

## **Roshan Raghavendra Rao**

New # 22, 5th Cross Road, Swimming Pool Extension,  
Malleswaram, Bengaluru – 560 003, India

(+91) 9538725513  
www.brightsunlabs.com

rao.roshan.r@gmail.com  
mail@roshanrao.com

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### **CURRICULUM VITAE**

#### **1. About me**

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I am a Citizen of India, male, unmarried, born on 23 November 1990, languages known – English, Kannada, Hindi, Tamil. I have recently defended my Ph.D. thesis and relinquished the position of Research Associate (provisional) at *Centre for Sustainable Technologies, Indian Institute of Science, Bengaluru*. At present, I am working independently on the publications of the doctoral research work and authoring a book on Solar Photovoltaics and waste management. I am strongly interested in working as a post-doctoral researcher at relevant research groups where I can contribute and learn to grow as an experienced independent researcher.

#### **2. Education**

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##### **Doctor of Philosophy**

**Jun 2023**

Indian Institute of Science, Bengaluru

Thesis: Exploring End-of-Life Photovoltaic (PV) Panel as a Building Material: A Case of Crystalline Silicon PV

Advisor: Prof. Monto Mani (Centre for Sustainable Technologies, Indian Institute of Science, Bengaluru)

##### **Master of Science (Engineering)**

**Jul 2016**

Indian Institute of Science, Bengaluru

Thesis: A method to derive an aerosol composition from downward solar spectral fluxes at the surface

Advisors: Prof. J. Srinivasan and Prof. S K Satheesh (Centre for Atmospheric and Oceanic Sciences, Indian Institute of Science, Bengaluru)

##### **Bachelor of Engineering (Mechanical Engineering)**

**Apr 2012**

Nitte Meenakshi Institute of Technology (NMIT), Bengaluru an autonomous University affiliated to Visveswaraya Technological University, Karnataka State, India.

Project Advisor: Prof. Sekhar Majumdar (NMIT, Bengaluru)

#### **3. Research Interest**

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Solar Photovoltaics (PV) reliability, Building integrated Photovoltaics (BIPV), Alternate building envelope materials, thermal performance of building envelope, End-of-Life (EoL) Photovoltaic, PV waste management strategies.

#### **4. Research Experience**

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##### **a) Research Associate (Provisional)**

**July 2023 – Oct 2023**

*Centre for Sustainable Technologies, Indian Institute of Science, Bengaluru.*

During this tenure, research communication on the solar transmittance and thermal transmittance measurements of End-of-Life PV panels, climate responsiveness of building integrated with EoL-PV panels were made in peer reviewed journals and international reputed conferences.

##### **b) Project Assistant**

**Sep 2016 – Jul 2017**

*Interdisciplinary Centre for Energy Research (SERIUS project), Indian Institute of Science, Bengaluru.*

During this tenure, I have worked on the following topics: (a) Photovoltaics performance monitoring of a BiPV (building integrated Photovoltaics) (b) Photovoltaics performance variability due to dust. The outcome of the research work includes a review article (2018) in the Elsevier's Heliyon Journal.

##### **c) Project Assistant**

**Jun 2012 – Jul 2013**

*Divecha Centre for Climate Change, Indian Institute of Science, Bengaluru.*

During this tenure, I have worked on the following topics:

(a) Improvement assessment on using a dual axis tracking system for a flat photovoltaic system.

(b) Techno-commercial project (co-funded by Ministry of New and Renewable Energy, Govt. of India) involving installation of 20kWp grid tied three phase solar power plant on rooftop of Main Library (JRD Tata Memorial Library) in Indian Institute of Science campus.

(c) Performance study of CPV (Concentrated Photovoltaic) in an urban region (Bengaluru) of India.

The outcomes of these research works have been communicated as research article (2015) in Indian Academy of Science's Current Science Journal and a National Conference (2012) publication in Third National Conference on Climate Change held in Nov 2012 at Indian Institute of Science, Bengaluru.

#### **5. Professional Affiliations and roles**

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- i) International Solar Energy Society (ISES) Member since 2022.
- ii) Reviewer for Current Science Journal.
- iii) Reviewer for Journal of The Institution of Engineers (India).

#### **6. Honors and Awards**

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The BHAVAN (Building Energy Efficiency Higher & Advanced Network), IUSSTF (2020) fellowship was awarded to pursue collaborative research at the Lawrence Berkeley National Laboratory, Berkeley, USA. This works was in collaboration with Berkeley

stepping in to identify sustainable end-of-life strategies to address the issue of mounting Photovoltaics waste worldwide.

