

Agenda

- **About PSG CARES**
- **Our journey from Ideation to Commercialization- Gait Watch^R**
- **The Take-aways**



To become a Centre of Excellence of world class standard in the field of Assistive Technology and Rehabilitation Engineering to enhance the Quality of Life (QoL) of Geriatric and Specially Challenged population through Innovative Technology Interventions

Mission

- To develop **innovative and cost effective** solutions for addressing the special needs of Elderly and physically Challenged population by leveraging the emerging technological advancements in Information and Communication Technologies (ICT) blended with Interdisciplinary approach
- To partner with government, industry and non-profit organizations to facilitate **commercialization** and **mass production** of the assistive technology interventions developed in the center
- To promote **entrepreneurship potential** in the areas of Wearable Assistive Technology and Rehabilitation Engineering and become a **Certified Testing Centre** for Smart Wearable Biomedical Devices

Objectives

- To design and develop **innovative and cost effective** smart health care solutions by leveraging the advancements in medical IoT, Artificial Intelligence, Data Analytics etc.
- To conduct **clinical and field validation trials** with the help of health care professionals
- To publish Research Findings to disseminate state-of-art knowledge in the fields of Assistive Technology, Smart Wearable Devices and Modern Rehabilitation Engineering
- To work out **sustainable business models** to commercialize the technologies so as to reach out to the masses

Focus Areas of R&D

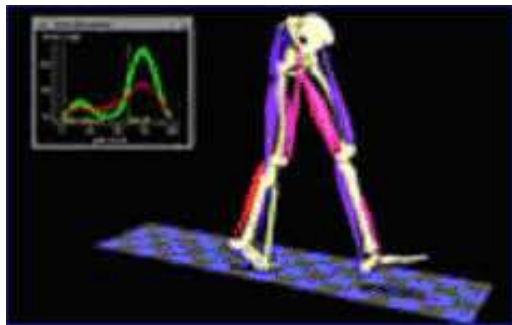
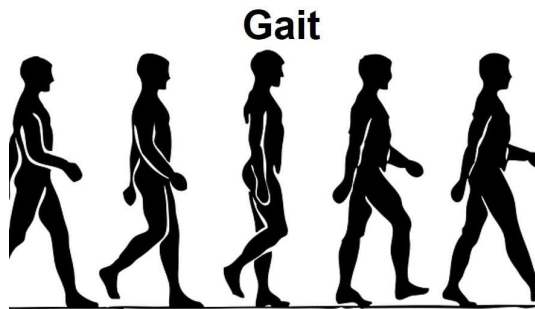
- **Gait and Human Biomechanics Analysis**
- **Wearable monitoring Devices** for Preventive Cardiology Applications
- **Early Warning Systems** and Medical Decision Support Systems
- **Connected Healthcare Solutions**
- **In - home Rehabilitation Solutions**



Gait Watch™ – A Gait Analysis and Fall Risk Prediction Device

Designed & Developed at PSG CARES under DST –TIDE funding

The Need for Gait Analysis



Gait is not recognised yet as a wellness marker since measuring it is cumbersome



Manual measurements are time consuming, inaccurate and subjective.

Available tools are costly and time consuming

Falls in Elderly

- Fall is considered as one of the most serious problems for the elderly.
- Adults older than 65 years of age suffer the greatest number of fatal falls.
- Preventing falls remains one of the highest health care priorities.

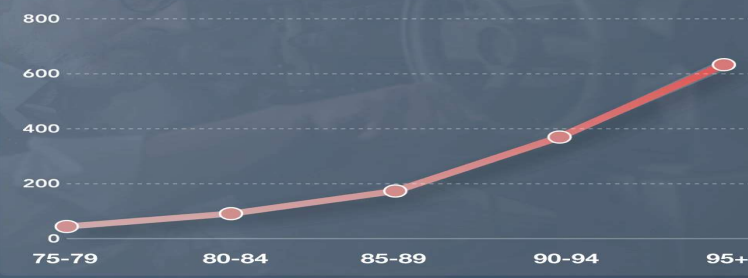


THE PROBLEM

Falls: Mortality Rate by Age

Fall mortality increases exponentially with age

Mortality Rate (per 100,000)



Clearvue Health

age 65+



1 out of 3 people falls each year

age 72+



fall every two years

age 80+



fall every year

September is Falls Prevention Awareness Month!

