Chiranjibi Shah, PhD

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Research Interests

My work in hyperspectral image analysis includes dimensionality reduction, classification, and anomaly detection, applicable to big data analytics across various fields. I've also applied machine learning and deep learning methods to fish imagery for species classification, object detection, and tracking, enhancing ecological studies and fisheries management. Using techniques like CNNs, transformers, GANs, and zero-shot detection, I improved accuracy in both hyperspectral and fish imagery analysis.

Teaching Philosophy

As an Assistant Professor at the University of the District of Columbia, I teach courses such as Engineering Mathematics, Probability and Random Processes, Wireless Communication, and Machine Learning. My teaching philosophy emphasizes knowledge sharing, clarity in instruction, and fostering a diverse, inclusive learning environment. I aim to connect theory with real-world applications and encourage critical thinking. My previous experience as a Teaching Assistant at Mississippi State University included lab instruction in Digital Devices, Intermediate Electronics, and Intro to Electronic Circuits.

Education

PhD in Electrical and Computer Engineering Aug 2017- May 2022
CGPA: 3.92/4.0
Mississippi State University (MSU), Mississippi State, MS, USA
Dissertation title: "Spatial-spectral analysis in dimensionality reduction for hyperspectral image classification"
Advisor: Prof. Dr. Qian (Jenny) Du

Bachelors in Electronics and Communication Engineering Aug 2008- Oct 2012
CGPA: 3.69/4.0
Pokhara University, Pokhara, Nepal

Work Experience

Assistant Professor Aug 2025 – Present
University of the District of Columbia (UDC), Washington, DC, USA
Department of Electrical and Computer Engineering

- Teaching undergraduate and graduate courses in electrical and computer engineering, including topics related to electronics, embedded systems, and machine learning applications.
- Mentoring students in academic projects, research, and career development.
- Initiating research projects in machine learning, deep learning, and computer vision with applications in environmental and underwater imaging.
- Contributing to curriculum development and departmental service activities.

Postdoctoral Associate May 2022- Aug 2025
Mississippi State University (MSU), Mississippi State, MS, USA

Project: Development of Innovative Sampling Technologies; Electronic Monitoring and Machine Learning Algorithms for Southeast Fisheries; Developing Cloud-based AI/ML Approaches for Fish Detection and Description.

- Working towards application of different machine learning and deep learning techniques in computer vision, such as active learning, semi-supervised learning, and zero-shot detection (ZSD) based techniques with different backbone networks and detection heads like VGG, ResNet, MobileNet, SSD, and YOLO to outperform existing methods in classification and object detection of fish imagery.
- Developed novel active learning based approach with VGG and ResNet backbone networks with SSD detection heads to reduce the annotation costs for classification and detection of fish imagery.
- Implemented enhanced YOLO based model for fish species recognition.
- Implemented Zero shot detection (ZSD) based approach for analysis of fish imagery.

TEACHING EXPERIENCE

Graduate Teaching Assistant Aug 2017 - May 2022

Electrical and computer engineering (ECE) department,
Mississippi State University (MSU), Mississippi State, MS, USA

My responsibilities as a teaching assistant included holding office hours and study sessions, grading homework, and teaching classes in the absence of the professor.

- ECE 3424 Intermediate Electronics (Fall 2017, Fall 2018, Spring 2019, Summer 2019, Fall 2020, Spring 2020, Summer 2020, Fall 2021).
- ECE 3714 Digital Device (Spring 2018).
- ECE 3413 Intro to Electronics (Summer 2020).

Lecturer Feb 2013- Nov 2016

Everest Engineering College,
Pokhara University, Nepal

My responsibilities as a lecturer included teaching classes holding office hours and study sessions, grading homework and exams, and mentoring undergraduate students for major and minor projects.

- Microprocessor, embedded systems, and robotics.
- Computer Networks, digital signal processing, and digital communications.
- Programming in C, object oriented programming with C++, and Java programming.

Training Experience June 2016- June 2017

Java Programmer, IT Training Nepal, Kathmandu, Nepal

- Developed desktop application, and web-based applications.

Honors and Awards

- March 2022, MSU, USA, PhD poster presentation winner in Engineering in spring 2022 graduate research symposium
- July 2021, MSU, USA, Bagley College of Engineering (BCoE) Bridge Award
- April 2021, MSU, USA, Bagley College of Engineering (BCoE) Bridge Award

Volunteer Experience

- Guest Editor Dec 2023 - present

Worked as a guest editor in the Journal of Marine Science and Engineering.

