Simanchal Padhy

Associate Professor, Dept. of Earth Sciences &
Joint Faculty, Mehta Family School of Data Science and Artificial Intelligence, IIT Roorkee
(Ex-Senior Principal Scientist/ Scientist-F, CSIR-NGRI, Hyderabad)
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Date of birth: 24th May 1973

Areas of interest:
Seismic wave propagation & scattering; Seismic imaging with ambient noise; AI/ML for signal & image Processing; Earthquake ground motions; Scale invariance, Multi-fractals & Wavelets

Education:
- Ph.D., Geophysics (Seismology), Osmania University, 2005
- M.Tech., Applied Geophysics, IIT (ISM) Dhanbad, 1998
  (First class with Distinction)
- M.Sc., Electronics, Berhampur University, 1994 (First class)
- B.Sc. with Physics Honors, Berhampur University, 1992
  (First class with Distinction)

Professional Experience:
- Feb 2021-present Associate Professor, IIT Roorkee
- Nov 2015-Feb 2021 Senior Principapl Scientist & Professor, CSIR-NGRI, Hyderabad
- Nov 2010-Nov 2015 Principal Scientist & Associate Professor, CSIR-NGRI, Hyderabad
- Nov 2006-Nov 2010 Senior Scientist & Assistant Professor, CSIR-NGRI, Hyderabad
- Nov 2003-Nov 2006 Scientist, CSIR-NGRI, Hyderabad
- Nov 1999-Nov 2003 Junior Scientist, CSIR-NGRI, Hyderabad
- Dec 1998-Nov 1999 Research Student, CSIR-NGRI, Hyderabad

Visiting and Sabbatical Appointments:
- Jun 2004-Sep 2005 DAAD Fellow, University of Leipzig, Germany
- Aug 2005 (3 weeks) Visiting Researcher, Universite Montpellier II, France
- Dec 2007-Feb 2008 Visiting Scientist, Tohoku University, Japan
- Jun 2010-Jun 2012 JSPS Postdoctoral Fellow, The University of Tokyo, Japan
- Oct 2012-Mar 2014 Postdoctoral Researcher, The University of Tokyo, Japan
- Jun 2015-Aug 2015 Visiting Scientist, The University of Tokyo, Japan
- Mar 2017-Jan 2018 JSPS Invitation Fellow, The University of Tokyo, Japan

Awards & Honors
- 2008 CSIR Young Scientist Award in Earth Sciences from Govt. of India
- 2014 National Geosciences Award (Formerly National Mineral Award) in Applied Geophysics from Govt. of India

Memberships & Services
- Member, 20th Indian Antarctica Expedition (Dec 2000-Mar 2001)
- Member, Seismological Society of Japan (SSJ)
- Member, Japan Geoscience Union (JpGU)

- Member, CED-39, Earthquake Engineering, Bureau of Indian Standards, New Delhi
- Member, Indian Society of Earthquake Technology (ISET)
- Reviewer, Journal of Geophysical Research (Solid Earth), Bulletin of Seismological Society of America (BSSA), Geophysical Journal International (GJI), Physics of the Earth and Planetary Interiors (PEPI), Geophysics, Tectonophysics, Journal of Seismology, Journal of Earth System Sciences, Physica A, Geosystems & Geo-environment, PAMC Geosciences of MoES, New Delhi, among others
- Ex-Professor, Academy of Scientific & Innovative Research (AcSIR), CSIR-NGRI
- Reviewer, Doctoral Advisory Committee (DAC) of AcSIR, CSIR-NGRI
- Associate Editor, ISET Journal of Earthquake Technology

Teaching Experience

IIT Roorkee:

- Digital Signal Processing (ESN-224)
- Digital Image Processing (ESN-475, DA-430)
- Essential Mathematics for AI & DS (AID-501)
- Time Series Data Analysis (AID-555, DA-208)
- Geophysical Prospecting (ESN-223, ESN-532)
- Geophysical Field Theory (ESN-221)
- Advanced Techniques in Geophysical Exploration (ESN-577)
- Applications of AI/ML in Earth Sciences (DA-427)
- Fundamentals of AI/ML (ESC-351)

AcSIR, CSIR-NGRI, Hyderabad:

- Geophysical Signal Processing, Inverse Theory, and Seismology

Book chapters

- **Padhy, S**., 2020. High-frequency seismology. In: Gupta H.K. (eds) *Encyclopedia of Solid Earth Geophysics. Encyclopedia of Earth Sciences Series*. Springer, Cham. https://doi.org/10.1007/978-3-030-10475-7_273-1. 2.

