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Litu Rout

Education

2014–2018 **Bachelor of Technology**, *Indian Institute of Space Science and Technology (IIST)*, Thiruvananthapuram, Kerala, India. Major: *Electronics and Communication Engineering* Minor: *Computer Science.*

Research Interest

I am interested in studying Artificial Intelligence at the intersection of Computer Vision, Self-Supervised Learning and Reinforcement Learning including theoretic puzzles of sample complexity and generalization.

Patent

2020 **Litu Rout**, Debajyoti Dhar, "ALERT: Adversarial Learning with Expert Regularization using Tikhonov Operator for Missing Band Reconstruction", Space Applications Centre, Indian Space Research Organisation. [Status: Applied]

2020 **Litu Rout**, Indranil Misra, S Manthira Moorthi, Debajyoti Dhar, "S2A: Wasserstein GAN with Spatio-Spectral Laplacian Attention for Multi-Spectral Band Synthesis", Space Applications Centre, Indian Space Research Organisation. [Status: Applied]

2020 Tapan Misra, **Litu Rout**, "A Method for Sequential Information Condensation using Fourier Basis", Space Applications Centre, Indian Space Research Organisation, App. No. 202041004166.

Peer Reviewed Publications

2020

1. **Litu Rout**, Indranil Misra, S Manthira Moorthi, Debajyoti Dhar, "S2A: Wasserstein GAN with Spatio-Spectral Laplacian Attention for Multi-Spectral Band Synthesis", in Proceeding of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) Earth Vision Workshop, Jun, 2020.
2. **Litu Rout**, Saumyaa Shah, S Manthira Moorthi, Debajyoti Dhar, "Monte-Carlo Siamese Policy on Actor for Satellite Image Super Resolution", in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) Earth Vision Workshop, Jun, 2020.
3. **Litu Rout** "ALERT: Adversarial Learning with Expert Regularization using Tikhonov Operator for Missing Band Reconstruction", in IEEE Transactions on Geoscience and Remote Sensing (TGRS), Jan, 2020.

2019

1. Matej Kristan, **Litu Rout**, Rama Krishna Sai S Gorthi et.al. "The seventh Visual Object Tracking VOT2019 challenge results", in International Conference on Computer Vision (ICCV) Workshops, Nov, 2019.
2. Indranil Misra, **Litu Rout**, Sampa Roy, Praveen K Gupta, and Debajyoti Dhar "Automated Processing System of Resourcesat-2/2A LISS-III/IV data for Wetland Inventory and Monitoring", in Indian Society of Systems for Science and Engineering (ISSE) National Conference, Sep, 2019.
3. **Litu Rout**, Rajesh Sadanandan, Deepak Mishra "Application of image enhancement and mixture of Gaussian approach in combustion research", Sadhana, Indian Academy of Sciences, May, 2019.

2018

1. **Litu Rout**, Priya Mariyam Raju, Deepak Mishra, Rama Krishna Sai S Gorthi "Learning Rotation Adaptive Correlation Filters in Robust Visual Object Tracking", in Asian Conference on Computer Vision (ACCV), Dec, 2018.
2. Matej Kristan, **Litu Rout**, Deepak Mishra, Rama Krishna Sai S Gorthi et.al. "The sixth Visual Object Tracking VOT2018 challenge result", in European Conference on Computer Vision (ECCV) Workshops, Sep, 2018.
3. **Litu Rout**, Deepak Mishra, Rama Krishna Sai S Gorthi "WAEF: Weighted Aggregation with Enhancement Filter for Visual Object Tracking", in European Conference on Computer Vision (ECCV) VOT Workshop, Sep, 2018.
4. **Litu Rout**, Sidhartha, Rama Krishna Sai S Gorthi, Deepak Mishra "Rotation Adaptive Visual Object Tracking with Motion Consistency", in IEEE Winter Conference on Applications of Computer Vision (WACV), pages 1047-1055, Mar, 2018.

Preprints

2020

1. **Litu Rout** "Why Adversarial Regularization Accelerates Training: A Theoretical Justification with Neural Topology Analysis", in International Conference on Machine Learning (ICML), Jul, 2020. [Under Peer Review]

2019

1. **Litu Rout**, Yatharath Bhateja, Ankur Garg, Indranil Misra, S Manthira Moorthi, Debajyoti Dhar "Global and Local Residual Learning for Spatio-Spectral Synthesis of SWIR Band using Multi-Sensor Concurrent Datasets", in ArXiv, May, 2019.

Work Experience

Scientist/Engineer

Aug 2018 – Present **Signal and Image Processing Group, Space Applications Centre**, *Indian Space Research Organisation*, Ahmedabad, Gujarat, India.

