DR. FERESHTEH NAYYERI

Postdoctoral Research Fellow

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ABOUT ME

As a postdoctoral fellow, I've been immersed in pioneering projects that blend computer vision, deep learning, and image processing. Currently, I'm passionate about working on Ending Plastic Waste mission and I collaborate with the CSIRO Marine Debris Team, including award-winning national and international leaders in efforts to understand and respond to this global marine challenge. I am using AI and computer vision to tackle plastic pollution. In my previous role, I led a groundbreaking collaboration with the Department of Transport and Main Roads, developing an innovative system to improve road safety by analyzing video data. I've also played a crucial role in a pilot study using AI for koala behavior detection and classification, aiming to protect these beloved animals from road accidents. My research spans diverse projects, from civil engineering to enviromental and biomedical imaging and I'm proud of my contributions to academia, including publications and recognition as an Associate Fellow of the Higher Education Academy. With a commitment to innovation and clear communication, I'm eager to continue making positive impacts in research and education.

PROJECT EXPERIENCES

Postdoctoral Research Fellow

Data61, CSIRO, Australia

August 2023 - Present

Project Title: Using AI and cameras to identify and monitor litter

The project aimed to address the pressing issue of marine debris by leveraging deep learning techniques to estimate the volume of floating litter in waterways and identify key hotspots. By evaluating existing management systems, the goal was to contribute to the preservation of healthy water ecosystems.

My Responsibilities:

- Managed the extensive image dataset captured by trail cameras strategically positioned across various waterways in Sydney, Australia.
- Created a comprehensive catalogue detailing different types of litter observed in the waterways, categorizing them into distinct classes for further analysis and classification.
- Developed ground truth annotations for a large image dataset. This process involved rigorous verification and validation to ensure accuracy and reliability.
- Implemented and train state-of-the-art artificial intelligence models to detect and classify marine litter types effectively.
- Contributed to the project's overarching goal by providing insights and recommendations based on findings from the analysis, ultimately aiming to enhance existing management systems and promote healthier waterway environments.
- News: 7News Australia

Postdoctoral Research Fellow

Data61, CSIRO, Australia

January 2023 - August 2023

Project Title : Development of Local Machine Web Application for Image Analysis and Visualization.

As part of my role, I spearheaded the creation of a robust web-based application designed to operate exclusively on local machines. Leveraging Flask, I engineered a comprehensive solution for visualizing images, running pre-trained machine learning models for image detection and classification, and presenting data analysis results through intuitive visual interfaces.

My Responsibilities:

- Developed a user-friendly web application using Flask, tailored to meet the specific requirements of local machine deployment.
- Integrated pre-trained machine learning models into the application, enabling users to analyze images for detection and classification purposes.
- Implemented functionalities to visualize detection results, providing users with insightful representations of analyzed data.
- Incorporated features to locate images on Google Maps based on metadata such as latitude and longitude, enhancing the spatial understanding of image capture locations.
- Conducted thorough testing and debugging to ensure the application's stability and reliability, addressing any issues promptly to deliver a robust and error-free user experience.
- Collaborated closely with stakeholders to gather requirements and incorporate feedback, ensuring the application met their expectations and provided value in facilitating image analysis and visualization tasks on local machines.

Casual Research Fellow

Griffith University, Australia

August 2021 - December 2021

Project Title: Predicting Koala Road Crossing Behaviours using AI-Powered Observation Network

As a casual researcher, I contributed to a pilot study focused on training artificial intelligence (AI) systems for koala "face recognition" at crossing locations throughout South East Queensland. The project aimed to leverage facial recognition technology to enhance koala conservation efforts and improve safety measures at these critical crossings.

My Responsibilities:

- Conducted research as part of the pilot study, investigating methodologies for training AI algorithms to recognize and classify koalas based on facial features.
- Implemented a methodology centered around artificial neural networks and deep learning algorithms, utilizing the Python programming language and TensorFlow framework. This facilitated the detection and classification of koalas, enabling the application of facial expression analysis techniques to understand koala behavior and usage patterns at crossing locations.
- Collaborated with interdisciplinary teams to ensure the integration of AI technologies with conservation efforts, contributing to the development of research-based strategies for koala conservation and habitat protection.
- Contributed insights and findings to support the project's objectives, including potential applications of AI-driven facial recognition in wildlife monitoring and conservation management practices.
- News: LinkedIn , ABS , DW News

Postdoctoral Research Fellow

Central Queensland University, Australia

June 2020 - June 2021

Project title: An Automated System for the Analysis of Road Safety and Conditions

The main aim of this ARC Linkage project, which is a collaboration between CQUinversity and DTMR (Department of Transport and Main Roads), is to assess road safety and conditions automatically for the purpose of improving road infrastructure and reducing fatalities on the roads. The major challenges of current manual systems are to accurately detect, segment and classify all road objects and also calculate the distance between objects. Deep learning has the ability to address such major challenges.

My Responsibilities:

- Established and maintained a comprehensive database comprising road attributes and signage extracted from DTMR videos, meticulously annotating the collected data.
- Implemented methodology based on Artificial Neural Network and Deep Learning algorithms with Python programming language and Tensorflow framework for detection and classification of road speed limit signs.
- Executed experiments leveraging deep learning architectures on High-Performance Computing (HPC) systems to analyze vast datasets effectively.

