BIRLA INSTITUTE OF TECHNOLOGY
Mesra, Ranchi, Jharkhand-835215
(A Deemed to be University, u/s 3 of UGC Act, 1956)

Department of Computer Science and Engineering

Footprints and Vision

Presented By:

Dr. (Mrs.) Vandana Bhattacharjee

Head of the Department, CSE, BIT, Mesra

Mission & Vision of the Department

Vision

The department strives to be recognized for outstanding education and research, leading to excellent professionals and innovators in the field of Computer Science and Engineering, who can positively contribute to the society
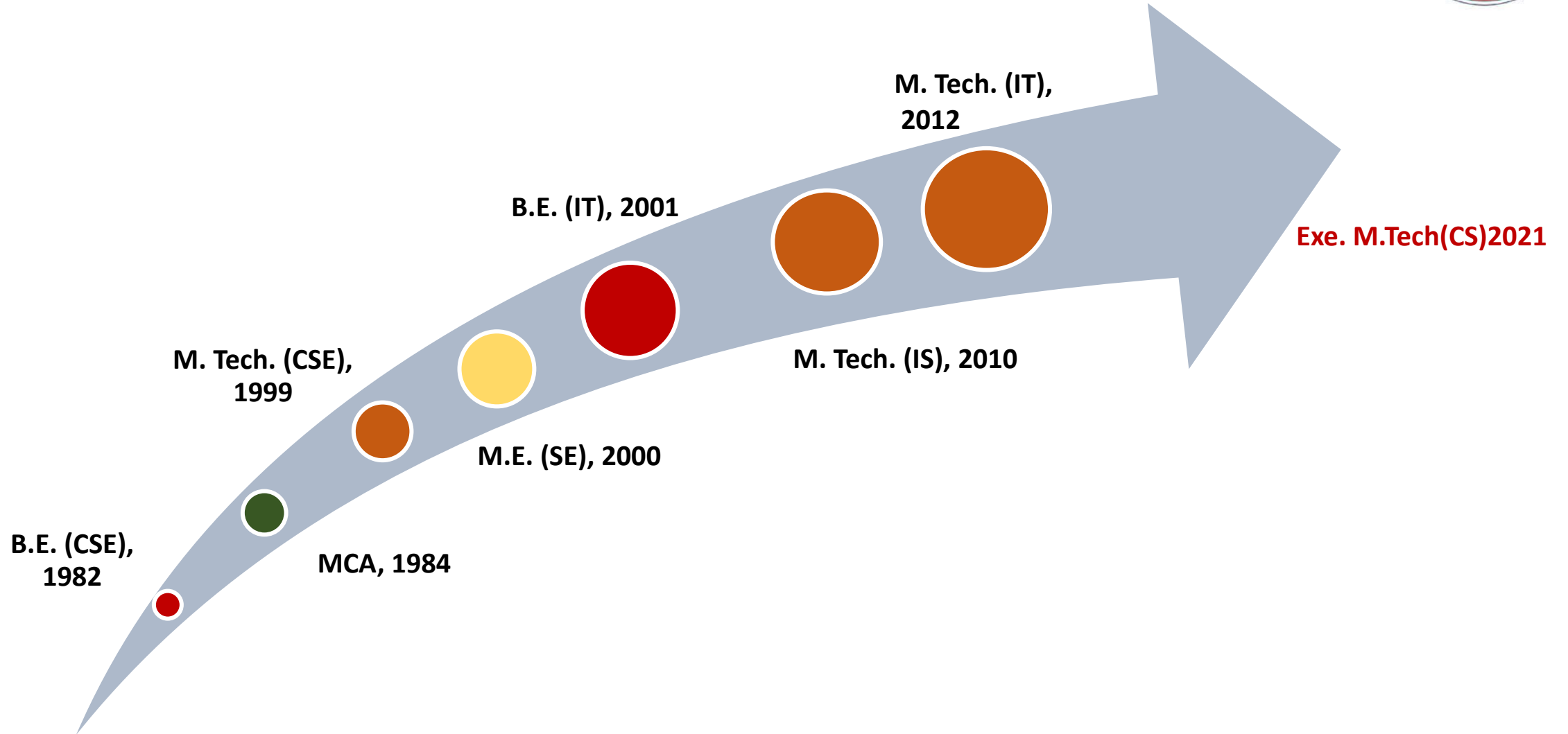
Mission

To impart quality education and equip the students with strong foundation that could make them capable of handling challenges of the new century.
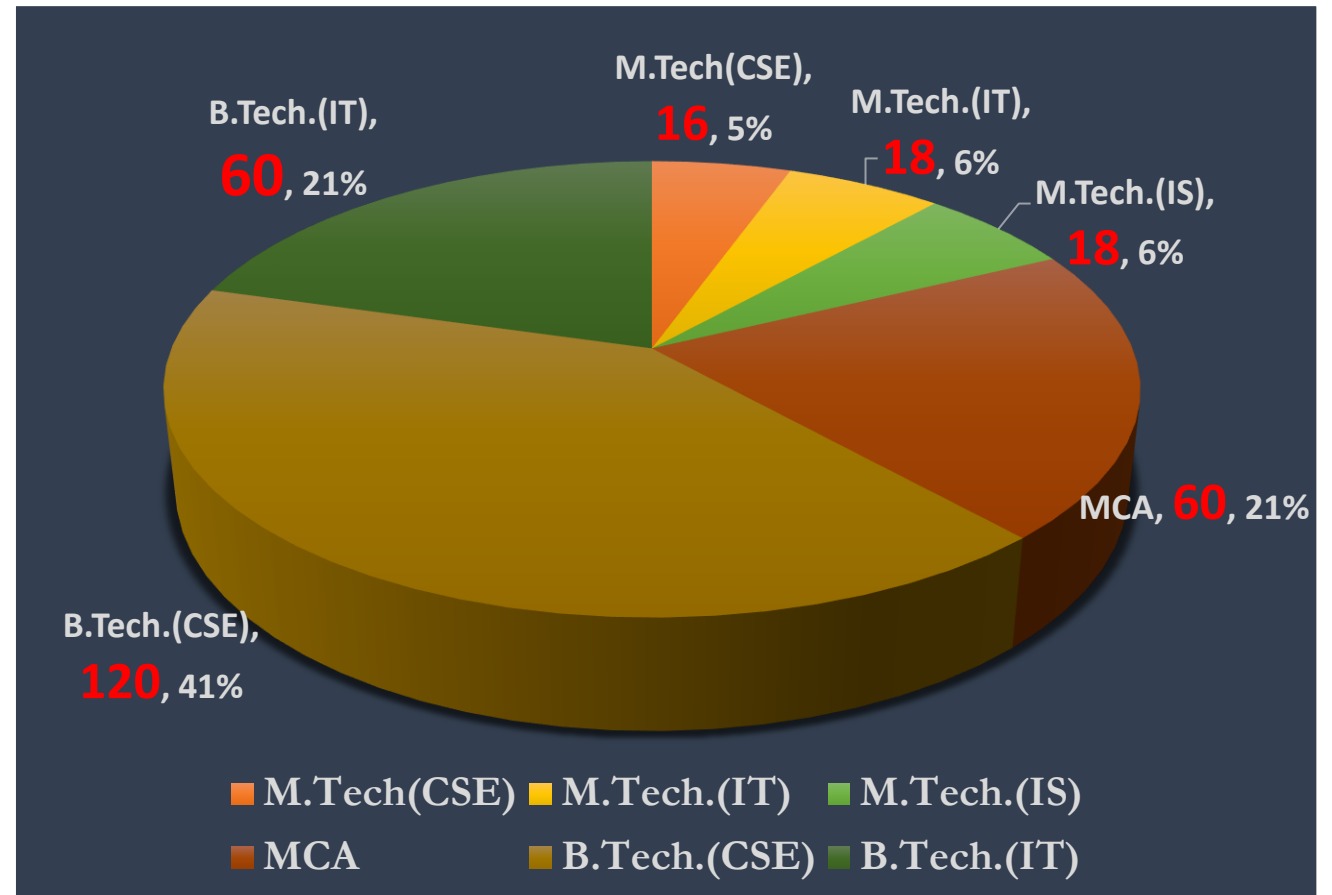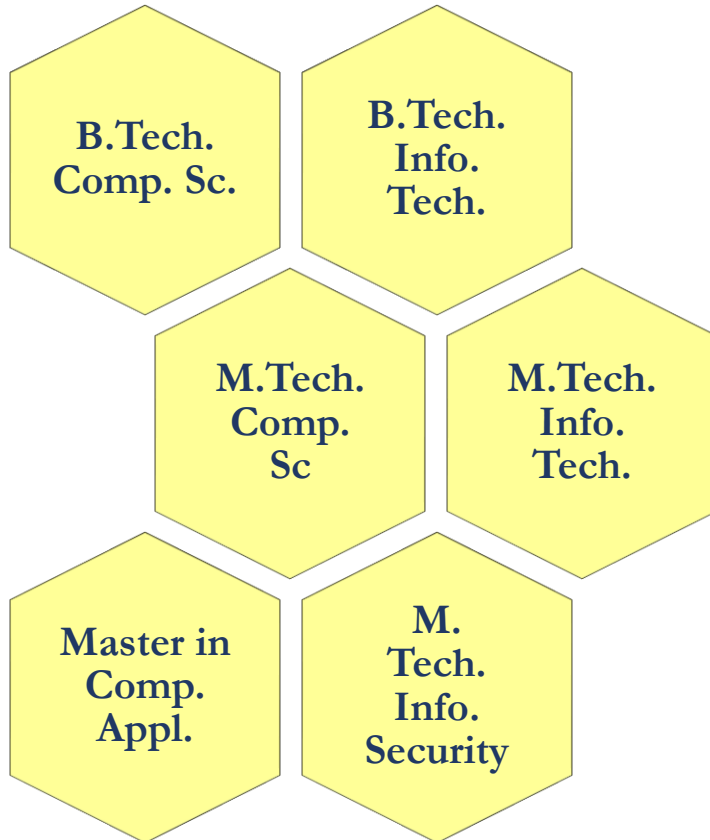
To maintain state of the art research facilities and facilitate interaction with world's leading universities, industries and research organization for constant improvement in the quality of education and research.
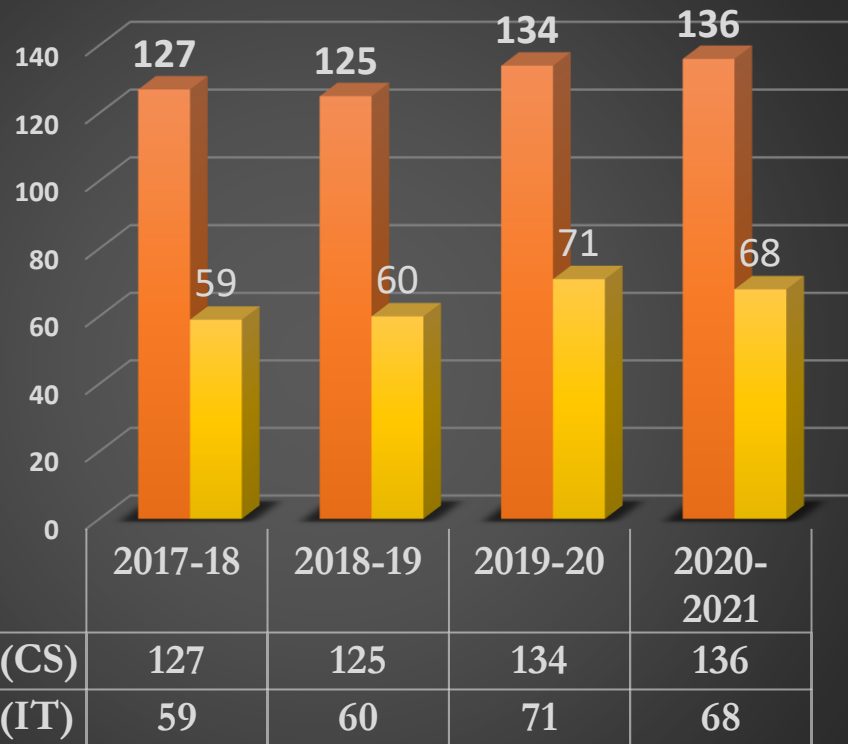
Inception of the Department

B.E. (CSE), 1982

MCA, 1984

M. Tech. (CSE), 1999

M.E. (SE), 2000

B.E. (IT), 2001

M. Tech. (IS), 2010

M. Tech. (IT), 2012

Exe. M.Tech(CS)2021

Programs Offered and Sanctioned Intake

B.Tech. Comp. Sc.

B.Tech. Info. Tech.

M.Tech. Comp. Sc

M.Tech. Info. Tech.

Master in Comp. Appl.

M. Tech. Info. Security

B.Tech.(IT), **60**, 21%

M.Tech(CSE), **16**, 5%

M.Tech.(IT), **18**, 6%

M.Tech.(IS), **18**, 6%

MCA, **60**, 21%

B.Tech.(CSE), **120**, 41%

■ M.Tech(CSE) ■ M.Tech.(IT) ■ M.Tech.(IS)
■ MCA ■ B.Tech.(CSE) ■ B.Tech.(IT)

Programs Vs # Student

Students Admitted in UG

	2017-18	2018-19	2019-20	2020-2021
■ B. Tech (CS)	127	125	134	136
■ B. Tech (IT)	59	60	71	68

■ B. Tech (CS)   ■ B. Tech (IT)

Students Admitted in PG

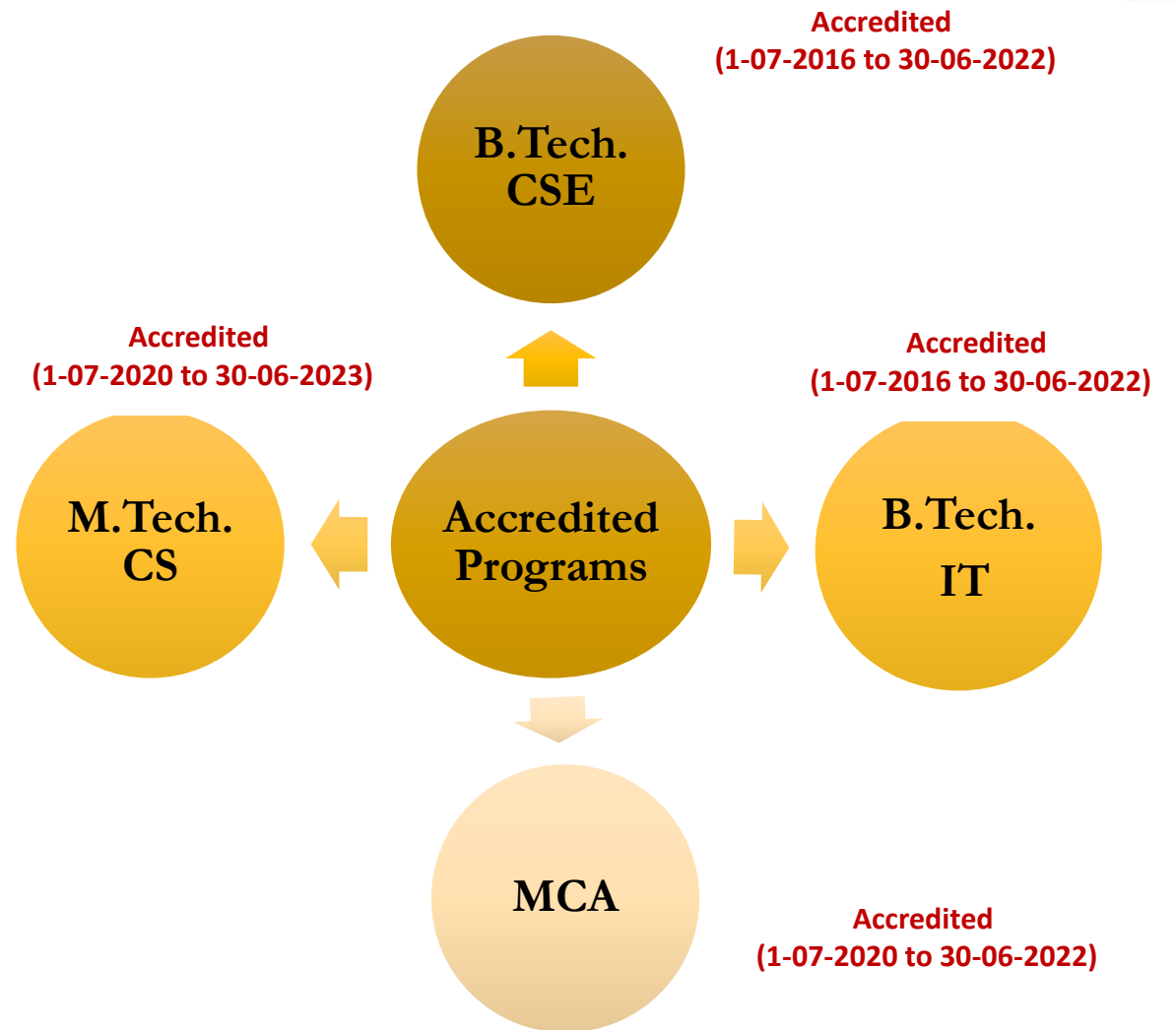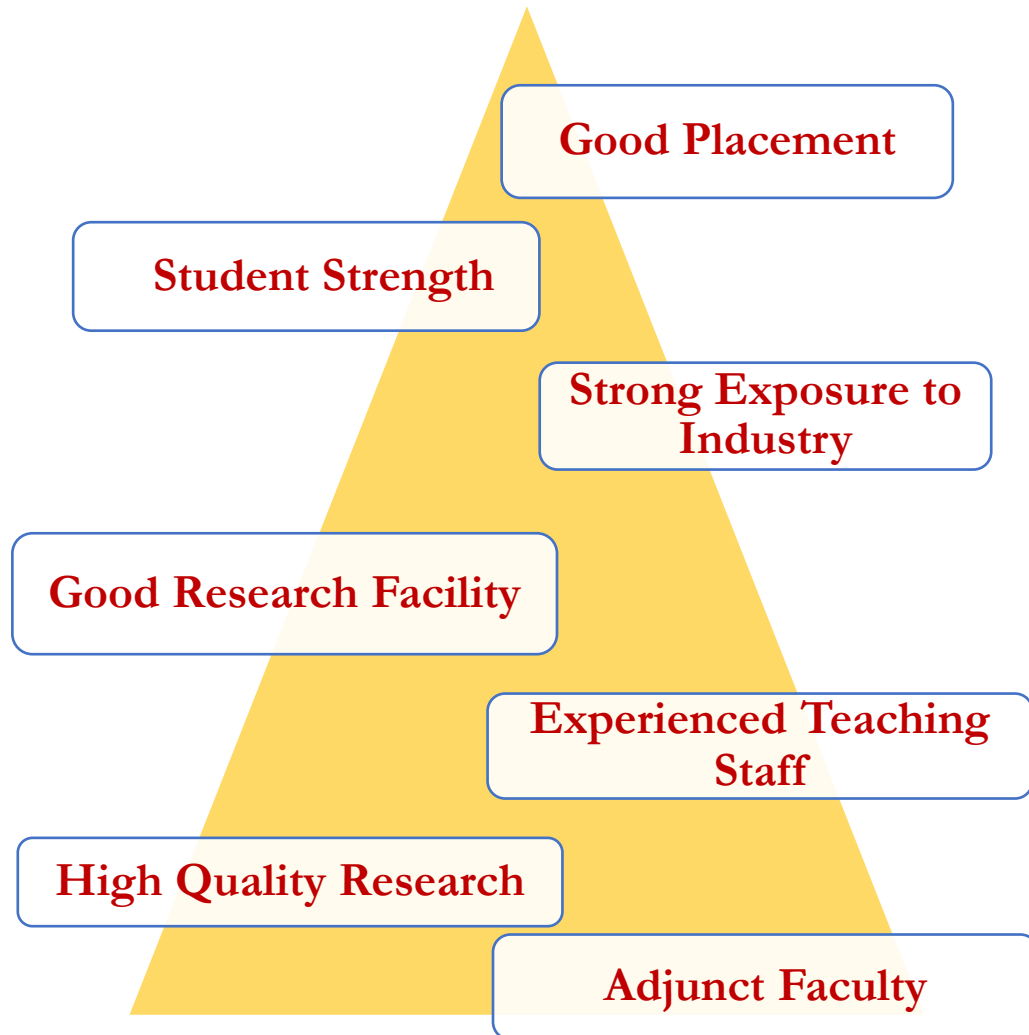|	2017-18	2018-19	2019-20	2020-21	2021-2022
■ M. Tech(CS)	13	14	14	16	10
■ M. Tech(IT)	10	6	8	11	6
■ M. Tech(IS)	6	2	2	7	4
■ MCA	48	55	52	50	55
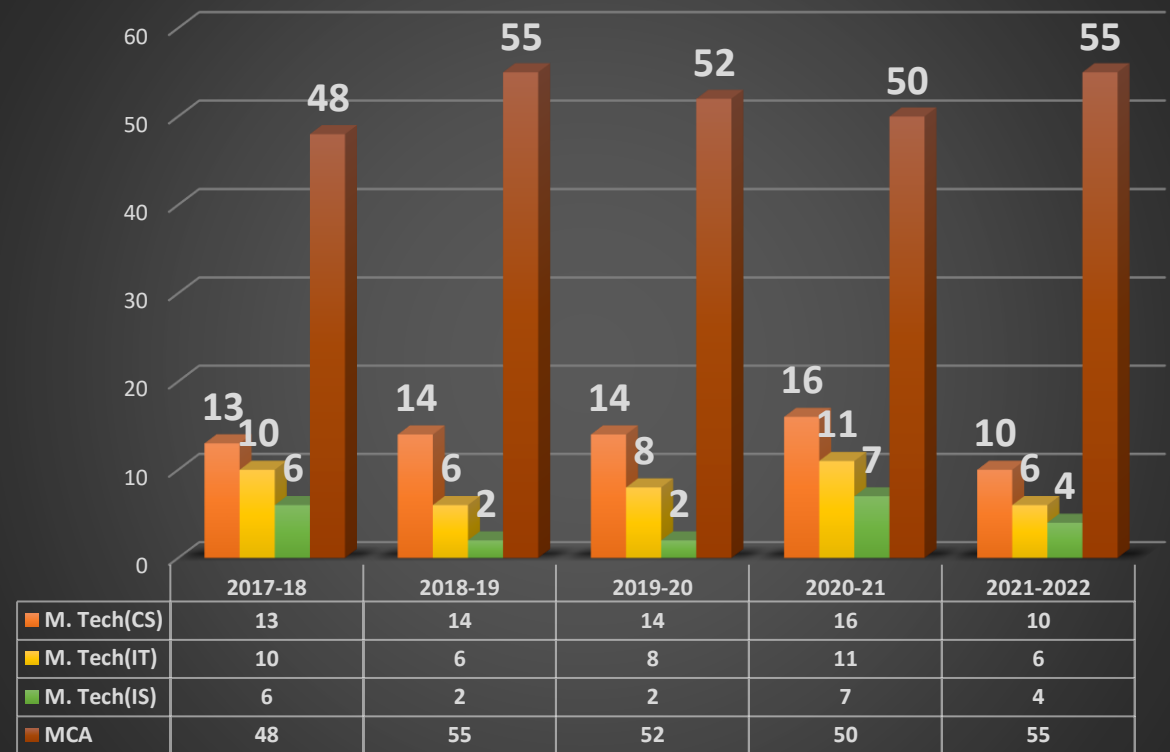
■ M. Tech(CS)   ■ M. Tech(IT)   ■ M. Tech(IS)   ■ MCA

Total student strength in 2020-21: 780(UG)+157(MCA)+58(PG) + RS = 1000 +

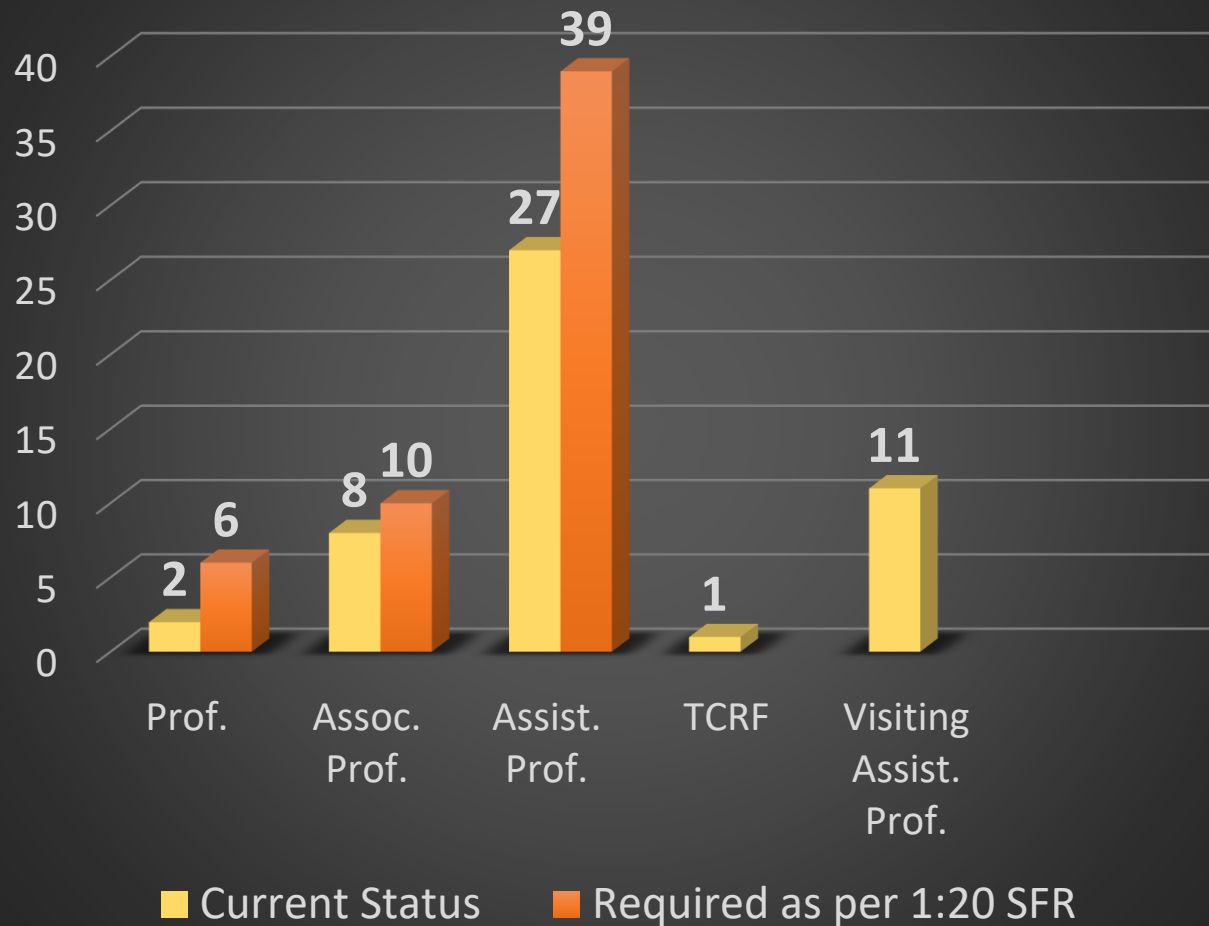# Strength of our department & NBA Accredited Programs

Faculty Details

Faculty Cadre wise

Cadre	Current Status	Required as per 1:20 SFR
Prof.	2	6
Assoc. Prof.	8	10
Assist. Prof.	27	39
TCRF	1	
Visiting Assist. Prof.	11	

Current Status — **Required as per 1:20 SFR**

Distinguished Adjunct Faculty Members

Prof. Supratim Biswas
Ex. Prof. IIT, Bombay
Research Areas
Programming Languages, Compiler Optimization, Parallelizing Compilers, Parallel and Distributed computing, Combinatorial Optimization

Prof. R. K. Ghosh
Ex. Prof. IIT, Bhilai
Research Areas
Wireless Networking, Wireless Sensor Networks, Distributed Systems, Mobile Computing

Prof. D. K. Gupta
Ex. Prof. IIT, Kharagpur
Research Areas
Numerical Analysis, AI, DBMS, Comp. Networks, Graph Theory & Combinatorial Optimization Problem

Newly Joined Faculty Members

Dr. Jit Mukherjee

Assistant Professor

Date of Joining: 18-08-21

Ph.D (IIT Kharagpur)

MS (IIT Kharagpur)

B.Tech (W.B.U.T)

Dr. Prashant Pranav

Assistant Professor

Date of Joining: 25-08-21

PhD (BIT, Mesra)

M. Tech (BIT, Mesra)

B.Tech (College of Engineering Bhubaneswar)

Dr. Parikshit Saikia

Assistant Professor

Date of Joining: 16-09-21

PhD (IIT Guwahati)
M.Tech (IIT Guwahati)
BE (Assam Engineering College)

Faculty Members of CSE

Dr. (Mrs.) Vandana Bhattacharjee
Professor and Head

Dr. Sandip Dutta
Professor & Ex Dean(AAC)

Dr. (Mrs.) Aruna Jain
Associate Professor

Dr. Vijay Kumar Jha
Associate Professor

Dr. Bhaskar Karn
Associate Professor

Dr. D. K. Mallick
Associate Professor

Dr. Abhijit Mustafi
Associate Professor

Dr. K.Sridhar Patnaik
Associate Professor

Dr. Kumar Rajnish
Associate Professor

Dr. Sujan Kumar Saha
Associate Professor

Dr. Amritanjali
Assistant Professor

Dr. Shamama Anwar
Assistant Professor

Faculty Members of CSE (Contd..)

