

RAJESH RANJAN

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PERSONAL DETAILS

- ◊ Date of Birth: 15 January 1983
- ◊ Nationality: Indian

RESEARCH INTERESTS

- ◊ Turbomachinery Flows, Unsteady Aerodynamics, High-speed flows
- ◊ CFD, HPC, Turbulence, Stability & transition, Flow Control
- ◊ COVID-19 Modeling

PROFESSIONAL EXPERIENCE

Postdoctoral Scholar , The Ohio State University (OSU), USA	<i>2017 - 2021</i>
Research Associate , JNCASR, Bengaluru, India	<i>2015 - 2017</i>
CFD Analyst , TATA Computational Research Laboratories (CRL), Pune, India	<i>2007 - 2010</i>

EDUCATION

Ph.D. (Engineering Mechanics Unit) , JNCASR, Bengaluru, India	<i>2010 - 2015</i>
M.E. (Aerospace Engineering) , Indian Institute of Science (IISc), Bengaluru	<i>2005 - 2007</i>
B.E. (Chemical Engineering) , Bihar Institute of Technology (BIT), Sindri, India	<i>2001 - 2005</i>

KEY AWARDS AND RECOGNITIONS

All India Rank-3 , Graduate Aptitude Test in Engineering(GATE), India	<i>2005</i>
Gold Medal , B.E., Chemical Engineering, BIT, Sindri, India	<i>2005</i>
Deshpande-Atkinson Award (thrice) , BIT, Sindri, India	<i>2001-05</i>
Outstanding Performance Award (thrice) , TATA CRL, Pune, India	<i>2008-10</i>
ICAM International Travel Award , Institute for Complex Adaptive Matter	<i>2013</i>
DST International Travel Support Award , DST, Govt. of India	<i>2014</i>
Best Poster Award , JNCASR In-house Symposium, Bengaluru, India	<i>2015</i>
Nominated for Dr. APJ Kalam HPC Award by CRAY Inc. , India	<i>2017</i>
Session Chair , Stability & Transition, 2018 AIAA Aviation Conference, Atlanta, USA	<i>2018</i>
Poster Judge , Statewide Users Group Conference, Ohio Supercomputer Center, USA	<i>2019</i>

EDITORIAL DUTIES & SOCIETY MEMBERS

Reviewer	AIAA Journal, Journal of Propulsion & Power, Aerospace Science & Technology Engineering Applications of Computational Fluid Mechanics (EACFM) Applied Mathematical Modelling, Transactions of INAE, Current Science, Sadhana
Member	AIAA, APS, ASME, EUROMECH

KEY CODES/PACKAGES DEVELOPED

- ◊ 3D unstructured compressible DNS code *ANUROOP* (Copyrighted) - *C++ & CUDA versions.*
- ◊ 3D compact higher-order implicit LES code in curvilinear formulation.
- ◊ Compressible linear stability solvers (Local, BiGlobal and Global) for temporal and spatial analysis.

TEACHING (COURSES AT IIT KANPUR)

- ◇ Fall 2021: Applied Compressible Flows (AE664), PG Compulsory
- ◇ Spring 2022: Aerospace Propulsion (AE341), UG Compulsory

PUBLICATIONS

Software Copyright-1, Journals-13, Book Chapter-1, Preprints-4, Peer-reviewed Conferences-33

Invited talks-6, Media Interviews: Broadcast-7, Print-10

Citations- 245, *h*-index- 7

SELECTED PUBLICATIONS

Software Copyright

1. **Rajesh Ranjan**, Roddam Narasimha, SM Deshpande. *ANUROOP: A compressible DNS code to simulate and study flow over turbine blades*. Govt. of India. Copyright with Reg. No. SW-9306/2017 (Aug. 2017). [Link](#)

Book Chapter

1. **Rajesh Ranjan**, S M Deshpande, Roddam Narasimha. *A high-resolution compressible DNS study of flow past a low-pressure gas turbine blade*. Chapter in **Advances in Computation, Modeling and Control of Transitional and Turbulent Flows** (2016) pp. 291–301. DOI: [10.1142/9789814635165_0028](https://doi.org/10.1142/9789814635165_0028)

