Dr. Varun Bajaj

CONTACT INFORMATION

Assistant Professor
Discipline of Electronics and Communication
Indian Institute of Information Technology, Design and Manufacturing Jabalpur

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OBJECTIVE

To utilize my knowledge, skills, and attitude towards growth of the organization.

RESEARCH INTERESTS

Non-stationary signal processing, Time Frequency analysis, and Pattern recognition.

JOURNAL PUBLICATIONS

Citations 364 h-index 7 i10-index 6

1. V. K Mishra, **V. Bajaj**, A. Kumar, D. Sharma and G. K. Singh, An efficient method for analysis of EMG signals using improved empirical mode decomposition, AEU-International Journal of Electronics and Communications, ISSN: 1434-8411, Impact Factor: 0.786, Volume 72, February 2017, Pages 200-209.
2. **V. Bajaj**, Khushnandan Rai, Anil Kumar, and Dheeraj Sharma, Time-frequency image based features for classification of epileptic seizure from EEG signals, Biomedical Physics & Engineering Express, ISSN: 2057-976, Accepted 2017.
3. S. Jain, Mitul Kumar Ahirwal, Anil Kumar, **Varun BAJAJ**, and G. K. Singh, QRS Detection using Adaptive Filters: A Comparative Study, ISA Transactions ISSN No: 0019-0578 Impact Factor: 2.6, Inpress, 2016.
4. Omer F. ALCIN, Siuly SIULY, **Varun BAJAJ**, Yanhui Guo, Abdulkadir SENGR, Yanchun Zhang, Multi-category EEG signal classification developing Time-Frequency Texture Features based Fisher Vector encoding method, Neurocomputing ISSN No: 0925-2312 Impact Factor: 2.392, Volume 218, 19 December 2016, Pages 251-258.
5. Vipin K Mishra, **V. Bajaj**, Anil Kumar, and G. K. Singh, Analysis of ALS and normal EMG signals based on empirical mode decomposition, IET Science, Measurement and Technology ISSN No: 1751-8822 Impact Factor 0.954, pp. 963- 971 Volume: 10, Issue: 8, 11 2016.
6. S Jain, **V. Bajaj**, and A. Kumar, An efficient algorithm for classification of ECG beats based on ABC-LSSVM classifier, Electronics Letters ISSN No: 0013-5194 Impact Factor 0.93, (SCI) Vol. 52, Issue 14, 07 July 2016, pp. 1198-1200.
7. S Jain, A. Kumar, and **V. Bajaj**, Technique for QRS complex detection using particle swarm optimization (PSO), IET Science, Measurement and Technology, ISSN No: 1751-8822 Impact Factor 0.954, Volume: 10, Issue: 6, 9 2016 pp. 626 - 636.
8. **V. BAJAJ**, Y. GUO, A. SENGUR, S. SIULY, O. F. ALCIN, A hybrid method based on Time-Frequency images for classification of alcohol and control EEG signals, Neural Computing and Applications ISSN No: 1433-3058 Impact Factor; 1.492, pp. 1-7, 2016.
9. S. Pare, A. Kumar, **V. Bajaj**, G. K. Singh, A Multilevel color image segmentation technique based on cuckoo search algorithm and energy curve, Applied Soft Computing ISSN No: 1568-4946 Impact Factor: 2.857, 47, 76-102, 2016.

