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ALI ZIA

Educational History

Doctor of Philosophy, 2020

University: Griffith University, Australia.

Supervisors: Associate Prof. Jun Zhou and Prof. Yongsheng Gao.

Thesis: Exploring extrinsic spectral properties of hyperspectral image for 3D computer vision.

Brief Thesis Description: This thesis explores the intrinsic and extrinsic spectral properties present in the hyperspectral image. Intrinsic properties encapsulate raw information and optical phenomenon (such as reflectance, chromatic aberration, defocus blur, etc.) that are inherently present in the hyperspectral image. And the pieces of information that are derived from these inherent attributes are known as extrinsic properties (such as structure from spectra, depth cues, continuous labels, etc.). This thesis explores some of the extrinsic properties present in the hyperspectral image that can help to solve problems linked to scene understanding of 3D computer vision. It is important to clarify here that this thesis mainly focuses on how properties in a hyperspectral image can contribute towards solving a particular problem, rather than addressing typical 3D computer vision issues for scene understanding. For this reason, problems such as 3D reconstruction, depth estimation, occluded object detection, and object boundary detection are explored from the hyperspectral viewpoint.

Master's in Computing, 2009

University: Australia National University, Australia.

Specialization: Human-Computer Interaction, Computer Vision, and Artificial Intelligence.

Supervisors: Prof. Antonio Robles-Kelly and Associate Prof. Jun Zhou.

Thesis/Project: Structured object recognition for content-based image retrieval.

Brief Thesis Description: This research-based project examined the use of a structured learning approach to the image classification problem. The main aim was to investigate the inclusion of structural and feature information in the image into a representation suitable for content-based image retrieval.

B.Sc. in Computer Sciences (Hons.), 2006

University: Punjab University, Pakistan.

Specialization: Computer Vision and Java Enterprise Development.

Final Project Supervisors: Mr. Sarfraz Chaudry.

Final Project Title: Biometric security system with control of electric devices of a building.

Brief Final Project Description: Design and implementation of a security system using thumb recognition and identification to verify. Implementation includes the development of API for thumb recognition, identification, and verification; also, there is a module in the project that is associated with controlling electrical devices remotely from pc. Finally, there are also modules that implement attendance and payroll system. Implementation is done in Java language.

Research Papers

Book Chapter:

Ali Zia, and Jie Liang. “3D plant modeling using spectral data from visible to near-infrared range”, of book, “Computer Vision and Pattern Recognition in Environmental Informatics”, by IGI Global Publication, 2015.

Journals:

1. Ali Zia, Jun Zhou, and Yongsheng Gao. “Exploring chromatic aberration and defocus blur for relative depth estimation from monocular hyperspectral Image”, IEEE Transactions on Image Processing (IEEE TIP),30:4357-4370, 2021. **(Impact factor: 11.041)**
2. Usman Bashir Tayab, Ali Zia, Fuwen Yang, Junwei Lu, and Muhammad Kashif. “Short-term load forecasting for microgrid energy management system using hybrid HHO-FNN model with best-basis stationary wavelet packet transform”, Energy, 203, 117857, 2020. **(Impact factor: 8.857)**
3. Suhad Lateef Al-khafaji, Jun Zhou, Ali Zia, and Alan Wee-Chung Liew. “Spectral-spatial scale-invariant feature transform for hyperspectral images”, IEEE Transactions on Image Processing (IEEE TIP), 27(2):837-850, 2018. **(Impact factor: 11.041)**
4. Zunaira Anwer, Muhammad Zeeshan Iqbal, Shahnawaz Qureshi, Ali Zia, Sajid Answer, Seppo Karrila “Predicting User Behavior on Video Streaming by Using Watch-Time Duration Analysis”, Computer in Human Behaviour,2023. (Under Review). **(Impact factor: 8.9)**
5. Asif Ameer, Ali Zia, Shahnawaz Qureshi, Ahsan Latif, Seppo Karrila “Comparing the Effectiveness of Classic Mask RCNN and Vision Transformer in Early Weed Detection”, Computers and Electronics in Agriculture, 2023. (Under Review). **(Impact factor: 6.7)**
6. Usman Bashir Tayab, Fuwen Yang, Ali Zia, Junwei Lu. “Home Energy Management System of a Grid-connected Microgrid with Photovoltaic and Battery Energy Storage System” Renewable Energy Journal, 2022, submitted (Under Review) **(Impact factor: 8.634)**
7. Usman Bashir Tayab, Ali Zia, Kazi Nazmul Hasan, Rakibuzzaman Shah, Syed Islam, Brendan McGrath. “Artificial Intelligence Based Optimum Battery Sizing and Energy Management for Grid-connected Microgrid” To Submit to IEEE Transactions on Sustainable Energy, 2023 (Finalizing Draft). **(Impact factor: 8.31)**
8. Bakhtiar Ali, Ali Zia, Han Xu, Robert Sang, Igor V. Litvinyuk, Maksym Rybachuk “Modelling and multi-objective optimization of an ultrashort femtosecond (30-fs) laser micromachining of diamond” To Submit to International Journal of Machine Tools and Manufacture, 2023 (Finalizing Draft). **(Impact factor: 10.331)**
9. Ali Zia, Abdelwahed Khamis, James Nichols, Zeeshan Hayder, Vivien Rolland, Lars Petersson “Topological Deep Learning: A Review of an Emerging Paradigm” AI Reviews, 2023, (To Submit). **(Impact factor: 8.9)**
Arxiv Link: <https://arxiv.org/abs/2302.03836>
10. Yajie Sun, Ali Zia, Vivien Rolland, and Jun Zhou, “Spectral 3D Computer Vision - A Review”. AI Reviews, 2023, (To Submit). **(Impact factor: 8.9)**
Arxiv Link: <https://arxiv.org/abs/2302.08054>

