

## Profile Page



Name : Indu Saini

Designation : Associate Professor

Department : Electronics and Comm. Engg.

Qualification : PhD Machine Learning Algorithms for Enhanced ECG Analysis (NIT Jalandhar)  
M.Tech (By Research) Electronics & Communication (NIT Jalandhar)  
B.Tech Electronics & Communication (GNDU Amritsar)

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Opp. PIMS, Jalandhar  
Jalandhar, punjab - 144001

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### Research Interests :

Biomedical Signal Processing, machine Learning Algorithms, Plant Signaling, VLSI Design

### Other Profile Links :

#### Google Scholar Link :

Indu Saini [Click Here](#)

### Journal Publications :

Year	Journal	Publication
2022	Biosystems Engineering, Volume 219, Pages 189 - 204, July 2022	Sai K.;Sood, Neetu;Saini, Indu, "Abiotic stress classification through spectral analysis of enhanced electrophysiological signals of plants "
2021	Silicon, vol. 13, no. 7, pp. 2309–2318	Singh, R.P., Khosla, M., Saini, I., Kumar, N., "Design and Analysis of IGZO Based Junctionless Thin Film Transistor Using SOI Technology"
2021	Research on Biomedical Engineering, vol. 37, no. 2, pp. 201–219	Soni, N., Saini, I., Singh, B., "Hybrid chaotic substitution and block-DCT-based ECG steganography with boosted embedding capacity"
2021	Optik Volume 246, November 2021, 167780	Ruchika Arora, InduSaini and NeetuSood, "Multi-label segmentation and detection of COVID-19 abnormalities from chest radiographs using deep learning".
2021	International Journal of Systems, Control and Communications, vol. 12(1), pp. 72–89	Chauhan, R., Sood, N., Saini, I., "PAPR reduction of MIMO-OFDM using galaxy inspired swarm-based PTS strategy"

2021	Multimedia Tools and Applications, vol. 80(6), pp. 8505–8540	Soni, N., Saini, I., Singh, B., "An integer wavelet transform and pixel value differencing based feature specific hybrid technique for 2D ECG steganography with high payload capacity"
2021	IET Signal Processing, Volume 15, Issue 5, Pages 337 - 351, July 2021	Soni, Neetika, Saini, Indu;Singh, Butta, "AFD and chaotic map-based integrated approach for ECG compression"
2020	International Journal of Machine Learning and Cybernetics-SCI, Article in press	Verma A K, Saini I, Saini B S," A new BAT optimization algorithm based feature selection method for electrocardiogram heartbeat classification using empirical wavelet transform and Fisher ratio",
2020	International Journal on Emerging Technologies 11(2), pp. 1-7, 2020-SCOPUS	Tanima, Saini I, Saini B S, "Monitoring arterial pulse waves with optical pulse sensor to detect the effect of aging and gender" ,
2020	Research Journal of Pharmacy and Technology 12(8), pp. 3854-3856, 2019. SCOPUS	Rawal, K., Sethi, G., Saini, B.S., Saini, I., "Impact of the menstrual cycle on heart rate variability" ,
2019	Australasian Physical and Engineering Sciences in Medicine, Article in press	Soni, N., Saini, I., Singh, B, "A morphologically robust chaotic map based approach to embed patient's confidential data securely in non-QRS regions of ECG signal"
2019	Communications in Computer and Information Science, Vol. 956, pp. 63-73	Kumar, A., Sood, N., Saini, I, "Electrical Signal Analysis of Different Types of Oxygen Efficient Plants"
2019	International Journal of Computer Applications in Technology -SCOPUS, 63(1-2), pp. 64-82, 2020	Singh M K , Saini I, Sood N, "A multi-functional BCI system for exigency assistance and environment control based on ML and IoT",
2018	International Journal of Wavelets, Multiresolution and Information Processing 16(6),1850049	Verma, A.K., Saini, I., Saini, B.S, "The baseline wandering noise removal from ECG signal using forward-backward Riemann Liouville fractional integral-based empirical wavelet transform approach"
2018	Australasian Physical and Engineering Sciences in Medicine 41(2), pp. 519-539	Verma, A.K., Saini, I., Saini, B.S, "Alexander fractional differential window filter for ECG denoising"
2018	International Journal of Medical Engineering and Informatics 10(2), pp. 135-149	Jambholkr, T., Saini, B.S., Saini, I, "An adaptive thresholding technique for QRS-complex detection in ECG signal based on empirical wavelet transform"
2017	International Journal of Medical Engineering and Informatics 9(4), pp. 299-315	K., Saini, B.S., Saini, I, "Effect of age and postural related changes on cardiac autonomic function in the pre-menopausal andpost-menopausal women"
2016	International Journal of Medical Engineering and Informatics, Inderscience, 8, 347-359	Dharmendra Gurve, Barjinder Singh Saini, Indu Saini, "An Improved Lossy And Lossless Combined ECG Data Compression Using ASCII Character Encoding"
2016	Journal of Medical Engineering and Technology, Taylor and Francis, Vol. 40. no. 5, pp. 223-238	K Rawal, B S Saini and I Saini, "Design of tree structure matched wavelet for HRV signals of Menstrual Cycle"
2016	International Journal of Medical Engineering and Informatics, (Inderscience), Vol. 9, no. 4, pp. 299-315	K. Rawal, B. S. Saini and I. Saini, "Effect of age and posture related changes on cardiac autonomic function in the premenopausal and postmenopausal women for HRV signals of menstrual cycle"
2015	Australasian Physical & Engineering Sciences in Medicine, Springer, vol. 38, no. 3, pp. 509-523	K Rawal, B S Saini and I Saini, "Adaptive correlation dimension method for analyzing Heart Rate Variability during Menstrual Cycle"