One in four people age 65 or older has a fall each year.



Don't be one of them!



The Centre for Disease Control and Prevention (CDC) and the American Geriatric Society recommend **yearly fall assessment screening** for all adults 65 years of age and older.

CDC'S STEADI consists of three core elements: **Screen, Assess, and Intervene** to reduce fall risk.

Prediction of the risk and grading of the fall can prevent an imminent fall

The Solution – Gait Watch™

- A smart wearable knee band, *Gait Watch™*, is an indigenously designed and developed device to comprehensively monitor the gait parameters of the wearer and accurately predict the fall risks
- Early prediction of fall risk helps in initiation of appropriate safety measures thus saving ***huge health care costs associated with geriatric falls.***

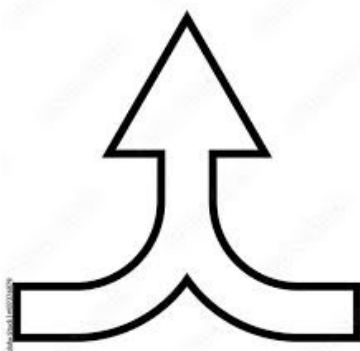


Gait Watch[®] as a Fall Risk Assessment Tool

Fall Risk Factors :

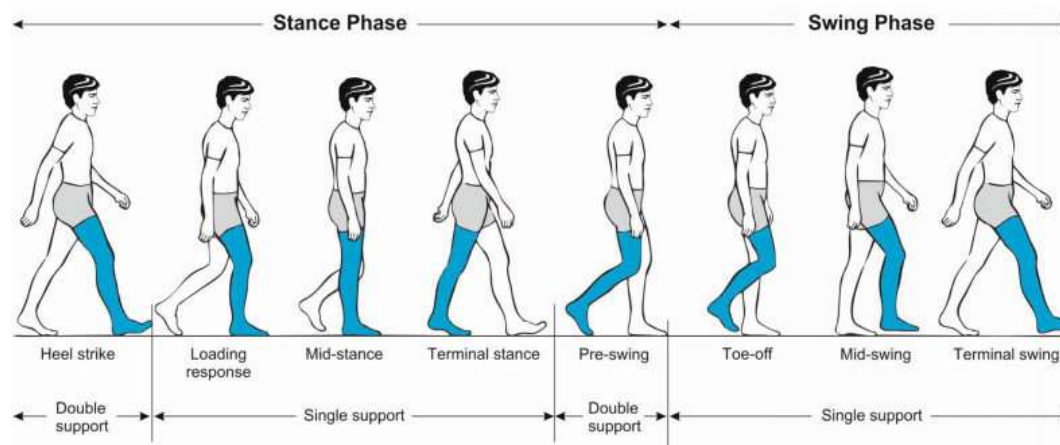
- Age
- Fall History
- Medications
- Medical conditions
- Vision impairments
- Cognitive Impairments

Fall Risk Score



Gait Quality Assessment :

- Step Count
- Cadence
- Velocity
- Stride Length
- Stance Time
- Range of Motion



Gait Watch™ - User Interface

Gait Assessment

HOME DETAILS RESULTS REPORT

Participant Details

Patient ID

Name

Age

Gender Male Female

Height

Weight


Contact No

Fall History (Intrinsic) Yes No

Mobility Support Aid Yes No

Medical Diagnosis Yes No

Gait Watch™



Gait Watch™ quantitatively measure the gait wellness markers in a comprehensive manner and estimate the fall risk score and hence the fall risk category of a given individual. Also it classifies the type of gait of the individual under consideration with an objective of providing some early indications about a few imminent motor function disabilities

Salient Features

- Predicting the fall risk of geriatric population.
- Assess and Quantify the gait wellness of individual.
- Support the individuals in rehabilitation stage
- Advance prediction of fall risk results in

