

# National Institute of Technology, Tiruchirappalli: Performa for CV of Faculty/ Staff Members

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## **Brief Profile:**

I am an Assistant Professor in the Department of Instrumentation Engineering at NIT Trichy, India. My research focuses on exploiting the engineering principles, methods and algorithms for the effective diagnosis and treatment of neurological and neuromuscular disorders.



Prior to my joining the current independent position, I worked as a Postdoctoral Research Fellow in the research group of Prof. Justin Dauwels at the Nanyang Technological University, Singapore. In the Dauwels lab, I primarily focused on developing signal processing and pattern recognition algorithms for the localization of sub-thalamic nucleus of the brain tissue for the effective deep brain stimulation.

Previously, I worked as a postdoctoral researcher at Montreal Neurological Institute and Hospital, McGill University, Canada with Prof. Jean Gotman. In the Gotman's group, I investigated the nonstationary and nonlinear characteristics of intracerebral EEG signals associated with seizure dynamics such as seizure origin, propagation and its termination. Further, I also involved in developing seizure prediction algorithms using nonlinear signal processing methods and pattern recognition techniques.

I received my Ph.D under the supervision of Professor S. Ramakrishnan in July 2016 from the Department of Applied Mechanics at Indian Institute of Technology Madras. My PhD research work consists of design and development of experimental protocol, subject recruitment, signal acquisition and analysis of muscle fatigue condition. During this period, I investigated the nonstationary and cyclostationary variations of surface electromyography signals for the identification of onset and progression of muscle fatigue condition. I have introduced several high resolution time-frequency methods and cyclostationarity measures that are more sensitive to subtle and fast variations of surface EMG signals.

I received my M.Tech from Indian Institute of Technology Madras, India, in 2012. My M.Tech thesis, under the supervision of Professor S. Ramakrishnan, focused on mathematical modelling of synthetic surface electromyography signals under varied neuromuscular conditions.

Previously, I received my B.E in the Department of Electronics and Instrumentation Engineering from Kongu Engineering College under Anna University in 2008.

Please see my CV for more details.

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**Curriculum Vitae**

1. Name: Dr. Karthick P. A.
2. Designation: Assistant Professor
3. Office Address: Physiological Measurements  
and Instrumentation Lab,  
Department of Instrumentation  
and Control Engg, National  
Institute of Technology,  
Tiruchirappalli, India
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pakarthick1@gmail.com
6. Field(s) of Specialization: Biomedical  
Instrumentation, Neural and neuromuscular  
Signal Processing, Machine Learning  
Algorithms, Wearable Devices

7. Employment Profile

Job Title	Employer	From	To
Assistant Professor (AGP 7000)	National Institute of Technology, Tiruchirappalli	06 <sup>th</sup> July 2018	Present

8. Academic Qualifications (From Highest Degree to High School):

Examination	Board / University	Year	Division/ Grade	Subjects
Ph.D.-Biomedical Engineering	Indian Institute of Technology Madras	July 2016	-	
M.Tech.-Biomedical Engineering	Indian Institute of Technology Madras	July 2012	7.95	

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B.E. -Electronics and Instrumentation	Kongu Engineering College, Anna University	July 2008	73	
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### 9. Academic/Administrative Responsibilities within the University

Position	Faculty/Department/Centre/Institution	From	To
Active member in the Academics Reforms Committee	National Institute of Technology, Tiruchirappalli	March 2021-	Feb 2022
Stock verification officer	National Institute of Technology, Tiruchirappalli	Dec 2018-	Jun 2020
Class committee chairperson for the second-year students,	National Institute of Technology, Tiruchirappalli	Jul 2020 Jul 2021	Dec 2020 Dec 2021
Faculty advisor	National Institute of Technology, Tiruchirappalli	Aug 2018	Till now

### 10. Academic/Administrative Responsibilities outside the University

Position	Institution	From	To
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### 11. Awards, Associateships etc.

Year of Award	Name of the Award	Awarding Organization
2019-2020	Best Performers Award	National Institute of Technology, Tiruchirappalli
2018-2019	Faculty Award	Institute by National Institute of Technology, Tiruchirappalli
2019	Early Career Research Award	Science and Engineering Research Board, Government of India
2021	Best Written Paper Award	Rocky Mountain Bioengineering Symposium, USA
2017	Post-doctoral fellowship	Savoy Foundation for Epilepsy Research, Canada

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12. Fellowships

Year of Award	Name of the Fellowship	Awarding Organization	From (Month/Year)	To (Month/Year)
2019	Duo-India Professor Fellowship	Asia-Europe Vision Group, Newcastle University	2019	2019
2019	Travel grant	Department of Science and Technology	2019	2019
2019	India-UKIERI support grant	SPARC	2019	2019

