

# DILANGA GALAPITA MUDIYANSELAGE

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## EDUCATION

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**Ph.D. in Information Technology at the University of Nebraska at Omaha, NE.** *May 2024*

*Concentration:* Artificial Intelligence, GPA 3.81

*Dissertation:* Self-Supervised Representation Learning on Multi-Label Classification

**Master of Computer Science at the University of Nebraska at Omaha, NE.** *Dec 2018*

*Concentration:* Database and Knowledge Engineering, GPA 3.70

*Thesis:* Multi-Label Classification Using Higher-Order Label Clusters

**Bachelor of Computer Science Honors at University of Peradeniya, Sri Lanka.** *Jan 2014*

*Major:* Computer Science, Statistics and Mathematics, GPA 3.75

*Thesis:* Performance Comparison of Emerging HEVC Standard with H.264/AVC and frame interpolation based Error Correction Technique for HEVC decoder.

## RESEARCH INTERESTS

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Medical and Bio-engineer imaging applications, Deep Learning, Representation Learning, Multi Label-Classification, Computer vision, Image/Video Processing, Database/Knowledge Engineering

## SKILLS

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| <b>Programming languages</b> | Python, Java, C#.NET, C++, PHP                            |
| <b>DevOps and Cloud</b>      | CI/CD, AWS, Docker, MLFlow, Falsk/FastAPIs, Gunicorn, Git |
| <b>Frameworks</b>            | LangChain/FAISS, OpenCV, PyTorch, SKLearn                 |
| <b>Database</b>              | MySQL, MSSQL server, Microsoft Access, MongoDB            |
| <b>Web technologies</b>      | RESTful/SOAP, JavaScript, XML, JSON, Dash                 |

## RESEARCH EXPERIENCE

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**Graduate Research Assistant - University of Nebraska at Omaha** *Aug 2016 - Present*

- Working on research and development for NSF T2 Data-Driven Material Discovery (DDMD), building deep segmentation models for bacteria cell segmentation on metal materials, in collaboration with South Dakota School of Mines and Technology (Published).
- Working on research and development for predicting the foveal center of the Adaptive Optics (AO) scanning images using a deep semantic segmentation approach, in collaboration with the Byers Eye Institute, Stanford University.
- Working on research and development for real-time object detection for safety enhancement using deep anomaly detection approaches (Published).
- Deep learning pipeline for detection and segmentation of lesions in Toxoplasmosis fundus images and data annotation enhancement techniques, in collaboration with the Byers Eye Institute, Stanford University (Published).
- Unsupervised (Cover Coefficient-based Clustering) and supervised machine learning approach to enhance generic high dimensional Multi-label classification performance.

- Serious game (QuaSim), a simulator to provide virtual assistance of Quantum Cryptography concepts with practical hands-on for the students. Analyzed player data to predict the performances and superimpose the lesson map to provide a player-specific gaming environment (Published).
- Technologies used: Python, Matlab, Java, and R statistical programming languages.

**Student Worker - University of Nebraska at Omaha**

*Aug 2017 - Aug 2018*

- Windows-based application for eye-tracking and automatic distortion correction of Age-Related Macular degeneration (AMD) patients. Uses tracing-based technique to determine patient status and correct the distortion in collaboration with the Byers Eye Institute, Stanford University (Currently: Experimenting on real-time patient trials).
- Technologies used: C#.NET, Tobii eye-x eye tracker hardware with Tobii SDK.

**Research Assistant - University of Peradeniya, Sri Lanka**

*Jan 2013 - Jan 2014*

- Conducted research on evaluating the performance of HEVC (High-Efficiency Video Coding) standard compared to H.264 Standard and developed edge-based frame interpolation technique for error correction at HEVC decoder.
- Technologies used: OpenCV library using C++ programming language.

