Munish Kumar, Ph.D.

(UGC-NET, GATE Qualified)

Contact No**.: +91-98723-19157**

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Website: https://mrsptu.irins.org/profile/147833

Date of Birth: 03rd June, 1984

Featured in Stanford University's 2022 World Ranking of the Top 2%

Objective:

To grow in the field of computer education, research and development through learning, enhancing self-development and contributing both as a human being and as a professional. To, develop a world-class center of excellence for teaching/learning and research.

Specialization: Handwriting Recognition; Image Processing; Machine Learning; Pattern Recognition

Research Summary:

Google Scholar: Total citations = 3454, H-Index = 31, i10 Index=71

SCI-JCR Accumulative Impact Factor (TIF): 457.028 (Highest Impact Factor: 17.564)

Experience Summary:

Total: 12+ Years
Research: 10+ Years

Teaching Experience

Organization	Designation	Duration	
		From	**To**
Maharaja Ranjit Singh Punjab Technical University, Bathinda	Assistant Professor, Computational Sciences	12.08.2016	Working
P.U. Rural Centre, Kauni, Muktsar	Assistant Professor, Computer Science	06.09.2013	11.08.2016
P.U. Constituent College, Sikhwala, Muktsar	Assistant Professor, Computer Science	03.08.2011	30.04.2013
GGS College for Women, Sec 26, Chandigarh	Assistant Professor, Computer Sci. and Appl.	07.08.2010	02.08.2011
Punjabi University Neighbourhood Campus, Jaito, Faridkot	Assistant Professor, Computer Science	03.10.2008	06.08.2010

Educational Qualification:

Degree	Specialization	University/Board	Passing Year
Ph. D	Computer Science	Thapar University Patiala, Punjab	2015
M. E.	Computer Science & Engineering	Thapar University Patiala, Punjab	2008
M.Sc.	Computer Science	Bharath Institute of Higher Education and Research, Chennai	2006

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B.Sc.	Information Technology	IKG Punjab Technical University, Jalandhar	2005
DOEACC A LEVEL	Computer Science	DOEACC Society, New Delhi	2004
Poly. Diploma	Computer Science & Engineering	Punjab State Technical Education & Industrial Training, Chandigarh	2003
10th	General Subjects	Punjab School Education Board, Mohali	2000

Title of Ph. D. Thesis:

"*Offline Handwritten Gurmukhi Script Recognition*"under the supervision of Dr. R. K. Sharma, Ex-Professor, CSED, Thapar University, Patiala (Now Vice-Chancellor, Jaypee University, Waknaghat, Himachal Pradesh, India) and co-supervision of Dr. Manish Jindal (Professor, Panjab University, Chandigarh, UT, India).

Title of M. E. Thesis:

"*Web Page Ranking Solution Through Snorm (P) Algorithm Implementation*" under the supervision of Dr. Ravinder Kumar, Associate Professor, CSED, Thapar University, Patiala, Punjab, India.

Research Guidance:

I am supervising research scholars in the domain of Handwriting Recognition, Machine Learning and Pattern Recognition.

    (a) Ph.D. Students Guided   06 (Completed) + 04 (Pursuing)
    (b) M. Tech Students Guided   08 (Completed)

Research Projects:

    (a) Principal Investigator   02 (filed)
    (b) Co-principal Investigator   01 (Granted)

Books:

    i. UGC-NET/JRF/SET Computer Science & Applications (PAPER-II), D.P.S. Publishing House, New Delhi, 2021. ISBN No. 9789390157204.
    ii. Machine Learning in Image Analysis and Pattern Recognition, MDPI, 2021, ISSN No. 2306-5729.
    iii. Data Science Using Python, D.P.S. Publishing House, New Delhi, 2022. In Press

Benchmark Dataset Published:

    i. Offline Handwritten Gurmukhi Benchmark Data Set
      https://sites.google.com/view/gurmukhi-benchmark
    ii. Postal Automation: Benchmark Gurmukhi Data Set
      https://sites.google.com/view/gurmukhi-benchmark/home/word-level-gurmukhi-dataset?authuser=0
    iii. Handwritten Urdu Characters Data Set
      https://www.kaggle.com/surindersinghkhurana/handwritten-urdu-characters-dataset

Patents Granted/Filed:

    i. "Agricultural fertilizer spreading apparatus and method thereof" Application No.

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TEMP/E-1/26636/2019-DEL
ii. "Real time object recognition method" Application No. 2020103520 (Australian Government, IP Australia) Granted
iii. "A method to word recognition for the postal automation and a system thereof" Application No. 2021100089 (Australian Government, IP Australia) Granted
iv. "A method for gender classification based on offline handwriting and a system thereof" Application No. 2021101078 (Australian Government, IP Australia) Granted

International Collaborators:

I have a passion for research-oriented activities and collaboration with a few renowned international and national faculty members. Details are as follows:

i. Prof. (Dr.) Ishwar Sethi
School of Engineering and Computer Science,
Oakland University, Rochester, MI 48309, USA
E-mail: isethi@oakland.edu

ii. Prof. (Dr.) Xiao-Zhi Gao
Professor,
School of Computing,
University of Eastern Finland, Kuopio, Finland
E-mail: xiao.z.gao@gmail.com

Administrative Experience:

I look forward to having the opportunity to fully contribute to the life of the department. I have a special interest in the area of admissions, examination work, hostel wardenship, etc. I had some experience in these roles at my present institution. Details are as follows:

Annexure-A

Research Publications:

My research interests include Character Recognition, Handwriting Recognition, Computer Vision, Machine Learning and Pattern Recognition. In these research areas, I have published more than 100 research articles including 92 articles in SCI-indexed journals. Details are as follows:

Annexure-B

Conference/Seminar/Short Term Courses/Faculty Development Program Attended:

I have attended the various international and national conferences in my research area. I have also participated in various STC/FDP for the development of my academic and research profile. Details are as follows:

Annexure-C

Conference/Seminar/Short Term Courses Organized:

Short Term Course on "Artificial Neural Network and Fuzzy Logic", at GZS Campus College of Engineering & Technology, Bathinda from 24th-28th April, 2017.