10. **V. Bajaj** and A. Kumar, Features based on intrinsic mode functions for classification of EMG signals, International Journal of Biomedical Engineering and Technology, Vol. 18, No. 2, pp. 156-167, 2015.
11. D.S. Yadav, D. Sharma, B.R. Raad and **V. Bajaj**, Impactful Study of dual work function, underlap and hetero gate dielectric on TFET with different drain doping profile for high frequency performance estimation and optimization, Superlattices and Microstructures ISSN No: 0749-6036 Impact Factor: 2.117, Volume 96, August 2016, pp. 36-46.
12. **V. Bajaj** and R.B. Pachori, Classification of seizure and nonseizure EEG signals using empirical mode decomposition, IEEE Transactions on Information Technology in Biomedicine ISSN No: 2168-2194 Impact Factor: 2.093, vol. 16, no. 6, pp. 1135-1142, 2012. IF-2.493.
13. **V. Bajaj** and R.B. Pachori, Automatic classification of sleep stages based on the time-frequency image of EEG signals, Computer Methods and Programs in Biomedicine, Elsevier ISSN No: 0169-2607 Impact Factor: 1.862, vol. 112, issue 3, pp. 320-328, 2013. IF-1.897.
14. **V. Bajaj** and R.B. Pachori, Epileptic seizure detection based on the instantaneous area of analytic intrinsic mode functions of EEG signals, Biomedical Engineering Letters, ISSN: 2093-9868 Impact factor: 0.89, vol. 3, issue 1, pp. 17-21, 2013.
15. R.B. Pachori and **V. Bajaj**, Analysis of normal and epileptic seizure EEG signals using empirical mode decomposition, Computer Methods and Programs in Biomedicine, Elsevier ISSN No: 0169-2607 Impact Factor: 1.862, vol. 104, issue 3, pp. 373-381, 2011.

BOOK CHAPTERS

1. **V. Bajaj** and R.B. Pachori, Detection of human emotions using features based on the multiwavelet transform of EEG signals, In: A.E. Hassanien and A.T. Azar (Eds.) Brain-Computer Interfaces: Current Trends and Applications, Intelligent Systems Reference Library by Springer-Verlag, Germany, 2015, (Book Chapter).
2. **V. Bajaj** and R.B. Pachori, Separation of rhythms of EEG signals based on Hilbert-Huang transformation with application to seizure detection, In: G. Lee et al. (Eds.) Convergence and Hybrid Information Technology, Lecture Notes in Computer Science by Springer-Verlag, Germany, 2012. (Conference paper published as a book chapter)
3. **V. Bajaj** and R.B. Pachori, EEG signal classification using empirical mode decomposition and support vector machine, In: K. Deep et al. (Eds.) SocProS 2011, Advances in Intelligent and Soft Computing by Springer-Verlag, Germany, 2012. (Conference paper published as a book chapter).

CONFERENCE PUBLICATIONS

1. Pooja Yadav, Anchala Priya, Sachin Taran, **V. Bajaj**, Dheeraj Sharma, Discrimination of Alcohol and Normal EEG signal using EMD, International Conference on Signal Processing and Integrated Networks, SPIN 2017, Amity University, Noida.
2. S. Jain, A. Kumar, and **V. Bajaj**, Real-time Detection of Electrocardiograph Peaks: A Genetic Algorithm based Approach, International Conference on Signal Processing and Integrated Networks, SPIN 2017, Amity University, Noida, accepted.