Conferences:

1. Ali Zia, Renuka Sharma, Vivien Rolland, Arablouei, Reza, Lars Petersson, Aaron Ingram. "CVB: A Video Dataset of Cattle Visual Behaviors", CVPR workshop on animal behavior, 2023. (Submitted)
2. Yajie Sun, Ali Zia, and Jun Zhou, "MultiScale Representations Learning Transformer Framework for Point Cloud Classification", IEEE International Conference on Image Processing (ICIP), 2023, (Submitted).
3. D. Bao, J. Zhou, S. A. Bhuiyan, A. Zia, R. Ford, and Y. Gao, "Early Detection of Sugarcane Smut Disease in Hyperspectral Images," International Conference on Image and Vision Computing New Zealand (IVCNZ), pp. 1-6, 2021.
4. Usman Bashir Tayab, Junwei Lu, Fuwen Yang, Mojaharul Islam, Ali Zia, and Jahangir Hossain. "Microgrid energy management system for academic building", The Australasian Universities Power Engineering Conference (AUPEC), 2019.
5. Suhad Lateef Al-khafaji, Ali Zia, Jun Zhou, and AlanWee-Chung Liew. "Material-based boundary detection in hyperspectral images", In Proceedings of the International Conference on Digital Image Computing: Techniques and Applications (DICTA), 2017.
6. Ali Zia, Jun Zhou, and Yongsheng Gao. "Relative depth estimation from hyperspectral data", In Proceedings of the International Conference on Digital Image Computing: Techniques and Applications (DICTA), 2015.
7. Ali Zia, Jie Liang, Jun Zhou, and Yongsheng Gao. "3D reconstruction from hyperspectral images", In Proceedings of the IEEE Winter Conference on Applications of Computer Vision (WACV), pages 318-325, Waikoloa Beach, Hawaii, 2015.
8. Jie Liang, Ali Zia, Jun Zhou, and Xavier Sirault. "3D plant modeling via hyperspectral imaging", International Conference on Computer Vision (ICCV) Workshop on Computer Vision for Accelerated Bioscience, 2013.
9. Ali Zia, T. Gulrez and T. Chaudhry "Heterogeneous Sensor Fusion Framework for Autonomous Mobile Robot Obstacle Avoidance" 10th International Conference on Intelligent Systems Design and Application, 2010.
10. T. Chaudhry, T. Gulrez and Ali Zia "B'ezier Curve based Dynamic Obstacle Avoidance and Trajectory Learning for Autonomous Mobile Robots" 10th International Conference on Intelligent Systems Design and Application, 2010.
11. Ali Zia, S. Bhatti "Object Recognition using SIFT feature over fastly extracted Salient Map" International Conference on Intelligence and Information Technology 2010.
12. Ali Zia, J.-H. Huang, J. Zhou, and A. Robles-Kelly. "Content-based image retrieval via subspace-projected salient features". In Proceedings of the international conference on Digital Image Computing: Techniques and Applications (DICTA), pages 593–599, December 2008.