- **Padhy, S**., Dimri, V.P., 2020. Fractal scaling of earthquakes. In: Gupta H.K. (eds) *Encyclopedia of Solid Earth Geophysics. Encyclopedia of Earth Sciences Series*. Springer, Cham. https://doi.org/10.1007/978-3-030-10475-7_274-1 2016 1.

- **Padhy S**., 2016. The Multi-fractal Scaling Behavior of Seismograms Based on the Detrended Fluctuation Analysis. In: Dimri V. (eds) *Fractal Solutions for Understanding Complex Systems in Earth Sciences. Springer Earth System Sciences. Springer, Cham*. https://doi.org/10.1007/978-3-319-24675-8_7

Publications (Peer-reviewed)

- Singh, S.P., **Padhy, S**. & Silwal, V., 2025. A high-resolution 3-D shear velocity model for Cameroon using ambient noise tomography: Constraints from the CPSO algorithm, *Geophysical Journal International*, 242(2), ggaf227.

- **Padhy, S**., 2025. Seismic Response of the Hi-Net Sites in Japan to Incident Teleseismic P-Waves from the 2008 Wenchuan Earthquake, *Jour. Geol. Soc. India*, 101 (6), 850– 854.

- Kumar, S., **Padhy, S**. & Kumar, N., 2025. Investigating 2D shear waves velocity (Vs) structure beneath Garhwal Himalaya, Uttarakhand, India, using microtremor H/V spectral ratios and surface wave dispersion measurements, *Journal of Seismology*, 29, 419–437.

- Akilan, A., Abdul Azeez, K. K., Kotluri, S. K., Satyanarayana, H.V.S., **Padhy**, **S**. & Pandey, O.P., 2025. Kinematics of the Capricorn microplate and its surrounding regions as inferred from the analyses of GPS data, *J. Ind. Geophys. Union*, 29(1), 56-63.
- Subhadra, N., **Padhy, S.**, Srinagesh, D., 2023. Regional variability in ground motion amplitude in Western Himalaya, *Journal of Seismology* 27 (3), 455-471.
- Malaimani, E.C., Ravikumar, N., Rao, S., **Padhy, S**., et al. 2022. Studies on seismotectonics and geodynamical processes between India and Antarctica: A review, *Geoscientific Investigations From the Indian Antarctic Program*, 138-159.
- **Padhy, S**, Subhadra, N., 2021. Frequency dependence of attenuation components including mantle leakage in Garhwal Himalaya based on a modified MLTWA method, *Geophysical Journal International* 227 (3), 2156-2179
- Akilan, A., **Padhy, S**., Dimri, V.P., et al., 2021. Co-seismic and Post-seismic Changes in ZTD and TEC of the 2015 Nepal Earthquake, *Pure and Applied Geophysics* 178 (9), 3339-3354.
- Dimri, V.P., **Padhy, S**., et al., 2021. The observed thermal anomaly as an earthquake Precursor: A case study from the 1993 Latur earthquake prone area in Western India. *The Journal of Indian Geophysical Union* 25(4), 4-6.
- Adimah, N.I., **Padhy, S**., 2020. Depth dependent azimuthal anisotropy in Madagascar island from ambient noise tomography, *Tectonophysics* 789, 228513.
- Kayal, J.R., **Padhy, S**., 2020. Seismicity and structure of the Indian subcontinent. *Episodes Journal of International Geoscience* 43 (1), 650-664.
- Adimah, N.I., **Padhy, S**., 2020. Ambient noise Rayleigh wave tomography across the Madagascar island. *Geophysical Journal International* 220 (3), 1657-1676.
- **Padhy, S.**, Dimri, V.P., 2020. Apparent scaling of virus surface roughness – An example from the pandemic SARS-nCoV. *Physica D: Nonlinear Phenomena* 414, 132704
- Akilan, A., Abdul Azeez, K., Schuh, H., **Padhy, S**., Kotluri, S.K., 2019. Perturbations in atmospheric gaseous components over coastal Antarctica detected in GPS signals and its natural origin to volcanic eruption, *Polar Science*, 19, 69-76.
- Subhadra, N., **Padhy, S**., Dimri, V.P., 2018. Characterizing spatial heterogeneity based on the b-value and fractal analyses of the 2015 Nepal earthquake sequence, *Tectonophysics* 722, 154-162.
- Subhadra, N., **Padhy, S**., et al., 2018. Evaluation of site effects on ground motions based one response equivalent-linear site response analysis and liquefaction potential in Chennai, south India, *Journal of Seismology*, 22 (4), 1075-1093.
- Subhadra, N., **Padhy, S**., et al., 2018. Evaluation of ground motion and site-specific response spectrum for different parts of India by the method of semi-empirical Green's function, Arabian Journal of Geosciences, 11:255.
- Akilan, A., Abdul Azeez, K., **Padhy, S**., Schuh, H., 2018. Temporal changes in atmospheric water content during the December 2004 Sumatra earthquake as estimated from GPS signals and its possible connection to the January 2005 California flash flood, *Annals of Geophysics*, 61(1), SE102.
- Boulanouar, A., El. Moudnib, L., **Padhy, S**., et al., 2018. Estimation of coda wave attenuation in northern Morocco, *Pure and Applied Geophysics*, 175 (3), 883-897.
- Furumura, T., Kennett, B.L.N., **Padhy, S**., 2016. Enhanced waveguide effect for deep-focus earthquakes in the subducting Pacific slab produced by a metastable olivine wedge, *Journal of Geophysical Research: Solid Earth* 121 (9), 6779-6796.