3. Swati Walde, Pragati Rani, Varun Bajaj, and Dheeraj Sharma Time Frequency Image based Features for detection of Focal EEG Signals, International Conference on Signal Processing and Communication ICSC2016, 358-362, JIIT Noida.
4. Vipin K Mishra, Varun Bajaj, and Anil Kumar, and Dheeraj Sharma. Discrimination between Myopathy and Normal EMG Signals using Intrinsic Mode Functions, *4th IEEE International Conference on Communication and Signal Processing-ICCSP'16*, 248-252, 6-8 April 2016 in Melmaruvathur, Tamilnadu, India.
5. Vipin K Mishra, Varun Bajaj, and Anil Kumar, Classification of Normal, ALS and Myopathy EMG signals using ELM classifier, *Second IEEE International Conference on Advances in Electrical, Electronics, Information, Communication and Bio-Informatics (AEEICB -16)* 460-464, 27th Feb, 2016 in Chennai, India.
6. A.R. Dwivedi, H. Bari, S. Nath, Varun Bajaj, Dheeraj Sharma and Anil Kumar, Analysis of focal and non-focal EEG signals using bivariate empirical mode decomposition, *IEEE Student conference on Elecrical, Electronics and Computer Science (SCEECS-2016)*, 5-6 March 2016 in MANIT Bhopal.
7. N. Agrwal, A. Kumar, and Varun Bajaj, Controlled Ripple Based Design of Digital IIR Filter, 21st International Conference on Digital Signal Processing (DSP) pp.627-631, 16-18 Oct 2016, Beijing China.
8. N. Agrwal, A. Kumar, and Varun Bajaj, Digital IIR Filter Design With Controlled Ripple Using Cuckoo Search Algorithm. International Conference on Signal and Information Processing (IConSIP-2016) 6th to 8th October, 2016. Nanded, Maharashtra, India.
9. K. Rai, **V. Bajaj**, and A. Kumar, Novel Feature for Identification of Focal EEG Signals with K-Means and Fuzzy C-Means Algorithms, *20th IEEE International Conference on Digital Signal Processing (DSP)*, pp. 412-416, July 21-24, 2015 in Singapore.
10. K. Rai, **V. Bajaj**, and A. Kumar, Hilbert-Huang transform based classification of sleep and wake EEG signals using fuzzy C-means algorithm, *4th IEEE International Conference on Communication and Signal Processing-ICCSP'15*, pp. 462-466, 2-4 April 2015 Melmaruvathur, India.
11. K. Rai, **V. Bajaj**, and A. Kumar, Features extraction for classification of focal and non-focal EEG signals, *Information Science and Applications Lecture Notes in Electrical Engineering* , Volume 339, 2015, pp 599-605. 2015,Pattaya, Thailand.
12. G. Sahu, N. Chaurasia, P. P. Suwalka, **V. Bajaj** and A. Kumar, HHT based features for discrimination of EMG signals, *In: Mandal, J.K., Satapathy, S.C., Kumar Sanyal, M., Sarkar, P.P., Mukhopadhyay, A. (Eds.) Proceedings of Second International Conference Information Systems Design and Intelligent Applications 2015 Volume 2, Advances in Intelligent Systems and Computing*, Vol. 340, 2015, pp 95-103, January 8-9, 2015, Kalyani, India.
13. M. Gehlot, Y. Kumar, H. Meena, **V. Bajaj**, and A. Kumar, EMD based features for discrimination of focal and non-focal EEG signals, *In: Mandal, J.K., Satapathy, S.C., Kumar Sanyal, M., Sarkar, P.P., Mukhopadhyay, A. (Eds.) Proceedings of Second International Conference Information Systems Design and Intelligent Applications 2015 Volume 2, Advances in Intelligent Systems and Computing*, Volume 340, pp 85-93, January 8-9, 2015, Kalyani, India.
14. N. Agrawal, A. Kumar, and **V. Bajaj**, Optimized Design of Digital IIR Filter using Artificial Bee Colony Algorithm, *2015 International Conference on Signal*

Processing, Computing and Control (2015 ISPCC) pp. 316-321, 24-26 Sep 2015 in Jaypee University of Information Technology Waknaghat, Solan, HP, India.

15. N. Agrawal, A. Kumar, and **V. Bajaj**, Hybrid method based optimized design of digital IIR filter, *4th IEEE International Conference on Communication and Signal Processing-ICCSP'15*, pp. 1568-1573, 02-04 April 2015 in Melmaruvathur, India.
16. **V. Bajaj** and R.B. Pachori, Human emotion classification from EEG signals using multiwavelet transform, *IEEE International Conference on Medical Biometrics*, 30 May-01 June, 2014, Shenzhen, China. Citations-3
17. **V. Bajaj** and R.B. Pachori, Separation of rhythms of EEG signals based on Hilbert-Huang transformation with application to seizure detection, *International Conference on Convergence and Hybrid Information Technology*, LNCS 7425, pp. 493-500, 23-25 August, 2012, Daejeon, South Korea. (Best Paper Award) Citations-8
18. **V. Bajaj** and R.B. Pachori, EEG signal classification using empirical mode decomposition and support vector machine, *International Conference on Soft Computing for Problem Solving*, AISC 131, pp. 623-635, 20-22 December, 2011, in Roorkee, India. Citations-11
19. **V. Bajaj** and R.B. Pachori, Application of the sample entropy for discrimination between seizure and seizure-free EEG signals, *5th Indian International Conference on Artificial Intelligence*, pp. 1232-1247, 14-16 December, 2011, Tumkur, India.
20. D.K. Mishra, and **V. Bajaj**, A single stage source couple CMOS VCO in 0.18um CMOS technologies with low power consumption, *International Conference On Control Automation, Communication and Energy Conservation-2009. Kangu Engg. College Perundurai Erode (Tamilnadu)*, pp. 584-586 vol. II, 5-6 June 2009, Erode (Tamilnadu).