Mr. B.K.Chanda
Assistant Professor

Dr Satish Chander
Assistant Professor

Dr. Shruti Garg
Assistant Professor

Dr. Pankaj Gupta
Assistant Professor

Mr. Ritesh Jha
Assistant Professor

Dr. Anup Kumar Keshri
Assistant Professor

Dr. Subrajeet Mohapatra
Assistant Professor

Dr. Indrajit Mukherjee
Assistant Professor

Dr. Debjani Mustafi
Assistant Professor

Dr. Akriti Nigam
Assistant Professor

Dr. Sanchita Paul
Assistant Professor

Dr. Sabina Priyadarshini
Assistant Professor

Faculty Members of CSE (Contd..)

Dr. Shashank Pushkar
Assistant Professor

Mr. Indra Deo Ram
Assistant Professor

Dr. Sudip Kumar Sahana
Assistant Professor

Mr. Kalyan Samanta
Assistant Professor

Dr. Bikash Kanti Sarkar
Assistant Professor

Dr. Kishore Kumar Senapati
Assistant Professor

Dr. Niraj Kumar Singh
Assistant Professor

Dr. S.P. Singh
Assistant Professor

Dr. Itu Snigdh
Assistant Professor

Dr. Sumit Srivastava
Assistant Professor

Dr. Amit Prakash
TCRF

Visiting Assistant Professors

Mr. Alok Baranwal

Mr. Shishir Singh Chauhan

Mr. Kumar Gaurav

Mr. Ashish Kumar

Mr. Dhananjay Kumar

Mr. Surya Narayan Mahapatra

Mr. Arunangshu Pal

Mr. Gaurav Kumar Pandey

Mr. Satya Prakash Patel

Mr. Mayur Shrirame

Mr. Rashmi Rathi Upadhyay

Technical Staff Members

Mr. Amit Sankar
Sr. Tech
Superintendent

Mr. Dineshwar Mahto
Jr. Tech Superintendent

Smt. Sabita Kumari
Jr. Tech.
Superintendent

Ms. Roma Kumari
Jr. Tech.
Superintendent

Mr. Shanti Prasad Tudu
Jr. Tech.
Superintendent

Smt. Meena Kumari
Jr. Tech.
Superintendent

Smt. Purnima Kumari
Jr. Tech.
Superintendent

Smt. Sunita Kumari
Jr. Tech.
Superintendent

Smt. Sugeeta Kumari
Jr. Tech.
Superintendent

Smt. Kumari Rashmi
Jr. Tech.
Superintendent

Mr. Jitendra Kr. Panday
Jr. Tech.
Superintendent

Mr. Tarkeshwar Kr. Singh
Jr. Tech.
Superintendent

Mr. Dheeraj Kumar. Nag
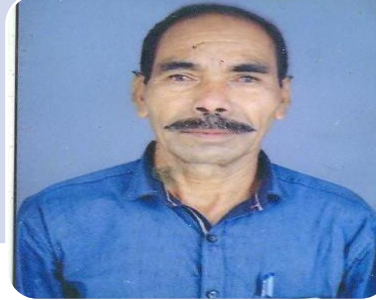Jr. Tech Superintendent

Office Staff Members

Smt. Geeta Kumari
Office Assistant

Mr. Deepak
Office Assistant

Mr. Vishal kumar Singh
Office Staff

Mr. Srinath Mahto
Office Staff

Mr. Arjun Vishwakarma
Office Staff

Mr. Balak Mahto
Office Staff

Mr. Rajesh Mahto
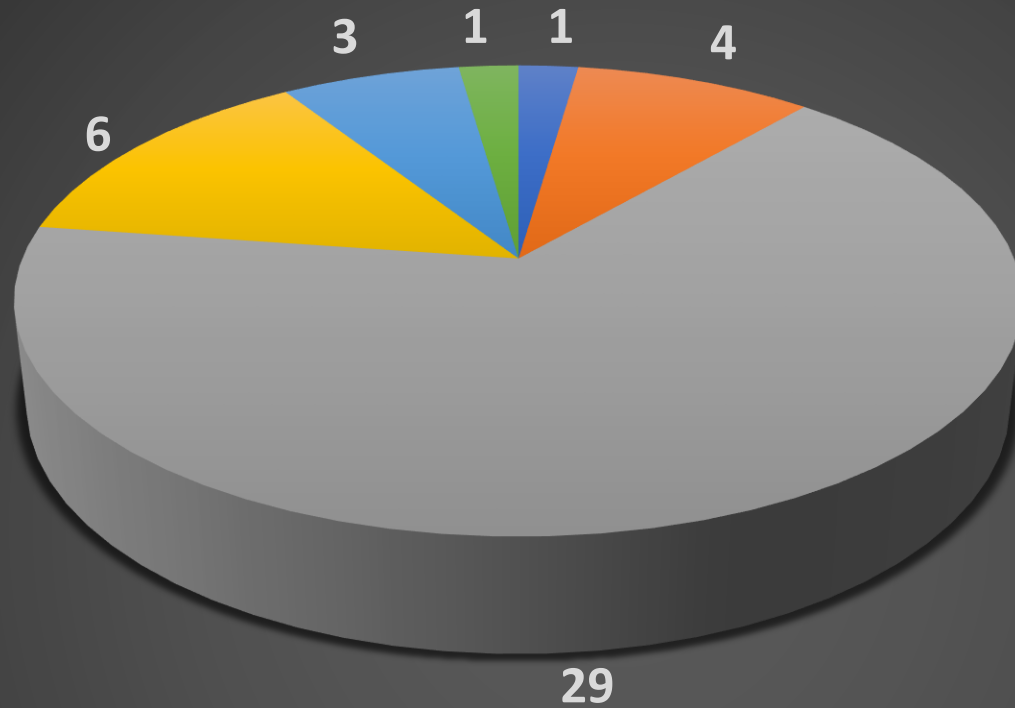**Office Staff**

Mr. Arjun Tanti
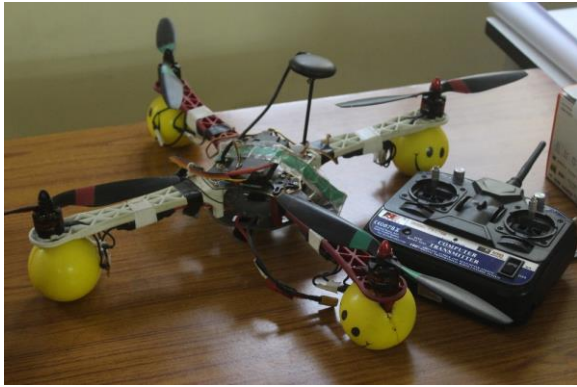Office Staff

Smt. Sunita Kumari
Staff

Smt. Chinta Devi
Staff

Physical Infrastructure

Pie chart values: 3, 1, 1, 4, 6, 29

Legend:
- Seminar Hall with Capacity 45
- Class Room
- Faculty Cabin
- Teaching Lab
- Research Lab
- Server Room

Some Snapshots of Infrastructures

LAB Equipment
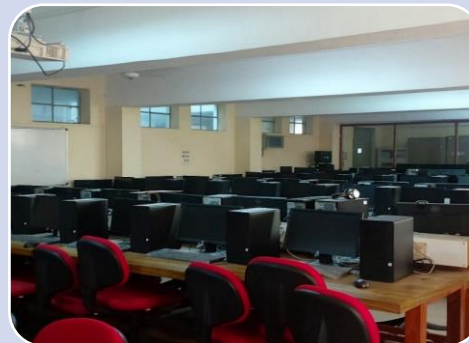

Visual Processing Lab

Dell optiplex 3010: (#90)

HP 280 G4 MT Business PC: (#30)

Operating system:- Windows 7 and Windows 10 Professional

Processor: Intel ® Core™ i5-3470@ 3.20 GHz 3.20 GHz

Installed Memory (RAM): 4 GB and 16GB

HDD: 500GB and 1TB(SATA)

Research Scholar Lab

Acer Veriton (#10)

Intel @Core TM 3.2GH

Installed MEMORY(RAM):16 GB

Hard Disk:-1TB, **HP280G4 MT-10**

Intel CoreTM 3.2 GHz

Installed memory(RAM): 16 GB

Hard Disk: 1 TB

Software Design Lab

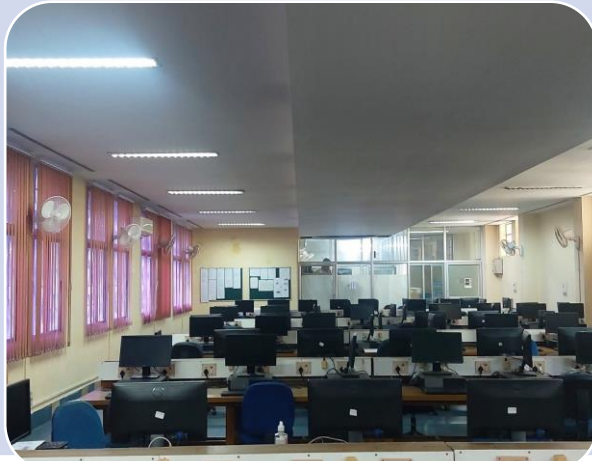**HP 280 G4 MT Business PC (#60)**

Operating system:-Windows 10 Professional

Processor: Intel Core i7- 8700 @ 3.20 GHz

Installed Memory (RAM):16 GB

HDD: 1 TB SATA

LAB Equipment

Programming Lab I

Dell optiplex 3010 (#80)

Operating system:- windows 8

Processor: Intel ® Core™ i5-3470@ 3.20 GHz 3.20 GHz

Installed Memory (RAM): 4 GB

HDD: 500GB

Programming Lab II

Acer VeritonM200 (#60)

RAM -16GB

64 bit operating System

HDD- 1TB

IOT Lab

Dell Optiplex 3060 (#30)
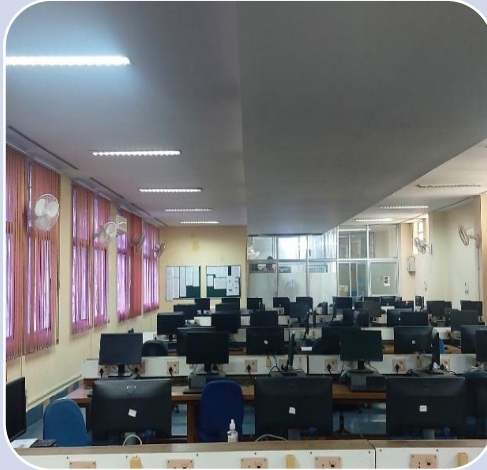
16 GB RAM, Windows 10

HDD -1TB Intel ® core ™ i7 8700 CPU@3.20 GHz

ACER Veriton (#30)

Operating system:- windows10 pro

Processor: Intel ® Core™ i7- 8700@ 3.2s0

LAB Equipment

Computational Intelligence Lab

HP 280 G2 MT (#75)

Operating system:- windows 7/ windows10

Processor: Intel ® Core™ i7 6700@ 3.40 GHz
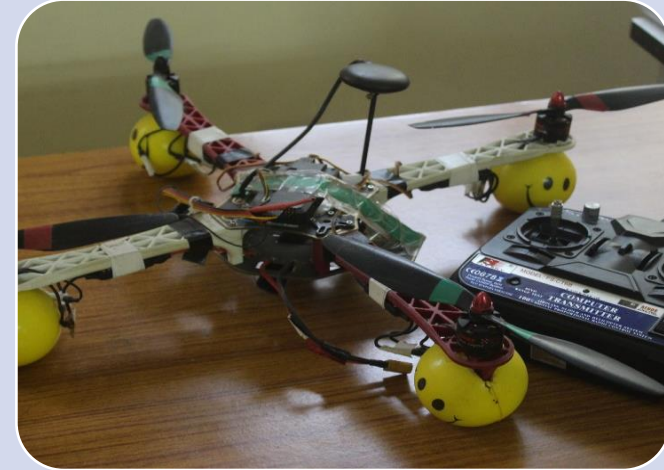
Installed Memory (RAM): 8 GB

HDD: 1TB

Machine Learning Lab

Acer VeritonM200 (#12)

RAM -16GB

64 bit operating System

HDD- 1TB

Intelligent System Lab

a) Acer VeritonM200 (#10)

RAM -16GB 64 bit operating System

HDD- 1TB

b) Dell Precision Workstation 7810 (#2)

Intel Xeon Processor RAM-128 GB(4*32)

c) Dell Precision Tower 7910 (#1)

RAM -128 GB(4*32)HDD-1 TB

d) BIOPAC Systems and accessories (#1)

Servers

HPC Server

(High Performance Computing)

Number of Servers: 01

Fujitsu Server

Number of Servers: 02

Dell Power edge Sever

Number of Servers: 02

CSE Traces @ BIT
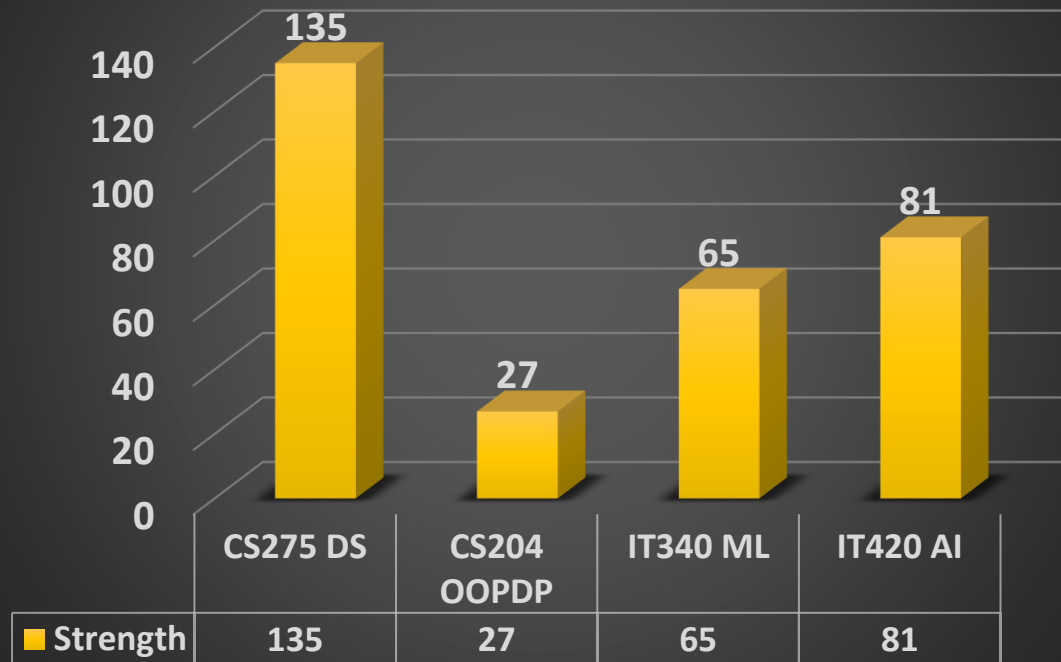
Courses Offered to Other Departments

Two theory courses and two Lab courses offered to all UG students
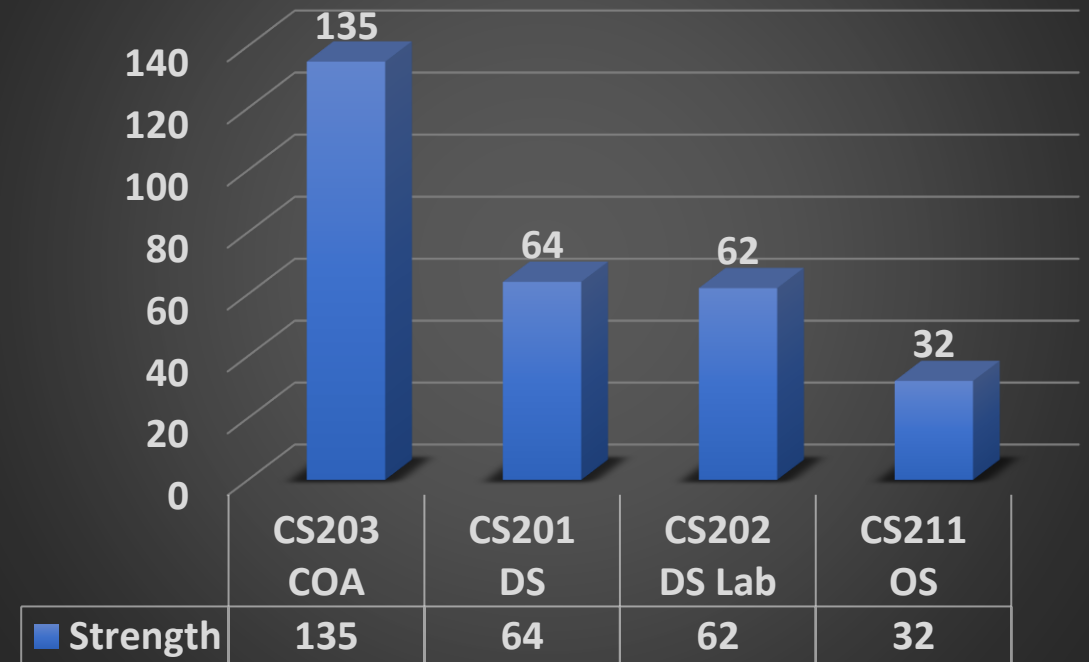Our OE courses are opted for by lots of students

Courses Offered to Other Departments & # Students Registered

Open Electives Vs. # students registered in current session

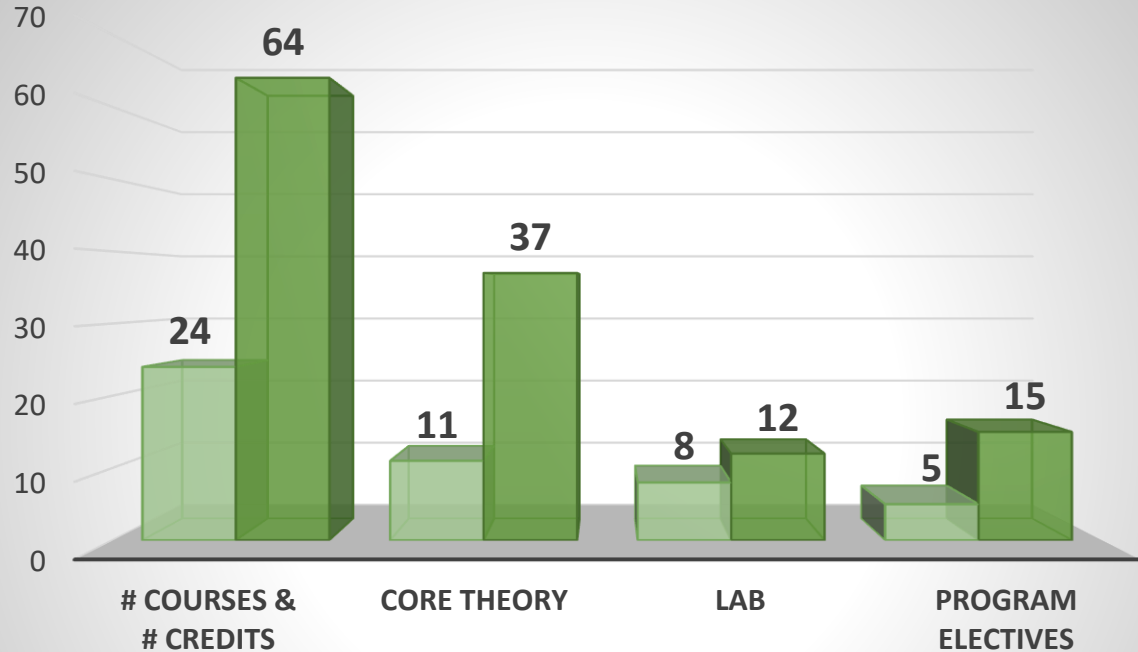|	CS275 DS	CS204 OOPDP	IT340 ML	IT420 AI
Strength	135	27	65	81

Minor Papers Vs. # students registered in current session

	CS203 COA	CS201 DS	CS202 DS Lab	CS211 OS
Strength	135	64	62	32

Courses Registered for IMSC(Maths & Comp.), PG and Pre-Ph.D.

Credits Registered by IMSc Students

	# Courses & # Credits	Core Theory	Lab	Program Electives
Number of Papers	24	11	8	5
Credits	64	37	12	15

Subjects	Departments
CS506 Machine Learning	ECE, Maths, Remote Sensing
CS524 Soft Computing	Maths, EEE, Civil
CS 518 Internet of Things	ECE, Prod., EEE, Phy., Remote Sensing
IT524 Image Processing	EEE, ECE, Remote Sensing

CSE Traces @ BIT for Last Three Years

Post Holders

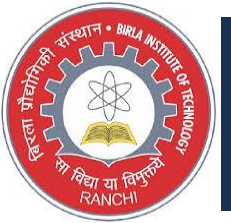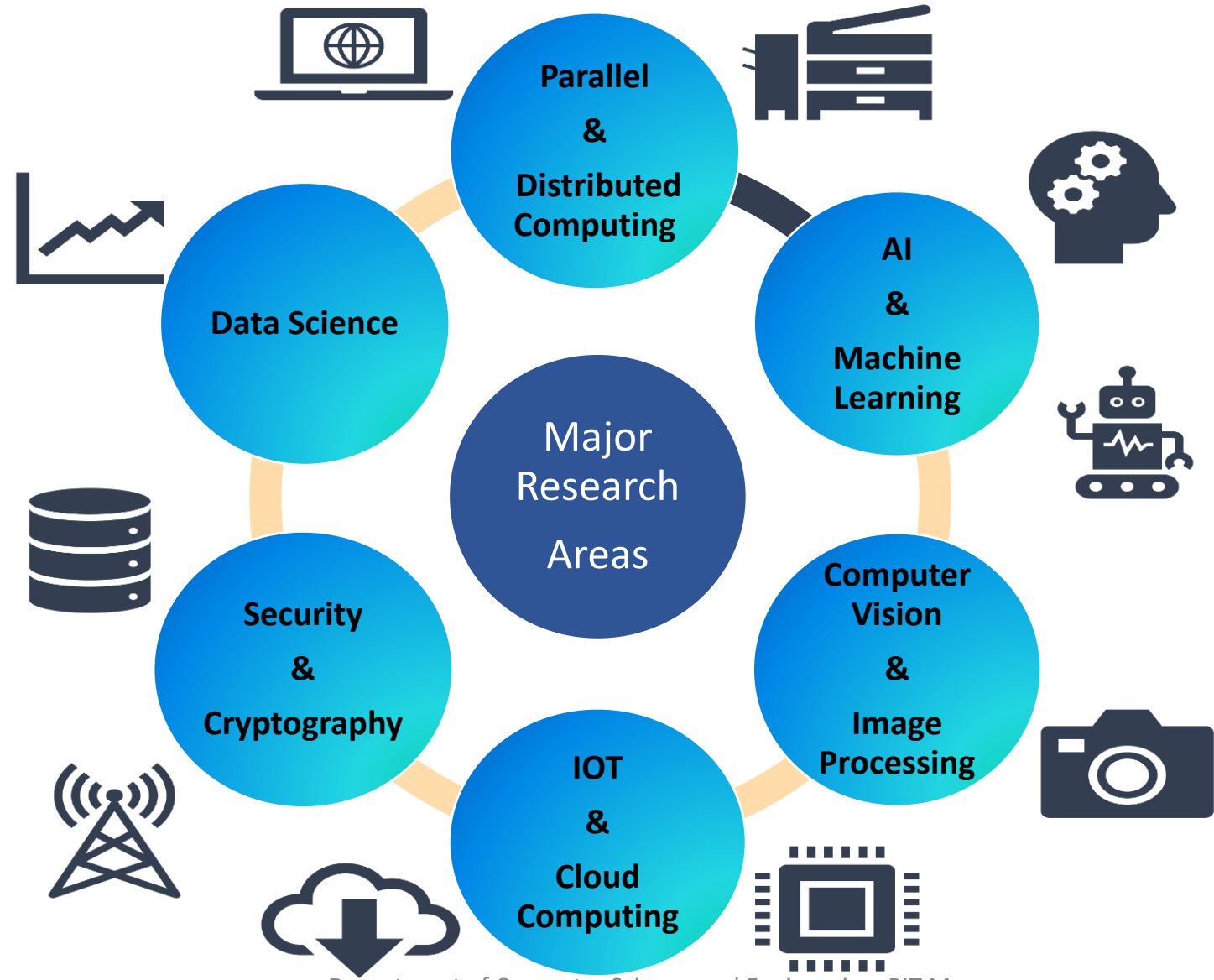| Name of the Faculty	Post	Responsibilities
Dr. Bhaskar Karn	Dy. Controller of Examination(2017-20)	Coordinating Examination Related activities.
Dr. Sridhar Patnaik	Assoc. Dean Students Affairs (Present) Convenor Value Education Cell (Present) Convenor IIC (Present)	Student's Cultural & Sports Activities, Integrating human values in Tech. education.
Dr. Abhijit Mustafi	Prof. In-charge ICT Cell (Present) Ms-Teams Institute Convenor(Present) Assoc. Dean Admission(2020) Convenor of 30th Online Convocation(2020)	Networks & Telecomm, Website maintenance, Institute level software maintenance, ERP related activities, Admission related activities, Coordinating online classes, Coordinating and conducting first online convocation
Dr. Sujan Kr. Saha	Assoc. Dean UG Studies (Present) Member SC/ST Cell (Present)	Coordination of under graduate students activities, resolving the issues related to SC/ST students, staffs.
Dr. K. K. Senapati	Controller of Admissions (Present) Coordinating Supervise (Present)	Institute Admission related activities. Coordinating ERP activities
Dr. Shruti Garg	Assistant Warden Girls Hostel (Present)	Girls hostel related activities