Additional Roles:

I am Associate Editor for 2 SCI Indexed journals in my research domain and working as Active Reviewers for various journals in Springer, Elsevier, ACM, and IEEE. Details are as follows:

Annexure-D

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References:

• **Dr. R. K. Sharma** Vice-Chancellor, Jaypee University Waknaghat, HP, India Former Professor, Department of Computer Science & Engineering, Thapar Institute of Engineering & Technology, Patiala 140 001, Punjab, INDIA E-mail: *rksharma@thapar.edu* Phone: +91-98722-02705	• **Dr. Krishan Kumar Saluja** Professor and Head, Department of Information Technology, UIET, Panjab University, Sec-25, Chandigarh 160 014, UT, INDIA E-mail: *k.salujauiet@gmail.com* Phone: +91-82880-12014
• **Dr. Manish Kumar Jindal** Professor Department of Computer Science and Applications, Panjab University Regional Centre, Sri Muktsar Sahib, Punjab, INDIA E-mail: manishphd@rediffmail.*com* Phone: +91-97793-51188	

Date: 17.01.2023   **(Dr. Munish Jindal)**

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Annexure-A

Administrative Experience

i. Associate Dean, IT Enabled Services, Maharaja Ranjit Singh Punjab Technical University, Bathinda

ii. Ph.D. Coordinator, Department of Computational Sciences, Maharaja Ranjit Singh Punjab Technical University, Bathinda

iii. Member, Faculty of Sciences, Maharaja Ranjit Singh Punjab Technical University, Bathinda

iv. Member, Administrative, Academic and Technical Committees of Department of Computational Sciences, Maharaja Ranjit Singh Punjab Technical University, Bathinda

v. Member, Department Research Board, Department of Computational Sciences, Maharaja Ranjit Singh Punjab Technical University, Bathinda

vi. Member of Admission Committee 2017-18, Maharaja Ranjit Singh Punjab Technical University, Bathinda

vii. Member of Admission Committee 2018-19, 2019-20, 2020-21 at Maharaja Ranjit Singh Punjab Technical University, Bathinda

viii. Member of Maharaja Ranjit Singh Punjab Technical University, Bathinda Youth Festival Committee 2017

ix. Placement Coordinator, Department of Computer Applications, Maharaja Ranjit Singh Punjab Technical University, Bathinda

x. Day Scholar Warden, Maharaja Ranjit Singh Punjab Technical University, Bathinda

xi. Member, Inspection Committees for granting courses affiliation to various colleges of Maharaja Ranjit Singh Punjab Technical University Bathinda

xii. In-charge at Punjabi University Neighbourhood Campus, Jaito (Faridkot) from Oct, 2008 to Aug, 2010.

xiii. Member, Board of Studies for Post-Graduate/Under-Graduate Computer Courses [MCA, BCA, M.Sc. (IT), BA/BSc (IT, Computer Science, Computer Applications), at Maharaja Ranjit Singh Punjab Technical University, Bathinda

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Annexure-B

Selected Publications in SCI/SCI-E Journals

(a) Published papers

[1] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "A Novel Feature Extraction Technique for Offline Handwritten Gurmukhi Character Recognition", *IETE Journal of Research*, Vol. 59(6), pp. 687-692, 2013. **(SCI Indexed) Impact Factor: 2.333** https://www.tandfonline.com/doi/abs/10.4103/0377-2063.126961

[2] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "Efficient Feature Extraction Techniques for Offline Handwritten Gurmukhi Character Recognition", *National Academy Science Letters*, Vol. 37(4), pp. 381-391, 2014. **(SCI Indexed) Impact Factor: 0.788** https://link.springer.com/article/10.1007/s40009-014-0253-4

[3] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "A Novel Hierarchical Technique for Offline Handwritten Gurmukhi Character Recognition", *National Academy Science Letters*, Vol. 37(6), pp. 567-572, 2014. **(SCI Indexed) Impact Factor: 0.788** https://link.springer.com/article/10.1007/s40009-014-0280-1

[4] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "A Framework for Grading Writers using Offline Gurmukhi Characters", *Proceedings of the National Academy of Sciences- Physical Science- A*, Vol. 86(3), pp. 405-415, 2016. **(SCI Indexed) Impact Factor: 1.544** https://link.springer.com/article/10.1007/s40010-016-0277-x

[5] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "Offline Handwritten Gurmukhi Character Recognition: Analytical Study of different Transformations", *Proceedings of the National Academy of Sciences- Physical Science- A*, Vol. 87(1), pp. 137-143, 2017. **(SCI Indexed) Impact Factor: 1.544** https://link.springer.com/article/10.1007/s40010-016-0284-y

[6] **Munish Kumar**, M. K. Jindal and R. K. Sharma, "A Novel Technique for Line Segmentation in Offline Handwritten Gurmukhi Script Documents", *National Academy Science Letters*, Vol. 40(4), pp. 273-277, 2017. **(SCI Indexed) Impact Factor: 0.788** https://link.springer.com/article/10.1007/s40009-017-0558-1

[7] **Munish Kumar**, and S. R. Jindal, "Devanagari Handwritten Grading System Based on Curvature Features", *Computer Modeling in Engineering & Sciences*, Vol. 113 (2), pp. 201- 209, 2017. **(SCI Indexed) Impact Factor: 1.610** https://www.techscience.com/CMES/v113n2/27349

[8] **Munish Kumar**, M. K. Jindal and R. K. Sharma, "A Novel Handwriting Grading System Using Gurmukhi Characters", *International Arab Journal of Information Technology*, Vol. 15 (6), pp. 945-950, 2018. **(SCI Indexed) Impact Factor: 0.724** http://iajit.org/index.php?option=com_content&task=view&id=1635&Itemid=25

[9] **Munish Kumar**, M. K. Jindal, R. K. Sharma and S. R. Jindal, "Offline Handwritten Numeral Recognition using Combination of Different Feature Extraction Techniques", *National Academy Science Letters*, Vol. 41(1), pp. 29-33, 2018. **(SCI Indexed) Impact Factor: 0.788** https://link.springer.com/article/10.1007/s40009-017-0606-x

Orcid Id: 0000-0003-0115-1620

[10] Malika Arora, **Munish Kumar** and N. K. Garg, "Facial Emotion Recognition Based on PCA and Gradient Features", *National Academy Science Letters*, Vol. 41 (6), pp. 365-368, 2018. **(SCI Indexed) Impact Factor: 0.788**
https://link.springer.com/article/10.1007/s40009-018-0694-2

[11] **Munish Kumar**, P. Chhabra and N. K. Garg, "An Efficient Content Based Image Retrieval System Using BayesNet and K-NN", *Multimedia Tools and Applications*, Vol. 77 (16), pp. 21557-21570, 2018. **(SCI Indexed) Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-017-5587-8