PROFESSIONAL SERVICE

Referee Service

- IEEE Signal Processing Letters
- IEEE Transactions on Information Technology in Biomedicine
- KSII Transactions on Internet and Information Systems
- Biomedical Signal Processing and control
- Journal of Medical Engineering and Physics
- Computer Methods and Programs in Biomedicine

RESEARCH SUPERVISION

- Ph.D Supervision -
  (1) Shweta Jain (Jointly), ECG signal enhancement and classification In Progress
  (2) Nikhil Agrawal (Jointly), IIR filter design using evolutionary algorithm In Progress
  (3) Santhos (Jointly), In Progress
  (4) Sachin Taran (Singly), Methodologies for classification of EEG signals, In Progress

- M.Tech Supervision -
  (1)Khushnandan Rai, New Features for Classification of EEG Signals, Completed 2015
  (2) Nikhil Agrawal, Optimal Design of IIR Filters Using Evolutionary Techniques, Completed 2015
  (3) Vipin kumar Mishra, New methodologies for classification of EMG signals, Completed 2016

(4) Sumit Kumar Yadav, In Progress

- B.Tech Supervision -
  (1) M. Gehlot, Y. Kumar, H. Meena, Classification of EEG signals, Completed 2014-15.
  (2) G. Sahu, N. Chaurasia, P. P. Suwalka, EMD based classification of EMG signals, Completed 2014-15
  (3) A.R. Dwivedi, H. Bari, S. Nath, Classification of Focal and non focal EEG signals, Completed 2015-16

EXPERIENCE

Assistant Professor, Department of Electronics and Communication Feb 2014-Till now

- Institute: Indian Institute of Information Technology, Design and Manufacturing Jabalpur
- Courses:
  - Session Jan 2015-May 2015:- ES 306f Time Frequency Analysis (UG IIIy+PG), EMF3-4 Biomedical Signal Processing (PG), IT 102L Workshop (MATLAB) (UG Iy), EC 201L Professional Lab I (UG IIy)
  - Session July 2014-Nov 2014:- ES 101 Fundamental of Electrical and Electronics (UG Iy), ES 204 Electrical Drives and Devices (UG II)
  - Summer Courses 2014:-EC 201 Digital Electronics (UG II), EC 203 Signals, Systems and Networks (UG II)
  - Session Jan 2014-May 2014:- ES 306f Time Frequency Analysis (UG IIIy), EC 612 Pattern Classification (PG Open to UG IVy)

Visiting Faculty, Department of Electronics and Communication Sept 2013-Feb 2014

- Institute: Indian Institute of Information Technology, Design and Manufacturing Jabalpur
- Session Sep 2013-Nov 2013:- EC 308b Digital Signal Processing (UG IIIy), EC 511 Advanced Digital Signal Processing (PG)

Assistant Professor, Department of Electronics and Instrumentation July 2009- July 2010

- Institute: Shri Vaishnav Institute of Technology and Science, Indore
- Autumn 2009: Signal and system , Digital signal processing
- Spring 2010: VLSI design, VHDL programming

EDUCATION

PhD CPI 9.13, Discipline of Electrical Engineering July 2010-Feb 2014

- Institute: Indian Institute of Technology, Indore, India
- Thesis Topic: Analysis and classification of EEG signals using novel features based on non-stationary signal decompositions.
- Area of Study: Biomedical signal processing

M. Tech. percentage 78%, Department of Electronics and Instrumentation August 2007-July 2009

- Institute: Shri Govindram Seksaria Institute of Technology and Science Indore, India

- Thesis Topic: Study and design of single stage CMOS voltage controlled oscillator in 0.18μm Technology.
- Area of Study: Microelectronics and VLSI Design

B. E. percentage 72.22%, Department of Electronics and Communication Engineering 2002-2006

- University: Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India
- Electronics and Communication Engineering

Qualified GATE 2007 with GATE Score 309.