Journals

1. Parshwanath Doshi, **Rajesh Ranjan**, Datta Gaitonde. Global and Local Modal Characteristics of Supersonic Open Cavity Flows. Under Revision (Physical Review Fluids)
2. Qiong Liu, Datta Gaitonde, **Rajesh Ranjan**. *Global stability analysis of flow behind an upswept aftbody*. **AIAA Journal** (2021), pp.1-5. DOI: [10.2514/1.J061091](https://doi.org/10.2514/1.J061091)
3. **Rajesh Ranjan**, Aryan Sharma, Mahendra Verma. *Characterization of the Second Wave of COVID-19 in India*. **Current Science** 121(1) (2021). DOI:[10.18520/cs/v121/i1/85-93](https://doi.org/10.18520/cs/v121/i1/85-93)
4. **Rajesh Ranjan**, S. Unnikrishnan, J.-Ch. Robinet, Datta Gaitonde. *Global transition dynamics of flow in a lid-driven cubical cavity*. **Theoretical & Computational Fluid Dynamics** (2021). 35(3), 397-418. DOI: [10.1007/s00162-021-00565-z](https://doi.org/10.1007/s00162-021-00565-z)
5. **Rajesh Ranjan**, Matthew Aultman, Datta Gaitonde. *Mean Flowfield Evolution with Upsweep Angle in a Simulated Cargo Fuselage Aftbody*. **Journal of Aircraft** (2020). DOI:[10.2514/1.C035860](https://doi.org/10.2514/1.C035860)
6. **Rajesh Ranjan**, Datta Gaitonde. *Hysteresis in Slanted-Base-Cylinder Afterbody Flows*. **Aerospace Science & Technology** (2020) 106. pp.106138. DOI:[10.1016/j.ast.2020.106138](https://doi.org/10.1016/j.ast.2020.106138)
7. Logan P Riley, **Rajesh Ranjan**, Datta V Gaitonde. *Spectral Content in a Supersonic Backward-Facing Step Flow*. **Journal of Spacecrafts & Rockets** (2020). DOI:[10.2514/1.A34890](https://doi.org/10.2514/1.A34890)
8. **Rajesh Ranjan**. *Temporal Dynamics of COVID-19 Outbreak and Future Projections: A Data-driven Approach*. **Transactions of Indian National Academy of Engineering** (2020), pp.1-7. DOI:[10.1007/s41403-020-00112-y](https://doi.org/10.1007/s41403-020-00112-y)
9. **Rajesh Ranjan**. *COVID-19 Spread in India: Dynamics, Modeling, and Future Projections*. **Journal of Indian Statistical Association** (2020) 58. pp. 47-65. [Link](#)
10. **Rajesh Ranjan**, S. Unnikrishnan, Datta Gaitonde. *A Robust Approach for Stability Analysis of Complex Flows Using High-order Navier-Stokes Solvers*. **Journal of Computational Physics** (2019) 403, pp.109076. DOI: [10.1016/j.jcp.2019.109076](https://doi.org/10.1016/j.jcp.2019.109076)

11. Kishore Singh Patel, NH Maruthi, **Rajesh Ranjan**, S M Deshpande, Roddam Narasimha. *A critical comparison of DNS versus model results on an HPT turbine blade*. **Journal of Aerospace Sciences and Technologies, Aeronautical Society of India** 71 (2019) pp. 219–224. [Link](#)
12. **Rajesh Ranjan**, S M Deshpande, Roddam Narasimha. *New insights from high-resolution compressible DNS studies on an LPT blade boundary layer*. **Computers & Fluids** 153 (2017) pp. 49–60. DOI: [10.1016/j.compfluid.2017.05.004](https://doi.org/10.1016/j.compfluid.2017.05.004)
13. **Rajesh Ranjan**, Roddam Narasimha. *An assessment of the two-Layer quasi-laminar theory of Relaminarization through recent high-Re accelerated turbulent boundary layer experiments*. **Journal of Fluids Engineering** 139.11 (2017) p. 111205. DOI: [10.1115/1.4037059](https://doi.org/10.1115/1.4037059)
14. Abhishek Khare, Raashid Baig, **Rajesh Ranjan**, Stimit Shah, S Pavithran, Kishor Nikam, Anutosh Moitra. *Computational Simulation of Flow Over a High Lift Trapezoidal Wing*. **International Journal of Aerospace Innovations** 1.4 (2009) pp. 189–199. DOI: [10.1260/175722509790291572](https://doi.org/10.1260/175722509790291572)