[12] Diksha Garg, N. K. Garg and **Munish Kumar**, "Underwater Image Enhancement using Blending of CLAHE and Percentile Methodologies", *Multimedia Tools and Applications*, Vol. 77 (20), pp. 26545-26561, 2018. **(SCI Indexed) Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-018-5878-8

[13] H. Kaur and **Munish Kumar**, "A Comprehensive Survey on Word Recognition for non-Indic and Indic Scripts", *Pattern Analysis and Applications*, Vol. 21(4), pp. 897-929, 2018. **(SCI Indexed) Impact Factor: 2.580**
https://link.springer.com/article/10.1007/s10044-018-0731-2

[14] **Munish Kumar**, M. K. Jindal, R. K. Sharma and S. R. Jindal, "A Novel Framework for Writer Identification Based on Pre-Segmented Gurmukhi Characters", *SADHANA*, Vol. 43(12), pp. 197, 2018. **(SCI Indexed) Impact Factor: 1.188**
https://link.springer.com/article/10.1007/s12046-018-0966-z

[15] P. Chhabra, N. K. Garg and **Munish Kumar**, "Content-Based Image Retrieval System using ORB and SIFT Features", *Neural Computing and Applications*, Vol. 32, pp. 2725–2733, 2020. **(SCI Indexed) Impact Factor: 5.606**
https://link.springer.com/article/10.1007/s00521-018-3677-9

[16] **Munish Kumar**, M. K. Jindal, R. K. Sharma and S. R. Jindal, "Character and Numeral Recognition for Non-Indic and Indic Scripts: A Survey", *Artificial Intelligence Review*, Vol. 52(4), pp. 2235-2261, 2019. DOI: 10.1007/s10462-017-9607-x **(SCI Indexed) Impact Factor: 8.139**
https://link.springer.com/article/10.1007/s10462-017-9607-x

[17] A. Kumar, A. Kaur and **Munish Kumar**, "Face Detection Techniques: A Review", *Artificial Intelligence Review*, Vol. 52(2), pp. 927-948, 2019. **(SCI Indexed) Impact Factor: 8.139**
https://link.springer.com/article/10.1007/s10462-018-9650-2

[18] **Munish Kumar** and S. R. Jindal, "Fusion of RGB and HSV Colour Space for Foggy Image Quality Enhancement", *Multimedia Tools and Applications*, Vol. 78(8), pp. 9791- 9799, 2019. **(SCI Indexed) Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-018-6599-8

[19] **Munish Kumar**, S. R. Jindal, M. K. Jindal and G. S. Lehal, "Improved Recognition Results of Medieval Handwritten Gurmukhi Manuscripts using Boosting and Bagging Methodologies", *Neural Processing Letters*, Vol. 50(1), pp. 43-56, 2019. **(SCI Indexed) Impact Factor: 2.908**
https://link.springer.com/article/10.1007/s11063-018-9913-6

Orcid Id: 0000-0003-0115-1620

[20] S. Dargon and **Munish Kumar**, "Writer Identification System for Indic and Non-Indic Scripts: State-of-the-art Survey", *Archives of Computational Methods in Engineering*, Vol. 26(4), pp. 1283-1311, 2019. **(SCI Indexed) Impact Factor: 7.302** https://link.springer.com/article/10.1007/s11831-018-9278-z

[21] P. Kaur, R. Kumar and **Munish Kumar**, "A Healthcare Monitoring System using Random Forest and Internet of Things (IoT)", *Multimedia Tools and Applications*, Vol. 78(14), pp. 19905-19916, 2019. **(SCI Indexed) Impact Factor: 2.757** https://link.springer.com/article/10.1007/s11042-019-7327-8

[22] S. Goel, R. Kumar, **Munish Kumar** and V. Chopra, "An Efficient Page Ranking Approach Based on Vector Norms using sNorm (p) Algorithm", *Information Processing and Management*, Vol. 56(3), pp. 1053-1066, 2019. **(SCI Indexed) Impact Factor: 6.222** https://www.sciencedirect.com/science/article/abs/pii/S0306457318305454

[23] **Munish Kumar** and S. R. Jindal, "A Study of Recognition of Pre-Segmented Handwritten Multi-lingual Characters", *Archives of Computational Methods in Engineering*, Vol. 27, pp. 577–589, 2020. **(SCI Indexed) Impact Factor: 7.302** https://link.springer.com/article/10.1007/s11831-019-09332-0

[24] S. R. Narang, M. K. Jindal and **Munish Kumar**, "Devanagari Ancient Character Recognition using DCT Features with Adaptive Boosting and Bootstrap Aggregating", *Soft Computing*, Vol. 23, pp. 13603–13614, 2019. **(SCI Indexed) Impact Factor: 3.643** https://link.springer.com/article/10.1007/s00500-019-03897-5

[25] S. R. Narang, M. K. Jindal and **Munish Kumar**, "Devanagari Ancient Character Recognition using Statistical Feature Extraction Techniques", *SADHANA*, Vol. 44: 141, 2019. **(SCI Indexed) Impact Factor: 1.188** https://www.ias.ac.in/describe/article/sadh/044/06/0141

[26] S. R. Narang, M. K. Jindal and **Munish Kumar**, "Drop Flow Method: An Iterative Algorithm for Complete Segmentation of Devanagari Ancient Manuscripts", *Multimedia Tools and Applications*, Vol. 78(16), pp. 23255-23280, 2019. **(SCI Indexed) Impact Factor: 2.757** https://link.springer.com/article/10.1007/s11042-019-7620-6

[27] S. Dargan, **Munish Kumar**, M. R. Ayyagari, and G. Kumar, "A Survey of Deep Learning and Its Applications: A New Paradigm to Machine Learning", *Archives of Computational Methods in Engineering*, Vol. 27, pp. 1071–1092, 2019. **(SCI Indexed) Impact Factor: 7.302** https://link.springer.com/article/10.1007/s11831-019-09344-w

[28] **Munish Kumar**, M. K. Jindal, R. K. Sharma, and S. R. Jindal, "Performance Evaluation of Classifiers for the Recognition of Offline Handwritten Gurumukhi Characters and Numerals: A Study", *Artificial Intelligence Review*, Vol. 53, pp. 2075–2097, 2020. **(SCI Indexed) Impact Factor: 8.139** https://link.springer.com/article/10.1007/s10462-019-09727-2