- Reviewer Jan 2021- present

Reviewed in journals like IEEE TGRS, Sensors, Remote Sensing, electronics, symmetry, agron-

omy, make, applsci,jmse,futureinternet,photonics,jimaging, IJRS, pattern recognition, and algorithms.

- Vice president, IEEE Student Chapter, MSU, USA May 2021- Apr 2022
- Judge, Summer Undergraduate Research Symposium, MSU, USA Aug 21, April 22, Aug 22

PUBLICATIONS

Journal Articles

1. **C. Shah**, M. M. Nabi, S. Y. Alaba, I. A. Ebu, J. Prior, M. D. Campbell, R. Caillouet, M. D. Grossi, T. Rowell, F. Wallace, J. E. Ball, and R. Moorhead, "Yolov8-tf: Transformer-enhanced yolov8 for underwater fish species recognition with class imbalance handling," *Sensors*, vol. 25, no. 6, 2025.
2. **C. Shah**, N. U. I. Hossain, M. M. Khan, and S. T. Alam, "A dynamic bayesian network model for resilience assessment in blockchain-based internet of medical things with time variation," *Healthcare Analytics*, vol. 4, p. 100280, 2023.
3. J. H. Prior, M. D. Campbell, M. Dawkins, P. F. Mickle, R. J. Moorhead, S. Y. Alaba, **C. Shah**, J. R. Salisbury, K. R. Rademacher, A. P. Felts *et al.*, "Estimating precision and accuracy of automated video post-processing: A step towards implementation of ai/ml for optics-based fish sampling," *Frontiers in Marine Science*, vol. 10, p. 1150651, 2023.
4. S. K. Roy, A. Deria, **C. Shah**, J. M. Haut, Q. Du, and A. Plaza, "Spectral–spatial morphological attention transformer for hyperspectral image classification," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 61, pp. 1–15, 2023.
5. S. Y. Alaba, M. Nabi, **C. Shah**, J. Prior, M. D. Campbell, F. Wallace, J. E. Ball, and R. Moorhead, "Class-aware fish species recognition using deep learning for an imbalanced dataset," *Sensors*, vol. 22, no. 21, p. 8268, 2022.
6. **C. Shah**, Q. Du, and Y. Xu, "Enhanced tabnet: Attentive interpretable tabular learning for hyperspectral image classification," *Remote Sensing*, vol. 14, no. 3, p. 716, 2022.
7. **C. Shah** and Q. Du, "Spatial-aware collaboration–competition preserving graph embedding for hyperspectral image classification," *IEEE Geoscience and Remote Sensing Letters*, vol. 19, pp. 1–5, 2021.
8. N. U. Ibne Hossain, M. Nagahi, R. Jaradat, **C. Shah**, R. Buchanan, and M. Hamilton, "Modeling and assessing cyber resilience of smart grid using bayesian network-based approach: a system of systems problem," *Journal of Computational Design and Engineering*, vol. 7, no. 3, pp. 352–366, 2020.
9. **C. Shah** and Q. Du, "Collaborative and low-rank graph for discriminant analysis of hyperspectral imagery," *IEEE Journal of selected topics in applied earth observations and remote sensing*, vol. 14, pp. 5248–5259, 2021.

Conference Proceedings

9. **C. Shah**, M. M. Nabi, S. Y. Alaba, J. Prior, R. Caillouet, M. D. Campbell, F. Wallace, J. E. Ball, and R. Moorhead, "A zero shot detection based approach for fish species recognition in underwater environments," in *OCEANS 2023 - MTS/IEEE U.S. Gulf Coast*, 2023, pp. 1–7.
10. **C. Shah**, M. Nabi, S. Y. Alaba, R. Caillouet, J. Prior, M. Campbell, M. D. Grossi, F. Wallace, J. E. Ball, and R. Moorhead, "Active detection for fish species recognition in underwater environments," in *Ocean Sensing and Monitoring XVI*, vol. 13061. SPIE, 2024, pp. 96–105.