International Conference Proceedings

1. Pranjali Anand, **Rajesh Ranjan**. *Aerothermal Predictions of High-Pressure Turbine Flows Using RANS Methods*. **ICTACEM-2021**. To be presented. 2021.
2. Shruti Rajpara, **Rajesh Ranjan**. *RANS modeling for short and long separation bubbles in flow past low-pressure turbine cascades*. **ICTACEM-2021**. To be presented. 2021.
3. **Rajesh Ranjan**, Daniel Garmann, Datta Gaitonde. *Compressibility Effects on Flow Behind a Simulated Transport Aircraft Fuselage*. **AIAA Aviation 2021 Forum**. AIAA paper 2021-2560. DOI: [10.2514/6.2021-2560](https://doi.org/10.2514/6.2021-2560)
4. **Rajesh Ranjan**, J.-Ch. Robinet, Datta Gaitonde. *Meandering of longitudinal wake vortices in slanted base afterbody flows*. **AIAA SciTech 2020 Forum**. AIAA paper 2020-1532. DOI: [10.2514/6.2020-1532](https://doi.org/10.2514/6.2020-1532)
5. Parshwanath Doshi, **Rajesh Ranjan**, Qiong Liu, Emma Gist, Datta Gaitonde, Mark Glauser. *Toward a Passive Control Strategy for a Supersonic Multi-Stream Flow using Resolvent Analysis*. **AIAA SciTech 2020 Forum**. AIAA paper 2021-1557. DOI: [10.2514/6.2021-1557](https://doi.org/10.2514/6.2021-1557)
6. Matthew Aultman, **Rajesh Ranjan**, Datta Gaitonde. *Effect of upsweep angle on the mean flow of a simulated cargo fuselage*. **AIAA SciTech 2020 Forum**, AIAA paper 2020-1323. DOI: [10.2514/6.2020-1323](https://doi.org/10.2514/6.2020-1323)
7. Parshwanath Doshi, **Rajesh Ranjan**, Datta Gaitonde. *2D and 3D Stability of cavity flows in high Mach number regimes*. **ASME International Mechanical Engineering Congress and Exposition (IMECE) 2019**. DOI: [10.1115/IMECE2019-10828](https://doi.org/10.1115/IMECE2019-10828).
8. Logan P Riley, **Rajesh Ranjan**, Datta Gaitonde. *Unsteadiness in a Supersonic Backward-Facing Step Flow*. **AIAA Aviation 2019 Forum**. AIAA paper 2019-3343. DOI: [10.2514/6.2019-3343](https://doi.org/10.2514/6.2019-3343)
9. Logan P Riley, **Rajesh Ranjan**, Datta Gaitonde. *Unsteady scales of a supersonic backward-facing step flow via perturbation analysis*. **AIAA Scitech 2019 Forum**. AIAA paper 2019-1910. DOI: [10.2514/6.2019-1910](https://doi.org/10.2514/6.2019-1910)
10. N. H. Maruthi, **Rajesh Ranjan**, S. M. Deshpande, Roddam Narasimha, S. R. Thejaswi, Bharatkumar Sharma. *Performance of a Compressible DNS code on latest GPU architectures*. **NVIDIA GPU Technology Conference (GTC) 2019**, 2019, San Jose, USA
11. **Rajesh Ranjan**, S. Unnikrishnan, Datta Gaitonde. *On the Use of Mean Flow Perturbation for Global Stability Analysis*. **AIAA Aviation 2018 Forum**. AIAA paper 2018-3378. DOI: [10.2514/6.2018-3378](https://doi.org/10.2514/6.2018-3378)
12. **Rajesh Ranjan**, S.M. Deshpande, Roddam Narasimha. *A Critical Comparison of RANS, LES, Hybrid LES/RANS and DNS Studies of the Flow Past a Low Pressure Turbine Blade in a Cascade*.

