

1. **Lasta Maharjan** (Supervised research), University of Texas at Arlington, Sep, 2022 – present.
2. **Achyuth Manoj** (Honors Thesis), University of Texas at Arlington, May, 2020 – Jul, 2022.
3. **Zain Khan** (Supervised research), University of Texas at Arlington, Jan, 2022 – Aug, 2022.
4. **Susanth Kakarla** (Supervised research), University of Texas at Arlington, Jun, 2020 – Aug, 2021.
5. **Juan Villegas** (Supervised research), University of Texas at Arlington, Aug, 2020 – Aug, 2021.

## Dissertation/Comprehensive/Diagnostic Exam Committee

1. Madhu Gupta, Dissertation committee (chair), Mathematics, UTA.
2. Hussein Ed Duweh, Dissertation committee (chair), Mathematics, UTA.
3. John Montalbo, Dissertation committee (co-chair; chair Gaik Ambartsoumian), Mathematics, UTA.
4. Jodi Treszoks, Dissertation committee (member; chair Suvra Pal), Mathematics, UTA.
5. Fawaz Alalhareth, Dissertation committee (member; chair Hristo Kojouharov), Mathematics, UTA.
6. Osama Alkhazaleh, Dissertation committee (member; chair Yue Liu), Mathematics, UTA.
7. Patrick Amanda Louise, Dissertation committee (member; chair Benito Chen-Charpentier), Mathematics, UTA.
8. Zachry Engel, Dissertation committee (member; chair Suvra Pal), Mathematics, UTA.
9. Mohammad Alharbi, Dissertation committee (member; chair Christopher Kribs), Mathematics, UTA.
10. Pei Wang, Dissertation committee (member; chair Suvra Pal), Mathematics, UTA.
11. Madhu Gupta, Comprehensive exam committee (chair), Mathematics, UTA.
12. Hussein Ed Duweh, Comprehensive exam committee (chair), Mathematics, UTA.
13. Asma Ali-Alghamdi, Comprehensive exam committee (chair), Mathematics, UTA.
14. Mesfer Alajmi, Comprehensive exam committee (chair), Mathematics, UTA.
15. John Montalbo, Comprehensive exam committee (co-chair; chair Gaik Ambartsoumian), Mathematics, UTA.

16. Ivan Toledo, Comprehensive exam committee (member; chair Tuncay Aktosun), Mathematics, UTA.
17. Ana Mendez, Comprehensive exam committee (member; chair Hristo Kojouharov), Mathematics, UTA.
18. Jodi Treszoks, Comprehensive exam committee (member; chair Suvra Pal), Mathematics, UTA.
19. Ananthkumar Jayamani, Comprehensive exam committee (member; chair Frank Lu), Aerospace Engineering, UTA.
20. Fawaz Alalhareth, Comprehensive exam committee (member; chair Hristo Kojouharov), Mathematics, UTA.
21. Patrick Amanda Louise, Comprehensive exam committee (member; chair Benito Chen-Charpentier), Mathematics, UTA.
22. Osama Alkhazaleh, Comprehensive exam committee (member; chair Yue Liu), Mathematics, UTA.
23. Mohammad Alharbi, Comprehensive exam committee (member; chair Christopher Kribs), Mathematics, UTA.
24. Zachry Engel, Comprehensive exam committee (member; chair Suvra Pal), Mathematics, UTA.
25. Pei Wang, Comprehensive exam committee (member; chair Suvra Pal), Mathematics, UTA.
26. Olusola Dehinsilu, Diagnostic exam committee (chair), Mathematics, UTA.
27. Asma Ali-Alghamdi, Diagnostic exam committee (chair), Mathematics, UTA.
28. Ana Mendez, Diagnostic exam committee (member; chair Hristo Kojouharov), Mathematics, UTA.
29. Fawaz Alalhareth, Diagnostic exam committee (member; chair Hristo Kojouharov), Mathematics, UTA.
30. Ana Mendez, M.S. committee (member; chair Hristo Kojouharov), Mathematics, UTA.
31. Rawan Joudeh, M.S. committee (member; chair Gaik Ambartsoumian), Mathematics, UTA.

## Teaching

### Regular Courses

1. ***MATH 3319 (Fall 2023)*** - *Differential Equations and Linear Algebra (undergraduate)*, University of Texas at Arlington.  
**Instructor**, Class size - about 60 students. Responsibilities: lectures, office hours, 3 exams per semester.
2. ***MATH 5392 (Fall 2022)*** - *Modeling and Optimal Control with ODEs (graduate)*, University of Texas at Arlington.  
**Instructor**, Class size - 13 students. Responsibilities: lectures, office hours, assignments.
3. ***MATH 3330 (Fall 2022)*** - *Introduction to Linear Algebra and Vector Spaces (undergraduate)*, University of Texas at Arlington.  
**Teams-teaching, primary instructor: Dr. Shan Sun-Mitchell**, Class size - 55 students. Responsibilities: lectures, office hours, quizzes.