**PROFESSIONAL EXPERIENCE**

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**AI Developer - Intern, GUARDIAN RFID<sup>®</sup> Internship**

*May 2022 - Aug 2022*

**Software Engineer - Trainee hSenid Mobiles Solution (Pvt) Ltd**

*Jan 2013 - Jan 2014*

- Contributed to the e-Local Government project, by developing Android RESTful Client mobile application and Server-side RESTful web services.
- Played a key role in the testing team of the ongoing Airtel (Sri Lanka) chat application project.

**Reviewer**

- Artificial Intelligence in Medicine, An International Journal, ScienceDirect. *Jul 2023*
- ACM SIGITE Conference on Information Technology Education. *Apr 2020*
- Expert Systems with Applications, An International Journal, Elsevier. *2019*

**TEACHING EXPERIENCE**

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**Teaching Assistant, University of Nebraska at Omaha**

*Aug 2022 - May 2023*

*Course:* CSCI 4970 - Undergraduate - Computer Science Capstone

*Duties:* Acted as a project manager role for 30 undergraduate capstone projects with real clients, task tracking, implementation progress tracking, attending client meetings, attending weekly progress meetings, grading and evaluation.

**Instructor - University of Nebraska at Omaha**

*Jan 2022 - May 2022*

*Course:* CIST 1300 - Introduction to Web Development

*Duties:* Conducted Lectures, lab sessions, grade assignments, proctor and grade exams, and other duties as assigned by the course in charge.

**Teaching Assistant, University of Nebraska at Omaha**

*Aug 2021 - Dec 2021*

*Course:* CIST 1620 - Introduction to Computer Science II (JAVA programming)

*Duties:* Conducted lab sessions, graded assignments, proctored and graded exams outside of scheduled class hours, and other duties as assigned by the supervisor.

- Instructor - Techademy, University of Nebraska at Omaha** *May 2020 - Aug 2020*  
*Course:* Artificial Intelligence and Intro to Machine Learning  
*Duties:* Conducted virtual sessions to high-school students
- Teaching Assistant, University of Nebraska at Omaha** *Aug 2019 - May 2020*  
*Course:* CIST 1400 - Introduction to Computer Science I (JAVA programming)  
*Duties:* Conducted lab sessions, graded assignments, proctored and graded exams outside of scheduled class hours, and other duties as assigned by the supervisor.
- Student Supervision, University of Nebraska at Omaha** *May 2019 - Aug 2019*  
*Duties:* Supervised two summer high-school interns on robotic car assembling (F1-tenth), and robotic vision concepts and implementations.
- Temporary Instructor, Information Technology Centre, University of Peradeniya, Sri Lanka.** *Feb 2015 - Jul 2016*  
*Duties:* Conducted IT-related tutorial discussions and practicals, Preparation of teaching materials, Assisted students' coursework
- Temporary Demonstrator, Faculty of Science, Department of Statistics and Computer Science, University of Peradeniya, Sri Lanka.** *Feb 2014 - Feb 2015*  
*Courses:* Digital Image processing using MATLAB, Artificial Intelligence and Expert Systems, Operating System Concepts, Object Oriented Programming (JAVA), Data Structures and Database Management Systems, Server-Side Web Programming.  
*Duties:* Mainly created exam papers, marked tutorials, quizzes, exam papers, and invigilated exams in the above-mentioned theory/practical courses.
- Visiting Instructor, Postgraduate Institute of Science (PGIS), University of Peradeniya, Sri Lanka.** *Jan 2015 - May 2015*  
*Course:* Database Management Systems (Practical), MySQL Database Management System for GIS applications

## PUBLICATIONS

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### Journals (Peer-reviewed)