Gait Assessment

HOME DETAILS RESULTS REPORT

Reference Table

Gait Parameters	Reference	Score
Step Count (steps/30 Secs)	45 - 50	20
Cadence (steps/min)	89 - 100	40
Velocity (m/sec)	1.25 - 1.58	1.21
Step Length (m)	0.645 - 0.765	1.8
Stride Length (m)	1.29 - 1.53	3.5
RoM (Deg/sec)	20 - 40	98.4

Inference

Fall Risk Assessment **High Fall Risk**

Type of Gait **Impaired Gait**

GAIT ASSESSMENT REPORT



Name karunakaran
 Age 45
 Patient ID P71221
 Gender Male
 MobileNo 1234567890
 Primary diagnosis test



Fall Assessment Model: Weighted Morse Fall Scale

Gait Report		
Date	07/12/2021	
Time	12:24:37	Reference Value
Step Count (Steps/30 sec)	54	46-51
Cadence (Steps/min)	109.00	91-101
Velocity (m/sec)	Left 1.30 Right 2.08	1.34-1.48
Step Length (m)	Left 0.45 Right 0.56	0.675-0.745
Stride Length (m)	Left 0.91 Right 1.12	1.35-1.49
RoM (deg/sec)	Left 25.84 Right 31.68	
Stance Time (sec)	Left 0.69 Right 0.73	
Gait Assessment	Normal Gait	
Fall Risk Score	0 *	
Fall Risk Category	No Fall Risk	

* Level of Fall Risk

0 - 24 (No Fall Risk) 25 - 50 (Low Fall Risk) >50 (High Fall Risk)

Approved by

(Signature)

The Beneficiaries



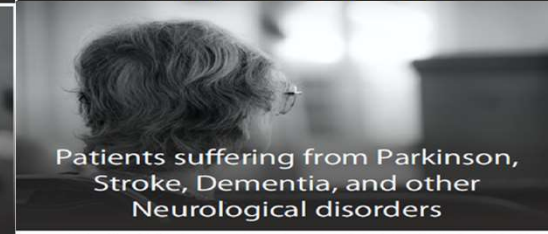
Geriatric patients with weak / impaired gait



Post-operative patients of Spine, Hip, Knee and other orthopedic conditions



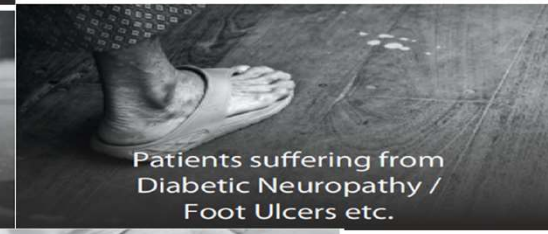
Physically challenged and special children with gait impairments



Patients suffering from Parkinson, Stroke, Dementia, and other Neurological disorders



Athletes / Sports persons suffering from sports-related injuries



Patients suffering from Diabetic Neuropathy / Foot Ulcers etc.



Patients under Rehabilitation after Neuro Muscular disorders

Gait Evaluation

What are the benefits ?

- To know fall risk in advance
- Personalized Treatment Plans
- To evaluate the efficacy of therapeutic interventions
- To monitor the progress of gait recovery Post op and Sports rehab
- To design customized footwear
- Orthotics



Customer Segments

- Ortho, Neuro, diabetic , Rehab, Psychiatry, Diabetic clinics
- Physiotherapists
- Ayurveda practitioners
- Gerontologists
- Sports Physicians
- Senior citizens communities
- Biomechanics Analysts & Researchers

GAIT WATCH^R MILESTONES

<https://pib.gov.in/PressReleasePage.aspx?PRID=1623600>



Ministry of Science & Technology

DST supports assistive tools, technologies and techniques to combat challenges faced by Divyangjan & Elderly during COVID-19

Devices have been tailor-made for the current COVID-19 situations

Posted On: 13 MAY 2020 6:37PM by PIB Delhi

The Department of Science and Technology has taken several initiatives to mitigate the impact of COVID-19 among Divyangjan and Elderly and identified various challenges faced by them for finding technological solutions.

The organizations supported by Science for Equity Empowerment and Development (SEED) Division of DST have been instrumental in developing various assistive tools, technologies and techniques, that are affordable and adaptable to the Indian milieu through its programme on Technology Interventions for Disabled and Elderly (TIDE), for creating inclusiveness and universal accessibility for Divyangjan and Elderly.



