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OBJECTIVE

To be a part of a dynamic and progressive academic organization that is involved in research and development of artificial intelligence based cutting edge challenges of national interest.

EXPERIENCE

Feb 2015 – till date COMSATS University

Assistant Professor

- Courses taught: Artificial Intelligence, Machine learning, Neural Networks, Computer Architecture, System Programming, Design and analysis of algorithm, Data Structures
- Supervised an M-Phil student in *Lungs Cancer Diagnosis* research domain
- Supervised a number of final year projects in the field of *Arduino based robotic control, Machine learning and Neural Networks*
- Research related activities include various areas of artificial intelligence such as *License Number Plate detection and recognition, Sign language Recognition for assisting hearing-impaired community, Heart disease diagnosis using machine learning, early disease identification in crops*

Aug 2013 – Feb 2015 Vision Photonics (Pvt) Ltd.

Senior Manager

Responsible for liaison with different organizations for Business Development.

Aug 2005 – Feb 2013 Advance Engineering Research Organization (AERO)

Consultant Image processing

- A multi-board (compact stackable solution) and multilayer PCBs design in PROTEL, Altium, SPECTRAA, and HyperLYNX were used for routing
- Development of Image processing algorithms in Matlab and their implementation in verilog HDL
- Verification test benches for hardware design testing using Verilog HDL

Jan 2002 – Aug 2005 Carrier Telephone Industries, Islamabad

Senior Design Engineer

- Designed an O&M module for a Multi-channel Digital Radio (MCDR)
- Hardware/Firmware of Analog Interface modules for the MCDR
- Matlab Signal and image processing toolbox for DSP algorithms
- Designing Multi-Layer PCBs in PROTEL99 and routing in SPECCTRA

ACADEMIC QUALIFICATION

In progress	PhD from University of Engineering and Technology, Taxila (In Progress)
2004-2006	Center for Advanced Studies in Engineering (CASE) Masters in Computer Engineering (CGPA 3.0/4.0) (Aug, 2006)
1997-2001	Moscow Power Engineering Institute (Technical University), BS Computer Engineering (grade excellent/A grade), (July, 2001)

Final year project

Estimation of various functions using Analog Devices ADSP-218x processors AND Applications and Implementation of Digital filters (theoretical case study)

RESEARCH WORK EXPERIENCE

- **Adaptive Framework for Multi-Feature Hybrid Object Tracking**
(This paper has been Accepted in the MDPI Applied Sciences Journal, it is published in Appl. Sci. 2018, 8(11), p. 2294)

Object tracking is a computer vision task deemed necessary for high-level intelligent decision-making algorithms. Researchers have merged different object tracking techniques and discovered a new class of hybrid algorithms that is based on embedding a meanshift (MS) optimization procedure into the particle filter (PF) (MSPF) to replace its inaccurate and expensive particle validation processes. The algorithm employs a combination of predetermined features, implicitly assuming that the background will not change. However, the assumption of fully specifying the background of the object may not often hold, especially in an uncontrolled environment. The first innovation of this research paper is the development of a dynamically adaptive multi-feature framework for MSPF (AMF-MSPF) in which features are ranked by a ranking module and the top features are selected on-the-fly. As a consequence, it improves local discrimination of the object from its immediate surroundings. It is also highly desirable to reduce the already complex framework of the MSPF to save resources to implement a feature ranking module. Thus, the second innovation of this research paper introduces a novel technique for the MS optimization method, which reduces its traditional complexity by an order of magnitude. The proposed AMF-MSPF framework is tested on different video datasets that exhibit challenging constraints. Experimental results have shown robustness, tracking accuracy and computational efficiency against these constraints. Comparison with existing methods has shown significant improvements in term of root mean square error (RMSE), false alarm rate (FAR), and F-SCORE.

- **Integration of Mean-Shift and Particle Filter: A Survey**

(This paper has been Accepted in FIT 2014 , paper included in the final proceedings appearing in IEEE Xplore)

Object tracking has become the cornerstone of many computer vision applications. Numerous object tracking methods have surfaced in the research community which are intended for high level applications such as automatic data analysis for activity recognition. Most of the methods are either too constrained in the context of the given application or they are costly in terms of computations to meet the real-time requirements. For example, Mean-Shift (MS) has rose to prominence due to its ease of implementation and robustness to various deformations however it fails to track objects with small sizes, fast motion and full occlusion. On the other hand, Particle Filter (PF) is known for its efficiency, accuracy and robustness to small sizes, fast object motion and full occlusion however it is heavily influenced by the number of particles. Decoupling the disadvantages of both the methods gave birth to a new era of modern trackers known as hybrid systems that are more efficient, accurate and robust to the aforementioned constraints. A few survey papers on object tracking has been published in the scientific circles during the last decade however we feel that this popular integration of MS and PF is still unregistered.

- **Realization of Balanced Contrast Limited Adaptive Histogram Equalization (B-CLAHE) for Adaptive Dynamic Range Compression of real time medical images**

(This paper has been Accepted in IBCAST 2013 , paper included in the final proceedings appearing in IEEE Xplore)

Medical devices these days come with very high dynamic range outputs to diagnose various diseases. This high dynamic range images should not only be compressed but also the contrast of the image must be enhanced to preserve the details on common display devices. This paper looks into the implementation of Balanced Contrast Limited Adaptive Histogram Equalization (BCLAHE) for Adaptive Dynamic Range Compression (ADRC) of real time medical images. This method is specifically targeted at situations where continuous exposure is required. For example in X-ray, CT-Scan or IR imaging, the real time video of the target is observed until the region of interest (ROI) is identified. The proposed implementation scheme is tested and has shown good results in terms of latency and perceptibility of minute details.

CONFERENCE AND SEMINAR ATTENDED

- International Conference on Computer Vision ICCV-2009 (**JAPAN**)
- International Conference on Machine Vision ICMV-2007 (**PAKISTAN**)
- International Conference on Frontiers of Information Technologies FIT-2014 (**PAKISTAN**)

RESEARCH PUBLICATION

- [1] A. Khattak, G. Raja, and N. Anjum, "Adaptive Framework for Multi-Feature Hybrid Object Tracking," *Applied Sciences*, vol. 8, p. 2294, 2018.
- [2] S. Khattak, G. Raja, N. Anjum, and M. Qasim, "Integration of mean-shift and particle filter: a survey," in *2014 12th International Conference on Frontiers of Information Technology (FIT)*, 2014, pp. 286-291.
- [3] R. Khan, M. Talha, A. S. Khattak, and M. Qasim, "Realization of Balanced Contrast Limited Adaptive Histogram Equalization (B-CLAHE) for Adaptive Dynamic Range Compression of Real Time Medical Images," in *Proceedings of 2013 10th International Bhurban Conference on Applied Sciences & Technology (IBCAST)*, 2013, pp. 117-121.

SKILLS

PYTHON programming environment	Proficiency in high level machine learning and deep learning libraries such as scikit-learn, tensorflow, keras.
MATLAB	Expert level proficiency in Matlab environment. Intensive experience in the Image Processing, Computer Vision and Machine Learning tool boxes.
Verilog HDL	Chip designing using Verilog HDL for hardware implementation of image processing algorithms. Other languages include C/C++, Assembly Language Programming,
General Computer literacy	Microsoft word, Photoshop, Coreldraw, and animation tools such as Macromedia Flash.