[29] R. P. Kaur, M. K. Jindal and **Munish Kumar**, "Recognition of Newspaper Printed in Gurmukhi Script", *Journal of Central South University*, Vol. 26(9), pp. 2495-2503,

2019 **(SCI Indexed) Impact Factor: 1.716**
https://link.springer.com/article/10.1007/s11771-019-4189-1

[30] S. R. Narang, M. K. Jindal and **Munish Kumar**, "Line Segmentation of Devanagari Ancient Manuscript", *Proceedings of the National Academy of Sciences- Physical Science- A*, Vol. 90, pp. 717–724, 2019. **(SCI Indexed) Impact Factor: 1.544**
https://link.springer.com/article/10.1007/s40010-019-00627-2

[31] A. Singh, V. Kadyan, **Munish Kumar**, and N. Baggan "ASRoIL: a comprehensive survey for automatic speech recognition of Indian languages", *Artificial Intelligence Review*, Vol. 53, pp. 3673–3704, 2020. **(SCI Indexed) Impact Factor: 8.139**
https://link.springer.com/article/10.1007/s10462-019-09775-8

[32] S. Gupta and **Munish Kumar**, "Forensic document examination system using boosting and bagging methodologies", *Soft Computing*, Vol. 24, pp. 5409–5426, 2020. **(SCI Indexed) Impact Factor: 3.643**
https://link.springer.com/article/10.1007/s00500-019-04297-5

[33] S. Gupta, **Munish Kumar** and A. Garg, "Improved Object Recognition Results using SIFT and ORB Feature Detector", *Multimedia Tools and Applications*, Vol. 78, pp. 34157–34171, 2019. **(SCI Indexed) Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-019-08232-6

[34] **Munish Kumar**, Surbhi Gupta, Xiao-Zhi Gao, Amitoj Singh, "Plant Species Recognition Using Morphological Features and Adaptive Boosting Methodology", *IEEE Access*, Vol. 7, pp. 163912-163918, 2019. **(SCI Indexed) Impact Factor: 3.367**
https://ieeexplore.ieee.org/document/8894140

[35] S. Dargan and **Munish Kumar**, A. Garg and K. Thakur, "Writer Identification System for Pre-Segmented Offline Handwritten Devanagari Characters using k-NN and SVM", *Soft Computing*, Vol. 24, pp. 10111–10122, 2019. **(SCI Indexed) Impact Factor: 3.643**
https://link.springer.com/article/10.1007/s00500-019-04525-y

[36] R. P. Kaur, **Munish Kumar** and M. K. Jindal, "Newspaper Text Recognition of Gurumukhi Script Using Random Forest Classifier", *Multimedia Tools and Applications*, Vol. 79, pp. 7435–7448, 2020. **(SCI Indexed) Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-019-08365-8

[37] S. Dargan and **Munish Kumar**, "A comprehensive survey on the biometric recognition systems based on physiological and behavioral modalities", *Expert Systems with Applications*, Vol. 143, 1131142020, 2020. **(SCI Indexed) Impact Factor: 6.954**
https://www.sciencedirect.com/science/article/abs/pii/S0957417419308310

[38] **Munish Kumar**, S. Gupta and N. Mohan, "A Computational Approach for Printed Document Forensics using SURF and ORB Features" *Soft Computing*, Vol. 24, pp. 13197-13208, 2020 **(SCI Indexed) Impact Factor: 3.643**
https://link.springer.com/article/10.1007/s00500-020-04733-x

[39] S. Gupta, K. Thakur and **Munish Kumar**, "2D-Human Face Recognition Using SIFT and SURF descriptors of Face's Feature Regions" *The Visual Computer*, Vol. 37,

Orcid Id: 0000-0003-0115-1620

pp. 447-456, 2021, **(SCI Indexed) Impact Factor: 2.601**
https://link.springer.com/article/10.1007/s00371-020-01814-8

[40] M. Bansal, **Munish Kumar**, and M. Kumar, "2D Object Recognition Techniques: State- of-the-Art Work", *Archives of Computational Methods in Engineering*, Vol. 28, pp. 1147-1161, 2021 **(SCI Indexed) Impact Factor: 7.302**
https://link.springer.com/article/10.1007/s11831-020-09409-1

[41] S. R. Narang, M. K. Jindal and **Munish Kumar**, "Ancient Text Recognition: A Review" *Artificial Intelligence Review*, Vol. 53, pp. 5517–5558, 2020. DOI: 10.1007/s10462-020-09827-4 **(SCI Indexed) Impact Factor: 8.139**
https://link.springer.com/article/10.1007/s10462-020-09827-4

[42] I. R. Parray, S. Singh and **Munish Kumar**, "Time Series Data Analysis of Stock Price Movement Using Machine Learning Techniques", *Soft Computing*, Vol. 24, pp. 16509- 16517, 2020. **(SCI Indexed) Impact Factor: 3.643**
https://link.springer.com/article/10.1007/s00500-020-04957-x

[43] S. R. Narang, M. K. Jindal, S. Ahuja, and **Munish Kumar**, "On the Recognition of Devanagari Ancient Handwritten Characters using SIFT and Gabor Features", *Soft Computing*, Vol. 24, pp. 17279-17289, 2020 **(SCI Indexed) Impact Factor: 3.643**
https://link.springer.com/article/10.1007/s00500-020-05018-z

[44] S. Gupta, N. Mohan and Munish Kumar, "A Study on Source Device Attribution using Still Images", *Archives of Computational Methods in Engineering*, Vol. 28, pp. 2209-2223, 2021 **(SCI Indexed) Impact Factor: 7.302**
https://link.springer.com/article/10.1007/s11831-020-09452-y

[45] R. P. Kaur, M. K. Jindal, and **Munish Kumar**, "Text and Graphics Segmentation of Newspaper Printed in Gurmukhi Script: A Hybrid Approach", *The Visual Computer*, Vol. 37, pp. 1637-1659, 2021 **(SCI Indexed) Impact Factor: 2.601**
https://link.springer.com/article/10.1007/s00371-020-01927-0

[46] Y. Kumar, N. Singh, **Munish Kumar**, and A. Singh "AutoSSR: an efficient approach for automatic spontaneous speech recognition model for the Punjabi Language", *Soft Computing*, Vol. 25, pp. 1617–1630, 2021 **(SCI Indexed) Impact Factor: 3.643**
https://link.springer.com/article/10.1007/s00500-020-05248-1