- **Padhy, S**., Subhadra, N., 2016. Spectral scaling and seismic efficiency for earthquakes in northeast India, *Bulletin of the Seismological Society of America* 106 (4), 1613-1627.

- Akilan, A., Azeez, KKA., Schuh, H., **Padhy, S**., et al., 2016. Changes in atmospheric water content associated with an unusual high snowfall during June 2004 at Maitri station (Schirmacher Oasis, East Antarctica) and the role of South West Indian ridge geodynamics, *Natural Hazards* 83 (1), 563-574.

- Akilan, A., Balaji, S., **Padhy, S**., et al., 2016. The plate kinematics of Burmese microplate relative to its surroundings, *Arabian Journal of Geosciences* 9 (5), 333.

- Subhadra, N., **Padhy, S**., Prasad, P.P., Seshunarayana, T., 2015. Site specific ground motion simulation and seismic response analysis for microzonation of Nanded city, India, *Natural Hazards* 78 (2), 915-938.

- **Padhy, S**., Mishra, O.P., Subhadra, N., Dimri, V.P., Singh, O.P., Chakrabortty, G.K., 2015. Effects of errors and biases on the scaling of earthquake spatial pattern: application to the 2004 Sumatra–Andaman sequence, *Natural Hazards* 77 (1), 75-96.

- **Padhy, S**., Furumura, T., Maeda, T., 2014. Decoupling of Pacific subduction zone guided waves beneath central Japan: Evidence for thin slab, *Journal Geophysical Research: Solid Earth,* 119 (11), 8478-8501.

- **Padhy, S**., Subhadra, N., 2013. Separation of intrinsic and scattering seismic wave attenuation in Northeast India, *Geophysical Journal International*, 195 (3), 1892-1903.

- **Padhy, S**., Takemura, S., Takemoto, T., Maeda, T., Furumura, T., 2013. Spatial and temporal variations in coda attenuation associated with the 2011 off the Pacific coast of Tohoku, Japan (Mw 9) earthquake, *Bulletin Seismological Society of America*, 103 (2B), 1411-1428.

- **Padhy, S**., Subhadra, N., Kayal, J.R., 2011. Frequency dependent attenuation of body and coda waves in the Andaman Sea basin, *Bulletin of the Seismological Society of America*, 101, 109-125.

- **Padhy, S**., Mishra, O.P., Zhao, D., Wei, W., 2011. Crustal heterogeneity in the 2007 Noto-Hanto earthquake area and its geodynamical implications, *Tectonophysics*, 509, 55- 68.

- Furumura, T., Takemura, S., Noguchi, S., Takemoto, T., Maeda, T., Iwai, K., **Padhy, S**., 2011. Strong ground motions from the 2011 off-the Pacific-Coast-of-Tohoku, Japan (Mw=9.0) earthquake obtained from a dense nationwide seismic network, *Landslides,* 8, 333–338.

- **Padhy, S**., Subhadra, N., 2010. Frequency dependent attenuation of P- and S-waves in the northeast India, *Geophysical Journal International*, 183, 1052-1060.

- **Padhy, S**., Subhadra, N., 2010. Attenuation of high-frequency seismic waves in northeast India, *Geophysical Journal International*, 181, 453-467.

- **Padhy, S.**, 2009. Inversion of seismogram envelopes using a multiple isotropic scattering model in Garhwal Himalaya. *Bulletin of the Seismological Society of America*, 99, 727-740.

- **Padhy, S**., 2009. Characteristics of body wave attenuation in the Bhuj crust, *Bulletin of the Seismological Society of America*, 99, 3300-3313.

- **Padhy, S**., Wegler, U., Korn, M., 2007. Seismogram Envelope Inversion using a multiple isotropic scattering model - Application to aftershocks of the 2001, Bhuj earthquake, *Bulletin of the Seismological Society of America*, 97, 222-233.