2014	Journal of Medical Engineering and Technology, Vol. 38, no. 3, pp. 115-124	Indu Saini, Dilbag Singh, Arun Khosla, "K-Nearest Neighbor-based algorithm for P and T-waves detection and delineation"
2014	IETE Journal of Research, Vol. 60, no. 6, pp. 423-431	Rakesh Kumar, Indu Saini, "Empirical Wavelet Transform Based ECG Signal Compression"
2014	Computers and Electrical Engineering, (Elsevier), Vol. 40, pp. 1774-1787	Indu Saini, Dilbag Singh, Arun Khosla, "Electrocardiogram Beat classification using Empirical mode Decomposition and Multiclass Directed Acyclic Graph Support Vector Machine"
2013	Journal of Advanced Research-Elsevier, Vol. 4, no. 4, pp. 331-344	Indu Saini, Dilbag Singh, Arun Khosla, "QRS Detection using K-Nearest neighbor algorithm (KNN) and evaluation on standard ECG databases"
2013	IETE Journal of Research, Vol. 59, no. 5, pp. 615-623	Indu Saini, Dilbag Singh, Arun Khosla, "P- and T-wave Delineation of ECG signal using Support Vector Machine"
2013	International Journal of Medical Engineering and Informatics, (Inderscience), Vol. 5, no. 1, pp. 85-101	Indu Saini, Dilbag Singh, Arun Khosla, "Detection of QRS-complex using K-Nearest Neighbor algorithm"
2013	International Journal of Bio-science and Bio-Technology, Vol. 5, no. 6, pp. 171-180	Srishti Sondele, Indu Saini, "Classification of Mammograms Using Bidimensional Empirical Mode Decomposition Based Features and Artificial Neural Network"
2012	International Journal of Medical Engineering and Informatics, Inderscience, Vol. 4, no. 3, pp. 299-324	Indu Saini, Dilbag Singh, Arun Khosla, "Support vector Machine based QRS-Detection- Evaluation on standard databases"
		Tanima, Saini I, Saini B S, "Monitoring arterial pulse waves with optical pulse sensor to detect the effect of aging and gender", International Journal on Emerging Technologies 11(2), pp. 1-7, 2020 SCOPUS

