R A O M U H A M M A D U M E R

Research Statement

My research revolves around a broad spectrum of **image restoration** problems, particularly in **image super-resolution**, **image deblurring**, and **image denoising**.

Research Interests

Computational Imaging, Image Restoration, Camera pipeline, Computer Vision, Machine Learning, Deep Learning, Medical Imaging.

Education

Nov 2018 - 2021	**PhD in Industrial and Information Engineering**, *University of Udine*, Udine, Italy. Research Area: Computer Vision and Deep Learning
Nov 2014 - 2016	**MS in Computer Science**, *Pakistan Institute of Engineering and Applied Sciences*, Nilore, Islamabad, Pakistan. Area: Computational Intelligence and Machine Learning Cgpa: 3.45/4.0, ranked in top 5% of the class.
Sep 2010 - 2014	**BSc. in Computer Systems Engineering**, *The Islamia University of Bahawalpur*, Bahawalpur, Pakistan. Major Subjects: AI, Parallel and Distributed Computing, Image Processing Cgpa: 3.82/4.0, ranked in top 5% of the class.
Sep 2008 - 2010	**FSc. in Pre-Engineering**, *Government Post Graduate College*, Sahiwal, Pakistan. Major Subjects: Mathematics, Physics, Chemistry Percentage average: 86%, 943/1100 Marks.
Mar 2006 - 2008	**Matriculation in Science**, *Lasani Public High School*, Sahiwal, Pakistan. Major Subjects: Mathematics, Physics, Chemistry, Biology Percentage average: 92%, 783/850 Marks.

Professional Experience

Dec 2017 - Sep 2018	**Research Fellow**, *Computational Imaging Group (CIG)* at the Skolkovo Institute of Science and Technology, Moscow, Russia.
Nov 2016 - 2017	**Lecturer**, *Department of CS & IT, The University of Lahore*, Lahore, Pakistan. Taught courses: ● Computer Vision, ● Data Structures and Algorithms, ● Digital Logic Design, ● Business Computing, ● Programming Fundamentals - I, ● Introduction to Information and Communication Technologies. **Note:** All taught courses materials are available at: https://raoumer.github.io/courses.html

Given Seminars

May 2020	Deep Neural Networks for Super-Resolution, *Deep Learning and more for Computer Vision Applications seminar*, Universit Politecnica delle Marche (UNIVPM), Italy.
Aug 2016	Deep Learning & GPUs, *Introduction to DNNs workshop*, Pakistan Institute of Engineering and Applied Sciences (PIEAS), Islamabad, Pakistan.
Feb 2016	Implementation of Linear Regression and Multi-variate Regression on GPU using Cuda C/C++, *GPU Computing workshop*, Pakistan Institute of Engineering and Applied Sciences (PIEAS), Islamabad, Pakistan.

Research Publications

Conference Publications:

NeurIPS 2021   **Rao Muhammad Umer**, and Christian Micheloni. *"RBSRICNN: Raw Burst Super-Resolution through Iterative Convolutional Neural Network"*. In proceedings of the 35th Conference on Neural Information Processing Systems (NeurIPS) Workshops, December 06–14, 2021, Australia.

SpliTech 2021   **Rao Muhammad Umer**, Asad Munir, and Christian Micheloni. *"A Deep Residual Star Generative Adversarial Network for multi-domain Image Super-Resolution"*. In proceedings of the 6th International Conference on Smart and Sustainable Technologies, Sept. 08–11, 2021, Croatia.

CVPR 2021   Goutam Bhat, Martin Danelljan, Radu Timofte, and others. *"NTIRE 2021 Challenge on Burst Super-Resolution: Methods and Results"*. In proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, June 19–25, 2021, USA.

ICPR 2020   **Rao Muhammad Umer**, Gian Luca Foresti, and Christian Micheloni. *"Deep Iterative Residual Convolutional Network for Single Image Super-Resolution"*. In proceedings of the IEEE International Conference on Pattern Recognition (ICPR), Jan 10–15, 2021, Italy.

ECCV 2020   **Rao Muhammad Umer**, and Christian Micheloni. *"Deep Cyclic Generative Adversarial Residual Convolutional Networks for Real Image Super-Resolution"*. In proceedings of European Conference on Computer Vision (ECCV) Workshops, August 24–28, 2020, UK.