Job Experience Summary

Title	Organization	Type	Duration
Postdoctoral Research Fellow in Future Science Platform under Object Detection Activity	Australian National University and CSIRO, Australia	Research and development equivalent to level B university grade.	2021 – Till Date
Postdoctoral Researcher	ARC Hub for Driving Farming Productivity and Disease Prevention, Griffith University, Australia	Research and development equivalent to the level A university grade.	2020 – 2021
Programmer Developer	Griffith Online Team, Griffith University, Australia	Full stack from solution architect to programmer at HEW Level 6 step 3	2016 – 2018
Lab Instructor, Lecturer, and Student Coach	Griffith University, Australia	Casual. Conducting labs, tutorials, and lectures	2014 – 2021
Assistant Professor	COMSATS University, Pakistan	Teaching, Research, and Solution Architect	2009 – 2014
Research Scholar	NICTA Neville Roach, Australia	Research and Development	2008 – 2009
Software Engineer	Various Software houses like Systems Ltd, Cambridge Docs, and Techlogix, Pakistan	Software Development and Quality Assurance	2006 – 2008
Teaching Assistant	Punjab University Pakistan	Casual. Conducting labs, tutorials, and lectures	2002 – 2006

Job Experience Details

1. Australian National University and CSIRO

URL: www.anu.edu.au

1.1 Postdoctoral Research Fellow in Future Science Platform under Object Detection Activity (2021- Till Date) – Equivalent to Level B position

I was hired by Australian National University to work with projects from CSIRO. Currently, I am working on:

- Multi-Object Tracking,
- livestock behavior detection and
- 3D hyperspectral analysis of meat to identify meat contamination.

Student Supervision:

I am currently co-supervising two **Ph.D.** students and one more **Ph.D.** expects to join soon.

Grants:

- I was awarded a Ph.D. scholarship for a 3D hyperspectral analysis of meat to identify meat contamination project as a supervisor by CSIRO under the AI4M program.
- I was awarded a grant under the CAS-CSIRO partnership for a project titled “Novel AI and hyperspectral-based tool to select salt-tolerant legumes to increase grain and pasture production”
- Applying grant for analyzing protein content in different varieties of chickpeas using hyperspectral imaging and machine learning.

2. Griffith University Australia

URL: www.griffith.edu.au

2.1 Postdoctoral Researcher in ARC Hub for Driving Farming Productivity and Disease Prevention (2020 – 2021)

I worked as a researcher at ARC Hub for Driving Farming Productivity and Disease Prevention in Griffith University. My main responsibilities were data collection, development of the prototype system, research and development of deep learning methods suiting the needs of the project, and integration and implementation of software and hardware components for the project. Here I worked on the following projects:

- Beneficial insect spreading project.
- Document reconstruction project.
- Sugarcane disease detection project.

Student Supervision:

I successfully co-supervised **two masters by research** students during this role.

2.2 Lab Demonstrator and Lecturer (2014 – 2021)

In Griffith, I have taught both ‘Master’ and ‘Bachelors’ degree courses. My responsibilities for different courses include instructing courses (taking lectures), creating assignments, helping in designing courses, demonstrating lab, checking assignments, and organizing workshops. The courses I taught are as follows :

- Sensor Networks (3706ICT).
- Introduction to Big Data Analytics (7030ICT).
- Introduction to Programming (1001ICT).
- Software Development (1802ICT).
- Programming Principals (7001ICT).
- Electric Circuits (1301ENG).

2.3 Programmer in Griffith online Team (2016 – 2018) – HEW 6

I worked for around two years at Griffith online team as a full-stack programmer, Details of this role are as follows:

Projects:

- Music Assessment Tool.
- Student Response Tool.
- Music repertoire player and others.

Technology Used: Php, oracle, silex, twig, Vue, and others.

Responsibilities: Analyse, design, manage, maintenance, and implement.

Project Type: Three-tier Web Applications.

Achievements:

- Analyzed the requirements and developed a general architecture for Music Assessment Tool and Student Response Tool.
- Developed and deployed projects successfully.
- Test the projects and fix bugs.

2.4 Student Coach (2014)

As part of the Student Success Team, I was responsible for helping weak students in the first year enrolled in ICT courses that are assigned to me. The program enables student success through embedded advising.

3. COMSATS University Pakistan (2009 – 2014)

Designation: **Assistant Professor**

URL: www.ciiit.edu.pk

COMSATS is one of the highly ranked and leading Universities in Pakistan. I was appointed at this prestigious institute as Lecturer in the Computer Science Department and later promoted to Assistant Professor. My **student evaluation** usually ranged from **80% to 95%** in courses that I have taught. My primary responsibilities include:

- Worked as **Principle Investigator/Developer and Project Manager** on various projects.
Details of the most prominent projects are given in the section below.
- **Teaching** undergraduate and graduate courses.
- **Administrative Assignments** as a member of various campus-level committees.