## Conference Publications :

Year	Conference	Publication
2021	International Conference on Women Researchers in Electronics and Computing, NIT Jalandhar	R Arora, I Saini, N Sood, "Efficient Tuning of Hyper-parameters in Convolutional Neural Network for Classification of Tuberculosis Images"
2021	International Conference on Women Researchers in Electronics and Computing, NIT Jalandhar	Mayank Kumar Singh, Indu Saini, Neetu Sood and Jasleen Saini, "A Sub-band Anisotropic Diffusion Technique for de-speckling of Ultrasound Images of Breast Cancer"
2021	International Conference on Women Researchers in Electronics and Computing, NIT Jalandhar	Kavya Sai, Neetu Sood and Indu Saini, "A Review on Plant Stress Detection and Analysis Through Electrophysiological Signals"
2021	2nd International Conference on Secure Cyber Computing and Communications (ICSCCC)-IEEE, NIT Jalandhar	R Arora, I Saini, N Sood, "Modified UNet++ Model: A Deep Model for Automatic Segmentation of Lungs from Chest X-ray Images"
2021	2nd International Conference on Communication, Computing and Industry 4.0 (C2I4)- IEEE	R Arora, I Saini, N Sood, "Deep Learning Approach for Diagnosis of Pneumonia"
2021	International Conference on Women Researchers in Electronics and Computing, NIT Jalandhar	Kirti Singh, Indu Saini, Neetu Sood, "Cardiovascular and Cardiorespiratory Signals Complexity Analysis Using Different Techniques"
2021	Lecture Notes in Networks and Systems, 140, pp. 321-33	Tanima,, Dogra, A.K., Saini, I., Saini, B.S, "Emotions recognition based on wrist pulse analysis"

2020	2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA-2020)-IEEE	Tanima, Indu Saini, BS Saini, "Physiological Characteristics Classification by Optical Pulse Sensor using Arterial Pulse Waves
2020	11th International Conference on Computing, communication and Networking Technologis (ICCCNT)-IEEE	Deepali garg, indu Saini and Mamta Khosla, "Low-power 32 bit Synchronous and reconfigurable ALU Design using Chain Structure",
2020	International Conference on computation Intelligence for smart power system and sustainable energy CISPSSSE 2020 IEEE	Dogra , A.K, Saini Indu, Sood Neetu ,Impact of wireless cellular Network on Heart rate variability. .
2019	National Conference on Innovations in Applied Science and Engineering. (2019)-NIT Jalandhar	Tanima, Saini, Indu and Sood, Neetu, "Review On Disease Examine Techniques Using Nadi Parikshan"
2019	3rd International Conference on Trends in Electronics and Informatics (ICOEI 2019)	Mayank Kumar Singh, Indu Saini, Neetu Sood"Brain Computer Interface Based Smart Environment Control"
2019	3rd International Conference on Trends in Electronics and Informatics (ICOEI 2019)	Diksha Kumari, Indu Saini, Neetu Sood, "Detection of Heart rate through Speech Using Mel Frequency cepstrum coefficients"
2019	International Conference on Intelligent Computing and Control Systems (ICICCS 2019]	Rajat Chauhan, Neetu Sood, Indu Saini, "Galactic Swarm Optimization-PTS strategy to minimize PAPR in WP-OFDM system"
2018	2nd International Conference on Advanced Informatics for Computing Research (ICAICR-2018), 2018.	Anurag Kumar, Neetu Sood, Indu Saini, "Electrical Signal Analysis of Different Types of Oxygen Efficient Plants"
2018	IEEE International Conference on Advances in computing, communication control and networking (ICACCCN 2018), Galgotias College of Engineering & Technology	Norkit Lepcha, Barjinder Singh Saini, Indu Saini, "GLCM and PCA based Image Steganography using Chaos-based Encryption"
2018	International Conference on Secure Cyber Computing and Communications (ICSCCC-2018)	Neetika Soni, Indu Saini and Butta Singh, "Morphologically Robust Discrete Cosine Transform based Lossless ECG Compression with Access Control Quality"
2018	International Conference on Secure Cyber Computing and Communications (ICSCCC-2018)	6. Neha Gupta, Neetu Sood and Indu Saini, "Statistical Feature Based Comparison of EEG in Meditation for Various Wavelet"
2017	Proceedings on 2016 2nd International Conference on Next Generation Computing Technologies, NGCT 2016 7877404, pp. 137-143	Verma, T., Saini, I, "Age-related variation in EEG to music stimulation: A nonlinear analysis"
2016	IEEE International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET),	D. Gurve, B. S. Saini and I. Saini, An improved lossless ECG data compression using ASCII character encoding
2014	2nd International Conference on Communication and Electronics Information (ICCEI 2014)	K. rawal and I. Saini, "Comparative Analysis of Measuring Heart Rate Variability during Phases of Menstrual cycle in young Healthy Women"
2014	41st International Congress on Electrocardiology (ICE-2014)	Indu Saini, Dilbag Singh, Arun Khosla," Automated ECG Delineation using Machine Learning Algorithms"
2013	3rd International Conference on physics science and technology, Dec 29-30 2012, Hongkong	Barjinder Singh Saini, Ravi Raj, Indu Saini, Locally adaptive bilateral clustering for image denoising and sharpness enhancement
2013	40th International Congress on Electrocardiology (ICE-2013 Glasgow), University of Glasgow	Indu Saini, Vinod Kumar, Arun Khosla, "Feature Extraction of ECG Signal using Support Vector Machine"