18th AeSI CFD Symposium, 2016

13. **Rajesh Ranjan**, S. M. Deshpande, Roddam Narasimha. *Direct numerical simulation of compressible flow past a low pressure turbine blade at high incidence*. **ASME 2014 4th Joint US-European Fluids Engineering Division Summer Meeting (2014)**. DOI: [10.1115/FEDSM2014-21773](https://doi.org/10.1115/FEDSM2014-21773)
14. **Rajesh Ranjan**, S. M. Deshpande, Roddam Narasimha. *Numerical methodology for simulating flows over turbine blades*. 14th **Asian Congress of Fluid Mechanics**, 2013. [Link](#)
15. **Rajesh Ranjan**, Abhishek Khare, Stimit Shah, Kishor Nikam, Anutosh Moitra. *Viscous Flow Analysis of a Twin-engine Commercial Transport Aircraft in High Lift Landing Configuration*. 29th **AIAA Applied Aerodynamics Conference (2011)**. AIAA paper 2011-3011. DOI: [10.2514/6.2011-3011](https://doi.org/10.2514/6.2011-3011)
16. Abhishek Khare, Raashid Baig, **Rajesh Ranjan**, Stimit Shah, S Pavithran, Kishor Nikam, Anutosh Moitra. *Computational Simulation of Flow Over a High Lift Trapezoidal Wing*. **IISc Centenary International Conference and Exhibition on Aerospace Engineering (ICEAE)**, May 18-22, 2009

National Conference Proceedings

1. Geetam Saha, **Rajesh Ranjan**. *Transition modelling for flow separation in low-pressure turbine cascades*. 48th **National Conference on Fluid Mechanics & Fluid Power**. To be presented. 2021.
2. M V Nitya, **Rajesh Ranjan**. *Numerical investigation of transitional flows over NACA 0012 Airfoil*. 48th **National Conference on Fluid Mechanics & Fluid Power**. To be presented. 2021.
3. Kishore Singh Patel, N.H. Maruthi, **Rajesh Ranjan**, S.M. Deshpande, Roddam Narasimha. *A critical comparison of DNS versus model results on an HPT blade for a small engine*. 20th **AeSI CFD Symposium**, 2018
4. Kishore Singh Patel, **Rajesh Ranjan**, N.H. Maruthi, S.M. Deshpande, Roddam Narasimha. *Predictions of aero-thermal loading on an HPT stator blade of a typical small turbofan engine*. 19th **AeSI CFD Symposium**, 2017
5. **Rajesh Ranjan**, S.M. Deshpande, Roddam Narasimha. *A Critical Comparison of RANS, LES, Hybrid LES/RANS and DNS Studies of the Flow Past a Low Pressure Turbine Blade in a Cascade*. 18th **AeSI CFD Symposium**, 2016
6. **Rajesh Ranjan**, B.R. Rakshith, S.M. Deshpande, Roddam Narasimha. *A RANS Study of Optimal Low-Drag Wings for Tractor Propeller-driven Aircraft*. **Proceedings of 7th Symposium on Applied Aerodynamics And Design of Aerospace Vehicles (SAROD)**, 2015
7. **Rajesh Ranjan**, S.M. Deshpande, Roddam Narasimha. *The Effects of Curvature on the Turbulent Boundary Layer in Flow Past Turbine Blades*. 16th **AeSI CFD Symposium**, 2014
8. **Rajesh Ranjan**, S.M. Deshpande, Roddam Narasimha. *DNS of flow past LPT blades*. 15th **AeSI CFD Symposium**, 2013
9. Sagar Deshpande, Raashid Baig, **Rajesh Ranjan**, Kishor Nikam, Rajendra Lagu. *CFD Simulations of Horizontal Axis Wind Turbine (HAWT) Blades for Variation with Wind Speed*. 2nd **National Conference CFD Applications in Power and Industry Sectors**, 2009. [Link](#)

IN MEDIA

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- ◇ Interview in ABP News, [Link](#)
 - ◇ Reference to our COVID-19 report by WHO, [COVID-19 weekly epidemiological update](#), 11 May 2021