4. **MATH 3330 (Fall 2021)** - *Introduction to Linear Algebra and Vector Spaces (undergraduate)*, University of Texas at Arlington.  
**Instructor**, Class size - 60 students. Responsibilities: lectures, office hours, assignments, 3 exams per semester.
5. **MATH 3330 (Spring 2021)** - *Introduction to Linear Algebra and Vector Spaces (undergraduate)*, University of Texas at Arlington (Hybrid 3).  
**Instructor**, Class size - 28 students. Responsibilities: lectures, office hours, assignments, 3 exams per semester.
6. **MATH 5321 (Fall 2020)** - *Applied Partial Differential Equations (graduate)*, University of Texas at Arlington (Hybrid 3).  
**Instructor**, Class size - 18 students. Responsibilities: lectures, office hours, assignments, midterms and final exams.
7. **MATH 5320 (Spring 2020)** - *Ordinary Differential Equations (graduate)*, University of Texas at Arlington (Transition to online classes mid-semester).  
**Instructor**, Class size - 12 students. Responsibilities: lectures, office hours, assignments, midterms and final exams.
8. **MATH 3319 (Fall 2019)** - *Differential Equations and Linear Algebra (undergraduate)*, University of Texas at Arlington.  
**Instructor**, Class size - about 60 students. Responsibilities: lectures, office hours, 3 exams per semester.
9. **MATH 2425 (Spring 2019)** - *Calculus 2 (undergraduate)*, University of Texas at Arlington.  
**Instructor**, Class size - about 70 students. Responsibilities: lectures, office hours, 3 exams per semester.
10. **MATH 1426 (Fall 2018)** - *Calculus 1 (undergraduate)*, University of Texas at Arlington.  
**Instructor**, Class size - about 80 students. Responsibilities: lectures, office hours, 3 exams per semester.

### Dissertation, Internships, Independent Study, and Research Study Courses

1. **MATH 5999-002 (Fall 2023)** - *Research in Mathematics*, Research Study Course.
2. **MATH 6699-007 (Fall 2023)** - *Dissertation*, Dissertation Course.
3. **MATH 6699-008 (Fall 2023)** - *Dissertation*, Dissertation Course.
4. **MATH 7399-002 (Summer 2023)** - *Doctoral Degree Completion*, Dissertation Completion Course.
5. **MATH 5699-007 (Fall 2022)** - *Research in Mathematics*, Research Study Course.
6. **MATH 7399-005 (Summer 2022)** - *Doctoral Degree Completion*, Dissertation Completion Course.
7. **MATH 5190-001 (Summer 2022)** - *Internship for Mathematical Sciences*, Internship Course.
8. **MATH 6699-005 (Spring 2022)** - *Dissertation*, Dissertation Course.
9. **MATH 5399-003 (Spring 2022)** - *Research in Mathematics*, Research Study Course.
10. **MATH 5699-009 (Spring 2022)** - *Research in Mathematics*, Research Study Course.



11. *MATH 5999-006 (Spring 2022) - Research in Mathematics*, Research Study Course.
12. *MATH 5399-013 (Fall 2021) - Research in Mathematics*, Research Study Course.
13. *MATH 5999-001 (Fall 2021) - Research in Mathematics*, Research Study Course.
14. *MATH 5399-002 (Spring 2021) - Research in Mathematics*, Research Study Course.
15. *MATH 5699-006 (Spring 2021) - Research in Mathematics*, Research Study Course.
16. *MATH 5391-011 (Fall 2020) - Introduction to Optimization*, Independent Study Course.
17. *MATH 5391-004 (Fall 2020) - Optimal Control of PDE*, Independent Study Course.
18. *MATH 5699-012 (Fall 2020) - Research in Mathematics*, Research Study Course.

### Teaching Assistant

1. *Mechanics (graduate) (Spring 2014)*, TIFR-CAM, Bangalore, India.  
**Teaching assistant**, Class size - about 18 students. Responsibilities: assignment and examination evaluations, supplementary lectures.
2. *Computational Partial Differential Equations (graduate) (Fall 2013)*, TIFR-CAM, Bangalore, India.  
**Teaching assistant**, Class size - about 10 students. Responsibilities: assignment and examination evaluations, supplementary lectures.

### Professional Memberships

1. Member of the *American Mathematical Society*, 2022-present.
2. Member of the *Mathematical Association of America*, 2018-present.
3. Member of the *Indian Society of Industrial and Applied Mathematics*, 2016-present.