- Member of organizing team to hold international conferences, workshops, and seminars.
- Student counselor and Batch Advisor.
- Research and Supervising undergraduate projects.

3.1 Courses Taught

- Artificial Intelligence. (eight semesters)
- Computer Programming. (three semesters)
- Introduction to Machine Learning. (two semesters)
- Human-Computer Interaction. (two semesters)
- Computer Vision. (two semesters)
- Operating Systems Concepts. (three semesters)
- Advanced Operating Systems. (one semester, Master's course)
- Systems Programming. (three semesters, Master's course).
- Computing for Management. (one semester, Master's course)

3.2 Research and Development Grants

I have worked on the following Research and development projects in COMSATS:

Personalized Smart Home Automation

Funded by: COMSATS and the National I.C.T Research and Development Fund by the Ministry of Information Technology

Designation of Project: Principal Investigator and Solution Architect.

Brief Description:

This research and development project revolves around the development of a personalized home automation system that can facilitate residents by providing intelligent surveillance, comfort, entertainment, and personalized control that can fit with the current home infrastructure. It had both software and hardware components associated with it. We successfully implemented and integrated both software and hardware designs.

The first module of the project was a surveillance system; it was developed to keep track of the resident's vehicle(s). The second module was the detection of human motion and the resident's recognition, if an unrecognized visitor was trying to enter the house, the system sends an alert to the resident's mobile. The third module allowed the user to view or control appliances remotely. The Fourth module focused on user profiling by learning user behavior using machine learning approaches. The last module implements voice recognition and commands through calls. This project facilitates an ordinary home into a smarter home, providing comfort, surveillance, and entertainment.

This project was developed under the umbrella of the Office of Research, Innovation, and Commercialisation (ORIC), COMSATS Lahore.

Smart Parkinson Patient Monitoring System

Funded by: National I.C.T Research and Development Fund by the Ministry of Information Technology

Designation: Principal Investigator and Solution Architect.

Brief Description:

Proposed the system that used sensors to monitor Parkinson's Patients continuously. This project had both software and hardware requirements. We identified sensors and developed their wearing interface and then write the software that integrates everything.

Different body sensors were tied on different body parts of the Parkinson's patient, and if any part shows abnormal movement by analyzing the sensor pattern, it will be sensed, recorded, and transmitted to the healthcare center or doctor through cellular/wireless infrastructure to help the doctor for the precise prescription for the patient.

3.3 Supervised Student Projects

I have supervised 36 undergraduate honors and 3 master's students. Following are titles of some of the research and development-based undergraduate projects that I managed:

- Interactive human facial emotion recognition system.
- Robot path identification and map construction (awarded best project, 2011).
- Computer control using finger movement.
- Interactive human emotion recognition through voice and facial expressions.
- Content-based video retrieval using object classification.
- Smart traffic surveillance and vehicular identification system.
- Autonomous mobile robot (car) path identification and obstacle avoidance.
- Camera surveillance using mobile phones.
- Smart Parkinson patient monitoring system.
- Smart home automation and personalization (awarded best project, 2012).
- 3D area reconstruction using autonomous mobile robots.

4. Systems Limited (April 2009 – July 2009)

Designation: Software Engineer

URL: www.systemsltd.com

Address: Chamber of Commerce Building 11, Sharae Aiwane Tijarat, Lahore, Pakistan.

Project: Vsi-Title.

Technology Used: Java Server Faces, java.

Responsibility: Analyse, design, and implement.

Main Tasks:

- Understand and review requirements, design, code, and identify improvements.
- Implement assigned Component.
- Implemented Report Functionality and reports using BIRT.

5. NICTA Neville Roach (November 2008 – February 2009)

Designation: Software Developer and Research Scholar

URL: www.nicta.com.au

Address: Laboratory 223 Anzac Parade Kensington NSW 2052 Australia

Name of Supervisor: Dr. Jian Zhang

Project: Vehicle Detection and Tracking for Embedded System

Technology Used: c/c++ (on Linux).

Responsibility: Analyse, research, design, and implement.

Brief Description:

In this research and development project, my main aim was to study and do research on existing traffic detection algorithms, and then modify or propose new methods, whose implementation can run on an embedded system.

Achievement:

I was able to successfully propose and implement the algorithms that ran on embedded devices manufactured by 3DLABS.