2013	10th International Conference on Information Technology-New Generations (ITNG 2013), Las Vegas, Nevada, USA	Indu Saini, Dilbag Singh, Arun Khosla, "Delineation of ECG wave components using K-Nearest Neighbor (KNN) algorithm"
2012	International conference ICPST-2012	Sanju Kuril, Indu Saini, B. S. Saini, "Cloud Classification for Weather Information by Artificial Neural Network"
2012	International conference on ISAI-2011	Indu Saini, B S Saini, "Cardiac Arrhythmia Classification using Error Backpropagation Method"
2012	2nd International Conference on Biomedical Engineering and Assistive Technologies (BEATS-2012), NIT Jalandhar	Indu Saini, Dilbag Singh, Arun Khosla, "Characteristic Wave Detection in ECG Signal using Support Vector Machine (SVM)"

### Book/Chapter Publications :

Type	Title	Publisher	Authors	ISBN/ISS N No.	Year
Book Chapter	Integer Wavelet Transform-Based ECG Steganography for Hiding Patients' Confidential Information in e-Healthcare Systems	Springer, Singapore Soft Computing: Theories and Applications	Neetika Soni, Indu Saini and Butta Singh	978-981-15-0751-9	2020
Book Chapter	_A Powerful Tool in Medical Diagnosis	IGI Global	K Rawal, G Sethi, BS Saini and Indu Saini	10.4018/978-1-5225-9787-2	2020
Book Chapter	Fog Removal Algorithms for Real-Time Video Footage in Smart Cities for Safe Driving	IGI-Global	N Sood, I Saini, T Awasthi, MK Saini, P Bhorwal, T Kaur	9781522580850	2019
Book Chapter	Electrocardiogram Beat Classification Using BAT-Optimized Fuzzy KNN Classifier	IGI-Global	Atul Kumar Verma, Indu Saini, Barjinder Singh Saini	9781522579526	2019
Book Chapter	Electrocardiogram Dynamic Interval Feature Extraction for Heartbeat Characterization	IGI-Global	Atul Kumar Verma, Indu Saini, Barjinder Singh Saini	9781522579526	2019
Book Chapter	Robust Steganography in Non-QRS Regions of 2D ECG for Securing Patients' Confidential Information in E-Healthcare Paradigm	IGI-Global	Neetika Soni, Indu Saini, Butta Singh	9781522579526	2019
Book Chapter	Analysis of HRV during the Menstrual Cycle and Postmenopause	IGI-Global	K Rawal, B S Saini and I Saini	9781522506607	2016
Book Chapter	Analysis of HRV during the Menstrual Cycle and Postmenopause	IGI Global	K Rawal, B S Saini and I Saini	2327-7033	2015