[47] M. Mittal, **Munish Kumar**, A. Verma, I. Kaur, B. Kaur, M. Sharma and L. M. Goyal, "FEMT: a computational approach for fog elimination using multiple thresholds", *Multimedia Tools and Applications*, Vol. 80, pp. 227–241, 2021 **(SCI Indexed). Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-020-09657-0

[48] M. Arora and **Munish Kumar**, "AutoFER: PCA and PSO Based Automatic Facial Emotion Recognition", *Multimedia Tools and Applications*, Vol. 80, pp. 3039–3049, 2021. **(SCI Indexed). Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-020-09726-4

[49] H. Kaur and **Munish Kumar**, "Offline Handwritten Gurumukhi Word Recognition Using eXtreme Gradient Boosting Methodology", *Soft Computing*, Vol. 25, pp. 4451-4464, 2021 **(SCI Indexed). Impact Factor: 3.643**

Orcid Id: 0000-0003-0115-1620

https://link.springer.com/article/10.1007/s00500-020-05455-w

[50] M. Bansal, **Munish Kumar**, M. Kumar, K. Kumar "An Efficient Technique for Object Recognition Using Shi-Tomasi Corner Detection Algorithm", *Soft Computing*, Vol. 25, 4423-4432, 2021 **(SCI Indexed). Impact Factor: 3.643** https://link.springer.com/article/10.1007/s00500-020-05453-y

[51] H. Kaur and **Munish Kumar** "On the Recognition of Offline Handwritten Word Using Holistic Approach and AdaBoost Methodology", *Multimedia Tools and Applications,* Vol. 80, pp. 11155-11175, 2021 **(SCI Indexed). Impact Factor: 2.757** https://link.springer.com/article/10.1007/s11042-020-10297-7

[52] A. Kumar, **Munish Kumar**, A. Kaur "Face Detection in Still Images under Occlusion and non-uniform illumination" *Multimedia Tools and Applications*, Vol. 80, pp. 14565-14590, 2021 **(SCI Indexed). Impact Factor: 2.757** https://link.springer.com/article/10.1007/s11042-020-10457-9

[53] S. Rani, M. Kaur and **Munish Kumar** "Detection of Shilling Attack in Recommender System for YouTube Video Statistics using Machine Learning Techniques", *Soft Computing*, 2021 (In Press), **(SCI Indexed). Impact Factor: 3.643** https://link.springer.com/article/10.1007/s00500-021-05586-8

[54] K. Kapoor, S. Rani, **Munish Kumar**, V. Chopra and G. S. Brar "Hybrid Local Phase Quantization and Grey Wolf Optimization Based SVM for Finger Vein Recognition", *Multimedia Tools and Applications*, Vol. 80, pp. 15233-15271, 2021 **(SCI Indexed). Impact Factor: 2.757** https://link.springer.com/article/10.1007/s11042-021-10548-1

[55] H. Singh, R. K. Sharma, V. P. Singh and **Munish Kumar** "Recognition of Online Handwritten Gurmukhi Characters Using Recurrent Neural Network", *Soft Computing*, Vol. 25, pp. 6329-6338, 2021 **(SCI Indexed). Impact Factor: 3.643** https://link.springer.com/article/10.1007/s00500-021-05620-9

[56] **Munish Kumar**, N. Singh, R. Kumar, S. Goel and K. Kumar "Gait Recognition Based on Vision Systems: A Systematic Survey", *Journal of Visual Communication and Image Representation*, Vol. 75, pp. 103052, 2021, **(SCI Indexed). Impact Factor: 2.678** https://www.sciencedirect.com/science/article/abs/pii/S1047320321000249

[57] S. Singh, U. Ahuja, **Munish Kumar**, K. Kumar and M. Sachdeva, "Face mask detection using YOLOv3 and faster R-CNN models: COVID-19 environment", M*ultimedia Tools and Applications*, Vol. 80, pp. 19753-19768, 2021 **(SCI Indexed). Impact Factor: 2.757** https://link.springer.com/article/10.1007/s11042-021-10711-8

[58] K. Shaheed, A. Mao, I. Qureshi, **Munish Kumar**, Q. Abbas, I. Ullah and X. Zhang, "A Systematic Review on Physiological-Based Biometric Recognition Systems: Current and Future Trends," *Archives of Computational Methods in Engineering*, 2021 **(SCI Indexed). Impact Factor: 7.302** https://link.springer.com/article/10.1007/s11831-021-09560-3

[59] L. M. Goyal, M. Mittal, **Munish Kumar**, B. Kaur, M. Sharma and A. Verma, "An

Orcid Id: 0000-0003-0115-1620

efficient method of multicolor detection using global optimum thresholding for image analysis, M*ultimedia Tools and Applications*, Vol. 80, pp. 18969-18991, 2021 **(SCI Indexed). Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-020-10365-y

[60] M. Bansal, **Munish Kumar** and M. Kumar, "2D Object Recognition: A Comparative Analysis of SIFT, SURF and ORB Feature Descriptors", *Multimedia Tools and Applications*, Vol. 80, pp. 18839-18857, 2021 **(SCI Indexed). Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-021-10646-0

[61] V. Chaturvedi, A. B. Kaur, V. Varshney, A. Garg, G. S. Chhabra and **Munish Kumar**, "Music mood and human emotion recognition based on physiological signals: a systematic review", *Multimedia Systems*, 2021 In Press **(SCI Indexed). Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s00530-021-00786-6

[62] S. R. Narang, **Munish Kumar** and M. K. Jindal, "DeepNetDevanagari: a deep learning model for Devanagari ancient character recognition", *Multimedia Tools and Applications,* Vol. 80, pp. 20671-20686, 2021 **(SCI Indexed). Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-021-10775-6

[63] M. Kumar, M. K. Jindal and **Munish Kumar**, "A Novel Attack on Monochrome and Greyscale Devanagari CAPTCHAs", *ACM Transactions on Asian and Low-Resource Language Information Processing,* Vol. 20(4), pp. 1-30, 2021 **(SCI Indexed). Impact Factor: 1.413**
https://dl.acm.org/doi/abs/10.1145/3439798

[64] F. Mushtaq, M. M. Misgar, **Munish Kumar** and S. S. Khurana, "UrduDeepNet: offline handwritten Urdu character recognition using deep neural network", *Neural Computing and Applications,* Vol. 33, pp. 15229-15252, 2022 **(SCI Indexed). Impact Factor: 5.606**
https://dl.acm.org/doi/abs/10.1145/3439798