- V. Bommanapally, **D. Abeyrathna**, M. Ashaduzzaman, M. Subramaniam, and P. Chundi. *Super-Resolution based Methodology for Self-Supervised Segmentation of Microscopy Images*. *Frontiers in Microbiology, Systems Microbiology*, 2024.
- **D. Abeyrathna**, S. Rauniyar, R.K. Sani, and P.C. Huang. *A Morphological Post-Processing Approach for Overlapped Segmentation of Bacterial Cell Images*. *Machine Learning and Knowledge Extraction (IMDP)*, 4(4), 1024-1041, 2022.
- **D. Abeyrathna**, M. Ashaduzzaman, M. Malshe, J. Kalimuthu, V. Gadhamshetty, P. Chundi and M. Subramaniam. *An AI-Based Approach for Detecting Cells and Microbial Byproducts in Low Volume Scanning Electron Microscope Images of Biofilms*. *Frontiers in Microbiology, Systems Microbiology*, 2022.
- A. D. Chakravarthy, **D. Abeyrathna**, M. Subramaniam, P. Chundi, and V. Gadhamshetty. *Semantic Image Segmentation Using Scant Pixel Annotations*. *Machine Learning and Knowledge Extraction (IMDP)*, 4(3), 621-640, 2022.
- M. B. Dissanayake and **D. Abeyrathna**. *Performance comparison of HEVC and H.264/AVC standards in broadcasting environments*. *Journal of Information Processing Systems*, 11(3), 2015.

### Conferences (Peer-reviewed)

- **D. Abeyrathna**, T. Life, S. Rauniyar, S. Ragi, R. Sani and P. Chundi. *Segmentation of Bacterial Cells in Biofilms Using an Overlapped Ellipse Fitting Technique*. In 2021 International Conference on Bioinformatics and Biomedicine (BIBM), pages 3548-3554. IEEE, 2021.
- **D. Abeyrathna**, M. Subramaniam, P. Chundi, M. Hasanreisoglu, S. Halim, P. Ozdal, and Q. Nguyen. *Directed Fine Tuning Using Feature Clustering for Instance Segmentation of Toxoplasmosis Fundus Images*. In 20th International Conference on Bioinformatics and Bio-engineering (BIBE). IEEE, 2020.
- **D. Abeyrathna**, P.C. Huang, and X. Zhong. *Anomaly Proposal-Based Fire Detection for Cyber-Physical Systems*. In 6th Annual International Conference on Computational Science and Computational Intelligence (CSCI'19), pages 1203-1207. IEEE, 2019.
- A. D. Chakravarthy, **D. Abeyrathna**, M. Subramaniam, P. Chundi, S. Halim, M. Hasanreisoglu, S. Yasir, and Q. Nguyen. *An approach towards automatic detection of Toxoplasmosis using fundus images*. In 19th International Conference on Bioinformatics and Bioengineering (BIBE), pages 710-717. IEEE, 2019.
- **D. Abeyrathna**, S. Vadla, V. Bommanapally, M. Subramaniam, P. Chundi, and A. Parakh. *Analyzing and predicting player performance in a quantum cryptography serious game*. In International Conference on Games and Learning Alliance, pages 267276. Springer, 2018.
- M. B. Dissanayake and **D. Abeyrathna**. *Edge-based frame inter-polation technique for error correction at HEVC decoder*. In 8th International Conference on Ubi-Media Computing (UMEDIA), pages 263-267. IEEE, 2015.

### Abstracts and Workshops

- M. Rahman, V. Bommanapally, **D. Abeyrathna**, M. Ashaduzzman, M. Tripathi, M. Zahan, M. Subramaniam, & V. Gadhamshetty. Poster on *Machine Learning-Assisted Optical Detection of Multilayer Hexagonal Boron Nitride for Enhanced Characterization and Analysis*. In 2023 IEEE International Conference on Bioinformatics and Biomedicine (BIBM), 2023.
- A. Akhavanrezayat, V. Bommanapally, **D. Abeyrathna**, M.S. Halim, C. Or, I. Karaca, G. Uludag, N. Yavari, V. Bazojuo, A. Mobasserian, Y. Shin, M. Hasanreisoglu, P. Chundi, Q. Nguyen, and M. Subramaniam. Abstract on *A novel objective method to detect the foveal center point in the rtx1<sup>TM</sup> device using artificial intelligence*, Investigative Ophthalmology & Visual Science, 64(8), pp.1068-1068, 2023.
- **D. Abeyrathna**, and M. B. Dissanayake. Abstract on *Performance Comparison of Emerging High-Efficiency Video Coding (HEVC) and h.264/ AVC Standards* was published in the proceedings of PGIS Research Congress, Post Graduate Institute of Science, University of Peradeniya, 2015.