### Research Projects :

Role	Project Type	Title	Funding Agency	From	To	Amount	Status	Co-Investigator
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	R&D	Design and Development of Anti-Eve Teasing Device for Women Safety	MIETY	23-09-2018	23-09-2020	15.00 lacs	Completed	Dr Neetu Sood
PI	R&D	Modified Solar Power based vehicle for Physically challenged person	TEQIP-II NIT Jalandhar	2014	2015	19000	Completed	Dr Neetu Sood
PI	R&D	Generation of Electricity from BIOGAS with GPS leakage detection	TEQIP-II NIT Jalandhar	2014	2015	15000	Completed	-
PI	R&D	Laser Based Smart Hardware Design for Power Saving	IEI R&D Cell	20-05-2019	20-02-2020	20,000	Completed	Dr Neetu Sood
PI	R&D	To Develop Low Cost Sanitizer for Fruits, Vegetables and Packed Food items	TEQIP-III	04-05-2020	21-12-2020	1,15,000	Completed	Dr Neetu Sood
PI	R&D	Investigations in Reconfigurable Systems	MHRD	2005	2011	8.00 lacs	Completed	-

### Events Organized :

Category	Type	Title	Venue	From	To	Designation
Workshop	National	Need for IPRs for Engineers and Researchers and new career opportunities in IPR	NIT Jalandhar	02-05-2015	02-05-2015	Coordinator
Self Financed STC	National	Electronics & Communication System Design Aspects	NIT Jalandhar	25-05-2015	29-05-2015	Coordinator

One-week Industrial-Institute-Interaction training program sponsored by TEQIP-II	National	Emerging Trends of Research in Electronics and Communication	NIT Jalandhar	01-12-2014	05-12-2014	Coordinator
Two weeks FDP/STTP	National	ICT for Computing & Signal Processing	CT Institute and NIT Jalandhar	03-06-2013	14-06-2013	Coordinator
2nd International Conference	International	International Conference on Biomedical Engineering and Assistive Technologies (BEATS-2012)	NIT Jalandhar	06-12-2012	07-12-2012	Member Organizing Team
Ist International Conference	International	International Conference on Biomedical Engineering and Assistive Technologies (BEATS-2010)	NIT Jalandhar	17-12-2010	19-12-2010	Member Organizing Team
Self Financed STC	National	Research Trends in VLSI Devices and Circuits Co-design	NIT Jalandhar	04-06-2018	08-06-2018	Co-coordinator
Self Financed STC	National	Current Trends in Signal and Image Processing	NIT Jalandhar	18-06-2018	22-06-2018	Cordinator
FDP	National	Artificial Intelligence using deep learning & Machine learning	NIT Jalandhar	09-12-2019	13-12-2019	Cordinator
Webinar	National	Design of Brain Controlled Applications	NIT Jalandhar	26-06-2020	26-06-2020	Cordinator
National level Hackathon- HackNITJ' 19	National	HackNITJ' 19	NIT Jalandhar	21-09-2019	21-09-2019	Co-coordinator
Symposium	National	Recent Research Trends in Sciences and Engineering (RRTSE-2019)	NIT Jalandhar	08-10-2019	08-10-2019	Cordinator

### Professional Affiliations :

Designation	Organization
Member (Membership No. - M-1595363)	Institution of Engineers, Kolkata, India
Member	IAENG

### PhD Supervised :

Scholar Name	Research Topic	Status	Year	Co-Supervisor
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Nitika Soni	Stegnography and Compression Techniques for ECG Signal	Completed	2021	Dr Butta Singh (GNDU ASR)
Mukesh Kumar	Wireless Communication Systems using ML	Ongoing	2021	Dr Neetu Sood
Pushpinder Singh	Wireless Communication Systems using ML	Ongoing	2021	Dr Neetu Sood
Atul Kumar Verma	ECG Signal Analysis and Characterization	Completed	2020	Dr B S saini
Mayank Kumar Singh	Biomedical Image Processing	Ongoing	2019	Dr Neetu Sood
Kavya Sai	Plant Signalling	Ongoing	2018	Dr Neetu Sood
Ruchika Arora	Machine Learning Approaches in Medical Image/Signal Analysis	Ongoing	2018	Dr Neetu Sood
Kirti Singh	Biomedical Signal Processing	Ongoing	2018	Dr Neetu Sood