CSE Traces @ BIT for Last Three Years

Post Holders

Name of the Faculty	Post	Responsibilities
Mr. Ritesh Jha	Hostel Warden (Present)	Hostel related activities
Dr. Akriti Nigam	Member IQAC (Present) BoG Member (2018-19)	Managing and generating reports using institute data, faculty representative of the institute
Dr. Shashank Pushkar	NSS Coordinator (Present) Additional Central Time Table Coordinator (Present) Executive Member Value Education Cell (Present)	Coordinating NSS activities, Preparation in institute Time Table
Dr. Niraj Kr. Singh	Asst. Warden Boy's Hostel (Present) Member Hindi Cell (Present)	Hostel related activities
Dr. S. P. Singh	Warden Boy's Hostel (Present) Member Hindi Cell (Present)	Hostel related activities
Dr. Itu Snigdh	Member ICC (Present) BoG Member (Present) Member IIC (Present)	Handing the issues subjected to gender specific discrimination etc., Faculty representative of the institute
Dr. Sumit Srivastave	Asst. Warden Boy's Hostel (Present)	Hostel related activities

Research @ CSE

Major Research Areas

Major Research Areas

- Parallel & Distributed Computing
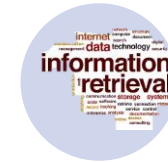- AI & Machine Learning
- Computer Vision & Image Processing
- IOT & Cloud Computing
- Security & Cryptography
- Data Science

Other Specific Research Areas

DEEP LEARNING

PATTERN RECOGNITION

SOFTWARE COST ESTIMATION

CRYPTOGRAPHY & BLOCKCHAIN

DIGITAL FORENSICS

KNOWLEDGE MANAGEMENT

CYBER LAWS

RIGHT TO INFORMATION

NATURAL LANGUAGE PROCESSING

INFORMATION RETRIEVAL

WEB MINING

AUDIO & SPEECH PROCESSING

WIRELESS SENSOR NETWORK

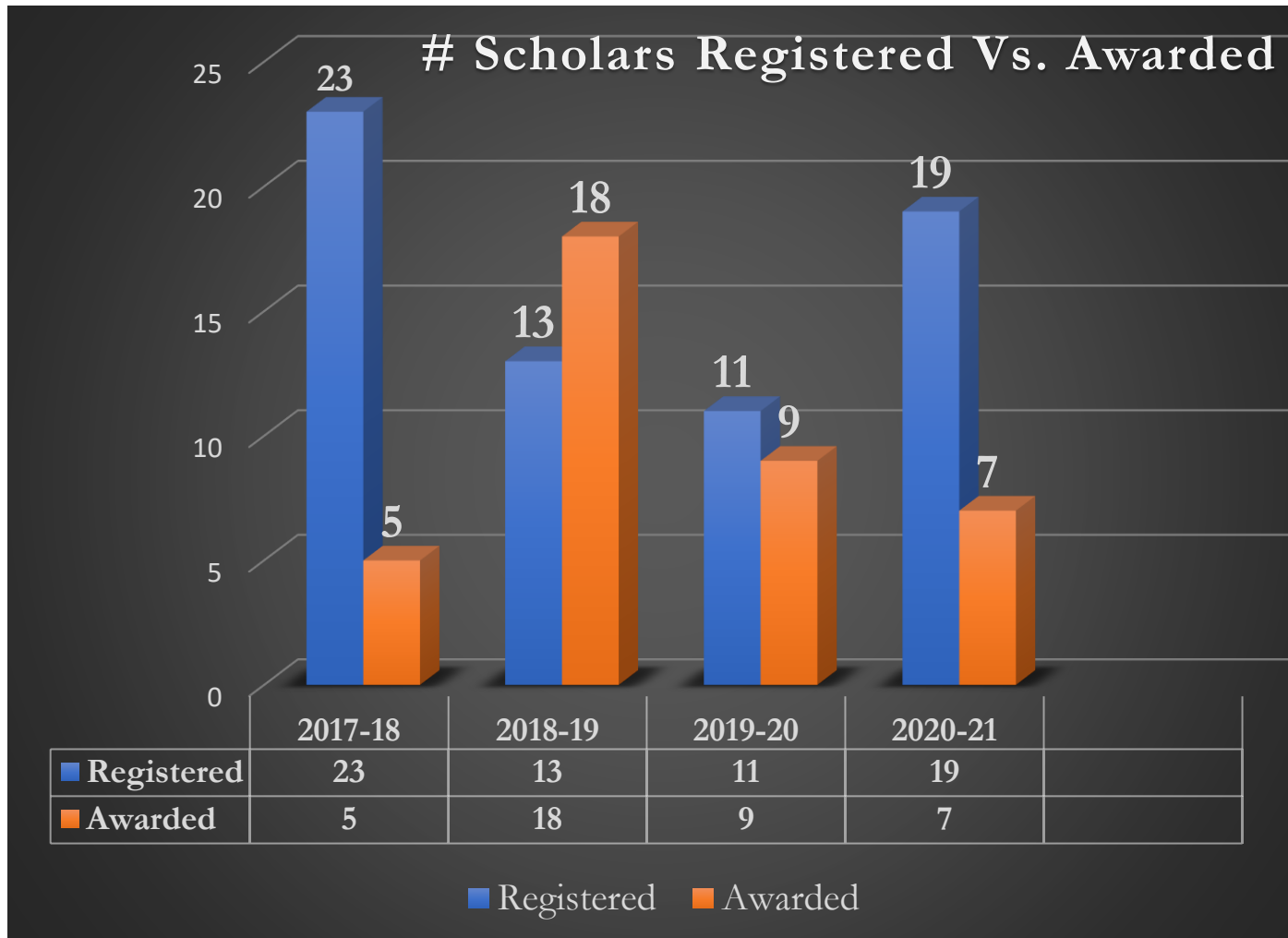URBAN COMPUTING
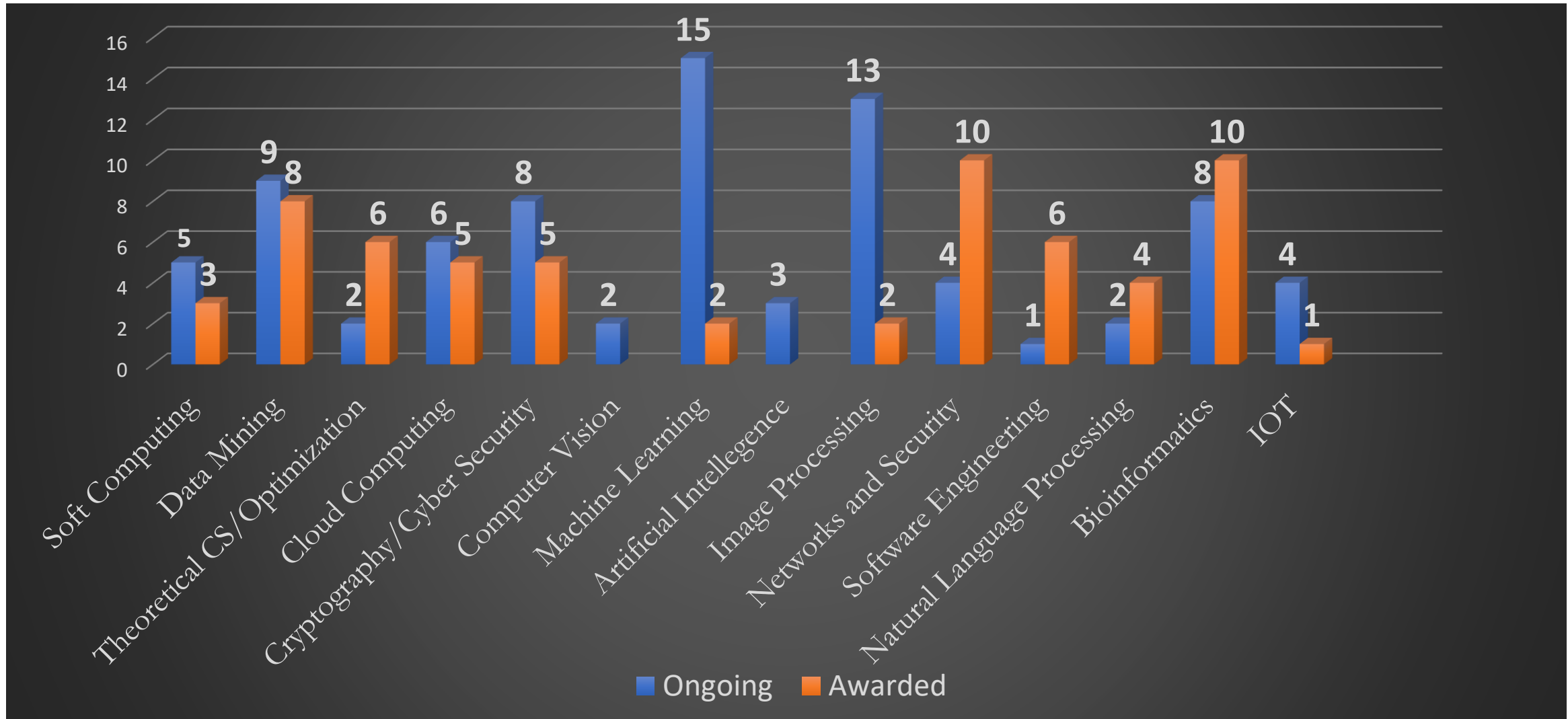
Research Scholars Registered/Awarded

- Total Awarded: **60**
- Total Ongoing: **72**

Research Areas vs. #PhD Scholars

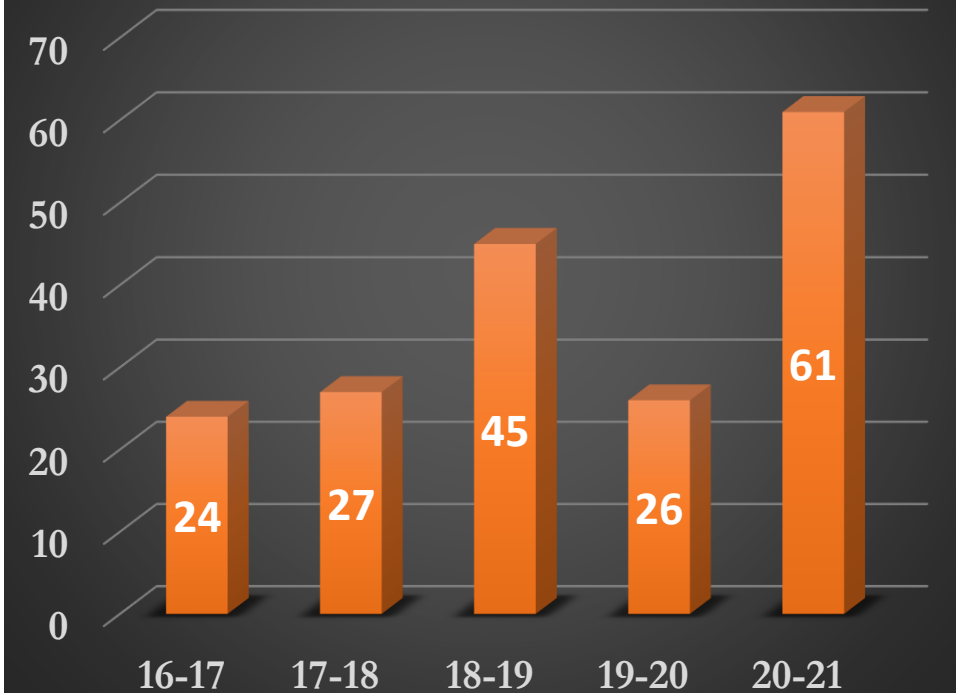Department of Computer Science and Engineering, BIT Mesra, Jharkhand

Faculty Publications

Journal Publications in last 5 years

SCI — Non Paid Scopus — Paid Scopus — Others

Year	SCI	Non Paid Scopus	Paid Scopus	Others
16-17	11	8	25	14
17-18	15	12	5	9
18-19	17	14	8	7
19-20	22	15	5	20
20-21	42	18	3	7
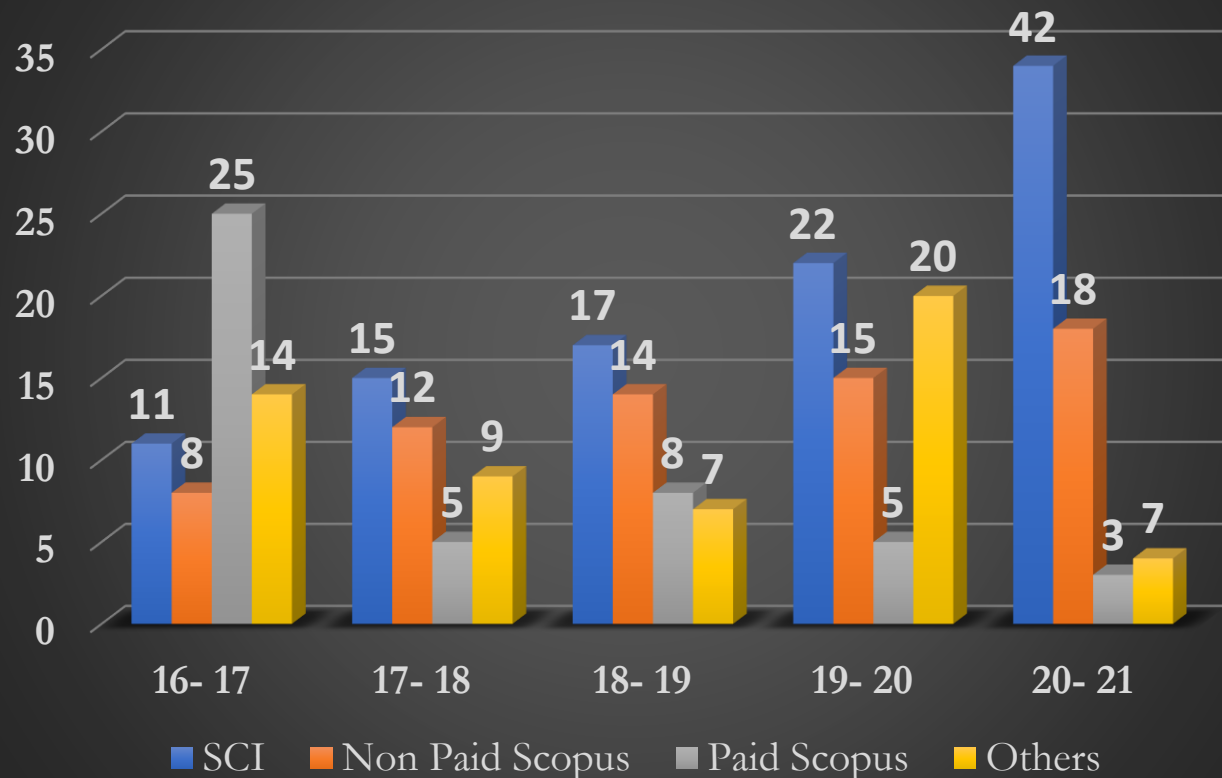
Book Chapters/ Conference Publications in last 5 years

Year	Count
16-17	24
17-18	27
18-19	45
19-20	26
20-21	61

Faculty Publications

Total Publications in last 5 Years

- SCI: 107
- Non Paid Scopus: 67
- Paid Scopus: 46
- Others: 57

■ Total Publications in last 5 Years
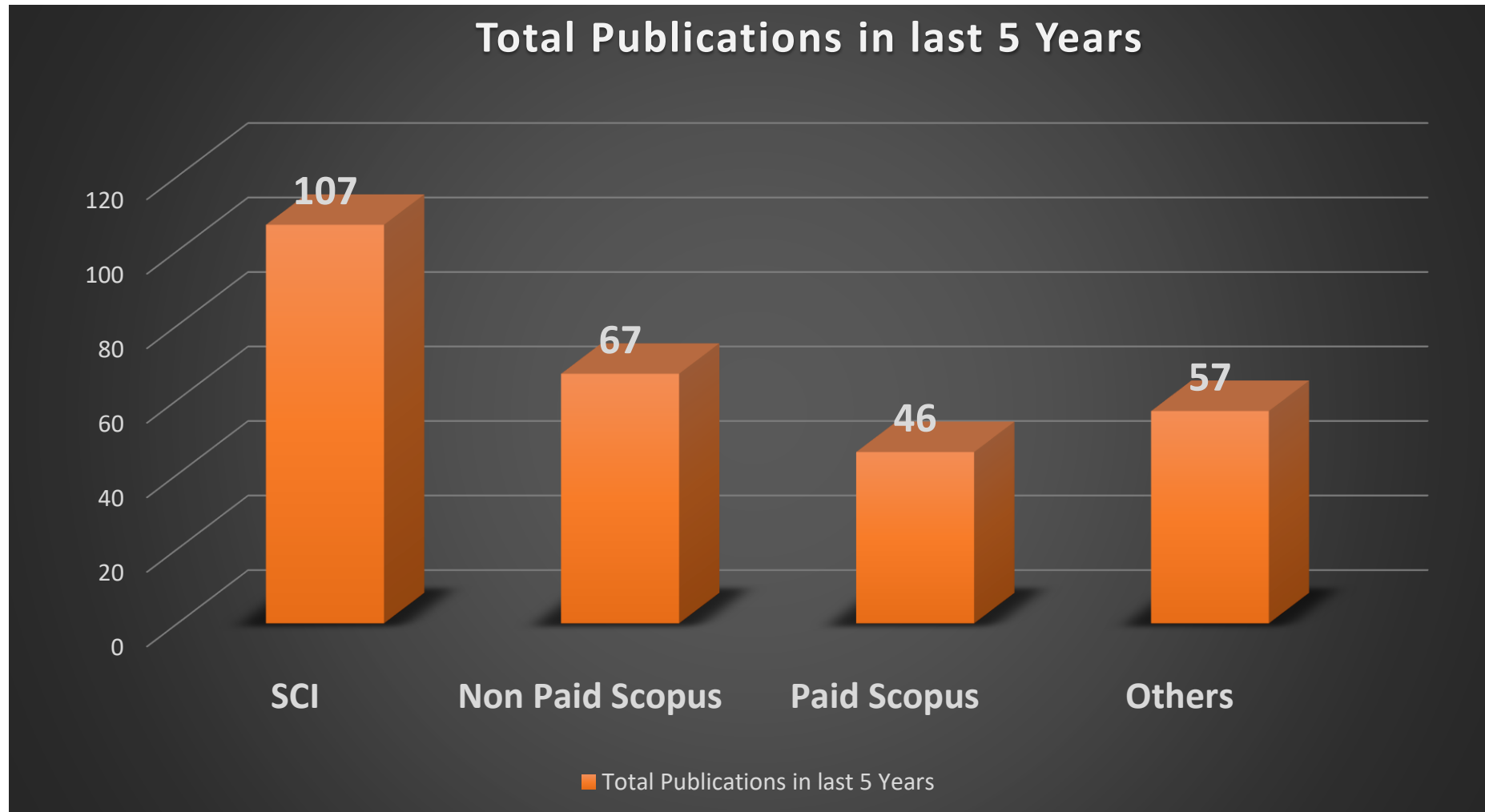
Total Journal Publications 277

Completed & Ongoing Sponsored Projects during last 4 Years

Sl. No.	Name	Title	Funding Agency	Amount (in Lacs)	Duration (in Months)
1.	Dr. Subrajeet Mohapatra(PI) & Dr. Vandana Bhattacharya(Co-PI)	Development of Machine Learning Algorithm for the early diagnosis of Delinquent Behaviour	CSRI, DST	25.09	36 (2019-2022)
2.	Dr. Abhijit Mustafi(Co-PI) & Dr. Vandana Bhattacharya(Co-PI)	Automated vegetation stress detection from very high resolution multi-temporal spectral data and to establish relationship using Artificial Intelligence	Skymap Global, Earth observation Analytics	7.5	12 (2019-2020)
3.	Dr. K.K. Senapati(PI)	Skill Development In Augmented Relity And Virtual Reality	AICTE	14.78	36 (2018-2021)
4.	Mr. Radhamadhab Dalai(PI) Dr. K.K. Senapati(Co-PI)	Auto Robotic Resection of Tumors by Volumetric Analysis of Medical Images	AICTE	11.38	12(2019-2020)
5.	Dr. Sujan Saha(PI)	Development of Basic Natural Language Processing Tools and Resources for Maithili	SERB	17.98	36 (2017-2020)

Completed & Ongoing Sponsored Projects during last 4 Years

Sl. No.	Name	Title	Funding Agency	Amount (in Lacs)	Duration (in Months)
6.	Dr. Sujan Saha(PI)	Automatic Question Generation and Evaluation Based System for Instant Assessment of Learning in School Level	SERB	19.61	36 (2016-2019)
7.	Dr. Shruti Garg(Co-PI)	Event Modelling and Predictive Analysis	Delhi University	3.5	6(2020-2021)

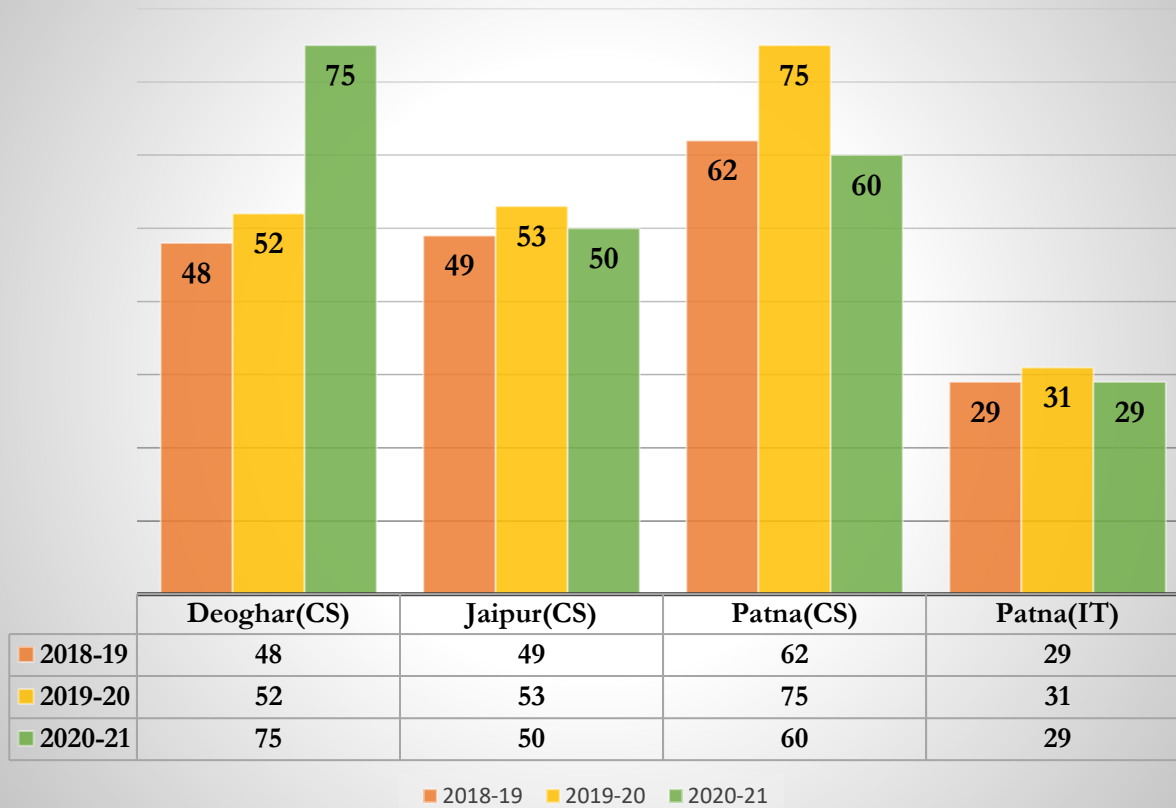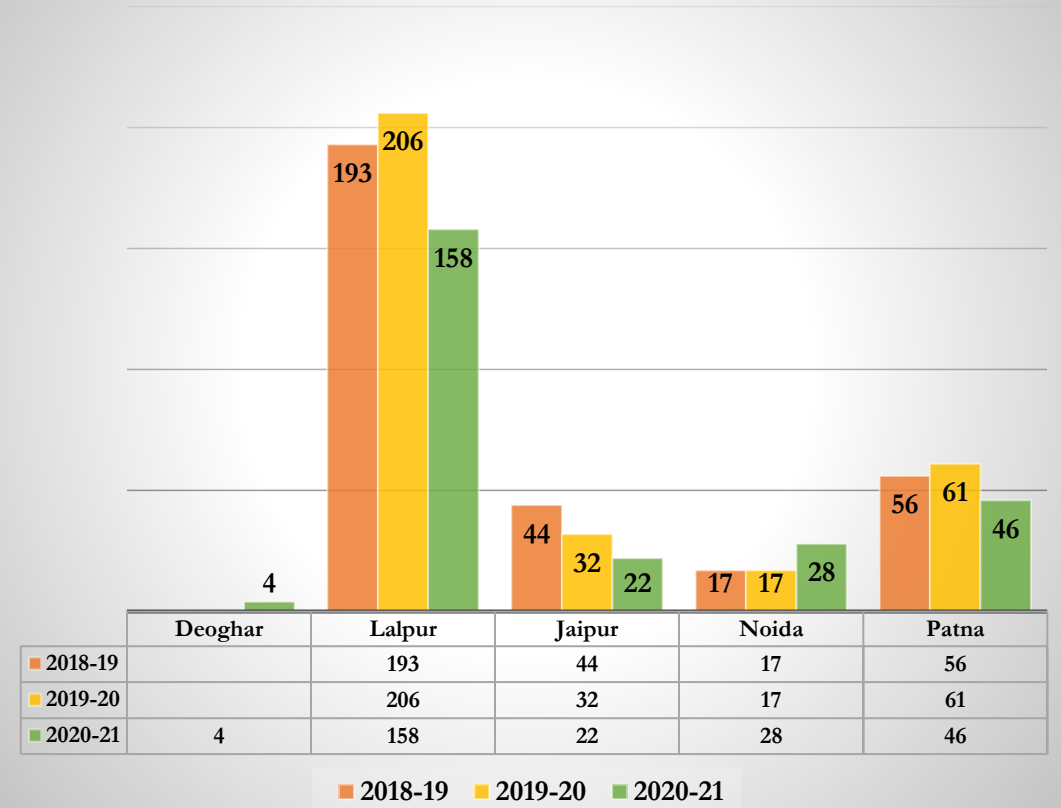| Other Academic / Research Activities during last Four years				
# FDP/ Training / STTP Attended	#Seed Money(Amount in INR)	Outside World Interaction(Invited Talk)	Workshop/ Conference Conducted	Foreign Visit
52	7(11L)	46	5	3