Projects:

- Developed deep learning based *operational solutions* to address the commonly observed challenging issues in satellite image processing.
  - Adversarial learning with expert regularization for band synthesis and partial data reconstruction.
  - Cycle consistent generative adversarial network for panchromatic band sharpening.
  - Global and local residual learning for image super-resolution, denoising, and destriping.
  - Residual dense networks for non-linear contrast stretching.
  - Image destriping using total variation minimization with L1 fidelity.
  - Fully convolutional residual networks for cloud and snow segmentation.
  - First and second order moment matching for relative radiometric normalization.
- Worked as a developer to build decentralized AI platform for intended users and provide end to end operational guidance at national level.

Workshops:

- Attended "Machine Learning (ML) applications to remote sensing", MathWorks, India.
- Attended "Accelerating Artificial Intelligence (AI) research on GPGPU", Intel, India.

Research Intern

Jan 2018 – May 2018 **Computer Vision and Virtual Reality lab**, *Indian Institute of Space Science and Technology*, Supervisors: Rama Krishna Gorthi and Deepak Mishra.

Bachelor's Thesis:

- Boosting Visual Object Tracking Performance using a Stack of Machine Learning Algorithms.

Aug 2017 – Nov 2017 **Computer Vision and Virtual Reality lab**, *Indian Institute of Space Science and Technology*, Mentor: Rama Krishna Gorthi and Deepak Mishra.

Relevant Projects:

- Semi-supervised classification using Generative Adversarial Networks (GANs).
- Affine Correction and Image Denoising using Variational Auto Encoder (VAE).
- Ship and Iceberg classification in satellite images using an ensemble of state-of-the-art convolutional neural networks.
- Toxic Comment Classification using an Ensemble of Recurrent Neural Networks (RNNs).

May 2017 – Jul 2017 **Computer Vision and Virtual Reality lab**, *Indian Institute of Space Science and Technology*, Mentor: Rama Krishna Gorthi.

Integrated Spatial Transformer Network (STN) in single object tracking. Implemented SiameseFC based rotation adaptive visual object tracking with motion consistency.

Honors and Awards

2018 **Innovative Student Project Award**, Bachelor Level, Indian National Academy of Engineering (INAE).

2018 **Bronze Medal** in "Toxic Comment Classification", Kaggle.

2014 **Chief Minister Merit Scholarship** in "Council of Higher Secondary Education".

2014 **Pathani Samant Mathematics Scholarship** in "Council of Higher Secondary Education".

2012 **Chief Minister Merit Scholarship** in "Board of Secondary Education".

2012 **National Sanskrit Scholarship** in "Board of Secondary Education".

2006 **District Merit Scholarship** in "Board of Primary Education".

Invited Talk

Apr 2020 **Litu Rout** "S2A: Wasserstein GAN with Spatio-Spectral Laplacian Attention for Multi-Spectral Band Synthesis", EPSA, Space Applications Centre, India

Apr 2020 **Litu Rout** "Monte-Carlo Siamese Policy on Actor for Satellite Image Super Resolution", EPSA, Space Applications Centre, India

Mar 2020 **Litu Rout** "Global and Local Residual Learning for Spatio-Spectral Synthesis of SWIR Band using Multi-Sensor Concurrent Datasets", National Remote Sensing Agencies, India

Jul 2018 **Litu Rout**, Deepak Mishra "Understanding Artificial Neural Networks to Deep Learning", Mohandas College of Engineering and Technology (MCET), Kerala, India

Service and Leadership

2020 Evaluator, Smart India Hackathon, Software Edition, India.

2019 – Present Mentor, ISRO Technology Incubation Centre, NIT Jalandhar.

2019 Reviewer, IEEE TENCON, Kochi, Kerala, India.

2018 – Present Student-Member, Indian National Academy of Engineering (INAE).

Students Mentored

2020 Saumyaa Shah, Undergraduate Research, Nirma University, Ahmedabad

2019-2020 Mayur D Chopda, Scientist/Engineer, Space Applications Centre, ISRO

2019 Modhuli D Goswami, Undergraduate Research, now a MS student at Columbia University

2018-2019 Bala Suraj Pedasingu, Undergraduate Research, Indian Institute of Technology, Tirupati.

Interests

- Football, Cricket, Badminton, Running

References

- **Dr. Deepak Mishra**, *Department of Electronics and Communication Engineering (Avionics), Indian Institute of Space Science and Technology, Thiruvananthapuram, India, Email: deepak.mishra@iist.ac.in*
- **Dr. Rama Krishna Sai Subrahmanyam Gorthi**, *Department of Electrical Engineering, Indian Institute of Technology, Tirupati, India, Email: rkg@iittp.ac.in*
- **Dr. S Manthira Moorthi**, *Space Applications Centre, ISRO, Ahmedabad, India, Email: smmoorthi@sac.isro.gov.in*