## PG Dissertation Guided :

Student Name	Dissertation Title	Status	Year	Co-Supervisor
Priyadarshini Babu	Enabling Remote Hardware-Software Interface Testing	Completed	2021	-
RajaniKant Tiwari	Design of a Low-Level Offset Op Amp using Ping-Pong Auto Zeroing Architecture	Completed	2021	-
Apoorva	Design and Analysis of Ultra-High Aspect Ratio InGaAs FinFET	Completed	2021	Dr Ashish Raman
Krisumraj	P-doped $\gamma$ -Ga <sub>2</sub> O <sub>3</sub> on AlN/ $\gamma$ -Ga <sub>2</sub> O <sub>3</sub> Normally Off HEMT for high frequency application	Completed	2021	Dr Ashish Raman
Shivam Kumar	JLTFT (Junctionless TFT) Based On SOI	Completed	2021	Dr Mamta Khosla
Tanima	Analysis Of Three Doshas - Vata, Pitta and Kapha in Various Physiological Conditions	Completed	2020	Dr B S Saini
Akshay Kumar	Reducing The Impact of Mobile Radiation On Variability in Heart Rate Using Negative Ion Generator	Completed	2020	Dr Neetu Sood
Deepali Garg	FPGA Implementation of a Low Power 8-bit Microcontroller for a wireless sensor node	Completed	2020	Dr Mamta Khosla
Rahul	Design and Analysis of SOI based IGZO Junction less Thin Film Transistor for Low Power Applications	Completed	2020	Dr Mamta Khosla
Diksha Kumari	Monitoring of Heart Rate through Spectral features of the Speech signal	Completed	2019	Dr Neetu Sood
Mayank Kumar Singh	Machine Learning based Brain Computer Interface system with smart GUI and IoT for assisting a disable	Completed	2019	Dr Neetu Sood
Rajat Chauhan	PAPR Reduction of MIMO-OFDM based PTS technique using Galactic Swarm Optimization.	Completed	2019	Dr Neetu Sood
Gaurav Joshi	Design and Performance Evaluation of Vertical TFET for Biosensor applications removal	Completed	2019	Dr Neetu Sood
Neha Gupta	Physiological Dynamics of EEG during meditation using wavelet families.	Completed	2018	Dr Neetu Sood
Anurag	Electrical Signal analysis of Different types of Oxygen efficient plants.	Completed	2018	Dr Neetu Sood
Neha	An improved convolution neural network for classification of small patches of granite tiles	Completed	2018	Dr B S Saini
Norkit Lepcha	GLCM and PCA based image steganography using Chaos-based encryption	Completed	2018	Dr B S Saini



**Patents :**

Name	Reg./Ref. No.	Date of Award/Filling	Organization	Status
SAFETY DEVICE FOR WOMEN FOR INSTANT PREVENTION OF BAD TOUCH	201911045905	12-11-2021	Dr B R Ambedkar National Institute of Technology Jalandhar	Granted
PERSONAL WEARABLE TOUCH-FREE SANITIZER DISPENSING SYSTEM	202011045662	13-07-2022	Dr B R Ambedkar National Institute of Technology Jalandhar	Granted

**Admin. Responsibilities :**

Position Held	Organization	From	To
Warden	Girls Hostel	May 2003	April 2007
Member	Women Cell	May 2013	January 2015
Faculty in-charge	Women Cell	Feb' 2015-	May' 16
Faculty Incharge	Music and Dramatic Society	August' 2008	Feb' 2010
Faculty Co-ordinator	NITJ Coding Club	September' 2018	Till date
Faculty Co-ordinator	SPIC Macay	May' 2020	Till date
Faculty Co-ordinator	Annual Report	Feb.' 2020	Till date

**Award and Honours :**

Title	Activity	Given by	Year
Distinguished Woman in Engineering	Academic Workshop	The Centre for Advanced Research and Design (CARD) of Venus International Foundation	2019
Bharat Excellence Award	National Conference	FFI, India	2019