CSE @ Off Campuses

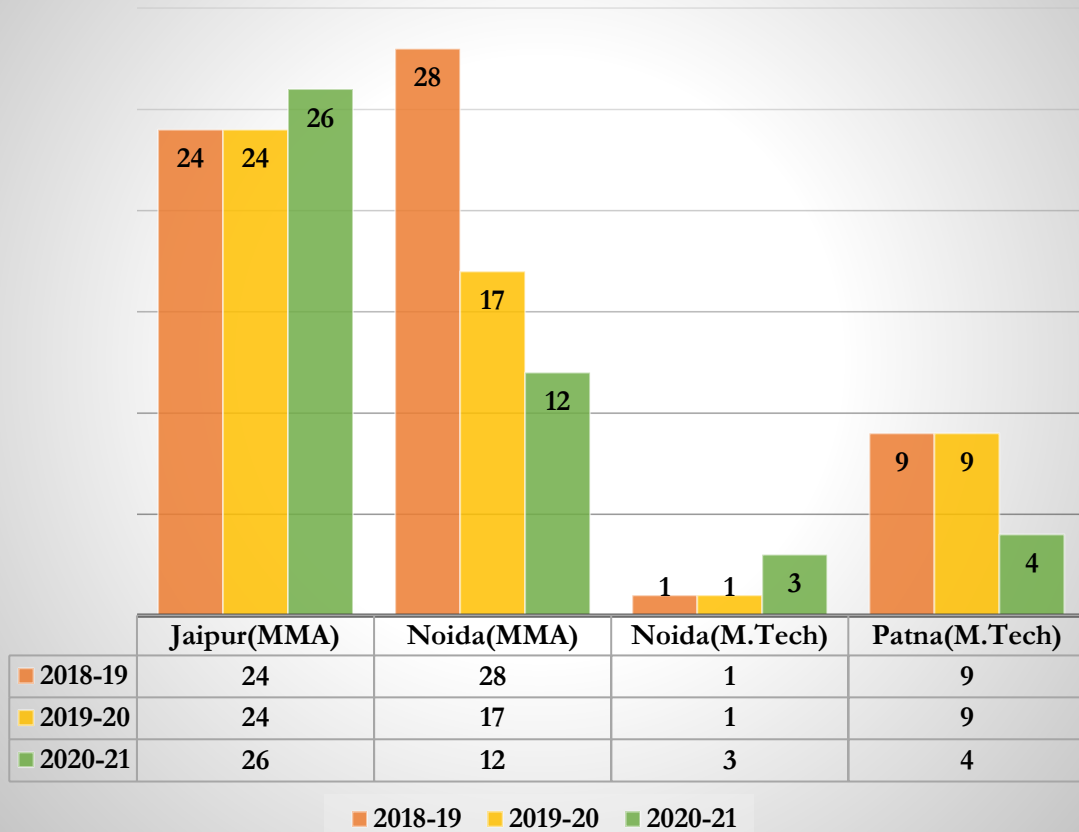# Off-Campus Student Strength

B.Tech(CSE / IT) Students

	Deoghar(CS)	Jaipur(CS)	Patna(CS)	Patna(IT)
2018-19	48	49	62	29
2019-20	52	53	75	31
2020-21	75	50	60	29

■ 2018-19 ■ 2019-20 ■ 2020-21

BCA Students

	Deoghar	Lalpur	Jaipur	Noida	Patna
2018-19		193	44	17	56
2019-20		206	32	17	61
2020-21	4	158	22	28	46

■ 2018-19 ■ 2019-20 ■ 2020-21

Off-Campus Student Strength

BSc.(Multimedia & Animation) & M.Tech. Students

	Jaipur(MMA)	Noida(MMA)	Noida(M.Tech)	Patna(M.Tech)
2018-19	24	28	1	9
2019-20	24	17	1	9
2020-21	26	12	3	4

■ 2018-19 ■ 2019-20 ■ 2020-21

MCA Students

	2018-19	2019-20	2020-21
Jaipur	19	15	31
Lalpur	77	71	67
Noida	17	12	17

■ Jaipur ■ Lalpur ■ Noida
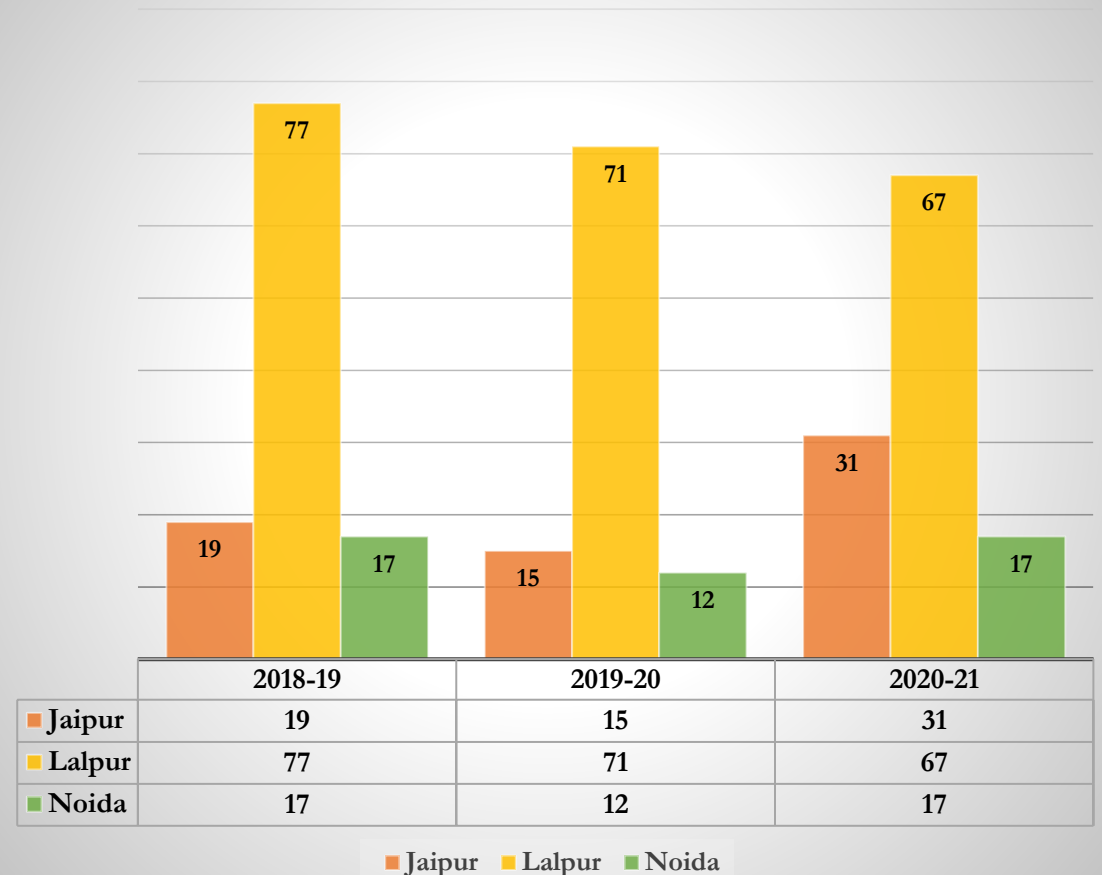
Total student strength in 2020-21 (Lalpur Campus): 557(UG)+213(MCA) = 750 +

Off-Campus Faculty Profile

Faculty Cadre wise
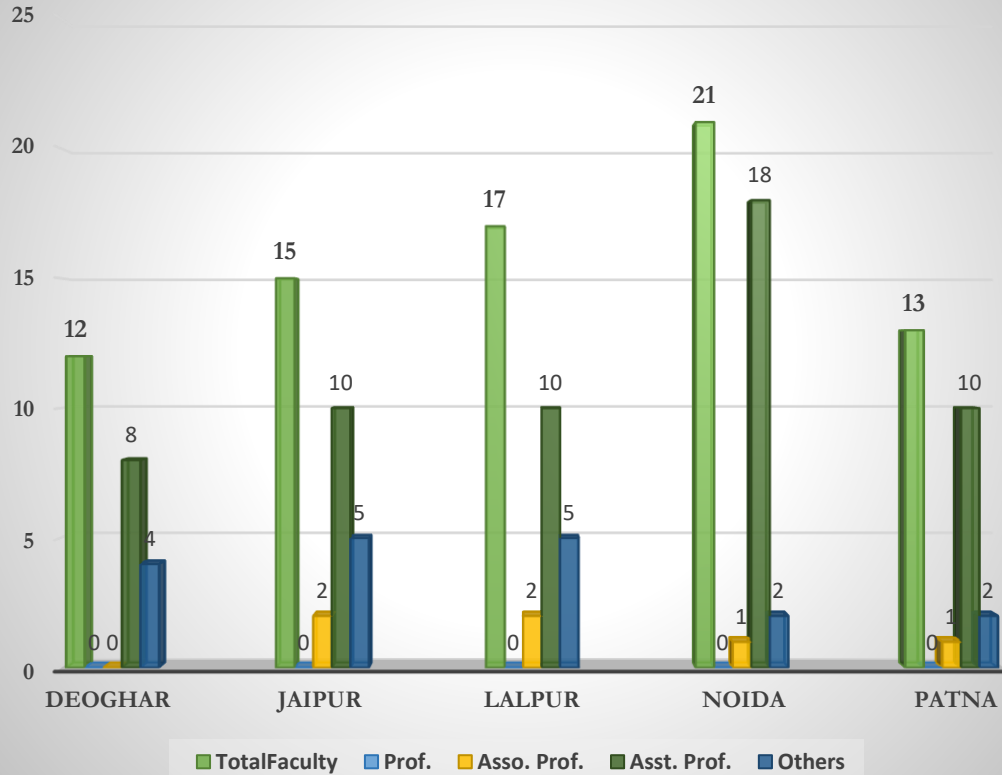
Publications Last Three Years

	Deoghar	Jaipur	Lalpur	Noida	Patna
Total Publication	36	20	36	18	40
SCI	9	1	6	2	20
Unpaid SCOPUS	10	10	15	11	9
SCOPUS	1	0	1	0	4
Others	16	9	14	5	7
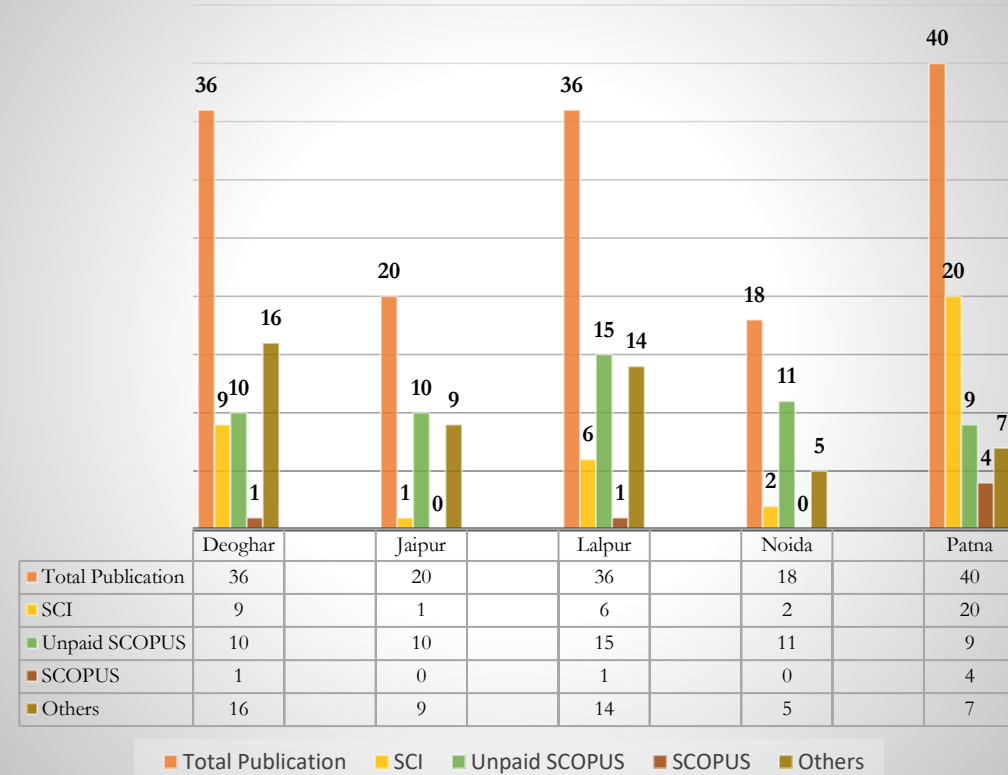
# Sponsored Projects	Amount Sanctioned
1 (Jaipur)	16.88 L

Activities, Interactions and Recognitions

Departmental activities during last 4 Years
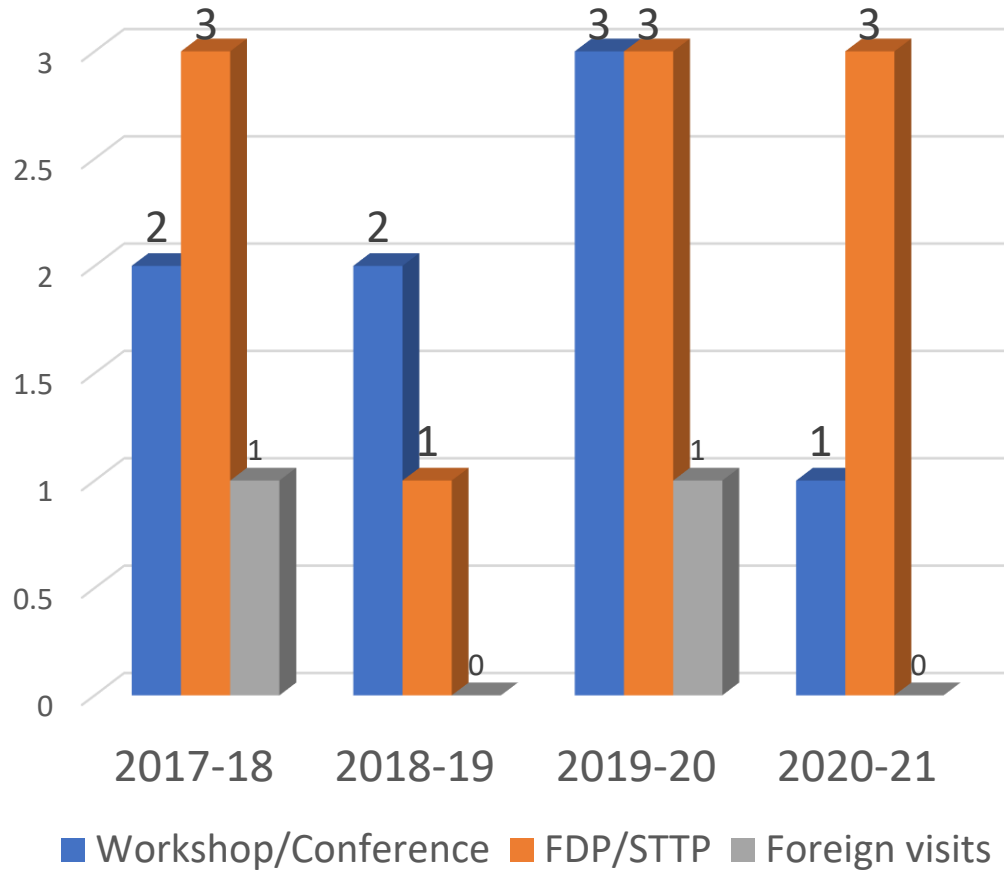
Departmental Activities

o **Online workshop on Research Through HPC, January 2021**

o **AICTE-ISTE Sponsored Deep Learning workshop, December 2020**

o **Online one week FDP on Cyber Security and Investigation Tools[CSIT-20], September, 2020**

o **12th National workshop on Recent Trends of Software Testing, May, 2019**

o **Workshop on Excellence in Pedagogy and Quantitative Research, (in collaboration with Mgmt. Dept.), August 2019**

o **2nd International Conference on Computational Intelligence, 2018**

o **Short Term Training Programme on Automata Theory, Formal Languages and Compiler Design, 2018**

o **Workshop on Cyber Crime and Investigation, 2018**

Foreign Visits & Patents in last 4 Years

Sl. No.	Name	Paper Title	Conference	Place and Duration
1	Dr. Bhaskar Karn	Social Perception Grading of Hospitals using Fuzzy Knowledge Base Systems	Fifth International Conference on Advances in Computing , Communication and Information Technology, organized by IRED	Zurich, Switzerland September 2-3, 2017
2	Dr. Sudip Kumar Sahana	Solving Scheduling Problems in PCB Assembly and Its Optimization Using ACO	Tenth International Conference on Swarm Intelligence (ICSI 2019) [Organized by Prof. Y. Tan, Peking University]	Chiang Mai, Thailand July 26-30, 2019
3	Dr. Shashank Pushkar	A Framework for analogy based software cost estimation using Multi Objective Genetic Algorithm	The World Congress on Engineering and Computer Science 2016	University of California, USA, Oct. 19-21, 2016

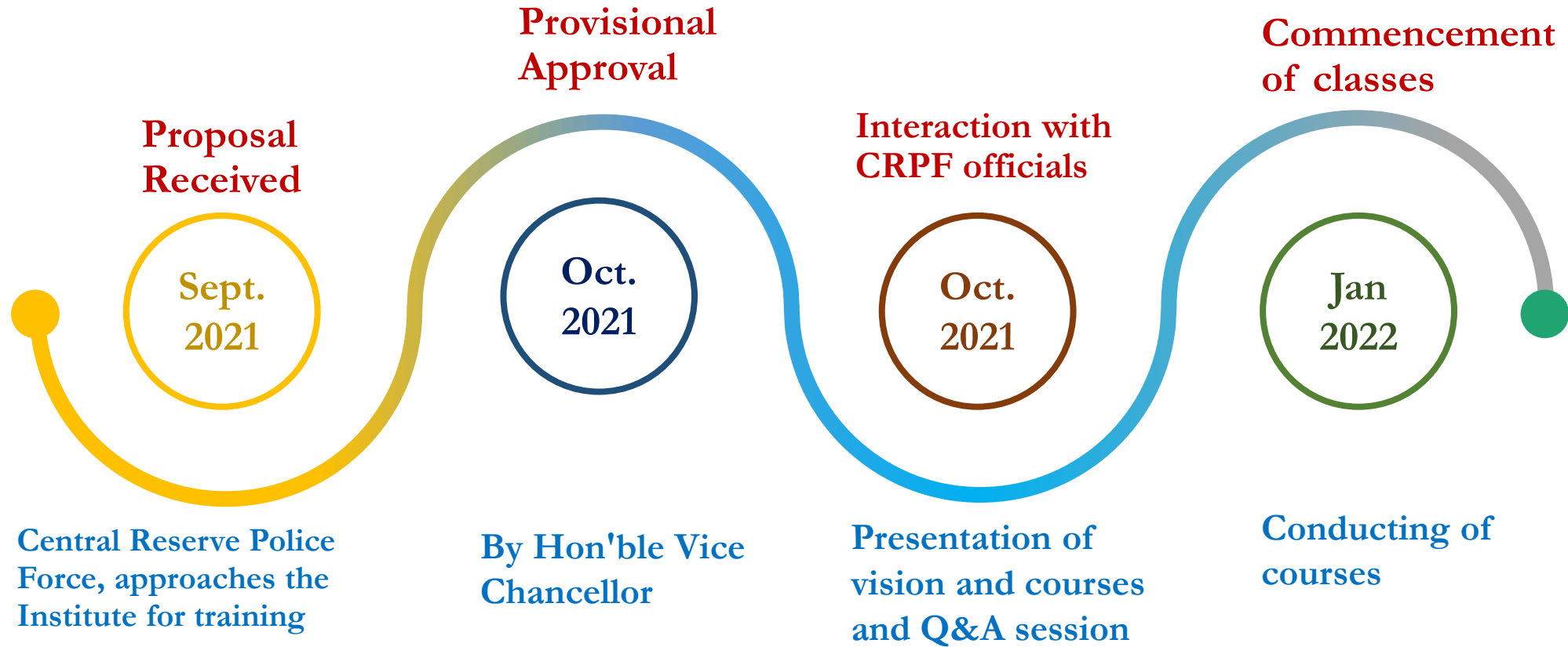| Sl. No.	Name of the applicant	Patent Title	Patent No.	Detail
1	Dr. K.K. Senapati	A System & Method for Predicting Student Academic Performance	2021103829	Australian Innovation Patent , Patent No: 2021103829 Date of Grant: 2 July 2021 US Patent, Patent Applied No: US XXXXX008 IND XXXXB5 Date of application: August 11, 2021 Indian Patent, Applied No: XXXXXXXX9861 Date of application: 21 September 2021
2	Dr. Sanchita Paul	Hybrid Depression Detection System		Status: Published Date of Application: August 2021

Higher Education Proposal, Cognizant

Timeline of events…

HEP Received

Provisional Approval

Interaction with Associates

Registration & Commencement of Classes

Feb. 2021

Mar. 2021

Apr. 2021

Dec. 2021

Cognizant India, approaches the Institute with HEP

By Hon'ble Vice Chancellor

Presentation of vision statement and Q&A session
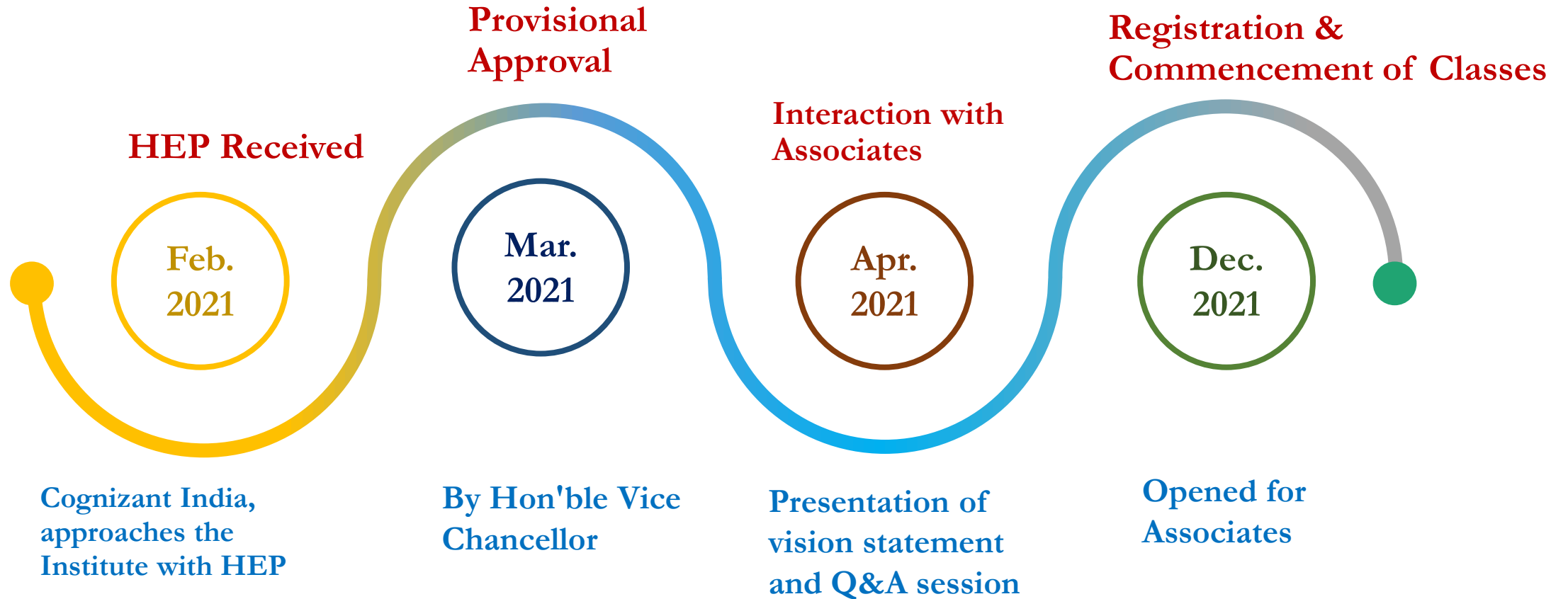
Opened for Associates

Departmental Achievements/Recognitions

Faculty Level

RULA Research Peace Award 2019

- **Dr. Vijay Kumar Jha** for international Distinguished Researcher 2019.

Best Paper Award

- **Dr. Shashank** Pushkar in The World Congress on Engineering and Computer Science 2016 San Francisco, USA, University of California, Berkley, 2016

Session Chair/Resource Person

- Dr. Amritanjali: BSNL, ARTTC
- Dr. Sanchita Paul: ARTTC
- Dr. Sudip Kumar Sahana: ARTTC
- Dr. Indrajit Mukherjee: ARTTC
- Dr. Shashank Pushkar   ARTTC
- Dr. Itu Snigdh: UMU
- Dr. V. K. Jha   ARTTC
- Dr. Kumar Rajnish   ARTTC

Departmental Achievements/Recognitions in last 4 Years

Faculty Level

Guest of Honour

- **Prof. (Mrs.) Vandana Bhattacharjee**:
  - Institution of Engineers India, Jharkhand on Women Engineer's Day
  - **Dr. Abhijit Mustafi**:
  - At Institute of Engineers India, Jharkhand, on World Computer Literacy Day

Member of Editorial Board/BOG

- **Dr. Sudip Kumar Sahana and Dr. Shamama Anwar**
  - **Guest Editor Multi Media Tools and Applications (Springer, SCIE Indexed)**
- **Dr. K.K. Senapati:**
  - Guest Editor of Microsystem Technologies (SCI Index Journal)
- **Dr. K.S. Patnaik:** Expert Member, BOG, YCCE, Nagpur University

Book Published

- Dr. P. S. Bishnu & Dr. V. Bhattacherjee on Data Analysis using Statistics & Probability using R Language , PHI, India (2019).
- Dr. S.K. Sahana and Dr. S. K. Saha on "Advances in Computational Intelligence - International Conference on Computational Intelligence 2015", 2017.
- Dr. B.K. Sarkar and Dr. S. Chakraborty on Combinatorics and Graph Theory, PHI, New Delhi, India
- Dr. S.K. Sahana and Dr. V. Bhattacharjee on "Advances in Computational Intelligence - International Conference on Computational Intelligence 2018", 2019.

Departmental Achievements/Recognitions in last 4 Years

Student Level

SMART INDIA HACKATHON

- Second prize in **SMART INDIA HACKATHON 2018** under the Ministry of Telecommunication.
- Second prize in HACK IN THE NORTH 2018 by IIIT Allahabad by developing an app Docker as Service.
- Third prize in WINTATHON 2017 (a HACKATHON for WOMEN) .
- Students participated in WINTATHON 2018 (a HACKATHON for WOMEN) and bagged Second and Third prize.

INNOVATION LAB CONTEST

- Our students have participated in BIT NISHAN Innovation 2021 and two groups of students(Team Jewarat and Team Protegan) was placed first.
- First prize of Rupees One Lakh in AMDOCS INNOVATION LAB CONTEST 2018

CODING COMPETITION

- Positive results in Google Summer Coding Competition, 2018
- Students of our Department stood first overall in the RR Donnelley BYOB Automation Challenge 2019. They have been awarded a cash prize of Rupees 150000.
- A team of six students participated in SMART INDIA HACKATHON made to the final and won KPIT most innovative award by developing an app to convert Ayurveda Metric System to Marsden Metric System.

PARTICIPATION

- Airtel Crack The Code, Circuits (Hackerearth), LoC etc.
- Students presented research paper on Enhanced Energy Efficient OSPF Algorithm for WSN in 2nd International Conference on Inventive Communication and Computational Technologies (ICICCT 2018) and accepted to be published in IEEE Xplore.