[65] M. Kumar, M. K. Jindal and **Munish Kumar**, "A Systematic Survey on CAPTCHA Recognition: Types, Creation and Breaking Techniques", *Archives of Computational Methods in Engineering,* Vol. 29, pp. 1107-1136, 2022 **(SCI Indexed). Impact Factor: 7.302**
https://link.springer.com/article/10.1007/s11831-021-09608-4

[66] H. Kaur and **Munish Kumar**, "Signature identification and verification techniques: state-of-the-art work", *Journal of Ambient Intelligence and Humanized Computing,* 2021, In Press **(SCI Indexed). Impact Factor: 7.104**
https://link.springer.com/article/10.1007/s12652-021-03356-w

[67] S. Walia, K. Kumar, **Munish Kumar**, X. Z. Gao, "Fusion of handcrafted and deep features for forgery detection in digital images", *IEEE Access,* Vol. 9, pp. 99742-99755, 2021 **(SCI Indexed). Impact Factor: 3.367**
https://ieeexplore.ieee.org/abstract/document/9481119/

[68] **Munish Kumar**, M. K. Jindal, R. K. Sharma, S. R. Jindal and H. Singh, "Improved recognition results of offline handwritten Gurumukhi characters using hybrid features and adaptive boosting", *Soft Computing,* Vol. 25, pp. 11589-11601, 2021

12

(SCI Indexed). Impact Factor: 3.643
https://link.springer.com/article/10.1007/s00500-021-06060-1

[69] S. Dargan, **Munish Kumar** and S. Tuteja, "PCA-based gender classification system using hybridization of features and classification techniques", *Soft Computing,* Vol. 25, pp. 15281-15295, 2021 **(SCI Indexed). Impact Factor: 3.643**
https://link.springer.com/article/10.1007/s00500-021-06118-0

[70] Sitender, S. Bawa, **Munish Kumar** and Sangeeta, "A comprehensive survey on machine translation for English, Hindi and Sanskrit languages", *Journal of Ambient Intelligence and Humanized Computing,* 2021, In Press **(SCI Indexed). Impact Factor: 7.104**
https://link.springer.com/article/10.1007/s12652-021-03479-0

[71] M. Bansal, **Munish Kumar**, M. Sachdeva and A. Mittal, "Transfer learning for image classification using VGG19: Caltech-101 image data set", *Journal of Ambient Intelligence and Humanized Computing,* 2021, In Press **(SCI Indexed). Impact Factor: 7.104**
https://link.springer.com/article/10.1007/s12652-021-03488-z

[72] R. P. Kaur, M. K. Jindal, **Munish Kumar**, S. R. Jindal, S. Tuteja, "LineSeg: line segmentation of scanned newspaper documents", *Pattern Analysis and Applications,* Vol. 25, pp. 189-208, 2022 **(SCI Indexed). Impact Factor: 2.580**
https://link.springer.com/article/10.1007/s10044-021-01031-6

[73] K. Shaheed, A. Mao, I. Qureshi, **Munish Kumar**, S. Hussain, I. Ullah, X. Zhang, "DS-CNN: A Pre-trained Xception Model based on Depth-wise Separable Convolutional Neural Network for Finger Vein Recognition", *Expert Systems with Applications, Vol.* 191, 116288, 2022 **(SCI Indexed). Impact Factor: 6.954**
https://www.sciencedirect.com/science/article/abs/pii/S0957417421015943

[74] K. Shaheed, A. Mao, I. Qureshi, **Munish Kumar**, S. Hussain, I. Ullah, X. Zhang, "Recent Advancements in Finger Vein Recognition Technology: Methodology, Challenges and Opportunities", *Information Fusion, Vol. 79,* pp. 84-109, 2022 **(SCI Indexed). Impact Factor: 12.975**
https://www.sciencedirect.com/science/article/abs/pii/S1566253521002025

[75] A. Kaur, **Munish Kumar**, M. K. Jindal, "Shi-Tomasi corner detector for cattle identification from muzzle print image pattern", *Ecological Informatics,* Vol. 68, Article Number. 101549, 2022 **(SCI Indexed). Impact Factor: 3.142**
https://www.sciencedirect.com/science/article/abs/pii/S157495412100340X

[76] M. Kumar, **Munish Kumar**, M. K. Jindal, "Design of Innovative CAPTCHA for Hindi Language", *Neural Computing and Applications, In Press*, 2022 **(SCI Indexed). Impact Factor: 5.606**
https://link.springer.com/article/10.1007/s00521-021-06686-0

[77] R. Kaur, **Munish Kumar**, M. K. Jindal, "Performance evaluation of different features and classifiers for Gurumukhi newspaper text recognition", *Journal of Ambient Intelligence and Humanized Computing, In Press*, 2022 **(SCI Indexed). Impact Factor: 7.104**
https://link.springer.com/article/10.1007/s12652-021-03687-8

Orcid Id: 0000-0003-0115-1620

[78] TG San, SS Khurana, **Munish Kumar**, "Semi-supervised labeling: a proposed methodology for labeling the twitter datasets", *Multimedia Tools and Applications, In Press*, 2022 **(SCI Indexed). Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-022-12221-7

[79] S Koul, **Munish Kumar**, SS Khurana, F Mushtaq, K Kumar, "An efficient approach for copy-move image forgery detection using convolution neural network", *Multimedia Tools and Applications, In Press*, 2022 **(SCI Indexed). Impact Factor: 2.757**
https://link.springer.com/article/10.1007/s11042-022-11974-5

[80] K Shaheed, A Mao, I Qureshi, Q Abbas, **Munish Kumar**, X Zhang, "Finger-Vein Presentation Attack Detection using Depthwise Separable Convolution Neural Network", *Expert Systems with Applications, Vol. 198, 116786*, 2022 **(SCI Indexed). Impact Factor: 6.954**
https://www.sciencedirect.com/science/article/abs/pii/S0957417422002457

[81] A Kaur, **Munish Kumar**, MK Jindal, "Cattle identification with muzzle pattern using computer vision technology: a critical review and prospective", *Soft Computing, In Press*, 2022 **(SCI Indexed). Impact Factor: 3.643**
https://link.springer.com/article/10.1007/s00500-022-06935-x

[82] K Shaheed, A Mao, I Qureshi, **Munish Kumar**, S Hussain, I Ullah, X Zhang, "DS-CNN: A pre-trained Xception model based on depth-wise separable convolutional neural network for finger vein recognition", *Expert Systems with Applications, Vol. 191, 116288,* 2022 **(SCI Indexed). Impact Factor: 6.954**
https://www.sciencedirect.com/science/article/abs/pii/S0957417421015943