PhD Project

Griffith University, Australia

April 2016 - November 2020

Project Title :Foreground-Background Classification for Crack Detection

My Responsibilities:

- Developed and programmed the innovative deep learning architecture using Python and TensorFlow programming languages, ensuring seamless integration with existing frameworks.
- Conducted extensive experimentation and optimization to refine the architecture's performance, achieving significant advancements in crack detection accuracy and efficiency.
- Collaborated with fellow researchers to analyze and interpret results, contributing insights crucial for the project's success and further advancements in the field.
- Published findings in reputable academic journals and presented results at conferences, garnering recognition and acclaim within the research community for innovative contributions to dimensionality reduction in semantic segmentation for crack detection.
- Principal Supervisor
- Associate Supervisor
- Conferral, page: 39

Research Assistant

National University of Malaysia (UKM), Malaysia

February 2014 - November 2015

Project Title : Designing and developing the algorithm to correct respiratory motion from PET/CT lung cancer images

As a Graduate Research Assistant within the Biomedical Imaging & Signal Processing research group at the School of Electrical and Electronic Engineering, I played an integral role in advancing the field of biomedical imaging. My work primarily focused on exploring innovative techniques for image reconstruction and addressing challenges related to respiratory motion correction in PET/CT imaging systems.

My Responsibilities:

- Conducted in-depth research into biomedical imaging techniques, with a particular emphasis on image reconstruction and respiratory motion correction.
- Identified technological limitations and deficiencies within existing PET/CT imaging systems, processes, and methodologies, contributing valuable insights towards enhancing imaging capabilities.
- Designed and developed sophisticated algorithms for biomedical image reconstruction, leveraging cutting-edge computational techniques to improve image quality and accuracy.
- Implemented and programmed various biomedical image reconstruction, processing, and analysis techniques using the MATLAB programming language, ensuring seamless integration with existing systems.
- Conducted rigorous testing, debugging, and diagnosis of errors and faults within the applications, guaranteeing optimal performance and adherence to specifications. Through meticulous attention to detail, I facilitated the refinement of algorithms and processes for enhanced biomedical imaging outcomes.

Master's Project

National University (UKM), Malaysia

July 2010 - August 2013

Project Title: Image matching using dimensionally reduced embedded Earth Mover's Distance

I published my Master's thesis as a book.

- Supervisor

EDUCATION

PhD
Griffith University, Australia
2016 - 2020

Master's of Computer Science

National University (UKM), Malaysia
2010 - 2013

SKILLS

Programming languages

Python

Flask

HTML/CSS

AWS

GCP

Java

Excel

Adobe

Photoshop

Illustrator

AWARDS

- **DST Women In STEM Award**
- **Excellence of Publication**

CERTIFICATES

AI (DataCamp-AI Fundamentals)

Project Management (Basics at CSIRO)

CISCO (CCNA Routing and Switching)

AFHEA (Higher Education Academy Fellowships - Associate Fellow)

MEMBERSHIPS

IIS (Institute of Integrated Intelligent Systems)

ORCID

SUBSCRIPTIONS

Github

OpenAI

HuggingFace

Udemy

LANGUAGES

English (Fluent)

Persian (Native)

HOBBIES

Dance | Movies | Music | Art | Baking | Plants | Coffee

PUBLICATIONS

1. Do, Brendan, et al. (2023), SkySea: Connecting Satellite, UAV and Underwater Imagery for Benthic Habitat Mapping , Proceedings of the 2023 Workshop on UAVs in Multimedia: Capturing the World from a New Perspective.
2. W. Xing, J. Zhou, W. L. Tan, F. Nayyeri, D. Kerlin and G. Castley (2022), Dual-stream Convolutional Neural Networks for Koala Detection and Tracking , International Conference on Digital Image Computing: Techniques and Applications (DICTA), Sydney, Australia, 2022, pp. 1-7
3. F. Nayyeri, J. Zhou (2021), Multi-resolution ResNet for road and bridge crack detection , International Conference on Digital Image Computing: Techniques and Applications (DICTA), Gold Coast, Australia.
4. F. Nayyeri, L. Hou, J. Zhou and H. Guan (2019), Foreground-background separation technique for crack detection , Journal of Computer-Aided Civil and Infrastructure Engineering, 34(6): 457-470.
5. F. Nayyeri, L. Hou, J. Zhou, H. Guan and A. W.-C. Liew (2018), Crack Detection via Salient Structure Extraction from Textured Background , International Conference on Structural Health Monitoring of Intelligent Infrastructure (SHMII-8), Brisbane, Australia, 1-8.
6. F. Nayyeri and M. F. Nasrudin (2017), Sketching Method Based on Earth Mover's Distance for Image Contour Matching , International Journal of Soft Computing, 12(1): 79-85.
7. F. Nayyeri, A. A. A. Rahni and A. Ab Aziz (2015), Modelling the GE discovery 690 PET/CT scanner , IEEE International Conference on Signal and Image Processing Applications (ICSIPA): 160-164.
8. F. Nayyeri (2015), A Review on Motion Correction Methods in PET/CT Images for Detection of Cancer Cells , Journal of Acta Medica Bulgarica, 42(2): 68-78.
9. F. Nayyeri and M. F. Nasrudin (2015), Similarity Comparison of Images Based on Earth Mover's Distance , Book, LAP Lambert Academic Publishing, ISBN: 978-3659697753.
10. F. Nayyeri and M. F. Nasrudin (2013), Image Matching Using Dimensionally Reduced Embedded Earth Mover's Distance , Journal of Applied Mathematics,: 11.