### Book Chapters, Patents

- **D. Abeyrathna**, M. Subramaniam, and P. Chundi. *An Overview of Machine Learning*. In P. Chundi, V. Gadhamshetty, B. Jasthi, and C. Lushbough (Eds.) *Machine Learning in 2D Materials Science* (pp. 144-163). CRC Press, 2023 (ISBN 9780367678203)
- A. Akhavanrezayat, K.J Hassan, Q.D. Nguyen, M. Subramaniam, V. Bommanapally, and **D. Abeyrathna**. Artificial Intelligence-Based Methods to Objectively Identify the Foveal Center in Adaptive Optics Retinal Imaging. U.S. Provisional Patent Application No. US 63/497,679. (Patent)

### AWARDS AND SCHOLARSHIPS

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- Awarded \$5,000 GRACA grant from the University of Nebraska at Omaha; through a competitive process and following a review of a peer committee, for conducting sole research and development work on "Model Debugging Based Novel Approach for Automated Training Data Augmentation for Deep Convolutional Neural Networks", (2020-2021).
- Awarded \$5,000 GRACA grant from the University of Nebraska at Omaha; through a competitive process and following a review of a peer committee, for conducting sole research and development work on "Digital Twin-based Reinforcement Learning for User-Specific Educational Serious Gaming Support Systems", (2024-2025).
- Best Visualization Award Runners Up Datapalooza, Data Analytics competition 2019 Conducted by Mutual of Omaha in collaboration with Holland Computer Center, Lincoln, Nebraska.
- Best Presenter Award - 8th Annual CS Graduate Research Workshop 2018: Presented on the topic of Cover Coefficient Clustering based approach to enhancing Multilabel classification predictive performance.
- Best Presentation Award - CSG International Hackathon 2017: Worked as a team of 3 to develop a mobile and web-based video streaming solution called Dartagram.
- University of Nebraska at Omaha - Advantage Scholarship (2016 - 2017)
- Championship award of IEEE ACES coders 2012 - coding competition, organized by IEEE student branch - Faculty of Engineering in University of Peradeniya, Sri Lanka.

## WORKSHOPS AND SEMINARS

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- The annual NSF-T2 Data-Driven Material Discovery (DDMD) workshop - Montana. Conducted an oral presentation on "Bacteria Cell instance segmentation and retrieve measurements using SEM images" on the 19th and 20th of October 2022.
- The Computer Science annual graduate research workshop - University of Nebraska at Omaha. Conducted an oral presentation on "Cover Coefficient Clustering Approach for Multi-label Classification" on 14th April 2017. (Awarded for the best presentation).
- The 8th IEEE International Conference on Ubi Media Computing (UMEDIA - 2015) in conjunction with the 15th International Conference on Advances in ICT for Emerging Regions (ICTer2015), sponsored by IEEE Sri Lanka section. Conducted an oral presentation in the session of Systems and Multimedia Processing.

## PROJECT WORK

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- **Bio-material info crawler:** A web API with custom Large Language Models (LLM) for accurate, and effective retrieval of relevant information from unstructured text collections of bio-material research articles. Hallucination mitigation with RAG. (Langchain, Huggingface, Docker, Flask)
- **HelloGaze:** A distortion correction App for Age-Related Macular Degeneration (AMD) patients, designed for Windows operating systems. (C#.NET, Tobii Eye Tracking Pro SDK, MSSQL)
- **Customer Churn Prediction:** built an ensemble classification model (with ~90% accuracy) to predict the churn probability of a customer accounts. Processed over 25k employee data records from multiple data sources (sponsored by Buildertrend). (R, GGally, dplyr, tidyverse)
- **Semi-Join simulation:** Windows-based GUI application to illustrate the process of Semi-Join SQL for large data in in-memory using C#.NET.