11. M. Nabi, **C. Shah**, S. Y. Alaba, R. Caillouet, J. Prior, M. Campbell, F. Wallace, J. E. Ball, and R. Moorhead, "Inconsistency-based active learning with adaptive pseudo-labeling for fish species identification," in *Ocean Sensing and Monitoring XVI*, vol. 13061. SPIE, 2024, pp. 84–95.
12. S. Y. Alaba, J. H. Prior, **C. Shah**, M. Nabi, J. E. Ball, R. Moorhead, M. D. Campbell, F. Wallace, and M. D. Grossi, "Multifish tracking for marine biodiversity monitoring," in *Ocean Sensing and Monitoring XVI*, vol. 13061. SPIE, 2024, pp. 106–112.
13. M. M. Nabi, **C. Shah**, S. Y. Alaba, J. Prior, M. D. Campbell, F. Wallace, R. Moorhead, and J. E. Ball, "Probabilistic model-based active learning with attention mechanism for fish species recognition," in *OCEANS 2023 - MTS/IEEE U.S. Gulf Coast*, 2023, pp. 1–8.
14. C. Shah and Q. Du, "Hyperspectral image classification of agricultural tillage practices using spatial-aware collaborative representation," in *2023 11th International Conference on Agro-Geoinformatics (Agro-Geoinformatics)*, 2023, pp. 1–6.
15. J. H. Prior, S. Y. Alaba, F. Wallace, M. D. Campbell, **C. Shah**, M. M. Nabi, P. F. Mickle, R. Moorhead, and J. E. Ball, "Optimizing and gauging model performance with metrics to integrate with existing video surveys," in *OCEANS 2023 - MTS/IEEE U.S. Gulf Coast*, 2023, pp. 1–6.
16. **C. Shah** and Q. Du, "Collaborative-competitive representation with spatial regularization for hyperspectral anomaly detection," in *IGARSS 2022-2022 IEEE International Geoscience and Remote Sensing Symposium*. IEEE, 2022, pp. 1253–1256.
17. S. Alaba, **C. Shah**, M. Nabi, J. Ball, R. Moorhead, D. Han, J. Prior, M. Campbell, and F. Wallace, "Semi-supervised learning for fish species recognition," in *Ocean Sensing and Monitoring XV*, vol. 12543. SPIE, 2023, pp. 248–255.
18. **C. Shah** and Q. Du, "Modified structure-aware collaborative representation for hyperspectral image classification," in *2021 IEEE International Geoscience and Remote Sensing Symposium IGARSS*. IEEE, 2021, pp. 3217–3220.
19. **C. Shah**, S. Y. Alaba, M. Nabi, R. Caillouet, J. Prior, M. Campbell, F. Wallace, J. E. Ball, and R. Moorhead, "Mi-afr: multiple instance active learning-based approach for fish species recognition in underwater environments," in *Ocean Sensing and Monitoring XV*, vol. 12543. SPIE, 2023, pp. 227–238.
20. **C. Shah** and Q. Du, "Laplacian regularized spatial-aware collaborative competitive representation for hyperspectral dimensionality reduction," in *IGARSS 2022-2022 IEEE International Geoscience and Remote Sensing Symposium*. IEEE, 2022, pp. 1732–1735.
21. **C. Shah**, S. Y. Alaba, M. Nabi, J. Prior, M. Campbell, F. Wallace, J. E. Ball, and R. Moorhead, "An enhanced yolov5 model for fish species recognition from underwater environments," in *Ocean Sensing and Monitoring XV*, vol. 12543. SPIE, 2023, pp. 239–247.
22. **C. Shah** and Q. Du, "Spatial-aware probabilistic collaborative representation for hyperspectral image classification," in *Image and Signal Processing for Remote Sensing XXVI*, vol. 11533. SPIE, 2020, pp. 154–161.
23. M. Nagahi, R. Jaradat, M. Ngahisarchoghaei, N. U. Hossain, **C. Shah**, and S. R. Goerger, "The relationship between engineering students' systems thinking skills and proactive personality: Research initiation," in *IIE Annual Conference. Proceedings*. Institute of Industrial and Systems Engineers (IISE), 2020, pp. 1–6.
24. **C. Shah** and Q. Du, "Collaborative and low-rank graph for discriminant analysis of hyperspectral imagery," in *2021 IEEE International Geoscience and Remote Sensing Symposium*

IGARSS. IEEE, 2021, pp. 3621–3624.

Book Chapters

25. N. U. I. Hossain and **C. Shah**, "Dynamic bayesian network based approach for modeling and assessing resilience of smart grid system," in *Handbook of smart energy systems*. Springer, 2023, pp. 1613–1632.
26. Q. Du, **C. Shah**, H. Su, and W. Li, "Collaborative representation for hyperspectral image classification and detection," in *Remote Sensing Handbook, Volume II*, 2nd ed. CRC Press, 2024, p. 13.

REFERENCES

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