Selected Publications in other Journals

[83] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "Size of Training set vis-Ã–vis Recognition Accuracy of Handwritten Character Recognition System", *Journal of Emerging Technologies in Web Intelligence*, Vol. 5(4), pp. 380-384, 2013.
http://www.jetwi.us/index.php?m=content&c=index&a=show&catid=148&id=781

[84] S. Bansal, M. Garg and **Munish Kumar**, "A Technique for Offline Handwritten Character Recognition", *International Journal of Computing and Technology*, Vol. 1(2), pp. 210-215, 2014.
https://www.semanticscholar.org/paper/A-Technique-for-Offline-Handwritten-Character-Bansal-Garg/30e83335e6caa383b486fa174d0ffce95919f800

[85] **Munish Kumar**, M. K. Jindal and R. K. Sharma, "MDP Feature Extraction Technique for Offline Handwritten Gurmukhi Character Recognition", *Smart Computing Review*, Vol. 3(6), pp. 397-404, 2013.

[86] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "Segmentation of Isolated and Touching Characters in Offline Handwritten Gurmukhi Script Recognition", *International Journal of Information Technology and Computer Science*, Vol. 2, pp. 58-

Orcid Id: 0000-0003-0115-1620

63, 2013.
http://www.mecs-press.org/ijitcs/ijitcs-v6-n2/IJITCS-V6-N2-8.pdf

[87] **Munish Kumar**, M. K. Jindal and R. K. Sharma, "PCA Based Offline Handwritten Gurmukhi Character Recognition System", *Smart Computing Review*, Vol. 3(5), pp. 346- 357, 2013.

[88] **Munish Kumar**, S. Gupta, K. Kumar and M. Sachdeva, "Spreading of Covid-19 in India, Italy, Japan, Spain, UK, US: A Prediction Using ARIMA and LSTM Model", *Digital Government: Research and Practice*, Article No. 24, 2020.
https://dl.acm.org/doi/10.1145/3411760

Selected Publications in the Proceedings of International Conferences

[89] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "Segmentation of Lines and Words in Handwritten Gurmukhi Script Documents", *Proceedings of the First International Conference on Intelligent Interactive Technologies and Multimedia*, Allahabad, pp. 28-30, 2010.
https://dl.acm.org/doi/abs/10.1145/1963564.1963568

[90] **Munish Kumar**, M. K. Jindal and R. K. Sharma, "k-Nearest Neighbour Based Offline Handwritten Gurmukhi Character Recognition", *Proceedings of International Conference on Image Information Processing*, Jaypee University of Information Technology, Waknaghat (Shimla), pp. 1-4, 2011.
https://ieeexplore.ieee.org/document/6108863

[91] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "Classification of Characters and Grading Writers in Offline Handwritten Gurmukhi Script", *Proceedings of International Conference on Image Information Processing*, Jaypee University of Information Technology, Waknaghat (Shimla), pp. 1-4, 2011.
https://ieeexplore.ieee.org/document/6108859

[92] **Munish Kumar**, M. K. Jindal and R. K. Sharma, "Offline Handwritten Gurmukhi Character Recognition Using Curvature Feature", *Proceedings of International Conference on Advances in Modeling, Optimization and Computing*, IIT Roorkee, pp. 981- 989, 2011.

[93] S. Gupta, Y. J. Singh and **Munish Kumar**, "Object Detection Using Multiple Shape-Based Features", *Proceedings of International Conference on Parallel, Distributed and Grid Computing (PDGC-2018),* Jaypee University of Information Technology, Waknaghat (Shimla), pp. 433-437, 2017.
https://ieeexplore.ieee.org/document/7913234

[94] M. Khatri, **Munish Kumar** and A. Jain, "Pulmonary Lesion Detection and Staging from CT Images Using Watershed Algorithm", *Proceedings of the 8th International Conference on Advance Computing Conference (IACC), Benett University, Noida*, pp. 108- 112, 2018.
https://ieeexplore.ieee.org/document/8692125

[95] **Munish Kumar**, M. K. Jindal, R. K. Sharma and S. R. Jindal, "Performance Comparison of Several Feature Selection Techniques for Offline Handwritten

Orcid Id: 0000-0003-0115-1620

Character Recognition", *Proceedings of International Conference on Research in Intelligent and Computing in Engineering,* pp. 1-6, 2018. https://ieeexplore.ieee.org/document/8509076

[96] R. P. Kaur, M. K. Jindal and **Munish Kumar**, "Zone Segmentation of a Text line Printed in Gurmukhi Script Newspaper", *Proceedings of 5th International Conference on Parallel, Distributed and Grid Computing (PDGC-2018),* Jaypee University of Information Technology, Waknaghat (Shimla), pp. 330-334, 2018. https://ieeexplore.ieee.org/document/8745796

[97] H. Singh, R. K. Sharma and **Munish Kumar**, "A Benchmark Dataset of Online Handwritten Gurmukhi Script Words and Numerals", *Proceedings of the International Conference on Computer Vision and Image Processing*, Jaipur, India, 2019. https://link.springer.com/chapter/10.1007/978-981-15-4018-9_41

[98] R. P. Kaur, M. K. Jindal and **Munish Kumar**, "Newspaper Text Recognition of Gurumukhi Script using Random Forest Classifier", *Proceedings of International Conference on Machine Intelligence and Data Science Applications (MIDAS-2020),* 2020.

[99] H. Kaur and **Munish Kumar**, "Offline Handwritten Gurumukhi Place Names Recognition using Curve Fitting Based Features", *Proceedings of International Conference on Robotics, Machine Learning and Artificial Intelligence*, 2020.

[100] R. P. Kaur, M. K. Jindal and **Munish Kumar**, "TxtLineSeg: Text Line Segmentation of Unconstrained Printed Text in Devanagari Script", *Proceedings of International Conference on Computational Methods and Data Engineering,* pp. 85-100, 2020. https://link.springer.com/chapter/10.1007%2F978-981-15-7907-3_7

[101] M. Bansal, **Munish Kumar**, and M. Kumar "XGBoost: 2D-Object Recognition using Shape Descriptors and Extreme Gradient Boosting Classifier", *Proceedings of International Conference on Computational Methods and Data Engineering,* pp. 207-222, 2020. https://link.springer.com/chapter/10.1007/978-981-15-6876-3_16

[102] H. Kaur and **Munish Kumar**, "Feature Selection Techniques for Offline Handwritten Gurumukhi Place Name Recognition", *Proceedings of International Conference on Machine Intelligence and Data Science Applications (MIDAS-2020)*, 2020.