Under this programme an e-Tool to create awareness and impart health and hygiene related information along with education and entertainment to overcome loneliness of the persons with intellectual disabilities, due to COVID-19 pandemic has been developed by Rajalakshmi Engineering College, Chennai. This will help the persons with Intellectual Disability to learn with fun through Tabs and mobiles. The e-Tool can also be converted to other vernacular languages and the Beta Version of the e-tool is being used by 200 specially-abled children.

Prof Ashutosh Sharma, Secretary, DST while stressing the importance of this less known S&T field for providing greater autonomy to Divyangjan and Elderly, called for development of more and more technically feasible and economically viable S&T solutions for Elderly and Divyangjan, which are the need of the hour for creating an inclusive society.

Screenshot of the e-Tool showing different components of the software/app

A wearable sensor device has been developed by PSG College of Technology, Coimbatore to remotely monitor the activities of Elderly and Divyangjan staying alone or those who happen to be under quarantine or isolation wards. The device also predicts and detects fall and frailty levels in Elderly. The device costs Rs. 1500/- when produced in bulk.



DST Press Release 14.05.2020 in PIB portal of Govt. of India

Technology Transfer



MoU signed between PSG CT & Agna Inc.on 21.09.2020

Gait Watch - Journey From TRL 6 to TRL 8



Ethical Clearance for Human Trials
Field Validations / Clinical trials
EMI/EMC Testing

TRL 8



Clinical Trials @ PSG IMSR, Coimbatore & Neuro Foundation, Salem



Gait Watch – Clinical Trials



Clinical trials at PSG IMSR with Principal Investigator and Co-PI. Clinical trials at various hospitals



Assessment trials at Neuro Foundation, Salem. Enthusiastic Crowd in Gait assessment Camp

THE TIMES OF INDIA

Coimbatore college teachers develop wearable 'gait monitoring and fall prediction' device



COIMBATORE: Faculty members of PSG College of Technology have developed a wearable gait monitoring and fall prediction device, which they have named as Gait Watch.

Developed by the research team at its Centre for Assistive Technology and Rehabilitation Engineering Solutions (PSG-CARES), the device could be used to screen patients with geriatric, neurological or orthopaedic conditions for their stability problems, which if timely detected could prevent them from an imminent fall.

This is designed for elderly and the people suffering from movement-related disorders.

Market Launch – Jan 2022



PSG's GAIT Watch, a gift for the elderly!

al Meet 2022

Gait Watch – Participation in Medical Camps



- Participated in Indian Medical Association -Tamilnadu State Annual Conference 2021 at PSG Hospitals and created awareness among the medical fraternity
- Participated in medical camp conducted by PSG Hospitals in Gobichettipalayam,
- Participated in Geriatric Physiotherapy Conference at Benz park Hotels, Chennai as a part of World Physiotherapy Day Celebrations.
- Participated in various geriatric health camps conducted by Padmashree Dr VS Natarajan Geriatric Foundation.

The Journey

GaiT Watch

1

SEP 2020

Technology Transfer MoU

2

NOV 2020

MeiTY Incubation Funding

3

NOV'20 - JAN'21

TRL 7 Prototype Developed

4

JAN 2021

Ethical Clearance for Human Trials

Milestones

5

MAR 2021

EMI/EMC Testing

6

MAR - DEC 2021

Large Scale Clinical Trials

7

MAR - MAY 2021

Stanford SPARK Mentoring

8

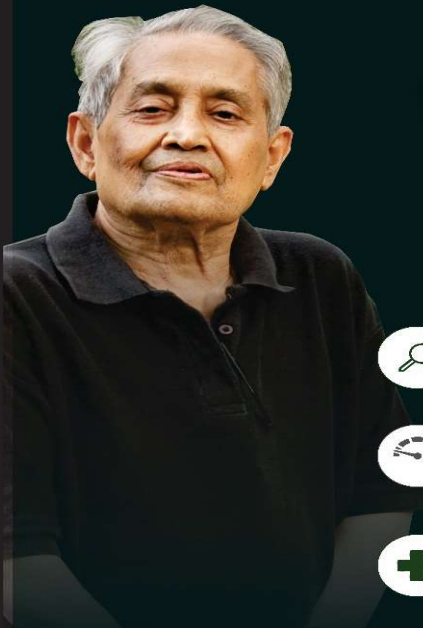
JAN 2022

Product Launch


GaiT WATCH™

A Fall Risk Prediction & Gait Assessment Device

An **Effective & User-friendly Solution** to tackle one of the biggest health risks of geriatric population - falls and associated morbidities