- **Padhy, S**., Crampin, S., 2006. High pore fluid pressures at Bhuj inferred from 90^0–flips in shear wave polarizations. *Geophysical Journal International*, 164, 370-376.

- **Padhy, S**., 2005. A Scattering model for seismic attenuation and its global applications. *Physics Earth Planetary Inter*. 148, 1-12.

- **Padhy, S.**, 2005. Rescaled range fractal analysis of a seismogram for identification of signals from an earthquake. *Current Science*, 87, 637-641.

- **Padhy, S**., 2004. Intermittent Criticality on regional scale in Bhuj. *Geophysical Journal International*, 158, 676-680.

- Mandal, P., **Padhy, S**., et al., 2001. Aftershock activity and frequency dependent low coda-Qc in the epicentral region of the 1999 Chamoli earthquake of Mw 6.4. *Pure and Applied Geophysics*, 158, 1719-1735.

Under Review

- Kumar, S. **Padhy, S**., Kumar, N. Near-surface 2D shear wave velocity structure beneath eastern Kumaon Himalaya, Uttarakhand, India from microtremor HVSR and surface wave analysis. *Journal of Asian Earth Sciences*.

- **Padhy, S**. Attenuation mechanism in Bhuj estimated with a modified MLTWA approach – Effect of velocity gradient on coda envelopes. *Geophysical Journal International*.

- Nicholas, I.A., **Padhy, S**. Lithospheric discontinuities beneath Madagascar Island from auto-correlation of teleseismic events. *Journal of Seismology*.

- Bhadani, V., Panigrahi, B., **Padhy, S**., Srivastava, D.C. Paleostress estimation from faultslip observations; a critical evaluation of the three methods. *Journal of Geological Society of India*.

- **Padhy, S**. Scattering attenuation of seismic body waves in a self-affine band-limited fractal medium. *Physica D: Nonlinear Phenomena*.

Mentoring experience

Ph.D. students

1. Adityam Rai (Ongoing): Monitoring of heterogeneous media using Passive Seismic Interferometry
2. Arpit Maurya (Ongoing): Broad-band earthquake ground motion modeling in north-west Himalayas
3. Puja Rani (Ongoing): Investigating crust and upper mantle structure with teleseismic wave attenuation in NW Himalayas
4. Ekta Yadav (Ongoing): Seismic imaging with deep learning-guided ful waveform inversion of seismic data

M.Tech (AI/DS) students

1. Pilli Vishnuvardhan: Seismic waveform denoising with Generative Diffusion models
2. Pratik P. Singh: Denoising of seismic signals using Deep Neural Networks
3. Banwari Lal: Detecting Causality in Time Series Modeling in the Deep Learning Framework
4. Ravindra Samria: Denoising and Reconstruction of Cryo-SEM Images with Weiner Filtering
5. Gaurav Ranjan: Automated classification of seismic signals with Continuous Random Forests

Undergraduate students (Geophysics): 28

Grants

Completed:

1. Seismic hazard studies of Northeast and Peninsular India (Main Lab Project of CSIR-NGRI) (Role: Co-PI).
2. Evaluation of strong ground motions in the Indo-Gangetic Plains (Fast Track Project of NGRI-CSIR) (Role: Co-PI).
3. Strong ground motion studies for the design of engineering structures (Nuclear Power Plants) (Sponsored Project by NPCIL) (Role: Co-PI).
4. Western India school earthquake lab programme (Funded by MoES) (Role: Co-PI).
5. Landslide potential of Vatada hill due to seismic activity (Varsha Project sponsored by Ministry of Defence, GoI) (Role: Co-PI).
6. Seismic hazard analysis for Mumbai Trans Harbour Link (Sponsored by MMRDA, Govt. of Maharastra) (Role: Co-PI).
7. Sandal-wood imaging and analysis of oil estimates (Sponsored by Dharampal Satyapal Group) (Role: Co-PI).

Granted

1. Investigating subsurface scattering structure of the Moon near the Chandrayaan-3 landing site with seismic data set (Granted by ISRO-IITR) (Role: PI; Rs. 43,07,524/-).

Under review

1. Seismic ambient noise and P-wave coda correlation imaging in the Bikaner-Nagaur basin, Rajasthan for detailed crustal structure (Under review in ANRF) (Role: PI; Rs. 98,73,040).
2. High resolution imaging of the crust and upper mantle beneath NW Himalaya by joint inversion of passive seismological data. (Under review, IIT-DAAD Bilateral Exchange program)

(Simanchal Padhy)