Photos of Some Departmental Achievements/Recognitions

On Campus Students Placement Record

 # Students Placed

	B.Tech(CS)	B.Tech(IT)	MCA	M.Tech(CS)	M.Tech(IS)	M.Tech(IT)
2017-18	114	43	25	3	1	
2018-19	108	47	34	2	1	1
2019-20	117	52	36	3	1	1
2020-21	93	48	25	5	1	1
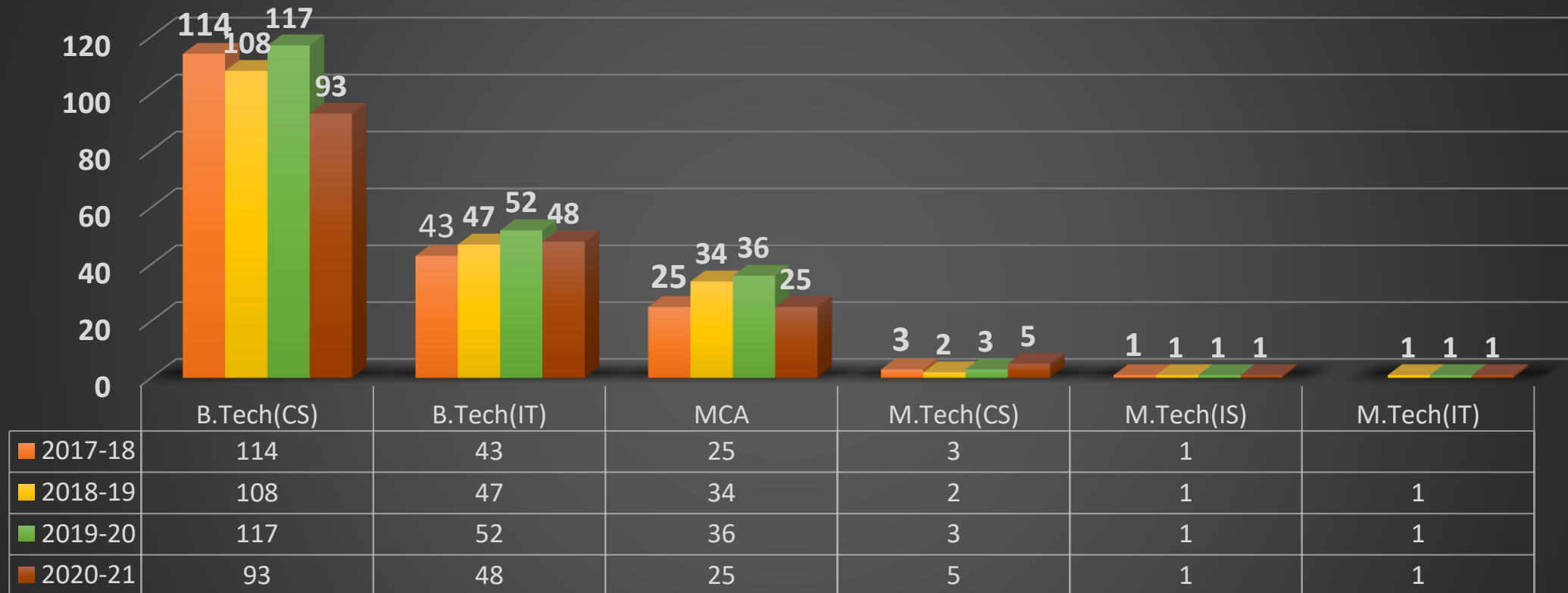
■ 2017-18 ■ 2018-19 ■ 2019-20 ■ 2020-21

Placement Packages for the Last Five years

Batch	Company	Course	Branch	No.of Students	Highest package(InLac/annum)
2016-2020	Atlassian	BE	IT	04	**50L**
2015-2019	Microsoft Development	BE	CSE	9	**40L**
	Microsoft Development	BE	IT	10	**40L**
2014-2018	SalesForce	BE	CSE	05	**31L**
2013-2017	Directi	BE	CSE	06	**27L**
2012-2016	Directi	BE	CSE	07	**27L**
	Directi	BE	IT	03	**27L**

External Members of Board of Studies

Mr. Amitabh Bhattacharya
CGM(IT) Mecon Ltd.

Dr. Annapa B
Prof., CSE NITK
Surathkal

Dr. Asif Ekbal
Asso. Prof. (CSE) IIT Patna

Mr. D.S. Verma
JAPIT, Ranchi

Mr. Suparna Kanti Das
EDRDO Kolkata

Dr. Ujjwal Maulik
Prof., CSE,Jadavpur University

Dr. Punam Bedi
Prof., CSE, University of Delhi

Distinguished Alumni of the Department

Vikram Kairi,
Deputy Commissioner, Majuli

Mr. Gurdeep Singh Pall
Vice President Microsoft Corp.

Aditya Ranjan
SDM, Govt. of Jharkhand

Ankit Jain, CEO & CTO,
MyOperator IT News

Mini Rani Sharma
State Project Manager at RDD (PR)
Govt. of Jharkhand

Amit Choudhry
Co-founder, Lenskart

Dr. Arvin Sahayam
Professor, Carson College
of Business

Subhas Dhar, Cofounder of
Commence Mint Ventures

Rajeev Kaul,
CEO CMS Infosystems

Nirav Baid
Amazon Lab,
British Columbia

Neha Prakash,
Joint Magistrate, IAS, UP

Raunak Tibrewal,
Engg. Manager,
Facebook, Meta

Rama Govind Raju,
Director of Engg. at
Google

Distinguished Alumni of the Department

Research Glimpses @ CSE

Business Intelligence

Automated Separation of Mine and Non-Mine Water Bodies

A New Cipher System Using Semi-natural Composition In Indian Raga

Automatic Question Generation from Textbook

Bi-Lingual Document Classification Model Using Fuzzy Approach

Differential Evolution and Lazy Learner based Text Clustering

Bio-inspired Road Traffic Management

Automatic Answer Evaluation

Lightweight Cryptography using Blockchain

Big data for secure healthcare system: A conceptual design

Improved Distributed Approximation for Steiner tree (ST)

Electroencephalogram (EEG) signal based study of Depression Disorder

Computer-Assisted Learning (CAL) Platform Design for School Students

Blockchain Enabled Healthcare Data Sharing For Privacy Preservation

Smart Pill Box

Image Processing in Additive manufacturing

Petrographic Characterization of Coal using Image Analysis

Software defect prediction via Graph Convolutional Network feature representation

IoT-Powered Waste Management System

Image Regeneration from EEG signals using Deep learning

A Deep Learning based Image Captioning Framework for Bengali Language

Remote health monitoring project

Fatty Liver Detection

Research on Natural Language and Speech Processing

Blind Source Separation of Images for image watermarking

An Automated Lung Workflow For Diagnostic Assistance In COVID-19

META-HEURISTIC APPROACH FOR SOLVING GREEN VEHICLE ROUTING OPTIMIZATION MODELING

Development of Machine Learning Algorithms for the Early Diagnosis of Delinquent Behavior in Juveniles

PUBLICATION SUMMARY

Name of the Journals where we have published recently

- **Computer Speech & Language (Elsevier)**
- **IEEE Transaction on Learning Technologies**
- **Soft Computing, Springer**
- **Journal of Parallel and Distributed Computing**
- **International Journal of Sensor Networks**
- **Network Modeling Analysis in Health Informatics and Bioinformatics, Springer**
- **IEEE Transactions of Knowledge and Data Engineering**
- **Int. J. of Oil, Gas and Coal Technology**
- **Knowledge Based Systems, Elsevier**
- **Education and Information Technologies, Springer**
- **Applied Soft Computing, Elsevier**
- **Education and Information Technology Springer**
- **Applied Mathematics and Computation, Elsevier**
- **Technology and Health Care, IOS Press**
- **Applied Intelligence, Springer**
- **Interactive Learning Environments, Taylor & Francis**
- **Natural Computing, Springer**
- **OPTIK - International Journal for Light and Electron Optics , Elsevier**
- **Optical and Quantum Electronics, Springer**
- **Journal of Innovative Optical Health Sciences, World Scientific Press**
- **Microsystem Technologies, Springer**
- **Computers in Industry , Elsevier**
- **AI Communications, IOS Press**
- **Neural Computing & Application, Springer**
- **Computer Methods in Biomechanics and Biomedical Engg., T&F**

Improved Distributed Approximation for Steiner tree (ST)

- Approximation ratio: $2(1 - 1/\ell)$, ℓ is the number of leave nodes in the optimal ST
- Round Complexity: $O(S + \sqrt{n} \log^* n)$, an improvement of a factor of $O(\log n)$ over the best known

In Video Conference

Phylogenetic Tree of Life

Bacteria   Archaea   Eukaryota
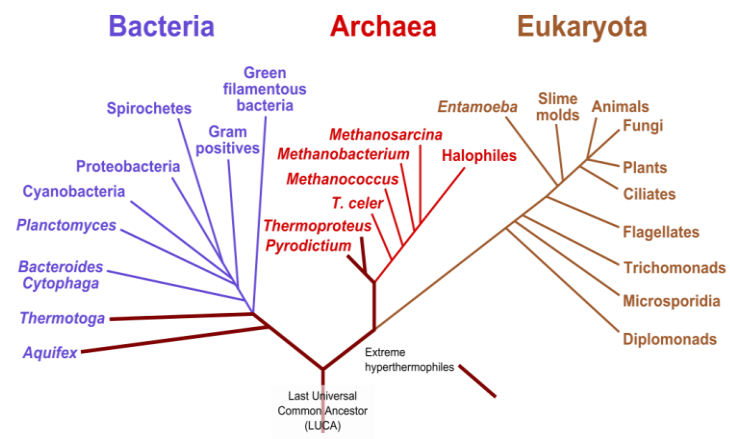
In Computational Biology:
Phylogenetic tree reconstruction

Designing a sensor network for leakage detection in Water distribution system

Automated Separation of Mine and Non-Mine Water Bodies

- Method:
  - Water Body Detection. Ex. - Using threshold over NDWI (Normalized Difference Water Index). Rectification by removing falsely detected bare soil regions using bare soil index.
  - Connected Component Analysis. Bounding Box over each connected component to study surrounding regions.
  - Geophysical Indexes - Clay Mineral Ratio, Iron Oxide Ratio. Use geophysical indexes as feature space for binary clustering.
- **Published in "IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing, 2019", "IEEE International Geoscience and Remote Sensing Symposium, 2018"**
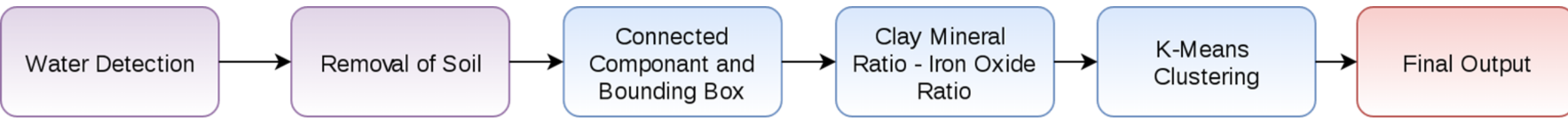
A: Detected Water Bodies, B: Bare Soils, C: Bare Soil Corrected Water Bodies, D: Connected Components, E: Bounding Boxes, F: Mine Water, G: Non-Mine Water
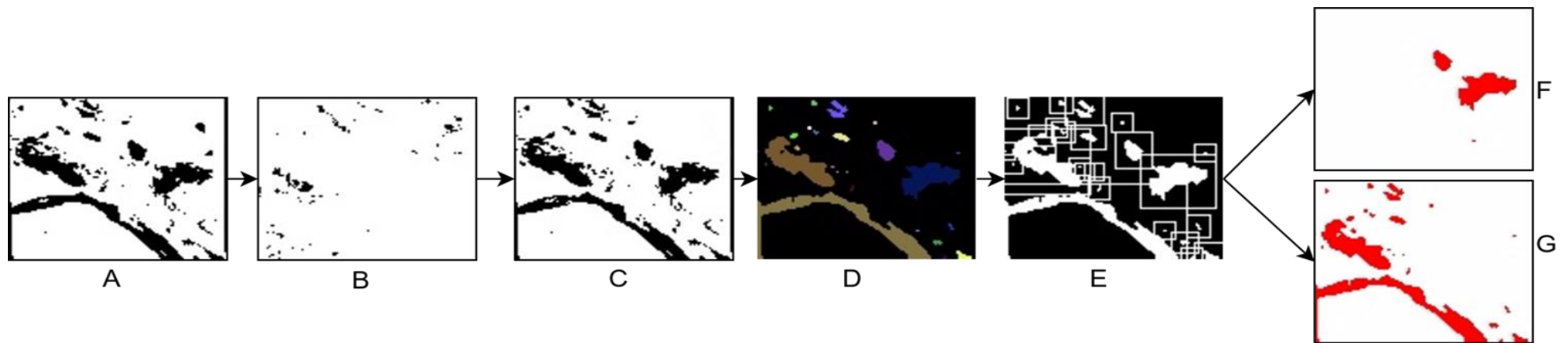
➢ Music is composed of the sequence of notes of any specific raga and the way in which these sequences are played.

➢ The sequence of notes makes the "what" part of any music and the way of playing the sequences makes the "how" part.
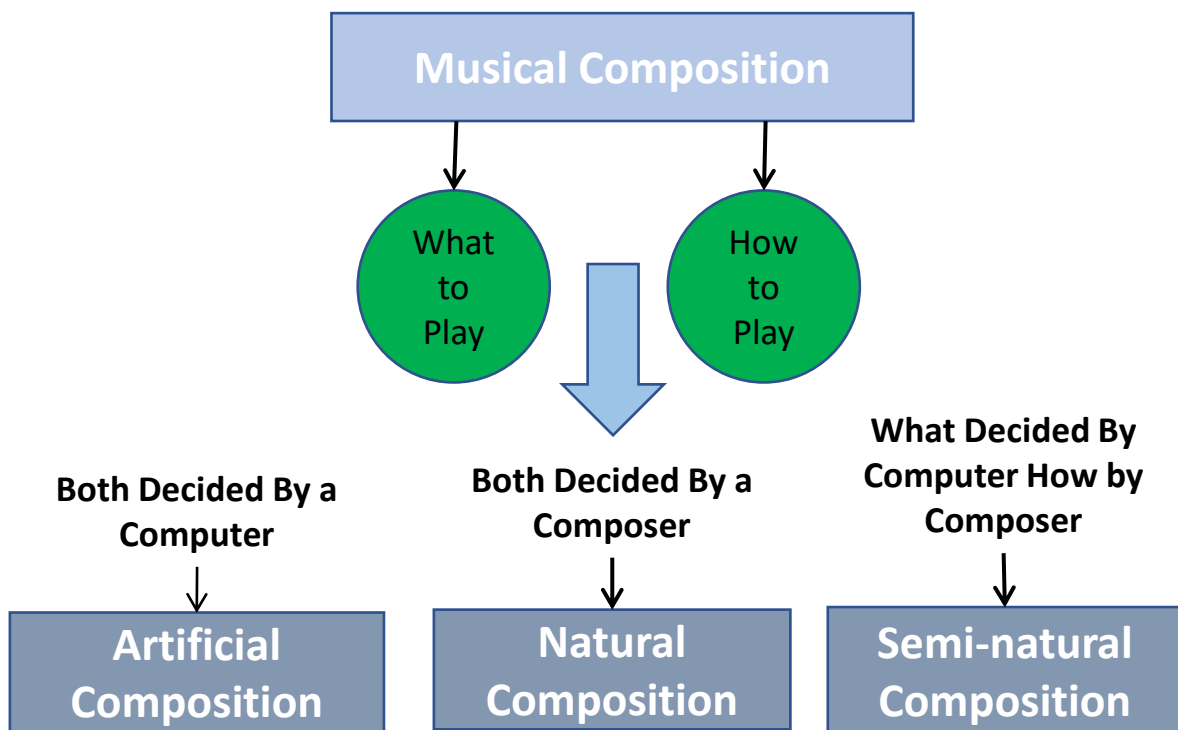
➢ If a composer decides both the what and how part, the musical composition is termed as natural composition

➢ If both the parts are decided by a computer or a machine, then it makes the composition an artificial one.

➢ But, if the what part is decided by the computer or machine and upon proper analysis of any specific raga, the how part is decided by a composer, then it is termed as an artificial composition

Musical Composition

What to Play

How to Play

Both Decided By a Computer

Both Decided By a Composer

What Decided By Computer How by Composer

Artificial Composition

Natural Composition

Semi-natural Composition

SEMI-NATURAL COMPOSITION ALGORITHM IN SECURING MESSAGES
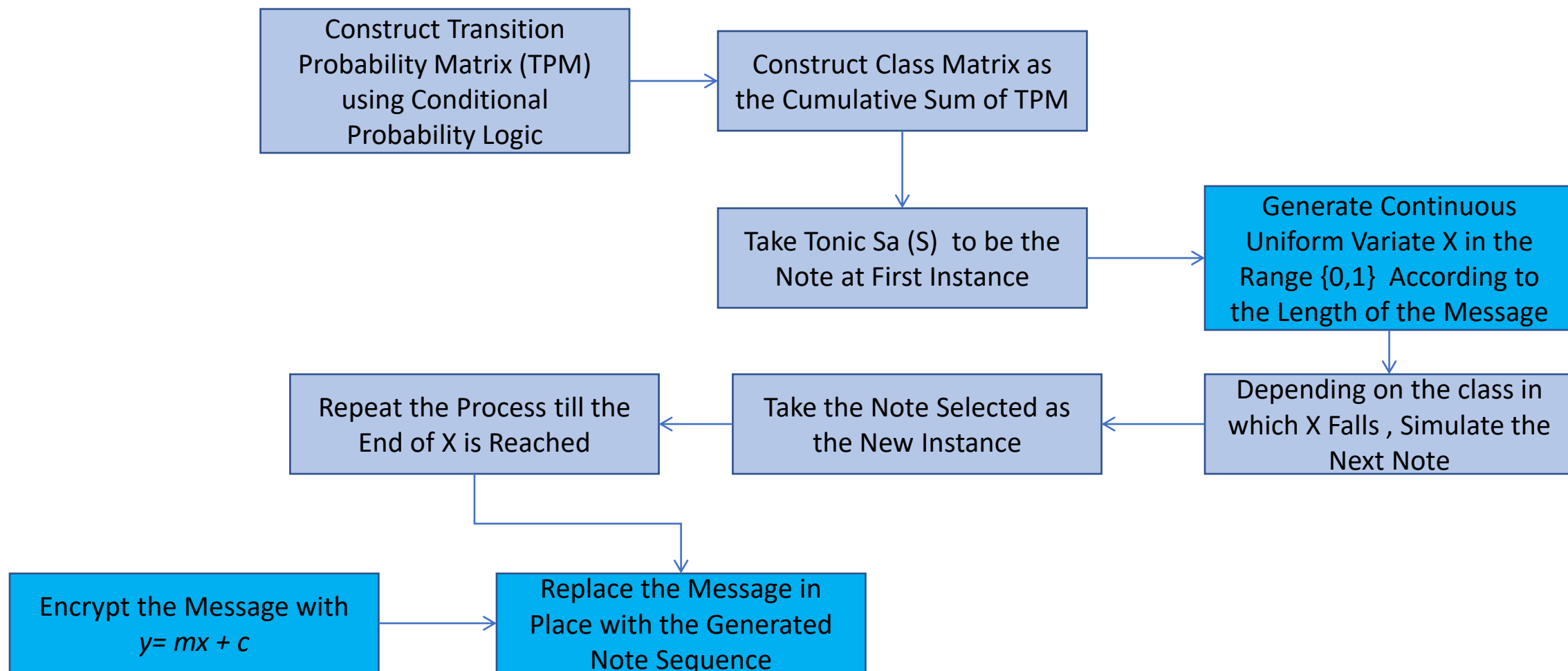
A Deep Learning based Image Captioning Framework for Bengali Language

❖ **The proposed method ivided into three phases :**

Phase I: Design and development of a web scraper
Phase II: Manual Annotation of downloaded images
Phase III: Training a deep learning network for image captioning and translation of captions
Phase IV: Generation of a seq2seq model for translation of English to Bengali
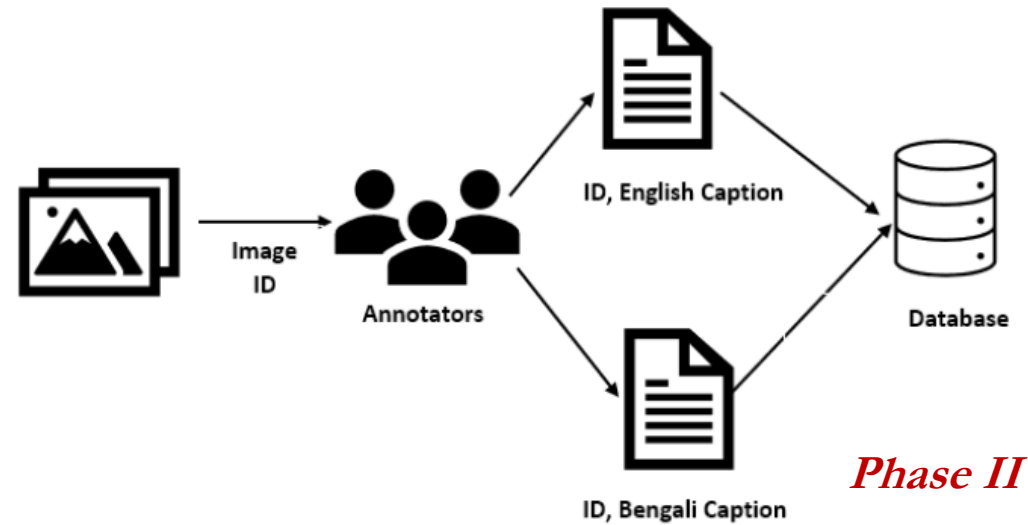
Phase II
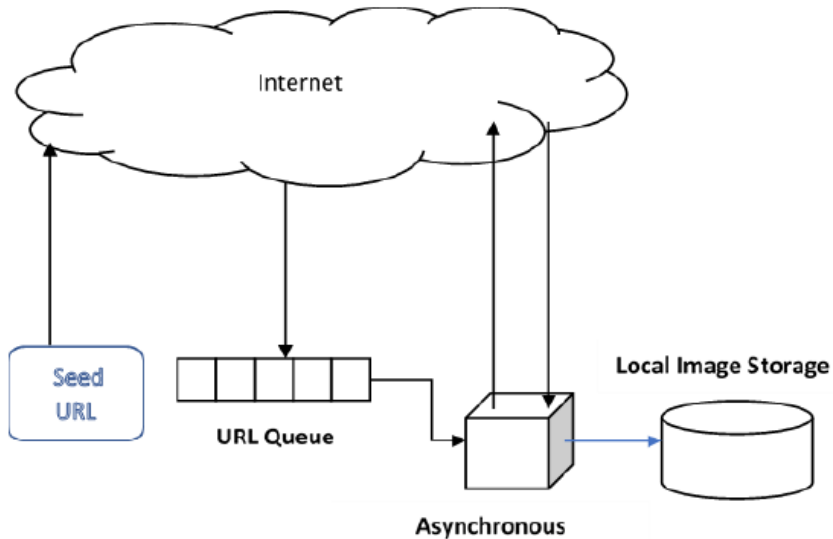
Phase: I
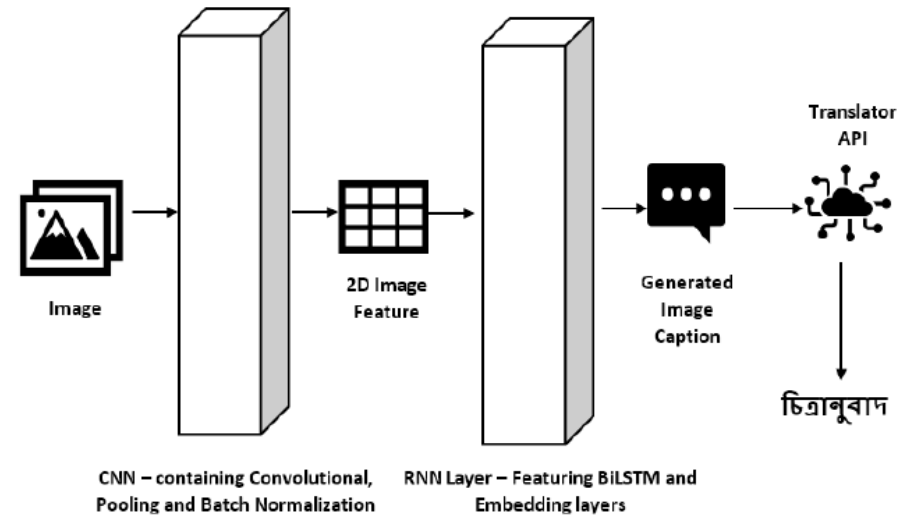
Phase III & IV

- Smart Education demands Smart Evaluation
  - We develop a system for automatic and instant assessment of learning
  - Achieved through automatic question generation and answer evaluation

| TextBook | Questionable Sentence | Keyword Extraction | Question Formation | Distractor Generation | Post-processing |

A high level AQG workflow

- The system generates FIB and MCQs from NCERT History & Science Books

- System with automatic FIB generation and Evaluation capability

SUBMIT

Total Questions	Correct Answer	Wrong Answer	Total Score
10	8	2	16

No	Question	Correct answer	Your answer	Score
1	The fundamental organisational unit of life is _____.	Cell	cell	1
2	_____ is a group of cells similar in structure and function.	Tissue	tissue	1
3	Chromoplasts that contain chlorophyll are called _____.	chloroplasts	cellulose	0
4	Most plant cells have large membranous organelles called _____.	plastids	plastids	1
5	_____ apparatus consists of stacks of membrane-bound vesicles.	The Golgi	golgi	1
6	The primary function of leucoplasts is _____.	storage	blood pumping	0
7	_____ cells have no membrane-bound organelles.	Prokaryotic	prokaryotic	1
8	Xylem and phloem are types of _____ tissues.	complex	complex	1
9	_____ may be due to infectious or non-infectious causes.	Disease	disease	1
10	Nervous tissue is made of _____.	neurons	neurons	1

- Developed a System for automatic evaluation of Long Answers
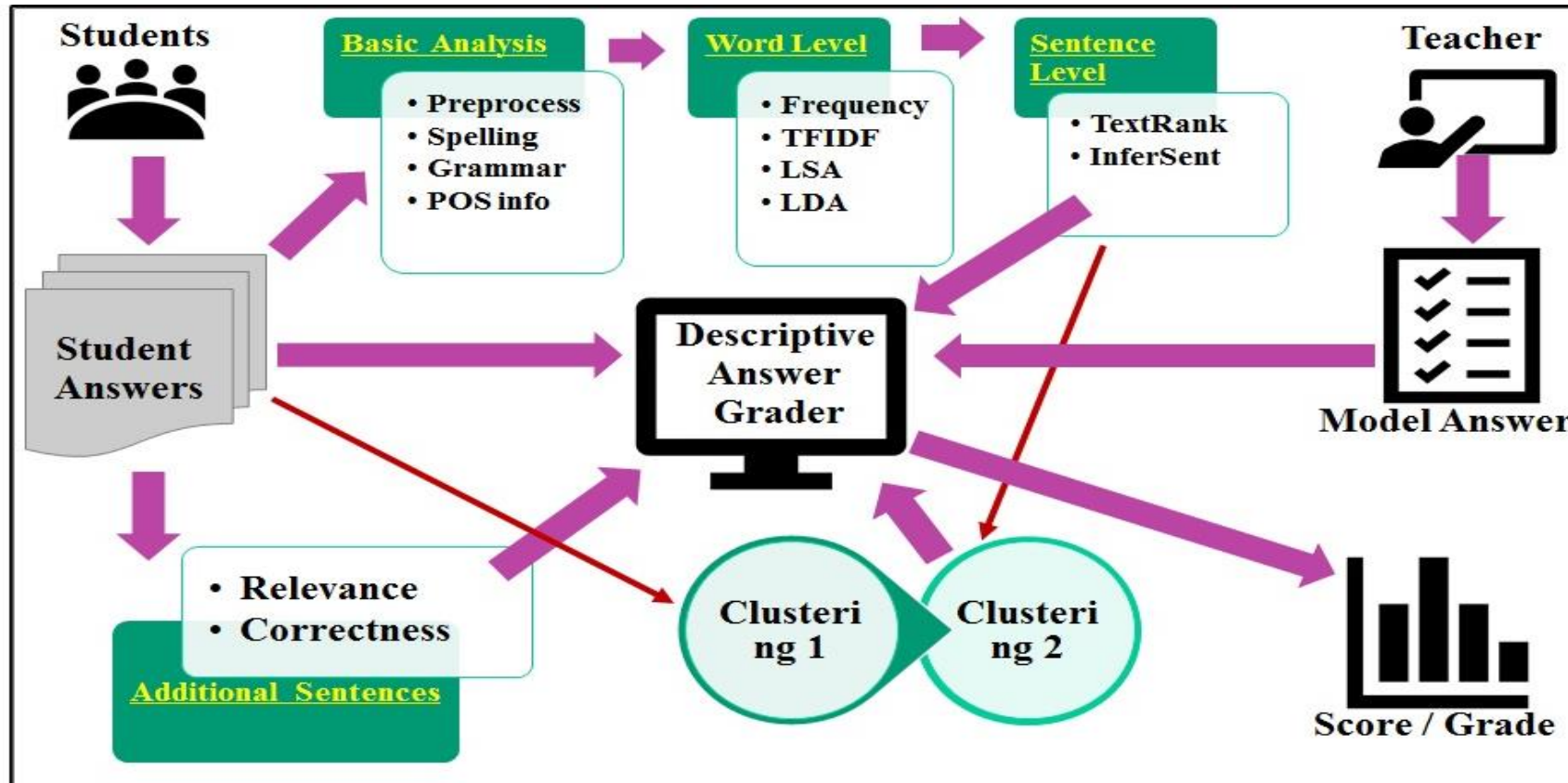
- The System is evaluated using Class VIII Social Science Copies
  - 40 answer books collected from a School in Ranchi
- Highest accuracy of the system: RMSE 0.35 (in 5 marks questions)

Computer-Assisted Learning (CAL) Platform Design for School Students

- CAL often provides superior performance than traditional learning
  - convenience & flexibility in content, timing, duration, style; comfortable environment
  - more and more information on demand; student-specific customization

- Requires Intelligent Platform to fulfil the needs of the students

- We develop a CAL platform for weak school students
  - Provides meaning of the words
  - Lists biological terms.
  - Lists biological equipment
  - Lists abbreviations & expansions.
  - Provides more images.
  - Provides images for equipment.
  - Extracts names of scientists and their inventions.
  - Identifies important sentences from textbook chapter.
  - Conducts trial examination.