ECCV 2020   Pengxu Wei, Hannan Lu, Radu Timofte, Liang Lin, Wangmeng Zuo, and others. *"AIM 2020 Challenge on Real Image Super-Resolution: Methods and Results"*. In proceedings of European Conference on Computer Vision (ECCV) Workshops, August 24–28, 2020, UK.

ECCV 2020   Kai Zhang, Martin Danelljan, Yawei Li, Radu Timofte and others. *"AIM 2020 Challenge on Efficient Super-Resolution: Methods and Results"*. In proceedings of European Conference on Computer Vision (ECCV) Workshops, August 24–28, 2020, UK.

CVPR 2020   **Rao Muhammad Umer**, Gian Luca Foresti, and Christian Micheloni. *"Deep Generative Adversarial Residual Convolutional Networks for Real-World Super-Resolution"*. In proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, June 14–19, 2020, USA.

CVPR 2020   Andreas Lugmayr, Martin Danelljan, Radu Timofte, and others. *"NTIRE 2020 Challenge on Real-World Image Super-Resolution: Methods and Results"*. In proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, June 14–19, 2020, USA.

ICDSC 2019   **Rao Muhammad Umer**, Gian Luca Foresti, and Christian Micheloni. *"Deep Super-Resolution Network for Single Image Super-Resolution with Realistic Degradations"*. In 13th International Conference on Distributed Smart Cameras (ICDSC), Sept. 9-11, 2019, Trento, Italy.

Theses and Dissertation:

UNIUD 2021	**Rao Muhammad Umer**. *"Deep Convolutional Neural Networks for Image Super-Resolution"*. Ph.D. dissertation, Department of Industrial and Information Engineering, University of Udine (UNIUD), Udine, Italy.
PIEAS 2016	**Rao Muhammad Umer**. *"Deep Web Extractor (DWX): Content Discovery From Deep Web Using Large Scale Data Analytics Paradigm"*. MS Thesis, Pakistan Institute of Engineering and Applied Sciences (PIEAS), Islamabad, Pakistan.
IUB 2014	**Rao Muhammad Umer**. *"Spam Filtering System: Malicious Email Detection and Filtering System Using Bayesian Machine Learning Algorithm"*. Technical Report, The Islamia University of Bahawalpur (IUB), Bahawalpur, Pakistan.

Reviewing Activities

JOURNAL REVIEWER	*Transaction on Pattern Analysis and Machine Intelligence (TPAMI), Pattern Recognition Letters (PRL).*
CONFERENCE REVIEWER	*International Conference of Pattern Recognition (ICPR).*

AI Summer Schools

AUG 2021	Oxford Machine Learning Summer School, (Virtual) in August 9–20, 2021, at University of Oxford, UK.
JUN 2019	AI-DLDA 2019 International Summer School on Artificial Intelligence, in June 3–7, 2019, at University of Udine, Italy.

Honors and Awards

NOV 2018 - 2021	**PhD Fellowship**, *sponsored by Italian Govt. for PhD studies.*
OCT 2016	**Best MS Thesis Award**, *from the Department of Computer and Information Sciences, PIEAS, Islamabad, Pakistan.*
NOV 2014 - 2016	**MS Fellowship**, *sponsored by the PIEAS IT-Endowment Fund for MS studies.*
SEP 2010 - 2014	**Fully Funded National ICT Scholarship**, *sponsored by the National ICT R & D Fund for BSc. studies.*
JUN 2011 - 2014	**Position Scholarship**, *by University College of Engineering and Technology, The Islamia University of Bahawalpur for excellent academic performance throughout undergraduate degree.*
SEP 2010 - 2014	**Merit Scholarship**, *by Punjab Educational Endowment Fund(PEEF) for excellent academic performance in higher secondary school examination.*
SEP 2008 - 2010	**Merit Scholarship**, *by Multan Board of Intermediate and Secondary Education for excellent academic performance in secondary school examination.*
MAR 2006 - 2008	**Merit Scholarship**, *by Multan Board of Intermediate and Secondary Education for excellent academic performance in District level school examination.*

Skills

Languages	• Native: Urdu, Punjabi	• English: Fluent
Hobbies	• Cricket, Running	• Reading World History
Programming	Python, C/C++, Java, MATLAB.	
Scientific Software	Pytorch, Cuda C/C++, Numpy, Scikit-learn, OpenCV, Flask, Git, Latex.	
Computer Skills	Experienced in managing Linux and Windows systems.	