13. Details of Academic Work: Courses taught at Postgraduate and Undergraduate levels

**Theory courses**

S. No.	Subject code and Subjects	No. of Credits	Session
1	ICPC28 Analytical Instrumentation	3	July 2018
2	ICPC30 Digital Signal Processing	3	
3	ICPC16 Signals and Systems	3	Jan 2019
4	ICPC17 Industrial Instrumentation	3	
5	ICPC28 Analytical Instrumentation	3	July 2019
6	ICPC28 Analytical Instrumentation	3	
7	ICPE30 Digital Signal Processing	3	Jan 2020
8	ICPE36 Medical Imaging Systems	3	
9	ICIR17 Project work- A section	3	
10	ICIR17 Project work- B section	3	July 2020
11	ICPC28 Analytical Instrumentation	3	
12	ICPE30 Digital Signal Processing	3	
13	MEPC14 Instrumentation and Control Engg	3	Jan 2021
14	IC614 Computer Vision and Image Processing	3	Jan 2021

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**Lab courses**

S. No.	Subject code and Subjects	No. of Credits	Session
1	ICLR12 Sensors and Transducers Laboratory	2	Jan 2019
2	ICLR15 Microprocessors and Microcontroller Lab	2	July 2019
3	ICLR12 Sensors and Transducers Laboratory	2	Jan 2020
4	ICLR14 Instrumentation Laboratory	2	July 2020
5	ICLR12 Sensors and Transducers Laboratory	2	Jan 2021

**Projects guided at Postgraduate level**

S. No.	Title of the Project
1	Implementation Of OPAS Platform
2	Analysis of Facial EMG Signal For Face Computer Interface
3	Facial EMG Based Myoelectric Control System

**Courses introduced**

S. No.	Subject code and Subjects	Session
1	ICPE41 Biomedical Signal Processing	From 2019 batch onwards

**Facility established**

S. No.	Name of the Instrument	UG / PG / Research	Amount Spent for Equipments
1	v-AMP Brain Products 16-Channel Data Acquisition Device	Research	Rs. 20,07,480.

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2	Biopac 4-Channel wireless EMG system, purchased jointly with Dr. R. Periyasamy using seed grant	Research	Rs. 9,60,000
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14. Details of Major R&D Projects

Title of Project	Funding Agency	Duration		Status
		From	To	Ongoing/ Completed
Development of Nonlinear Signal Processing Schemes for the Assessment of Muscle and Neural Functions	Early Career Research Grant awarded by Science and Engineering Research Board	1 <sup>st</sup> April 2019	September 2022	Ongoing
Novel Human-Machine Interaction Technology for the Tetraplegics (NITT)”	Scheme for Promotion of Academic and Research Collaboration (SPARC)	1st April 2019	September 2022	Ongoing

15. Number of PhDs guided

Name of the PhD Scholar	Title of PhD Thesis	Role(Supervisor/ Co-Supervisor)	Year of Award
K. Divya Bharathi, IIT Madras	Characterization of muscle fatiguing contractions using Surface electromyography based geometric features	Co-Supervisor	2022

16. Participation in Workshops/ Symposia/ Conferences/ Colloquia /Seminars/ Schools etc. (mentioning the role)

Date (s)	Title of Activity	Level of Event	Role (Participant/ Speaker/ Chairperson,	Event Organized by	Venue
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		(International/ National/ Local)	Paper presenter, Any other)		
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**17. Workshops/ Symposia/ Conferences/ Colloquia/Seminars Organized (as Chairman/  
Organizing Secretary/ Convenor / Co-Convenor)**

Title of Activity	Level of Event (International/ National/ Local)	Date (s)	Role	Venue
Five days AICTE Teaching, and Learning Academy (ATAL) sponsored Faculty Development Programme on Instrumentation, Signals and Images for the Evaluation of Physiological Systems	National	16 <sup>th</sup> Aug 2021-20 <sup>th</sup> Aug 2021	Organizer	National Institute of Technology, Tiruchirappalli
Three days SPARC sponsored international workshop on Recent Trends in Biomedical Instrumentation and Assistive Technology	International	26th May 2021-28th May 2021	Organizer	National Institute of Technology, Tiruchirappalli
Five days AICTE sponsored Faculty Development Programme on Modern Techniques for Wireless Communication Networks and Signal Processing	International	19 <sup>th</sup> Aug 2019-23 <sup>rd</sup> Aug 2019	Co-Convenor	National Institute of Technology, Tiruchirappalli
Organizing committee member for the International Conference on Instrumentation and Control Engineering (ICECON 2019)	International	19 <sup>th</sup> -21 <sup>st</sup> December 2019	Co-Convenor	National Institute of Technology, Tiruchirappalli