Research on Natural Language and Speech Processing

➢ Developed basic NLP tools and resources in Maithili

✓ Created the NLP resources for Maithili

     a) Raw corpus in domain of interest

     b) Rules for stemming of Maithili words

     c) Manually annotated corpus for POS tagging (52,190 words)

     d) Manually annotated corpus for NER (2,00,000 words)

✓ Developed Natural Language Processing tools in Maithili

     a) Parts-of-speech (POS) tagger – accuracy 91.53%

     b) Stemmer (root extractor) – accuracy 84.6%

     c) Named Entity Recognition (NER)   – accuracy ~90%

➢ Work on Automatic Speech Recognition in Santali

✓ Speech to text conversion – ongoing – Santali speech corpus recording

✓ Target – recording of 20 hours continuous speech from 50 Santali speakers

Business Intelligence

Data

- **Ranked customer data** (Customers ranked the items as per preferences)

- **Products feature relationship data** (Customers record their favorite product feature)

Data Mining

- **Apply clustering to get customer segment**
- Kendall's tau, Spearman's rho square, Spearman's footrule, Cayley's distance are used, since Euclidean distance is *not* applicable for ranked data

- Identification of the highly **promising features**, the **least promising feature**s, and the **basic features** of the products.

Business Intelligence

- **Business Intelligence objective**
- Identification of Clusters (Consumer Group) for the Given Campaigns
- Selection of Campaigns for the Given Cluster

- **Business Intelligence objective**
- To produce the most competitive product by selecting the *k*-most promising features.

Clustering on Ranked Data for Campaign Selection

Set Blue Ocean Strategy in Decision Making

Empirical and statistical comparison of intermediate steps of AES-128 and RSA in terms of time consumption

- Cryptography algorithms are composed of many complex mathematical functions which are generally compounded (a group of singular operations)

- Algorithm analysis is an integral part of computer science wherein one tries to estimate the overall complexity (both space and time) before running the algorithm for any application.

- Analysis of the running code by programmers has shown that often much of the time is spent in a small portion of the code and the inefficient places in the code are difficult to find.
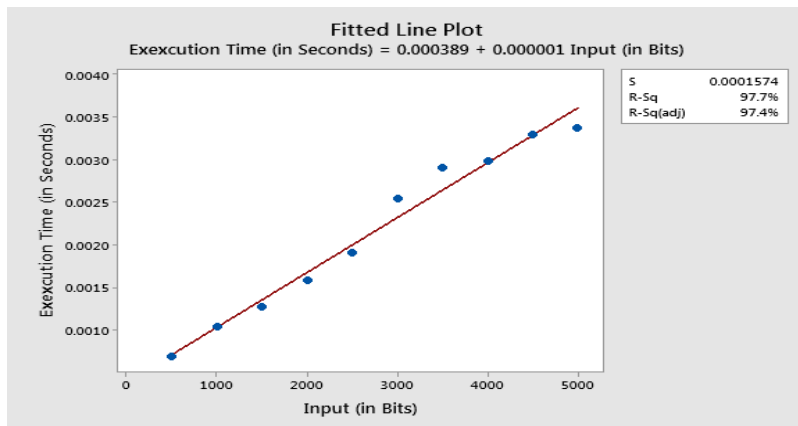
Lightweight Cryptography using Blockchain

- Lightweight cryptography is a branch of the modern cryptography, which covers cryptographic algorithms intended for use in devices with low resources.

- Information security is one of the major concerns while transferring some information publicly.

- Blockchain technology has the characteristics of high security, decentralization and tamper-proof.

- Our objectives is to implement lightweight blockchain technology for resource constrained devices.
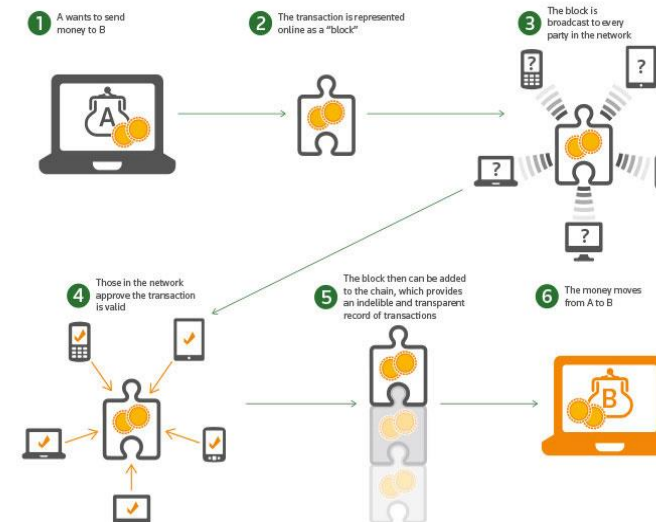
# Blind Source Separation of Images for image watermarking

Motivation: The idea of multi channel speaker identification has been carried onto the domain of image processing where we separate a mixture of images into their constituent images.
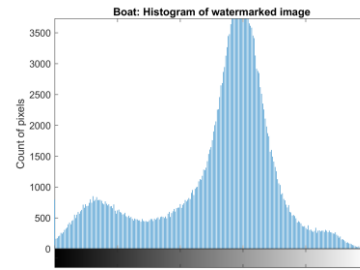
Research Challenge: Estimate a pseudo invertible mixing matrix to separate the image mixture.

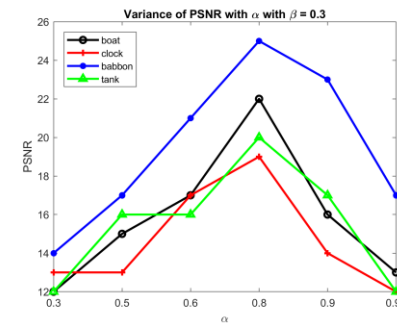**Innovation:** Use of Fractional Fourier Transform to estimate the mixing matrix.
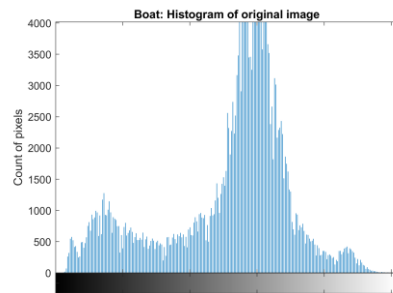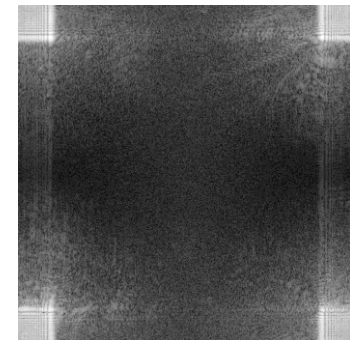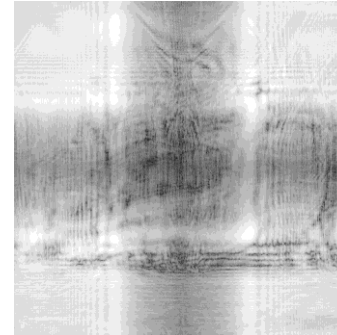
BDCS Model

Steps:

- Preprocesses Image Document: layout analysis, skew detection and noise removal.

- Extraction of lines and words through pre-segmentation.

- Extraction of words into character images through post-segmentation.

- Removal of Shirorekha in Hindi documents.

- Feature extraction from PC images and classifier I training.

- Get Detected Words (DWs).

- Reverse process: join the characters.

- Document classification II using classifier II.
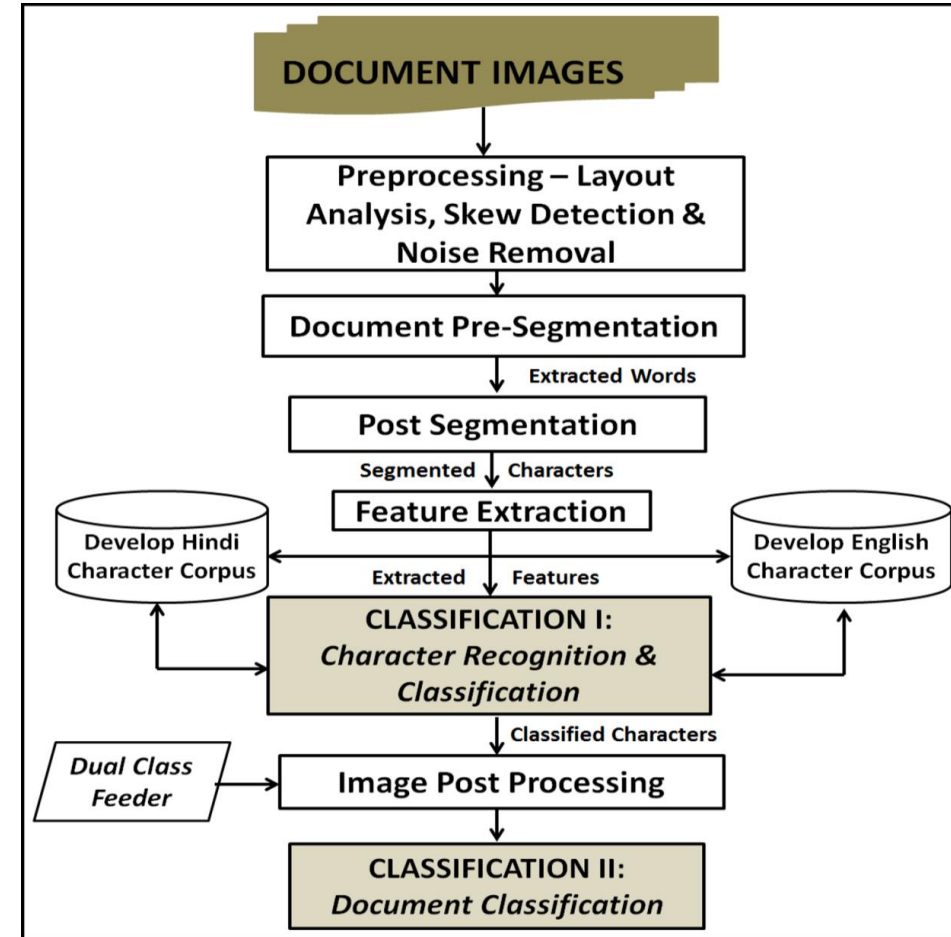
Basic Layout of Bilingual Document Classification System

Differential Evolution and Lazy Learner based Text Clustering

❖ The proposed method divided into three phases :

Phase I: DE based Clustering

| #	Name	No. of documents	No. of terms	No. of clusters
1	Technical Reports	299	1725	4
2	Web pages corpus	333	4339	4
3	TREC	204	5832	6
4	Medline	913	3100	10
5	20newsgroup	18828	45433	20
6	BBC News Dataset	2225	8645	5
7	BBC Sports Dataset	737	4613	4
8	IMDB Movie Dataset (sampled)	500	3540	2

Number of generations	10000
Population size	60
Crossover parameter	0.5
Mutation parameter	adaptive

Phase II: Identification of Fringe Points

- Nearest-Cluster Based Re-evaluation(N-CBR)
- Multiple-Cluster Based Re-evaluation(M-CBR)
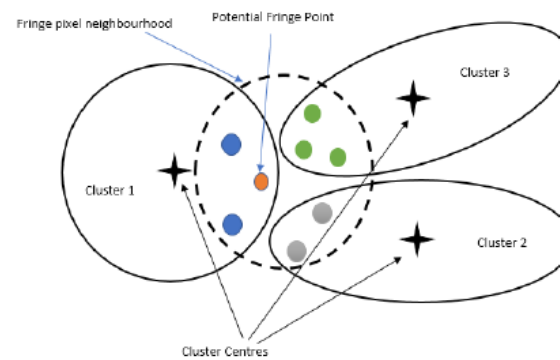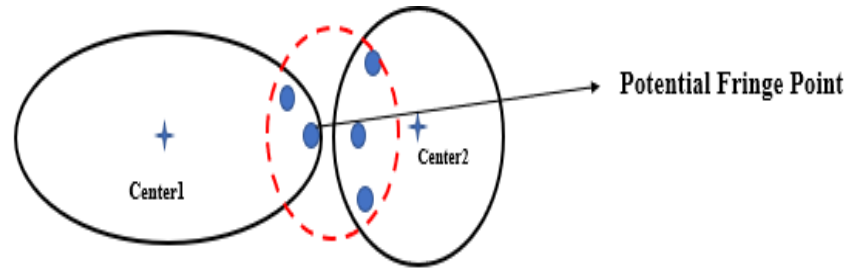
Phase III: Re-evaluation strategy for Fringe Points
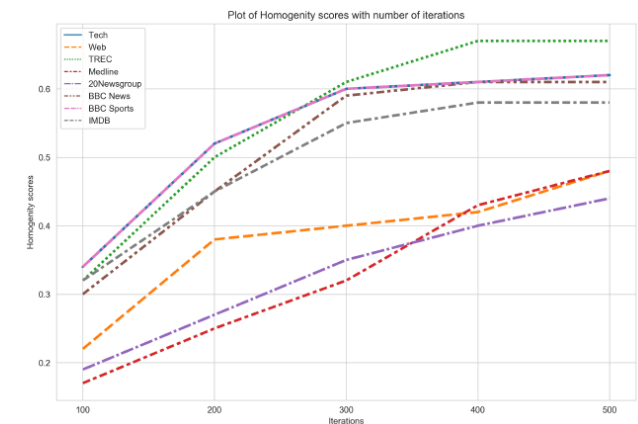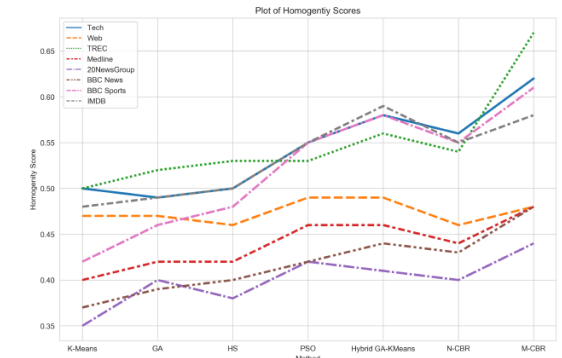
Image Regeneration from EEG signals using Deep learning

Objectives

The aim of the work is to extract some cues/relevant features from the brain electrical activity recorded using an EEG device, and classify, visualize and generate the image of an object a person is thinking about.

Dataset Used

Perceive Lab:

Stimuli used: 10 image class (IMAGENET)

No. of Electrode: 128, Subjects: 6

MindBig:

Stimuli used: 10 image class (IMAGENET) and 10 grayscale digit image class (MNIST)
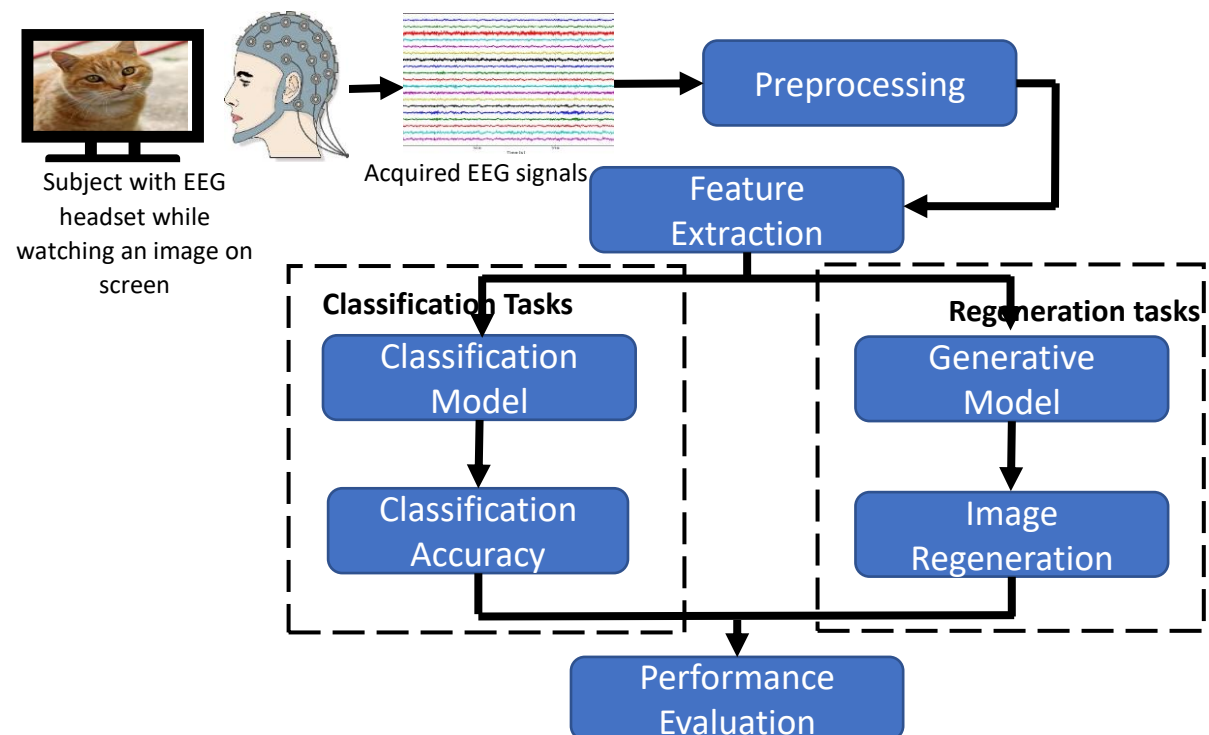
No. of Electrode: 5, Subjects: 1

Steps

- EEG Data preparation (Pre Processing)
- EEG feature extraction
- Classification (Machine Learning vs. Deep Learning)
- Performance Analysis Comparison
- Image Regeneration and Image Quality Assement

Current Status

- Performance Analysis Comparison in underway.
- Review and Implementation of Image Regeneration techniques is in progress.

Work Flow

Subject with EEG headset while watching an image on screen

Acquired EEG signals

Preprocessing

Feature Extraction

Classification Tasks

Classification Model

Classification Accuracy

Regeneration tasks

Generative Model

Image Regeneration

Performance Evaluation

Blockchain Enabled Healthcare Data Sharing For Privacy Preservation

Objectives

Blockchain provides a secure infrastructure and robust platform for integrated private health records. A blockchain eliminates central authority and contains a continuously growing linked list of records, which ensures that a piece of data recorded in a block cannot be tampered with.

Centralized healthcare data storage issues

- Slow access to medical data.
- The lack of system interoperability.
- Delays treatment progress.
- Data may not be available instantly.
- Single point of failure.
- Adversary can easily target the centralized data.

Why Blockchain

- Immutable
- Ease of data sharing and accessibility
- Decentralized storage
- Distributed and transparent
- Interoperability
- Secure
- Easily Scalable

Structure of blockchain
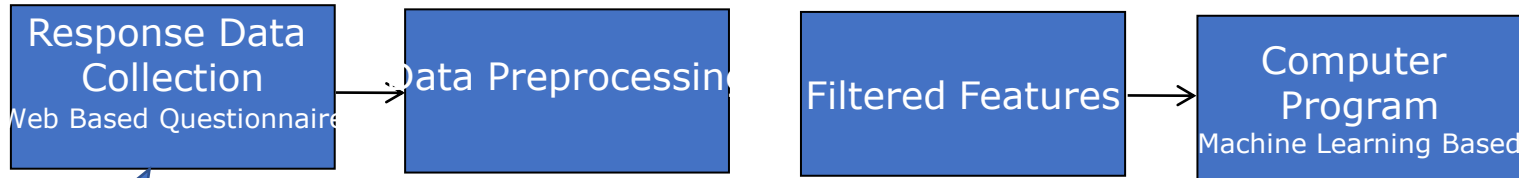
BLOCK 1   BLOCK 2   BLOCK 3

Essential Component – KEY

DNA based Encryption

- PKCS5 Padding
- Random DNA Sequence Generator
- AES Key Expansion
- DNA Table Generation
- Encryption

Current Status

- Key Generation and Encryption using DNA based technique has been implemented.
- Key Sensitivity Analysis completed.
- Blockchain based healthcare data sharing platform under implementation.

Development of Machine Learning Algorithms for the Early Diagnosis of Delinquent Behavior in Juveniles

Research aim: Feature measurement of single layer deposition
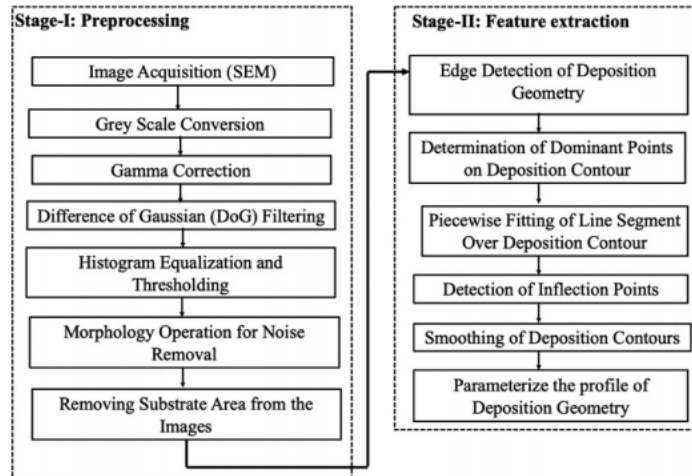
Fig: Proposed image processing technique

Table: Comparison of obtained features

	Width (mm)			Height (mm)		
Exp. no.	Manual measurement	Image processing	Relative error (%)	Manual measurement	Image processing	Relative error (%)
1	1.32	1.3	1.5	1.28	1.26	1.59
2	2.49	2.5	0.4	1.73	1.75	1.14
3	2.24	2.23	0.4	1.86	1.83	1.64
4	2.01	1.98	1.5	1.59	1.61	1.24
5	1.83	1.82	0.5	1.49	1.51	1.32
6	2.42	2.38	1.7	1.66	1.67	0.60

International Journal of Computer Integrated…

Q1 Aerospace Engineering
best quartile
SJR 2020 0.88
powered by scimagojr.com

Journal of Manufacturing Processes

Q1 Industrial and Manufacturing Engineering
best quartile
SJR 2020 1.39
powered by scimagojr.com

Research aim: Feature measurement of multi-layer multi-track deposition
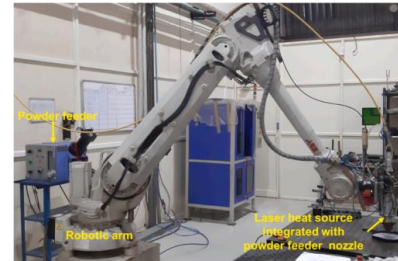

Fig: Setup

Fig: Proposed image processing technique
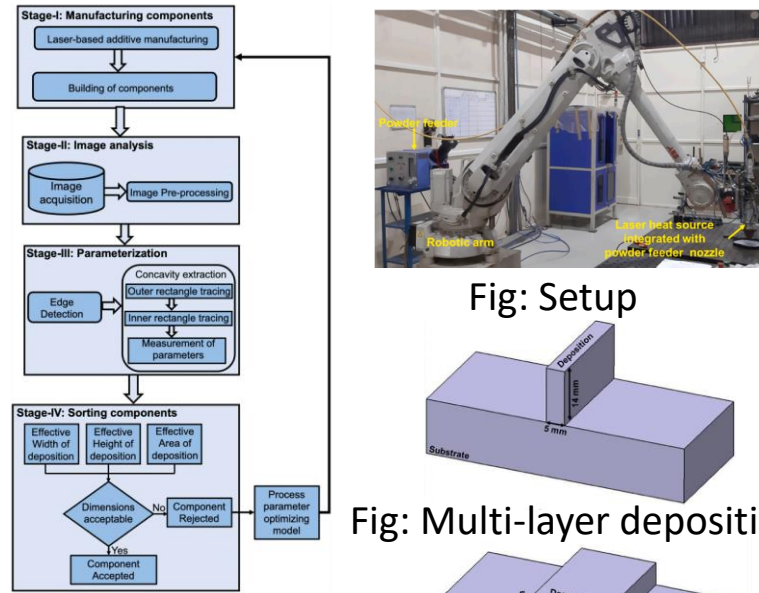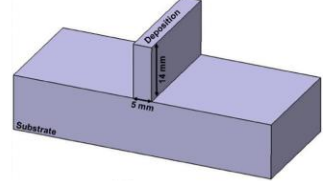
Fig: Multi-layer deposition

Fig: Multi-track deposition

Table: Comparison of obtained features

Exp no.	Image processed effective width (mm)	Image processed effective height (mm)	Image processed effective area (mm²)	Image processed total width (mm)	Image processed total height (mm)	Image processed total area (mm²)
1	4.95	13.98	69.2	6.35	15.17	70.63
2	4.98	13.96	69.5	6.62	14.43	75.06
3	3.75	13.91	52.1	6.38	14.72	63.86
4	4.98	14.05	70.0	7.22	15.05	82.62
5	3.71	13.83	50.9	6.15	15.50	60.73
6	4.91	13.07	64.2	6.02	14.23	70.63
7	4.99	14.02	70.0	7.14	14.39	74.93
8	5.06	13.99	70.8	6.86	14.28	73.94
9	5.01	13.94	69.8	6.96	14.83	76.48
10	4.96	14.01	69.5	6.40	15.55	77.68
11	4.95	14.15	70.0	6.49	15.87	70.68
12	5.12	12.50	64.5	3.23	14.10	76.33

Research aim: Machine learning approach to detect defects in additive manufactured components

Fig: Machine learning approach to detect defect

Diagnosis of Alzheimer's disease using Artificial Neural Network Techniques

OBJECTIVE

➢ To perform a multi-modal, integrated and Artificial Neural Network based techniques for distinguishing people with normal brain from those who can develop mild cognitive impairment (MCI) and Alzheimer's disease with age.