### Service

#### Professional Service

1. Panel Member for the **US National Science Foundation Grant Proposal Reviews**, 2023.
2. Chair of two sessions at the minisymposium titled *Recent Developments in Tomographic Imaging* at the conference **SIAM Conference on Imaging Science**, 2022.
3. Principal organizer of a minisymposium titled *Recent Developments in Tomographic Imaging* at the conference **SIAM Conference on Imaging Science**, 2022.
4. Tenure and promotion review letter writer for assistant professor at a **Community College**, 2021-2023.
5. Chair of a session at the minisymposium titled *The Passage from Optimal Control to Differential Game Problems* at the conference **SIAM Conference on Optimization**, 2021.

6. Principal organizer of a minisymposium titled *The Passage from Optimal Control to Differential Game Problems* at the conference **SIAM Conference on Optimization**, 2021.
7. Co-chair of a session at the minisymposium *Generalized Radon Transforms and Applications* at the conference **Inverse Problems Modeling and Simulation**, Turkey, 2016.
8. Journal reviewer
  - Applied Mathematics
  - Applied Mathematics and Computation
  - Applied Mathematical Modeling
  - Automatica
  - Exploration of Targeted Anti-tumor Therapy
  - Foundations
  - Fractals and Fractionals
  - IEEE Signal Processing Letters
  - IMA Journal of Applied Mathematics
  - Imaging Science
  - International Journal of Computer Mathematics
  - Inverse Problems
  - Inverse Problems in Science and Engineering
  - Journal of Applied Analysis
  - Journal of Dynamical and Control Systems
  - Journal of Imaging
  - Journal of Mathematical Imaging and Vision
  - Journal of Ramanujan Mathematical Society
  - Mathematics
  - SIAM Journal on Imaging Sciences
  - SIAM Journal on Scientific Computing
  - SIAM Reviews
  - Symmetry
9. Other reviewer
  - AMS Mathematical Reviews
  - Foundations for Undergraduate Research in Mathematics, Springer (Book Series)
  - Zentralblatt MATH (zbMATH)

### Department/College/University Service

1. Member of the College of Science Standing Committee for Diversity, Equity and Inclusion: Undergraduate Subcommittee, UTA, Dec, 2020 – Aug, 2023.
2. Member of the Advisory Committee, Department of Mathematics, UTA, May, 2022 – present.
3. Grader of the Preliminary Exam - Linear Algebra, Department of Mathematics, UTA, Jan, 2022.
4. Grader of the Preliminary Exam - Mathematical Analysis, Department of Mathematics, UTA, Dec, 2020 – present.
5. Member of the Preliminary Exam - Mathematical Analysis Subcommittee, Department of Mathematics, UTA, Dec, 2020 – present.
6. Member of the Preliminary Exam - Pure and Applied Analysis Subcommittee, Department of Mathematics, UTA, Jul, 2020 – Dec, 2020.
7. Member of the Faculty Hiring Committee, Department of Mathematics, UTA, May, 2019 – Apr, 2021.
8. Co-organizer of the Calculus Bowl, Department of Mathematics, UTA, Jan, 2019 – present.
9. Proctor, Preliminary Exam - Mathematical Analysis, Department of Mathematics, UTA, Aug, 2019.

10. Recommendation letter writer for students (46 letters), UTA, Oct, 2018 – present.
11. Organizer of the Inverse Problems Seminar Series, UTA, Jan, 2015 – May, 2015.

### **Media contributions (hyperlinks)**

1. Radiology Today (**featured article**): Light and Sound (vol 24, No. 8, Pg 21)
2. Health Imaging: 'Robust' new imaging technique combines ultrasound with optical tomography
3. Mirage News: Revolutionary Imaging Technique Promises Clearer Oncology Images
4. Eureka Alert: New imaging technique could provide clearer images for oncologists
5. BIONTX: UTA Researcher On a Mission to Improve Medical Imaging for Oncologists
6. National Science Foundation: DMS-LEAPS Awardees 2022
7. Dallas News: To treat esophageal cancer, professor turns to mathematical models
8. LinkedIn: To treat esophageal cancer, professor turns to mathematical models
9. Facebook: To treat esophageal cancer, professor turns to mathematical models
10. UTA News Release: To treat esophageal cancer, professor turns to mathematical models
11. Science Trends: Solving mass transportation problems using Liouville equations
12. Eureka Alert: On a collision course with game theory
13. PhysOrg: On a collision course with game theory
14. Science Daily: On a collision course with game theory
15. N+1: Pedestrian traffic described using game theory
16. Jura Forum: On a collision course with game theory

### **Additional Information**

#### **Programming Skills**

- C++, PYTHON, MATLAB
- FENICS, COMSOL, DEAL.II
- PARAVIEW, VISIT
- GITHUB