**18. Invited Talks delivered**

Topic	Date	Inviting Organization
Advanced Topics in Medical Signal Processing	17th December 2021	Pondicherry Technical University

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Applications of Surface EMG Signals	6th September 2021	Madras Institute of Technology, Anna University
Advanced Topics in Biomedical Signal Processing	26th May-28th May 2021	NIT Trichy
Hands on Project-Based Approach for Biomedical Signal Analysis using MATLAB	5 <sup>th</sup> January 2021	Kakatiya Institute of Technology & Science, Warangal
Artificial Intelligence & Machine Learning for Biomedical Signal and Image Analysis	5 <sup>th</sup> July 2022	Kakatiya Institute of Technology & Science, and NIT Warangal

### 19. Membership of Learned Societies

Type of Membership (Ordinary Member/ Honorary Member / Life Member )	Organization	Membership No. with date
Member	IEEE	
Member	American Epilepsy Society (AES)	

### 20. Academic Foreign Visits

Country	Duration of Visit	Programme
Germany	July 2019	IEEE EMBS
Singapore	Jan –June 2018	Postdoctoral Training
Canada	July 2016 -Dec 2017	Postdoctoral Training
HongKong	July 2014	IEEE DSP
USA	July 2014	IEEE EMBS

### 21. Publications

#### (A) Refereed Research Journals:

Author(s)	Title of Paper	Journal	Volume (No.)	Page numbers	Year	Impact Factor (Optional)
Shib Banarjee, Divya B, PA.Karthick, and S.Ramakrishnan	Influence of Viscoelasticity on Dynamic Fatiguing	IEEE Transactions on Instrumentati	Accepted	-	2022	4.016



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	Behavior of Muscle Using Myotonometry and Surface Electromyography Measurements	on and Measurement				
Navaneethkrishna, M., PA. Karthick, and S. Ramakrishnan	Analysis of Dynamics of EMG Signal Variations in Fatiguing Contractions of Muscles using Transition Network Approach	IEEE Transactions on Instrumentation and Measurement	70	1-8	2021	4.016
K. Divya Bharathi, P. A. Karthick, S. Ramakrishnan	'Automated muscle fatigue detection using cyclostationarity based geometric features from surface electromyography signals'	Computer Methods in Biomechanics and Biomedical Engineering	25	1-13	2021	1.763
S. Edward Jero, K. Divya Bharathi, P. A. Karthick, S. Ramakrishnan.	'Muscle Fatigue Analysis in Isometric Contractions using Geometric Features of Surface Electromyography signals'	Biomedical Signal Processing and Control	68	1026-03	2021	3.88
Vinothini S, Punitha N, Karthick P.A., and Ramakrishnan S,	Automated detection of Preterm Condition using Uterine Electromyography based Topological Features	Biocybernetics and Biomedical Engineering	41	293-305	2021	5.687
Divya Bharathi K, Karthick P.A., Ramakrishnan S.,	Variational Mode Decomposition based Differentiation of Fatigue Conditions in Muscles using Surface	IET Signal Processing	14	745-753	2021	1.99

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	Electromyography Signals					
Makaram N, Karthick P.A., Gopinath V, Swaminathan R.	Electromyography -Based Muscle Fatigue Analysis Using Binary and Weighted Visibility Graph Features.	Fluctuation and Noise Letters	20	2150 016	2020	1.31
Karthick, P.A., Kai Rui Wan, Angela See An Qi, Justin Dauwels, and Nicolas Kon Kam King.	Automated detection of subthalamic nucleus in deep brain stimulation surgery for Parkinson's disease using microelectrode recordings and wavelet packet features.	Journal of Neuroscience Methods	343	1088 26	2020	2.785
Karthick, P. A., Hideaki Tanaka, Hui Ming Khoo, and Jean Gotman	Could we have missed out the seizure onset: A study based on intracranial EEG	Clinical Neurophysiology	131	114- 126	2020	3.614

**(B) Conferences/Workshops/Symposia Proceedings**

Author(s)	Title of Abstract/ Paper	Title of the Proceedings	Page numbers	Conference Theme	Venue	Year
Joseph Mathew, Sivakumaran N., and Karthick, P.A.	Detection of Seizure Types from the Wavelet Entropy of Scalp EEG	43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)	pp. 2423- 2426	Biomedical	Mexico	2021
Vinothini. S, Karthick, P.A. and Ramakrishnan, S, , Accepted	Analysis of frequency bands of uterine electromyography signals for the	31 <sup>st</sup> Medical Informatics Europe Conference (MIE)	pp.283- 287	Medical Informatics	Marseille, France	2021