PET(Positron Emission Tomography)
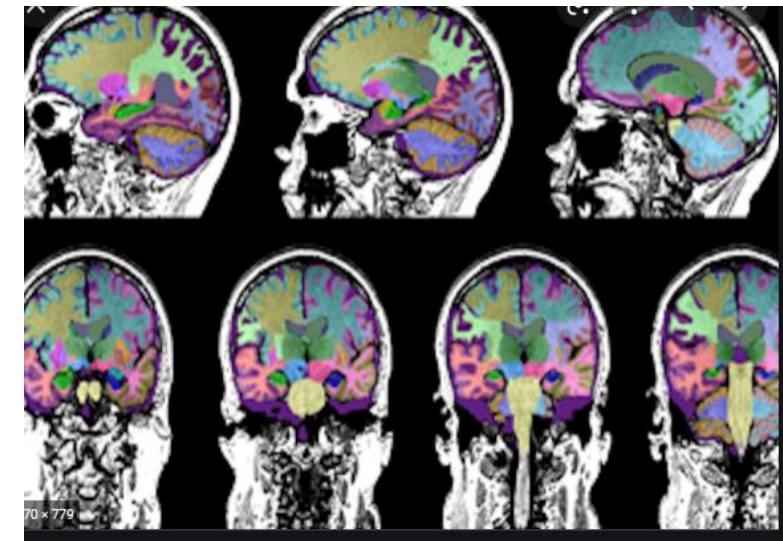
METHODOLOGY

Segmentation & parcellation

Parallelization of Reconstruction

RESULTS
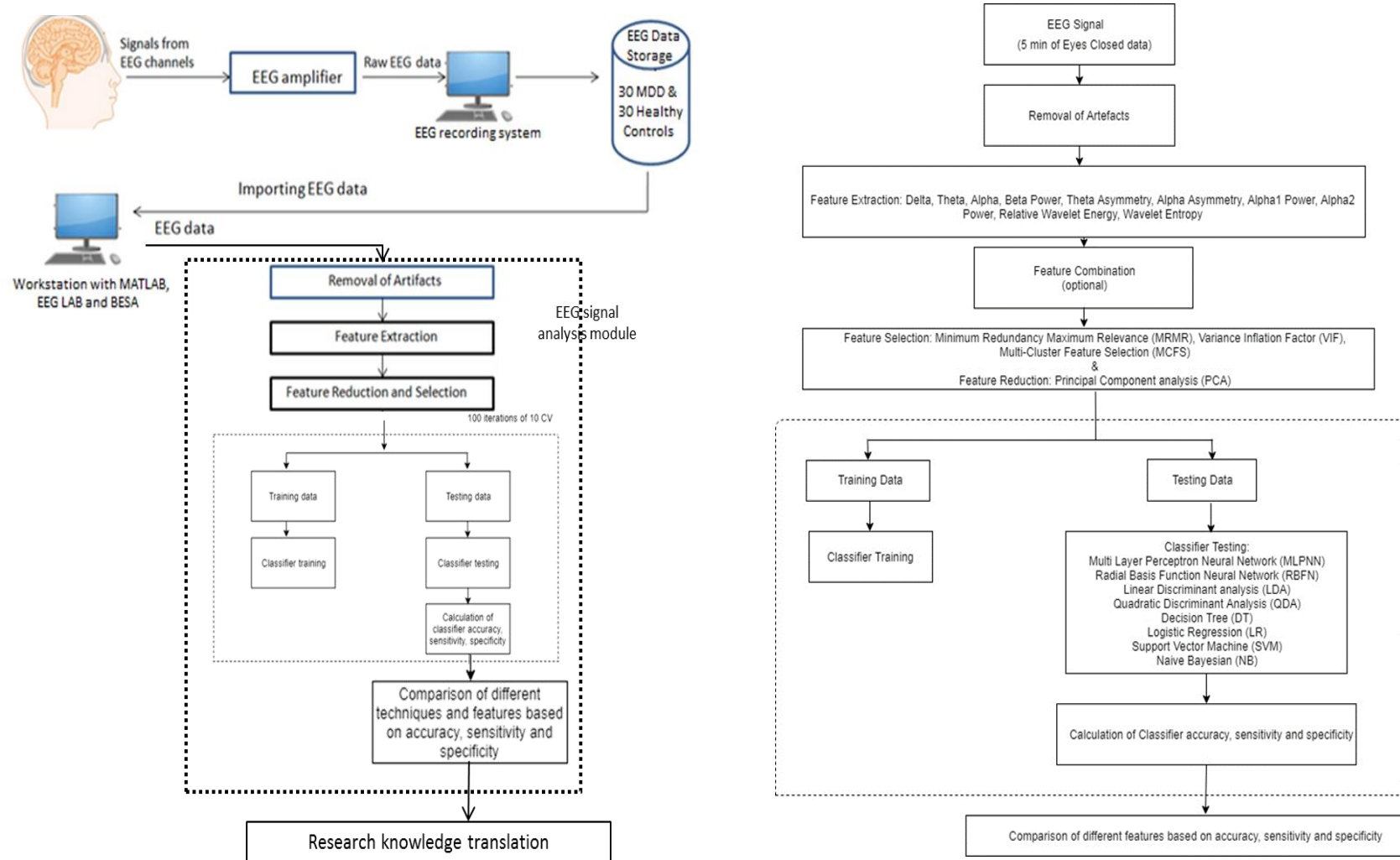
Proposed framework for detection of MDD patients
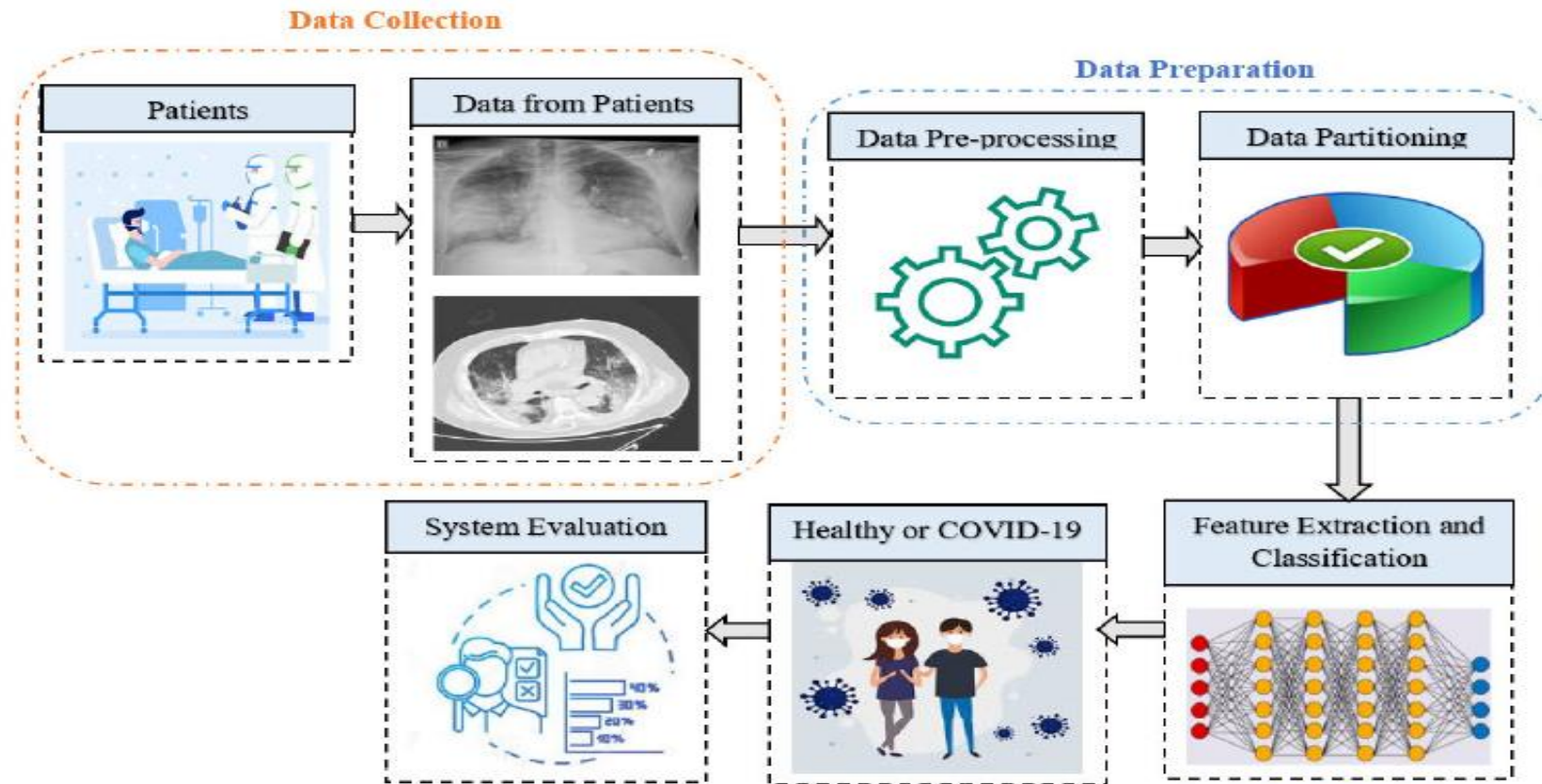
- The significant increase in tourism in the recent time and the contribution of tourism to the Indian economy have motivated us to think in the direction of tourism through intelligent computing.

- We are currently working on the Tourist Trip Design Problem(TTDP) and their variants.
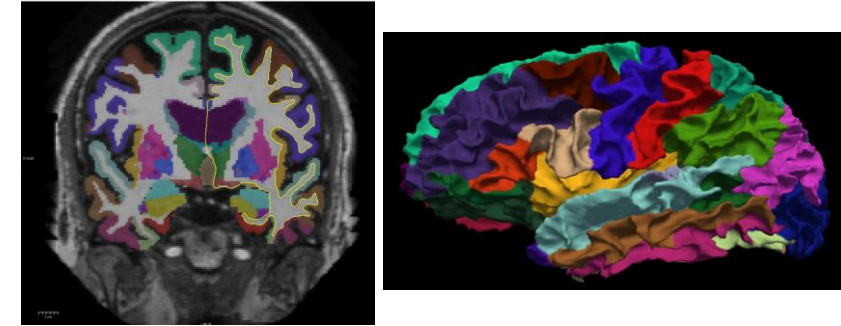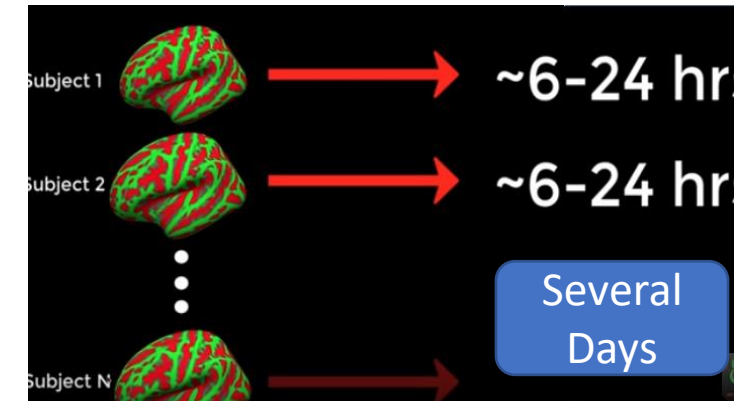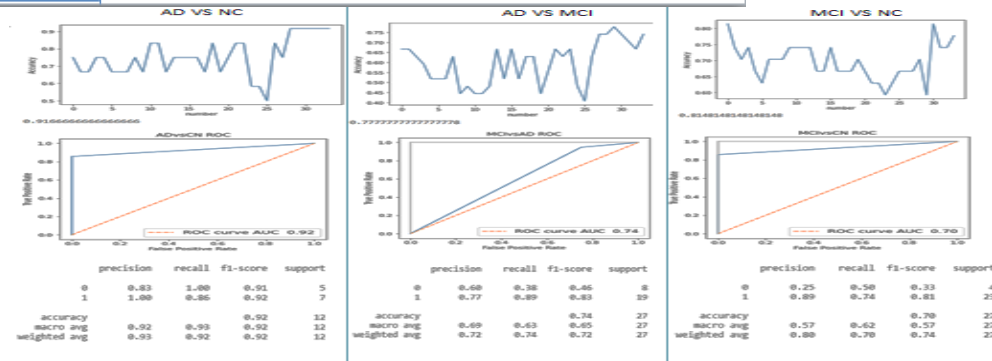
- The objective is to design an automated decision support tool that will help in personalized and efficient planning for tourist trips using optimization Meta-heuristics.

```
                 ┌─────────────────┐
                 │   Multimodal    │
                 │ public transport│
                 │      data       │
                 └────────┬────────┘
                          │
                          ▼
┌──────────┐      ┌──────────────┐      ┌──────────────────┐
│POIs Data │─────▶│ Optimization │◀─────│      User        │
│          │      │  algorithm   │      │preference/Constraints│
└──────────┘      └──────┬───────┘      └──────────────────┘
                         ▲
                         │
                 ┌───────┴───────┐
                 │    Tourist    │
                 │  Itineraries  │
                 └───────────────┘
```

Road Traffic Management
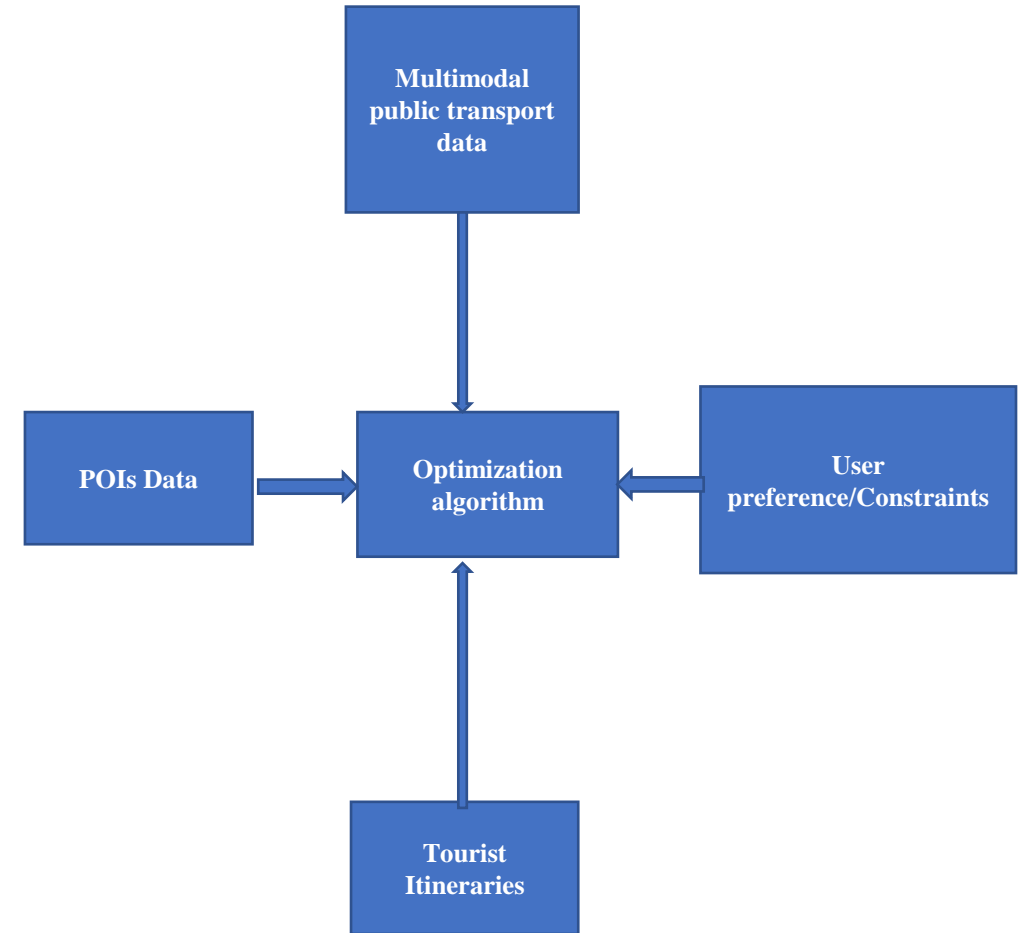
Background:

- Urbanization and growth of transport network.

- Heterogeneous nature of traffic that share road.

Problem:

- Unmanageable traffic

- Long hours of traffic jam

- Increased travel time

- Pollution and fuel consumption

- Road accidents

Expectations:

- Proper flow of vehicle on the road network.

- Road capacity as per requirements

- Adaptive traffic signal and Real-time traffic feedback system

- Smart corridors for emergency services

Objective:

Properly planned and monitored road network for optimizing traffic by reducing travel cost/time, and congestion.
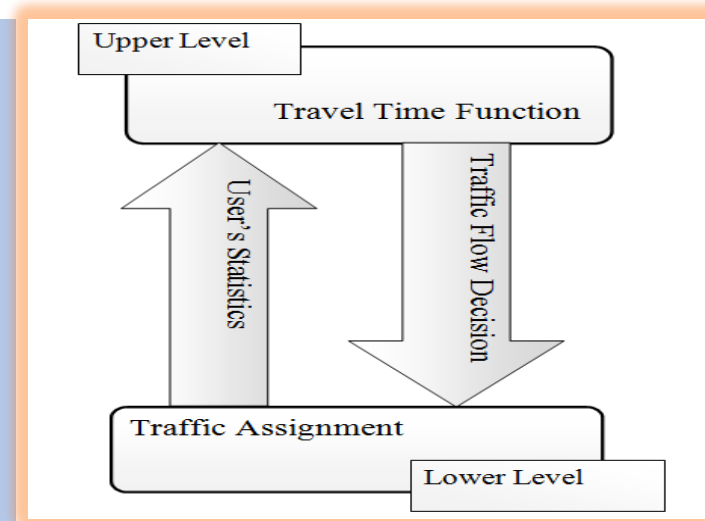
Modelling:

- Leader-follower game model
- Upper level depends on the results from the lower level and the lower level can be solved by using results from the upper level

Bio-inspired Road Traffic Management
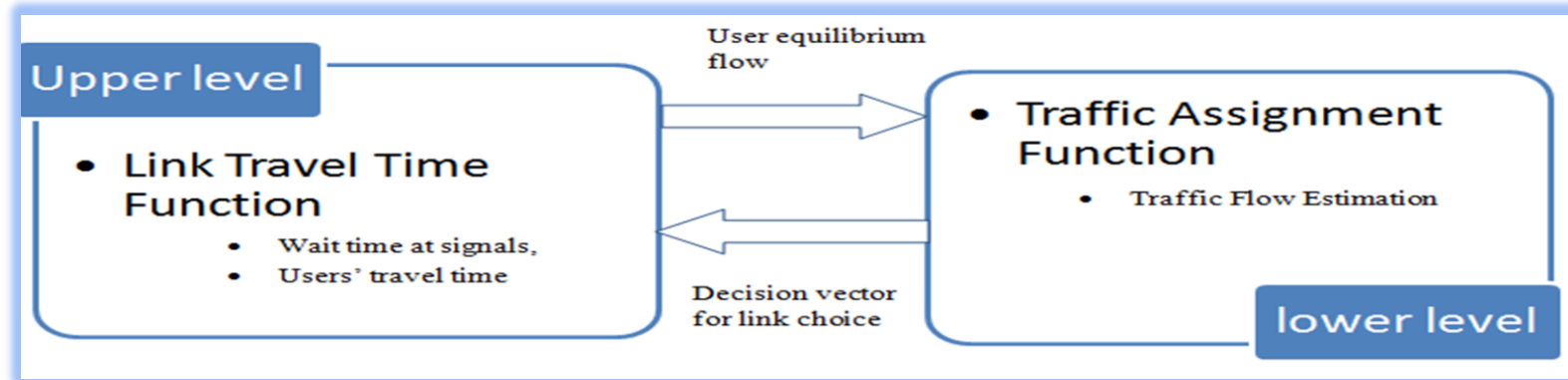
Upper level (minimize the total wait-time of all vehicles on every intersection). can be mathematically modeled as:

Minimize TW $(\Psi, q^*(\Psi)) = \sum_{a \in I}\sum_{b \in L(a)} q_{ab}(\Psi, q^*(\Psi)) \times t_{ab}(\Psi, q^*(\Psi))$

Subject to: $\qquad\qquad\qquad \Psi_{min} \leq \Psi \leq \Psi_{max}$

Where, TW is total wait time.

Ψ is the signal variable.

q* is the optimized load distribution function (From layer 2).

I is the set of all Intersections.

L (a) is the set of links attached to intersection 'a'.

q_{ab} is the load waiting on link 'b' at intersection 'a'.

t_{ab} is the time for which q_{ab} waited.

Lower level (Stochastic user equilibrium) can be mathematically represented as:

Minimize D (Ψp, C)

Where,

D is the distance cost of travelling on a link determined by previous signal (Ψp)

C is the actual length of the link**.**

Methodology :
GA, ACO, PSO, and BA

Hybrid model for prediction of heart disease

Aim

- *Accurate* and *quick* prediction of heart-disease (a cardiovascular disorder), one of the most dangerous diseases in the world - that causes **31%** of worldwide deaths

- *Saving* lives and cost

Block diagram of the hybrid model with two-level optimization

Block diagram for rule-level optimization
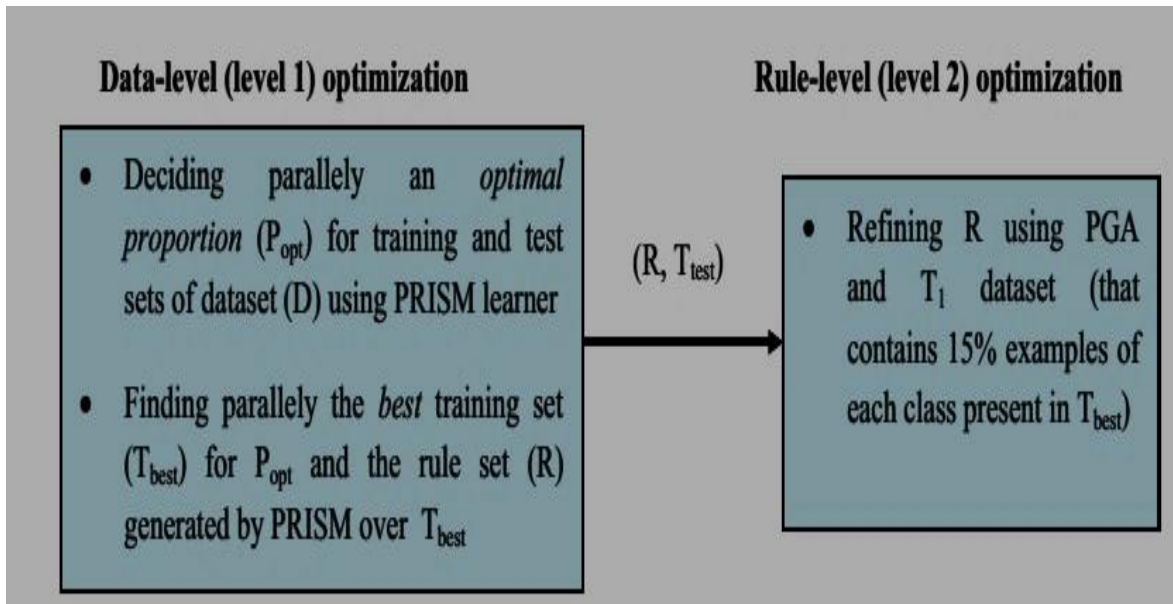
Adopted base learner: Perfect Rule Induction by Sequential Method (PRISM) learner that is capable to handle *rare case* data set [It is a *rare case* dataset]
Used rule refining tool – Genetic algorithm
Performance measuring metrices – Classification accuracy, TPR, FPR, AUC
Sources of datasets: UCI repository
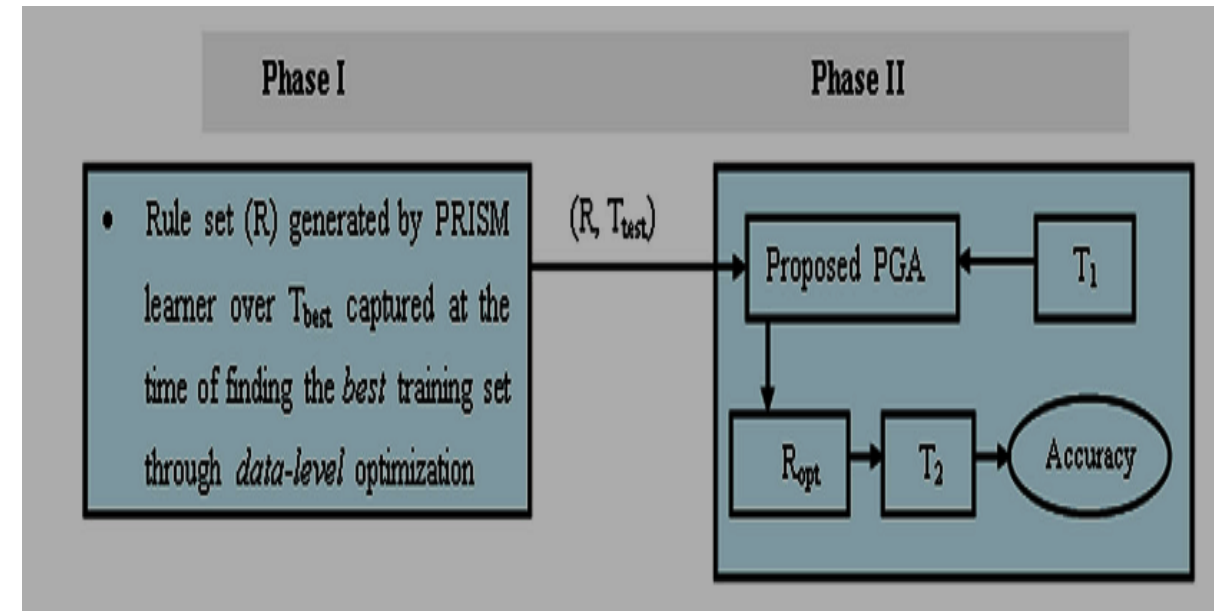
Implementation of the model:

The concurrent section of each stage (of data level and rule level optimization) is implemented using OpenMP thread-based tool in on Cluster HPC machine (FUJITSU) with a total 256 cores (under one Master node), 64 GB RAM.