6. CambridgeDocs (August 2007 – November 2007)

Designation: Software Engineer

URL: www.cambridgedocs.com

Address: 40 – Saddiq Trade center Gulberg Lahore Pakistan

Projects: In-design plug-in for document conversion and RTFJ2.

Technology Used: C/C++, java.

Responsibility: Analyse, design, and implement.

Main Tasks:

- Analyse requirements and develop the general architecture of the system.
- Develop a simple plug-in that uses Docx capability to convert the document.
- Develop a server that can convert InDesign documents to other formats.
- Integrate the Server conversion option so that users can remotely convert InDesign documents.
- Write part of the application which converts some of the RTF file struts to a standard XML file so that XML could be used to convert it to any other format.
- Fix bugs as per assigned.

7. Techlogix (October 2006 – August 2007)

Designation: Software Quality Assurance Engineer

URL: www.techlogix.com

Address: 39 Empress Road Lahore Pakistan.

Projects: Motorola (U.S.A) Cost Pledge and Picateers

Technology Used: BPM studio, Java struts, load runner, and QTP.

Responsibility: Manual testing, writing test scripts, reporting bugs, and writing and executing test plans.

Main Tasks:

- Review and analyze requirement specification and functional specification documents and propose required changes in design.
- Test the solution that is used to automate the SC Pledge process and its integration with the NPI dashboard.
- Write test scripts to test the application functionally.
- Write scripts to load test the application.
- Report bugs and help remove the bugs from the application
- Deploy the Application.

8. Teaching Assistant at Punjab University Pakistan (2002-2006)

Designation: Teaching Assistant

URL: www.pucit.edu.pk

Address: Hostel Rd Katchery Road Lahore, Pakistan.

My main responsibilities as “Teaching Assistant” at Punjab University during my undergraduate were to conduct labs and check lab assignments. I did this job for the following courses:

- Introduction to Information Technology.
- Computer Programming.
- Software Engineering.
- Object-Oriented Analysis and Design.
- Web Development (using Java).

Achievements

Grants:

- I was awarded a Ph.D. scholarship for a 3D hyperspectral analysis of meat to identify meat contamination project as a supervisor by CSIRO under the AI4M program.
- I was awarded a grant under the CAS-CSIRO partnership for a project titled “Novel AI and hyperspectral-based tool to select salt-tolerant legumes to increase grain and pasture production”
- Applying grant for analyzing protein content in different varieties of chickpeas using hyperspectral imaging and machine learning.
- Got a grant for Personalized Smart Home Automation which was funded by COMSATS and the National I.C.T Research and Development Fund by the Ministry of Information Technology, Pakistan.
- Got a grant for the Smart Parkinson Patient Monitoring System which was funded by the National I.C.T Research and Development Fund by the Ministry of Information Technology.

Others:

- Main Article Reviewer for following notable conferences and Journals.
 - Pattern Recognition (PR) Journal.
 - IEEE Transactions on Image Processing (IEEE TIP) Journal.
 - WACV conference.
 - DICTA conferences.
- Awarded Ph.D. tuition and living scholarship from Griffith University.
- Got funding in COMSATS for various research and development projects.
- 85% marks in the Artificial intelligence online course offered by Peter Norvig and Sebastian Thrun (Stanford University Professors).
- Successfully Organised Project Exhibition and job fair in spring 2011 at COMSATS.
- Co-Founder of “Intelligent Machines and Robotics” **Research Group** at COMSATS Lahore
- Participated as a Judge in the **ACM** Speed programming competition at COMSATS.
- Selected as Research Scholar for **NICTA** STAR Project
- Participated in **ACM** programming competition Representing ANU.
- Participated in **Softec 2006** in Dynamic Programming represented P.U.C.I.T.
- Got certification for **J2EE** development using struts, hibernate, and spring.

Technical Skills

Development Languages:

C/C++, Java, PHP, Python, R, JavaScript, Objective C, C#, Assembly Language.

Selected Tools, Frameworks, and Libraries:

OpenCV, PyTorch, TensorFlow, NumPy, MATLAB, Octave, Data mining tools like Orange and Weka, versioning tools like svn and Github, Silex, Twig, Vue.js, Angular, Symfony, Laravel, Visual Studio, Java Struts, JavaServer Faces, Crystal Reports, BPM studio, Bea web Logics server, Apache Tomcat, Rational Rose, Visio, Macromedia Flash, Load Runner, Microsoft Project Manager, etc.

Database:

SQL server 2003, MySQL, and Oracle.

References

Available on Demand.