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	detection of preterm birth					
J. Shiva, N. Makaram, P. A. Karthick and R. Swaminathan	Emotion Recognition Using Spectral Feature from Facial Electromyography Signals for Human-Machine Interface	31st Medical Informatics Europe conference	pp. 486-487	Medical Informatics	Mar seille, France	2021
Joseph Mathew, Sivakumaran N., and Karthick, P.A	Detection of Seizure Types from the Wavelet Energy of Scalp EEG	58th annual Rocky Mountain Bioengineering Symposium (RMBS),	pp.339-348	Bioengineering	Mississippi	2021
Arun Ganesh K, Sivalumaran N, Karthick, P.A. and S. Kumaravel. Accepted.	Analysis of Corticomuscular Coherence between Cortical and Lower Limb Muscle Activities	58th annual Rocky Mountain Bioengineering Symposium (RMBS),	pp.378-384	Bioengineering	Mississippi	2021,
C. A. D'Souza, J. Shiva, K. Gobinath and P.A. Karthick	Features Selection for Facial Emotion Recognition Improvement from Facial Electromyography	58th annual Rocky Mountain Bioengineering Symposium	pp.385-390	Bioengineering	Mississippi	2021
K. Divya Bharathi, P. A. Karthick, S. Ramakrishnan	'Variation of instantaneous spectral centroid across bands of surface electromyographic signals'	Rocky Mountain Bioengineering Symposium	pp.355-360	Bioengineering	Mississippi	2021
J. Shiva, K. Gobinath, N. Makaram, P.A. Karthick and R. Swaminathan	Recognition of Emotions from Time and Time-Frequency Features Using Facial Electromyography Signals	58th Annual Rocky Mountain Bioengineering Symposium, 2021		Bioengineering	Mississippi	2021
J. Shiva, C. Sanjay, N. Makaram, P A Karthick and R. Swaminathan	Analysis of surface electromyography signals in fatigue conditions under dynamic contractions using	IEEE Signal Processing in Medicine and Biology Symposium,		Signal Processing in Medicine and Biology	Philadelphia, Pennsylv	2020

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	time difference of muscle activations				vani a,	
Divya Bharathi K, Karthick P.A., Ramakrishnan S	'Geometric Features based Muscle Fatigue Analysis using Low Frequency Band in Surface Electromyographic signals	Asia-Pacific Signal and Information Processing Association		Signal and Information Processing	Auckland, New Zealand	2020
Karthick, P.A., Kai Rui Wan, R. Yuvaraj, Angela AQ See, Nicolas Kon Kam King, and Justin Dauwels.	Detection of subthalamic nucleus using time-frequency features of microelectrode recordings and random forest classifier	In 2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)	pp. 4164-4167	Engineering in Medicine and Biology Society		2019
N. Sivakumaran, Raji Sundarajan and P.A. Karthick	Analysis of Epileptic seizures using Electroencephalography signals and High-resolution time-frequency based features	Annual Meeting of the Electrostatics Society of America (ESA),		Biomedical	US A.	<b>2019</b>
Edwards Jero, P. A. Karthick, and S. Ramakrishnan	Surface EMG Based Fatigue Index Estimation for Biceps Brachii Muscle with Polynomial Wigner-Ville Marginal Spectrum	55th annual Rocky Mountain Bioengineering Symposium (RMBS),		Bioengineering	US A	2019

**(C) Books & Monographs**

Author(s)	Title of Book/Monograph	Name of Publishers	Year of Publication	ISSN/ISBN Number
Vinothini. S, Karthick, P.A., and Ramakrishnan. S	Analysis of Frequency Bands of Uterine Electromyography Signals for the Detection of Preterm	IOS Press	2021	978-1-64368-184-9

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	Birth, Public Health and Informatics,			
J. Shiva, N. Makaram, P. A. Karthick and R. Swaminathan,	Emotion Recognition Using Spectral Feature from Facial Electromyography Signals for Human-Machine Interface, Public Health and Informatics	IOS Press	2021	978-1-64368-184-9
Arunganesh K, Sivakumaran N, Kumaravel S, and Karthick P. A	Analysis of EEG-EMG Coherence in Low Frequency Bands, Public Health and Informatics	IOS Press	2021	978-1-64368-184-9
M. Joseph, N. Sivakumaran, and P.A.Karthick	Detection of Tonic-Clonic Seizures Using Scalp EEG of Spectral Moments, Biomedical Signal Based Computer-Aided Diagnosis of Neurological Disorders	Springer	2022	978-3-030-97845-7
Arunganesh K, Sivakumaran N, Kumaravel S, and Karthick P. A	Analysis of Intramuscular Coherence of Lower Limb Muscles Activities Using Magnitude Squared Coherence, Biomedical Signal Based Computer-Aided Diagnosis of Neurological Disorders	Springer	2022	978-3-030-97845-7