[103] M. Bansal, **Munish Kumar**, and M. Kumar "2D-Object Recognition: Performance Comparison of Various Feature Extraction Techniques for Caltech-101 Image Dataset", *Proceedings of International Conference on Advances and Applications of Artificial Intelligence & Machine Learning,* pp. 207-222, 2020.

[104] S. Dargan and **Munish Kumar**, "Writer Identification System Based on Offline handwritten Text in Gurumukhi Script", *Proceedings of International Conference on Parallel, Distributed and Grid Computing (PDGC-2020), 2020.*

Chapters in Edited Books

[105] **Munish Kumar**, M. K. Jindal and R. K. Sharma, "Review on OCR for Handwritten Indian Scripts Character Recognition", *Proceedings of the First International Conference on Digital Image Processing and Pattern Recognition*, DPPR, Vol. 205, pp.

Orcid Id: 0000-0003-0115-1620

268-276, 2011.
https://link.springer.com/chapter/10.1007%2F978-3-642-24055-3_28

[106] **Munish Kumar**, R. K. Sharma and M. K. Jindal, "SVM based Offline Handwritten Gurmukhi Character Recognition", *Proceedings of International Workshop on Soft Computing Applications and Knowledge Discovery*, National Research University Higher School of Economics, Moscow (Russia), pp. 51-62, 2011.
https://www.semanticscholar.org/paper/SVM-Based-Offline-Handwritten-Gurmukhi-Character-Kumar-Jindal/9de4d1b45832c8f27730c0b6ae38d70f59c476a4

[107] **Munish Kumar**, M. K. Jindal and R. K. Sharma, "Weka based Offline Handwritten Gurmukhi Character Recognition", *Proceedings of International Conference on Soft Computing for Problem Solving*, pp. 711-720, 2012.
https://link.springer.com/chapter/10.1007/978-81-322-1602-5_76

[108] S. Kataria, **Munish Kumar** and N. K. Garg, "Writer identification System for Handwritten Gurmukhi Characters: Study of Different Feature-Classifier Combinations", *International Conference on Computational Intelligence & Data Engineering* (ICCIDE-2017), pp. 125-131, 2017.
https://link.springer.com/chapter/10.1007/978-981-10-6319-0_11

[109] **Munish Kumar**, R. K. Sharma, M. K. Jindal, S. R. Jindal and H. Singh, "Benchmark Datasets for Offline Handwritten Gurmukhi Script Recognition", *Proceedings of the Workshop on Document Analysis and Recognition*, pp. 143-151, 2018.
https://link.springer.com/chapter/10.1007/978-981-13-9361-7_13

[110] H. Kaur and **Munish Kumar**, "Benchmark Dataset: Offline Handwritten Gurmukhi City Names for Postal Automation", *Proceedings of the Workshop on Document Analysis and Recognition*, pp. 152-159, 2018.
https://link.springer.com/chapter/10.1007/978-981-13-9361-7_14

[111] H. Singh, R. K. Sharma, R. Kumar, K. Verma, R. Kumar and **Munish Kumar**, "A Benchmark Dataset of Online Handwritten Gurmukhi Script Words and Numerals", *Proceedings of the International Conference on Computer Vision and Image Processing*, 457- 466, 2020.
https://link.springer.com/chapter/10.1007/978-981-15-4018-9_41

[112] V. Rani, **Munish Kumar**, A. Mittal and K. Kumar "Artificial Intelligence for Cybersecurity: Recent Advancements, Challenges and Opportunities", *In: Nedjah, N., Abd El-Latif, A.A., Gupta, B.B., Mourelle, L.M. (eds) Robotics and AI for Cybersecurity and Critical Infrastructure in Smart Cities. Studies in Computational Intelligence, vol 1030. Springer, Cham.*
https://link.springer.com/chapter/10.1007/978-3-030-96737-6_4

Orcid Id: 0000-0003-0115-1620

Annexure-C

i. Microsoft Sponsored Faculty Development Program on "Microsoft Office" from 18th-19th Sep, 2017.

ii. NITTTR Sponsored Short Term Course on "Data Mining and Business Intelligence", from 04th-08th Sep, 2017.

iii. NITTTR Sponsored Short Term Course on "SciLab Programming", from 21st-25th Aug, 2017.

iv. NITTTR Sponsored Short Term Course on "Wireless Networks", from 22nd-26th May, 2017.

v. NITTTR Sponsored Short Term Course on "Artificial Neural Network and Fuzzy Logic", from 24th-28th April, 2017.

vi. Google Sponsored Faculty Development Program on "Android Applications Development" from 09th-13th Jan, 2017.

vii. NITTTR Sponsored Short Term Course on "Open-Source Technologies Through ICT", from 29th Aug-02nd Sep, 2016

viii. National Workshop on Multilingual Technologies 2013 at Punjabi University, Patiala from 11th-17th Nov, 2013

ix. QIP on "Society and Web", at IIT Guwahati (1 week)

x. Faculty Development Program at MSIT, New Delhi on 22nd May, 2010

xi. Role of IT in Technical Education at MIMIT, Malout (2 weeks)

xii. Seminar on RAFIP-2010 at Punjabi University, Patiala on 30th March, 2010

xiii. National Conference on RAFIT-2009 at Punjabi University, Patiala on 9th-10th April, 2009.

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Annexure-D

i. Associate Editor, Soft Computing Journal (SCI Indexed)

ii. Associate Editor, ACM Transactions on TALLIP Journal (SCI Indexed)

iii. Reviewer of Proceedings of the National Academy of Sciences- Physical Science- A (SCI Indexed Journal)

iv. Reviewer of IETE Journal of Research Journal (SCI Indexed Journal)

v. Reviewer of Information Processing and Management Journal (SCI Indexed Journal)

vi. Reviewer of Artificial Intelligence Review Journal (SCI Indexed Journal)

vii. Reviewer of IEEE Access Journal (SCI Indexed Journal)

viii. Reviewer of Expert Systems with Applications Journal (SCI Indexed Journal)

ix. Reviewer of Optik Journal (SCI Indexed Journal)

x. Member of International Association of Computer Science and Information technology (IACSIT), Singapore.

xi. Member of International Association of Engineers (IAENG), Hong-Kong.

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