## **7. Indexed Journal Publications**

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- 1) Priyadarshani Suchi, Roshan R Rao, Mani M, Maskell D. Examining Occupant-Comfort Responses to Indoor Humidity Ratio in Conventional and Vernacular Dwellings: A Rural Indian Case Study. *Energies*. 2023; 16(19):6843. <https://doi.org/10.3390/en16196843>
- 2) Roshan R Rao, Monto Mani, "Review and preliminary insights into impacts between Photovoltaic (PV) installations and climate-change", *Current Science*, VOL. 125 (9), 1-10 (2023) doi: 10.18520/cs/v125/i9/
- 3) Roshan R Rao, Suchi Priyadarshani and Monto Mani, "Examining the use of End-of-Life ( EoL ) PV panels in housing and sustainability," *Solar Energy*, vol. 257, no. June 2023, pp. 210–220, 2023, doi: 10.1016/j.solener.2023.04.033
- 4) Roshan R Rao, Monto Mani, Praveen C. Ramamurthy, "An updated review on factors and their inter-linked influences on photovoltaic system performance", *Heliyon* 4 (2018) e00815. doi: 10.1016/j.heliyon.2018. e00815
- 5) Roshan R Rao, H. R. Swetha, J. Srinivasan and Sheela K Ramasesha, "Comparison of performance of solar photovoltaics on dual axis tracker with fixed axis at 13 degrees N latitude" *Current Science*, VOL. 108 (11),2087-2094(2015)

## **8. Works in Progress**

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- 1) Roshan R Rao, Monto Mani, "Solar Transmittance of EoL-PV panels" (Manuscript to be submitted for publication in November 2023)
- 2) Roshan R Rao, Monto Mani, "Thermal performance of building integrated with EoL-PV panels" (Manuscript to be submitted for publication in November 2023)

## **9. Conference Publications**

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- 1) Roshan R Rao, Monto Mani, "Examining the climate responsiveness of End-of-Life Photovoltaic (EoL-PV) integrated buildings ", International scientific conference on the Built Environment in Transition (CISBAT 2023), Sep 13 – Sep 15, 2023, Lausanne & Fribourg, Switzerland
- 2) Roshan R Rao, Monto Mani, "Examining the applicability of End-of-Life (EoL) Photovoltaic (PV) panels as a building material ", 40th European Photovoltaic Solar Energy Conference and Exhibition, Sep 18 – Sep 22, 2023, Lisbon, Portugal

- 3) Suchi Priyadarshani, Roshan R Rao, Monto Mani, "Studying Interventions to Regulate Indoor Hygrothermal Comfort in Building Integrated with End-of-Life (EoL) PV Panels ", 40th European Photovoltaic Solar Energy Conference and Exhibition, Sep 18 – Sep 22, 2023, Lisbon, Portugal
- 4) Roshan R Rao, Suchi Priyadarshani, Monto Mani, "An Investigation into thermal performance of buildings built using upcycled End-of-Life Photovoltaic panels", 5th Building Simulation Applications 2022 (BSA 2022), July 29 – July 01, 2022, Bozen/Bolzano, Italy
- 5) Suchi Priyadarshani, Roshan R Rao, Monto Mani, Daniel Maskell "Investigating the role of humidity on indoor wellness in vernacular and conventional building typologies", 5th Building Simulation Applications 2022 (BSA 2022), July 29 – July 01, 2022, Bozen/Bolzano, Italy
- 6) Roshan R Rao and Monto Mani, "Degradation observation of 9 year old PV modules in Bengaluru, India", 46th IEEE Photovoltaic Specialists Conference (PVSC-46), June 16-21, 2019, Chicago, Illinois, USA. DOI: 10.1109/PVSC40753.2019.8981278
- 7) Roshan R Rao and Monto Mani, "Case study on degradation of 8-year-old BiPV modules in Bengaluru, India", 7th edition of the World Conference on Photovoltaic Energy Conversion (WCPEC-7), June 10-15, 2018, Waikoloa Village, Hawaii, USA. DOI: 10.1109/PVSC.2018.8547411
- 8) Gayathri Aadithya, Roshan R Rao and Monto Mani, "Integrability Comparison between BIPV and BAPV in Tropical Conditions: A Bengaluru Case-Study", 2017 IEEE 44th Photovoltaic Specialist Conference (PVSC), Washington, DC, 2017, pp. 604-607. DOI: 10.1109/PVSC.2017.8366449
- 9) Roshan R Rao, Satheesh S K, J Srinivasan, "High resolution spectral irradiance measurements: Spectral aerosol radiative forcing and techniques to develop an aerosol model", EGU General Assembly 2016, April 16-22, 2016, Vienna, Austria.
- 10) Roshan R Rao, Satheesh S K, J Srinivasan, "Estimation of optically equivalent aerosol composition using ground-based spectral irradiance measurements", National Climate Science Conference, 2-3 July 2015 at Indian Institute of Science, Bengaluru
- 11) Roshan R Rao, Sheela K Ramasesha and J Srinivasan, "Performance Study of rooftop photovoltaic panels", Third National Research Conference on Climate Change, November 3-4, 2012 at Indian Institute of Science, Bengaluru.