BENEFITS

-  Monitors effects of therapeutic interventions & disease progression
-  Gait score as a clinical indicator for monitoring therapeutic efficiency
-  Minimizes huge health care associated cost following fall-related injuries
-  Comprehensive evaluation of gait metrics (step length, stride length, velocity, cadence, range of motion, type of gait and fall risk score) within few minutes

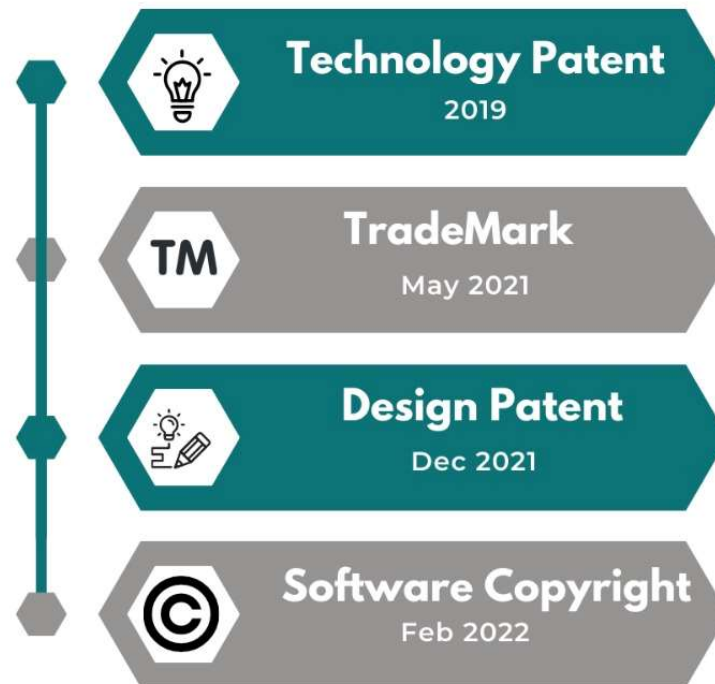
FEATURES

- Instant report generation ✓
- Quick to conduct a Gait test ✓
- Easy to wear & easy to operate ✓
- Keeps track of progression of Gait Metrics ✓
- Quantitative Evaluation of Gait bio mechanics ✓

THE UNIQUE SELLING PROPOSITION

- First of its kind in the Indian market
- **Cost effective alternative** to sophisticated Gait labs, which is out of reach of common public
- Aids **gait evaluation as a routine clinical procedure** in Movement disorder / Rehab clinics
- **Image booster** to Rehab clinics

The IP Assets Created





ORIGINAL

मूल/No : 120545



भारत सरकार
GOVERNMENT OF INDIA
पेटेंट कार्यालय
THE PATENT OFFICE
डिजाइन के पंजीकरण का प्रमाणपत्र
CERTIFICATE OF REGISTRATION OF DESIGN

डिजाइन सं. / Design No. : 355119-001
तारीख / Date : 18/12/2021
पारस्परिकता तारीख / Reciprocity Date* :
देश / Country :

प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो **MEDICAL DIAGNOSTIC DEVICE** से संबंधित है, का पंजीकरण, श्रेणी **24-02** में 1.Psg College Of Technology 2. L S Jayashree के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class **24-02** in respect of the application of such design to **MEDICAL DIAGNOSTIC DEVICE** in the name of 1.Psg College Of Technology 2. L S Jayashree.

डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्याधीन प्रावधानों के अनुसरण में।

In pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

INTELLECTUAL
PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

निर्गमन की तारीख/Date of Issue : 16/12/2022

भारत सरकार
Controller General of Patents, Designs and Trade Marks

पारस्परिकता तारीख (यदि कोई हो) जिसकी अनुमति देश के नाम पर की गई है। डिजाइन का स्वामित्वार पंजीकरण की तारीख से दस वर्षों के लिए होगा जिसका विस्तार, अधिनियम एवं नियम के निबंधनों के अंतर्गत, पाँच वर्षों की अतिरिक्त अवधि के लिए किया जा सकता है। इस प्रमाण पत्र का उपयोग विधिक कार्यवाहियों अथवा विदेश में पंजीकरण प्राप्त करने के लिए नहीं हो सकता है।

*The reciprocity date (if any) which has been allowed and the name of the country. Copyright in the design will subsist for ten years from the date of Registration, and may under the terms of the Act and Rules, be extended for a further period of five years. This Certificate is not for use in legal proceedings or for obtaining registration abroad.



Institutional Human Ethics Committee
PSG Institute of Medical Sciences & Research

Recognized by The Strategic Initiative for Developing Capacity in Ethical Review (SIDCER, WHO)
POST BOX NO. 1674, PEELAMEDU, COIMBATORE 641 004, TAMIL NADU, INDIA
Phone : +91 422 - 4345818, Fax : +91 422 - 2594400, Email : ihec@psgimtar.ac.in



Ref. No.: PSG/IHEC/2021/Appr/FB/003

January 06, 2021

To
Dr Jayashree L S
Professor
Department of Computer Science and Engineering
PSG College of Technology
Coimbatore
Co-investigators: Dr Udayamoorthy S / Mr Prabhu P / Mr Soundharyan P

Ref: Project No. 20/266

Dear Dr Jayashree,

Institutional Human Ethics Committee, PSG IMS&R reviewed and discussed your application dated 31.10.2020 to conduct the research study entitled "Design and development of a wearable intelligent navigation guidance (WING) kit (with a Fall Predictor) for preventing wandering away and falls in elderly with dementia (EwD)" during the IHEC review meeting held on 20.11.2020.

The following documents were reviewed and approved:

1. Project Submission form
2. Study protocol (Version 2 dated 10.12.2020)
3. Informed consent forms (Version 2 dated 10.12.2020)
4. Data collection tool (Version 1 dated 31.10.2020)
5. Permission letter from Director – Research & Innovation
6. Permission letter from concerned Head of Department
7. Authorship Agreement
8. MOU
9. Current CVs of Principal investigator, Co-investigators
10. Budget.

Due to the current lock down in view of COVID-19 pandemic, the full board review meeting was convened through Zoom video conference on 20.11.2020 between 2.30 pm and 4.30 pm. The following members of the Institutional Human Ethics Committee (IHEC) were present for the discussions:

Sl. No.	Name of the Member of IHEC	Qualification	Area of Expertise	Gender	Affiliation to the Institution Yes/No	Present at the meeting Yes/No
1	Mr Antony Raj B	MA	Social Sciences	M	Yes	Yes

Proposal No. 20/266 dt.06.01.2021, Title: Design and development of a wearable intelligent navigation guidance (WING) kit (with a Fall Predictor) for preventing wandering away and falls in elderly with dementia (EwD). COIMBATORE-641004



Office of the Controller General of Patents, Designs & Trade Marks
Department of Industrial Policy & Promotion,
Ministry of Commerce & Industry,
Government of India



Application Details	
APPLICATION NUMBER	201941053600
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	24/12/2019
APPLICANT NAME	PSG COLLEGE OF TECHNOLOGY
TITLE OF INVENTION	SYSTEM AND METHOD FOR PREDICTING A FALL STATE AND A GAITWELLNESS OF A PERSON
FIELD OF INVENTION	BIO-MEDICAL ENGINEERING
E-MAIL (As Per Record)	ipo@myipstrategy.com
ADDITIONAL-EMAIL (As Per Record)	ipo@myipstrategy.com
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	23/01/2020
PUBLICATION DATE (U/S 11A)	31/01/2020
REPLY TO FER DATE	02/12/2021

Application Status

Deny Filed Application in amended examination

OUR HEARTFELT ACKNOWLEDGEMENT TO



Stepping towards a fall free aging

<https://www.youtube.com/watch?v=6ZgjUM4lgCE>



lsj.cse@psgtech.ac.in
+91- 99942 54502