WORKSHOP

- Participated as a active member of IIT Indore team in "Paniit Global Conference 2012,"at Science City Auditorium, Kolkata, India from December 7-9, 2012.
- Participated in international workshop on Joint Indo-Canadian meeting on "Development of Low-Cost Lab-on-a Chip Medical Devices for Health Monitoring,"held under the department Electrical Engineering at Indian Institute of Technology, Bombay from January 9-11, 2011.
- Participated in workshop on "MATLAB Application in Modeling and Simulation of Engineering Systems,"held under the department EC at S.V.C.E. Indore from 19/02/10 to 21/02/10.
- Participated in workshop on "National Workshop on Enhancing Effectiveness of Classroom Teaching in Engineering and Management Education,"sponsored by AICTE new Delhi at Shri Vaishnav Institute of Technology and Science, Indore on 6-7 Nov.2009.
- Participated in workshop on "Introduction to MATLAB and Simulink,"held under the department EEE at L.N.C.T. Indore from 7/10/09 to 10/10/09.
- Participated in workshop on "MATLAB," ATHENA held at SIRT Bhopal (M.P) on 24 and 25 Apr.2009.

ADMINSTRATION REASONABILITY

- Faculty In-charge of Central Mess of IIITDM Jabalpur Since June 2016.
- Co-coordinator of Time table committee of IIITDM Jabalpur Since Jan 2016.
- Industry Cell committee of IIITDM Jabalpur Since Nov 2016.

Workshops/Seminars Etc. Organized

- Expert lecture on "Computer Aided Design based Recent Trends for Diagnosis of Diseases,"in National Pharmacy Week 2016 on K.N Polytechinque Co-coordinated national conference "Recent Trends in Instrumentation, Communication and Microelectronics,"at Shri Vaishnav Institute of Technology and Science, Indore 2010
- Co-coordinated national conference "Recent Trends in Instrumentation, Communication and Microelectronics,"at Shri Vaishnav Institute of Technology and Science, Indore 2010
- Organized one day Workshop on "MATLAB application in signal processing,"at Department of Electronics and Communication, Sushila Devi Bansal College of Technology Indore, on Feb 2014.
- Guest lecture on "Recent trend of biomedical signal processing,"at Department of Electronics and Communication, IPS Academy Indore, on Feb 2014.

SOFTWARE SKILLS

- Programming Language: C, MATLAB.
- HDL Language: VHDL, Verilog.
- Software Packages: SPSS Software
- Front end Tool: Xilinx ISE, Quartus, Modelsim.
- Backend Tool:
  - TANNER Tool(S-Edit, T-spice, w-Edit).
  - Synopsys (CosmosSE and Csope)
  - Cadence (icfb and virtuoso, spectreRF)

AWARDS

- Paper entitled, "Separation of rhythms of EEG signals based on Hilbert-Huang transformation with application to seizure detection", is selected as the best paper award in ICHIT 2012, South Korea.
- Paper entitled, "Analysis of normal and epileptic seizure EEG signals using empirical mode decomposition", is selected in the top 20 articles in BioMedLib 2011.
- Doctoral scholarship, Ministry of Human Resource Development, India (2010-2013)
- Post graduate scholarship, Ministry of Human Resource Development, India (2007-2009)
- Graduate scholarship, Government of India (2002-2006)

PERSONAL PROFILE

- Date of Birth : 14 -04-1984
- Category : General
- Nationality : Indian
- Marital Status : Married
- Languages known : English, Hindi
- Hobbies : Making Friends
- Permanent Address : KeshavGanj, Near Kalakhan Building,
  Bada Bazar Sagar (M.P.) 470002