## **10. Other Publications**

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- 1) A. Saifudeen, Roshan R Rao, and M. Mani, "Reassessing climate classification for buildings under climate change: Indian context," World Development Sustainability, vol. 2, p. 100053, Jun. 2023, doi: 10.1016/J.WDS.2023.100053.

- 2) Siddharth Nair, Roshan Rao, Tarun Kumar, Guru Prasad G, Manish Kumar, Khadeeja Henna P, Aysha Saifudeen, Monto Mani, "Design of a Do-It-Yourself (DIY) based Solar Powered LED Lighting System for Training and Empowering Rural youth", 7th International Conference on Research Into Design, 9 - 11 January 2019, Indian Institute of Science, Bengaluru, India
- 3) Tarun Kumar, Roshan Rao, Praveen C Ramamurthy and Monto Mani, "Safety of Light Emitting Diode (LED) Based Domestic Lighting Rural Context", 15th IEEE India Council International Conference (INDICON) (INDICON 2018), 16 - 18 December 2018, Amrita Vishwa Vidyapeetham, Coimbatore, India
- 4) Siddharth Nair, Roshan Rao, Tarun Kumar, Guru Prasad G, Manish Kumar, Khadeeja Henna P, Aysha Saifudeen, Monto Mani, "Roshini- Developing a DIY Rural Solar Light: utilizing products at End-of-Life (EoL) stage", IEEE Global Humanitarian Technology Conference (GHTC 2018) 18 - 22 October 2018, San Jose, California, USA

## **11. Teaching, Talks and Workshops**

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- 1) Conducted a workshop session on Solar Photovoltaics and hands on session to build simple solar Photovoltaic LED lighting systems for homes to polytechnic college students at Sirsi district of Karnataka state in India during Dec 2018 as a part of a collaborative project with Earthwatch Institute India.
- 2) Conducted a part of tutorial session on multi-layer earth atmosphere energy balance model in the "Training on Glacier, Climate Change and Remote Sensing" held at Divecha Centre for Climate Change, Indian Institute of Science, Bengaluru, India in June 2015.
- 3) Delivered one-day training to the research assistants as a part of RVE (Remote village electrification) scheme of MNRE on difficulties and uncertainties of solar home systems working on the project headed by Dr. Hippu Salke at National Institute for Advanced Studies (NIAS), Bengaluru during September 2013.

## **12. References**

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### **1. Professor Monto Mani**

Doctoral Research Supervisor

Professor at Centre for Sustainable Technologies (formerly Astra) and Centre for Product Design and Manufacturing

Indian Institute of Science, Bengaluru

Contact: [monto.mani@gmail.com](mailto:monto.mani@gmail.com) or [monto@iisc.ac.in](mailto:monto@iisc.ac.in)

Phone: +91 (080) 2293 3048 [https://cst.iisc.ac.in/sudesi/acad\\_backg/](https://cst.iisc.ac.in/sudesi/acad_backg/)

## **2. Professor J. Srinivasan**

Research Supervisor for MSc (Engg.) research thesis

Distinguished Scientist at Divecha Centre for Climate Change and Honorary Professor at Centre for Atmospheric and Oceanic Sciences, Indian Institute of Science, Bengaluru

Contact: [jaysri@gmail.com](mailto:jaysri@gmail.com) or [jayes@iisc.ac.in](mailto:jayes@iisc.ac.in)

Phone: +91 (080) 2293 3068 [http://dccc.iisc.ac.in/web/js\\_home.html](http://dccc.iisc.ac.in/web/js_home.html)

## **3. Professor B V Venkatarama Reddy**

Chairman of C.S.T and course instructor during Ph.D.

Professor at Department of Civil Engineering and former Chairman at Centre for Sustainable Technologies (formerly Astra), Indian Institute of Science, Bengaluru

Contact: [byrasandravenkat@gmail.com](mailto:byrasandravenkat@gmail.com) or [venkat@iisc.ac.in](mailto:venkat@iisc.ac.in)

Phone: +91 (080) 2293 3126 <https://cst.iisc.ac.in/bvvr/>

*I declare that the above information is true.*

**ROSHAN RAGHAVENDRA RAO**