A Two-Step Knowledge Extraction Framework for Improving Disease Diagnosis

Purpose – Generic model for *effective* diagnosis of diseases, taking less time

Contributions:
- Managing *missing* and *inconsistent* values (frequently found) in medical datasets
- *Design of* entropy-based feature *reduction* approach
- *Adjustment* strategy for training data
- PRISM learner based hybrid model
- *Design of innovative* rule-filtering mechanism to *filter out* high quality decision rules, *discarding* conflicting rules

Design/methodology/approach
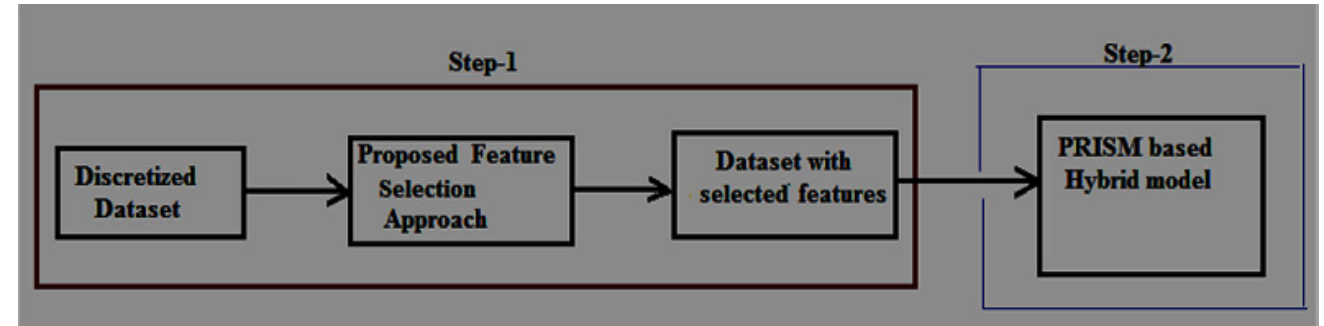
Findings–
- Better Feature selection
- Tackle data imbalance issue.
- *Significantly low* standard deviation results computed over the datasets. This reports the *reliability* of the model for predicting unseen instances of medical datasets.
- It elucidates its knowledge in understandable: IF-THEN form (easy-to-use)
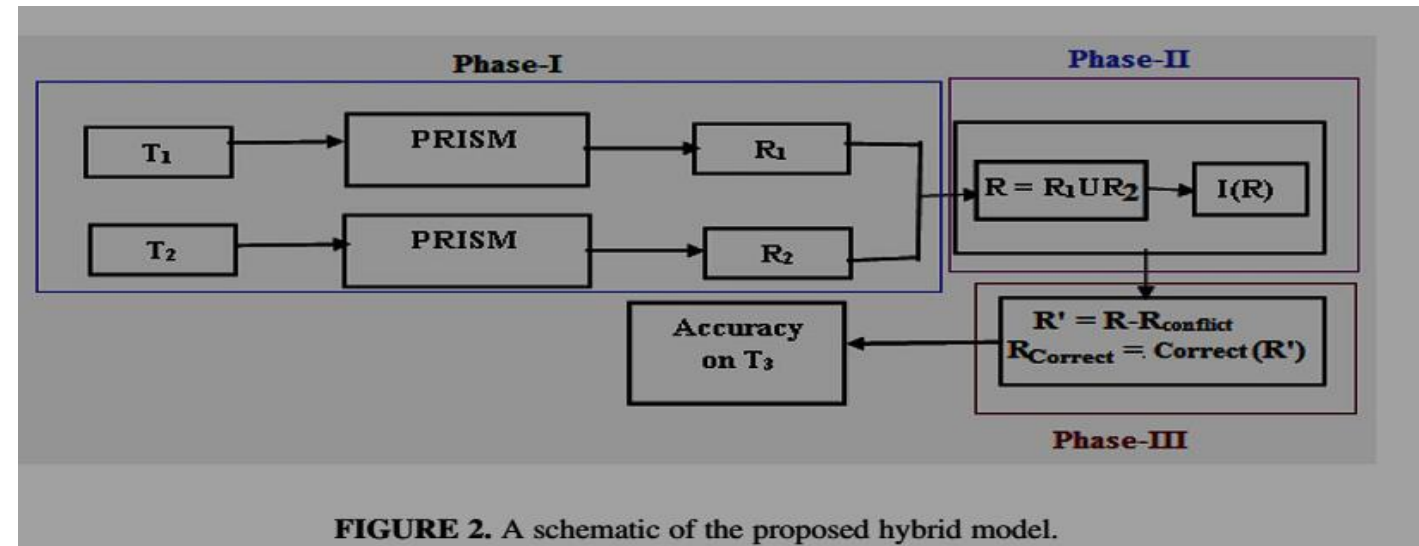
FIGURE 2. A schematic of the proposed hybrid model.

➤ Classic methods for solving Vehicle Routing Problem (VRP) seek to minimize business expenses by correctly distributing the vehicle fleets that require several delivery centers for prospective customers.

➤The advancements in the electric vehicle (EV) technology have gained momentum in parallel with the growing environmental concerns in societies.

➤ Here , GVR(Green Vehicle Routing) is being addressed which seeks to minimize travel time renewable fuel sources for large number of Battery Electric Vehicles (BEVs) AND Hybrid Electric Vehicles (HEVs), with a limited refueling network.

➤ Meta-heuristic based approach with Machine learning techniques are being applied to develop a Green Vehicle Routing Optimization Model which would handle the aspects like energy consumption , scalability, and reliability.

Figure 1: Static features values from GCN outputs

Source Files
(defect/no-defect)

- Apply cognitive approach to find the cognitive complexity measure for node features value of graph through cognitive weight.
- Node features with cognitive weights used for this work:
  1. IN: number of inputs in a program
  2. OUT: Number of outputs in a program
  3. IF: 2, WHILE:3, FOR: 3
  4. EXP: number of sequence statement.
- Cognitive weight (W_c) of BCS as assign by wang [9] can be calculated as:
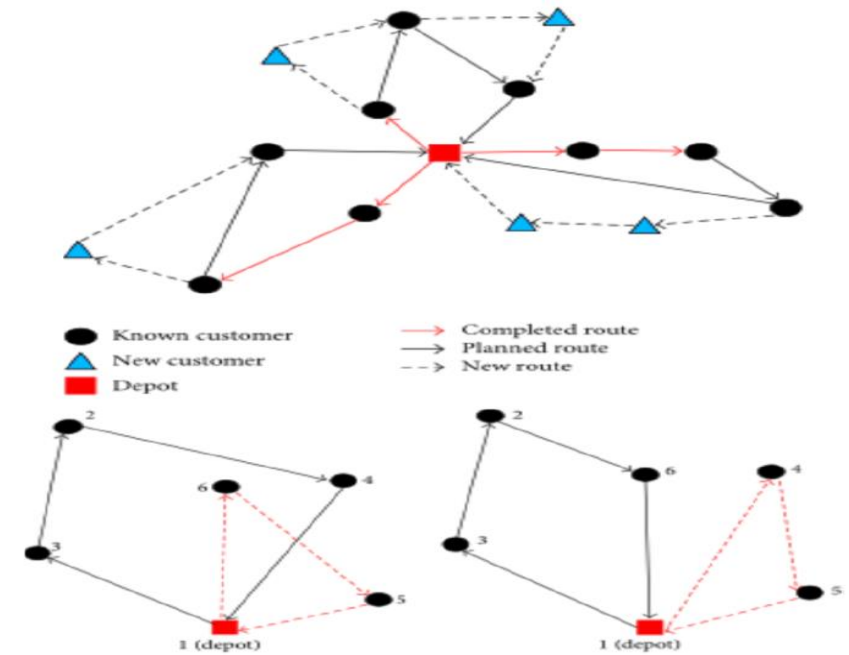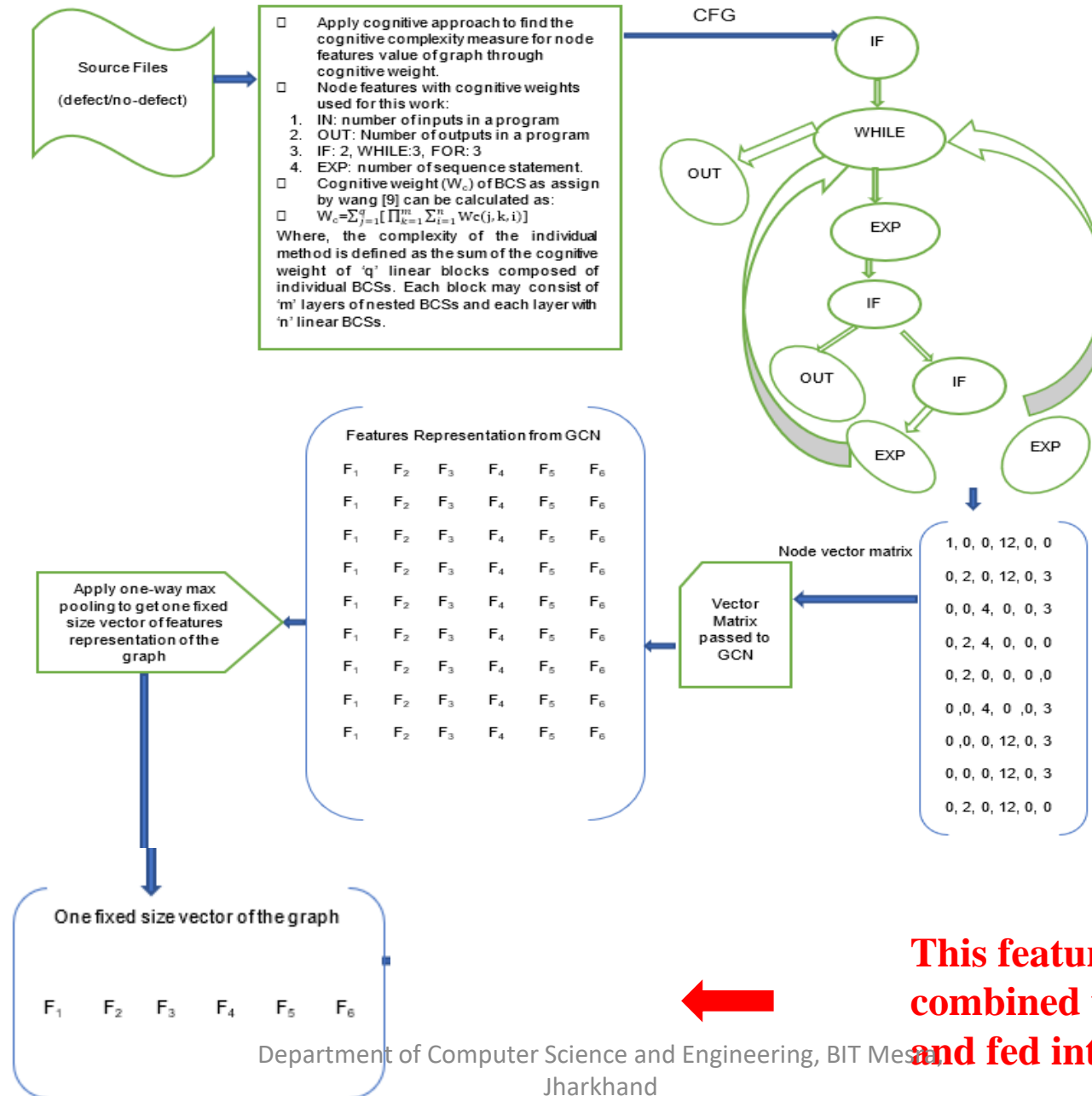- $W_c = \sum_{j=1}^{q} [\prod_{k=1}^{m} \sum_{i=1}^{n} Wc(j, k, i)]$

Where, the complexity of the individual method is defined as the sum of the cognitive weight of 'q' linear blocks composed of individual BCSs. Each block may consist of 'm' layers of nested BCSs and each layer with 'n' linear BCSs.

CFG

IF

WHILE

OUT

EXP

IF

OUT   IF

EXP   EXP

Node vector matrix

$$\begin{matrix}
1, 0, 0, 12, 0, 0 \\
0, 2, 0, 12, 0, 3 \\
0, 0, 4, 0, 0, 3 \\
0, 2, 4, 0, 0, 0 \\
0, 2, 0, 0, 0, 0 \\
0, 0, 4, 0, 0, 3 \\
0, 0, 0, 12, 0, 3 \\
0, 0, 0, 12, 0, 3 \\
0, 2, 0, 12, 0, 0
\end{matrix}$$

Vector Matrix passed to GCN

Features Representation from GCN

F_1	F_2	F_3	F_4	F_5	F_6
F_1	F_2	F_3	F_4	F_5	F_6
F_1	F_2	F_3	F_4	F_5	F_6
F_1	F_2	F_3	F_4	F_5	F_6
F_1	F_2	F_3	F_4	F_5	F_6
F_1	F_2	F_3	F_4	F_5	F_6
F_1	F_2	F_3	F_4	F_5	F_6
F_1	F_2	F_3	F_4	F_5	F_6
F_1	F_2	F_3	F_4	F_5	F_6

Apply one-way max pooling to get one fixed size vector of features representation of the graph

One fixed size vector of the graph

F_1	F_2	F_3	F_4	F_5	F_6

Applications of GCN

Determining whether a protein is an enzyme or not

Traffic prediction problem

Predicting criminal associations.

This feature representation is combined with static features and fed into a NN classifier
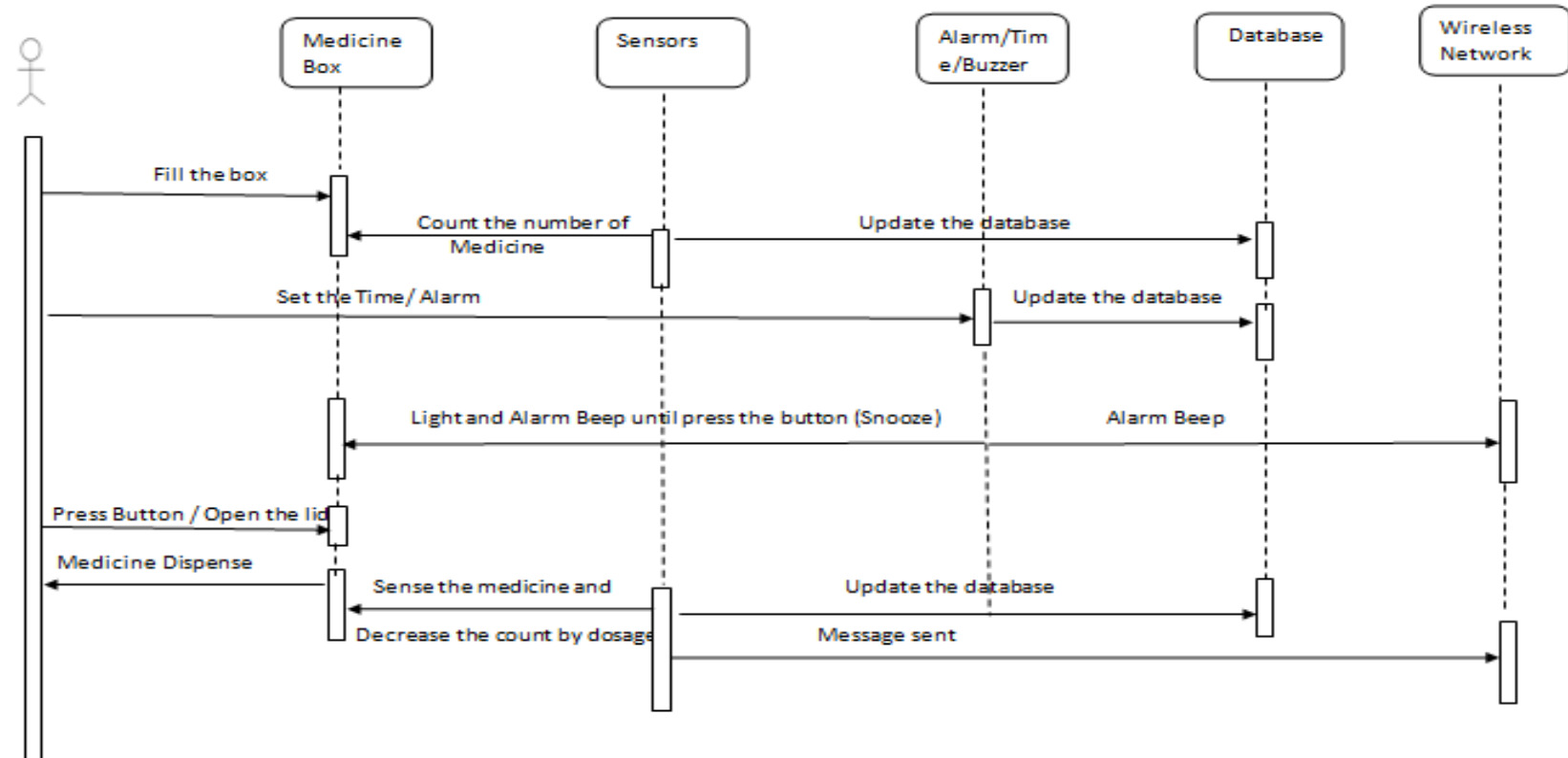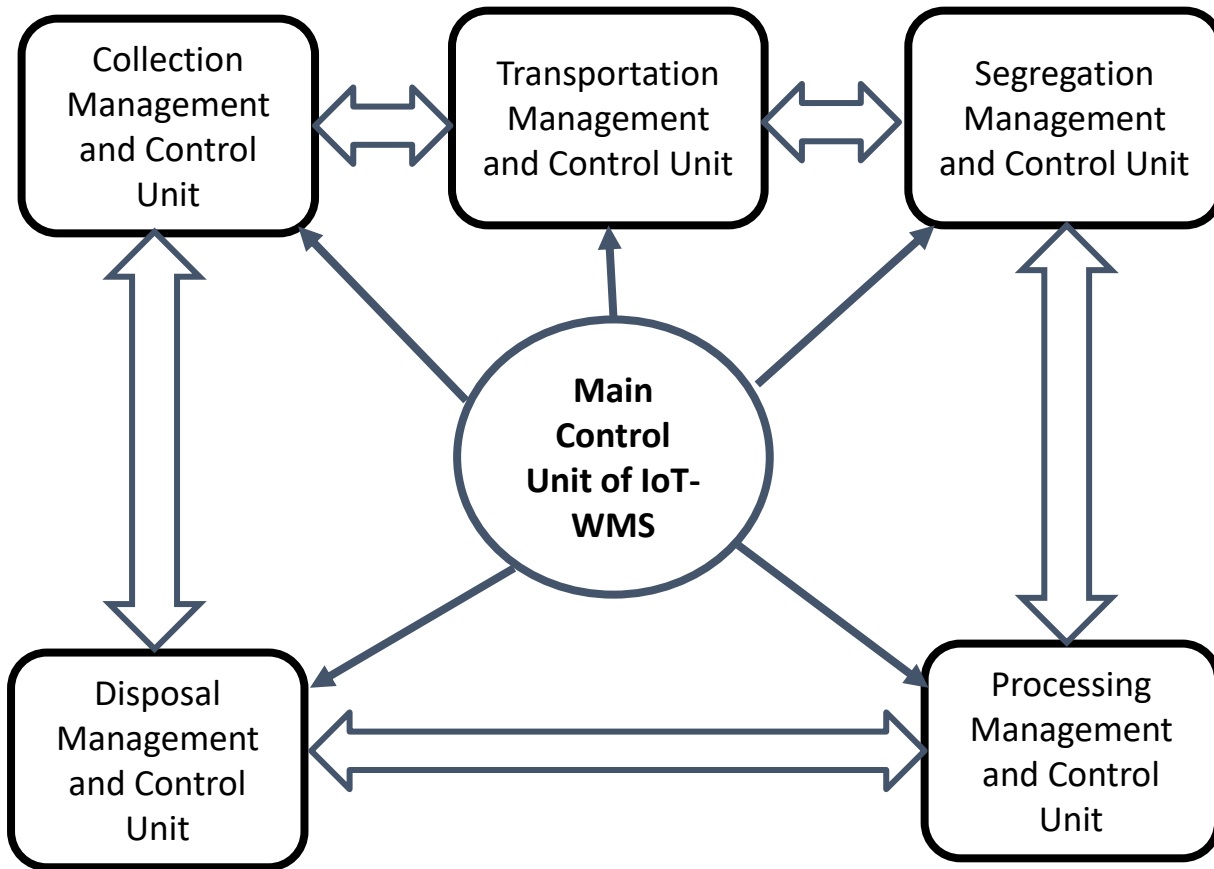
Smart Pill Box

OBJECTIVES:

- **Develop a robust Medicine box designed to prevent errors in hospitals and elderly people homes**

- **Apply optimization to speed up work for the caretakers or nurses**

- **Pill management and real time based scheduling by use of real time clocks.**

IoT-Powered Waste Management System

The Modular Structure

- An efficient **Collection** module implies better connection between collection point and the transportation units.
- **Transportation** module aims to achieves is an efficient transportation nexus which can pickup waste from all the collection points, cover all the areas with minimal overlap and repetition of resource allocation, and drop-off the collected waste to the processing factory.
- **Segregation** must be done at the processing plant with a good capacity to hold large volume of waste. Through image sensing and magnetic field much of the segregation can be achieved.
- **Processing** is a complex module, and requires the utmost attainable level of efficiency, as any amount of inefficiency would backpropagate, and destabilise the previous modules. One critical aspect of this module is to relay the efficiency level of itself to the central unit, which can make decisions for the previous modules. Communication between immediate participating modules and units is a critical aspect.
- **Disposal** follows processing and is critical for the whole system to stand up-to-the-mark and serve the purpose. Complexity involves communicating the capacity information of the buffer, request to transportation units, and correct disposal or correct byproduct.

The biggest issues facing us today in the realms of Waste Management System can largely be attributed to lack of planning, **technical expertise**, government's investment, and social awareness.
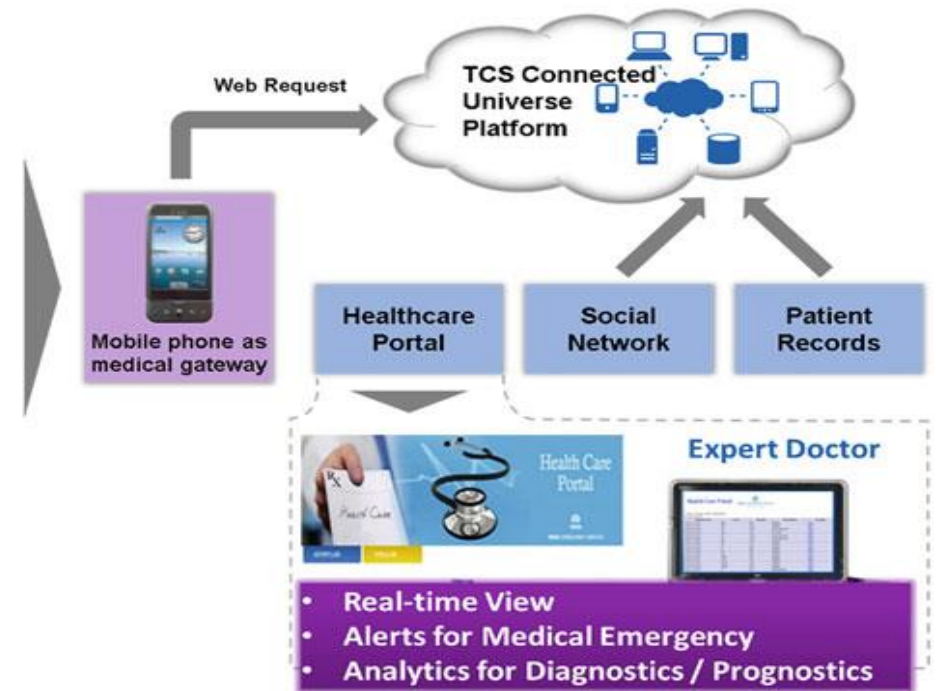
Remote health monitoring project
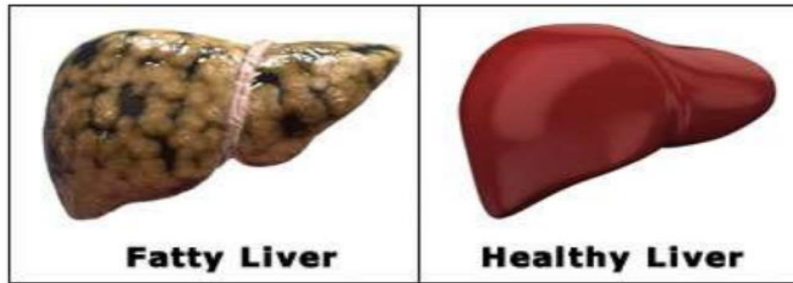
Objective:
To develop an Internet-of-Things (IoT) driven remote health monitoring architecture which tries to address the home and elderly care, capacity and reachability issues

The system is divided into four modules (Pictorial representation is for example)

- Data extraction through Nearable and Wearable devices
- Development of Gateways through Mobile
- Development of clouds
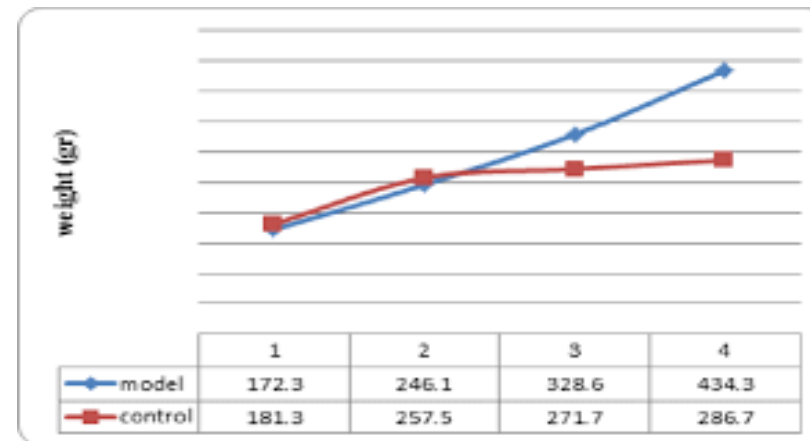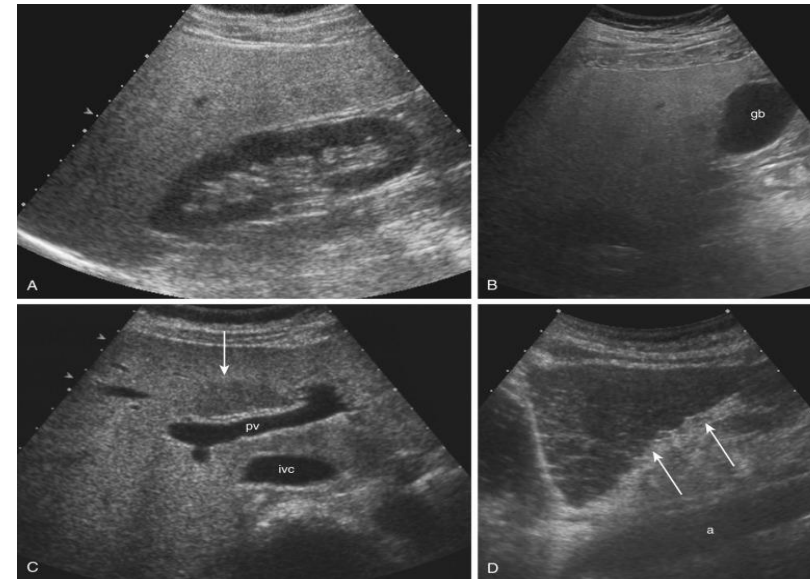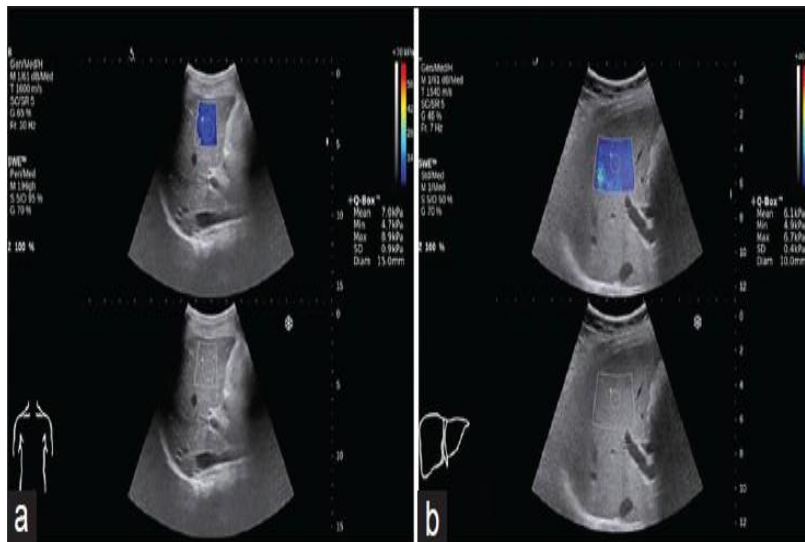- Real Time Report Generation

Fatty Liver | Healthy Liver

12.3-14.9g   7.74-8.89g

	1	2	3	4
model	172.3	246.1	328.6	434.3
control	181.3	257.5	271.7	286.7

Normal vs. Enlarged Prostate Size

Adrenal gland dimensions in cm		
Gestational age (weeks)	Length (range)	Width (range)
25-30	1.2 (0.9-3.6)	0.3 (0.2-0.5)
31-35	1.4 (0.9-3.6)	0.3 (0.2-0.5)
36-40	1.7 (0.9-3.6)	0.3 (0.2-0.5)

Dist 1 4.67 cm
Dist 2 4.53 cm
Dist 3 5.24 cm
Volume 58.0 ml

PROSTATE
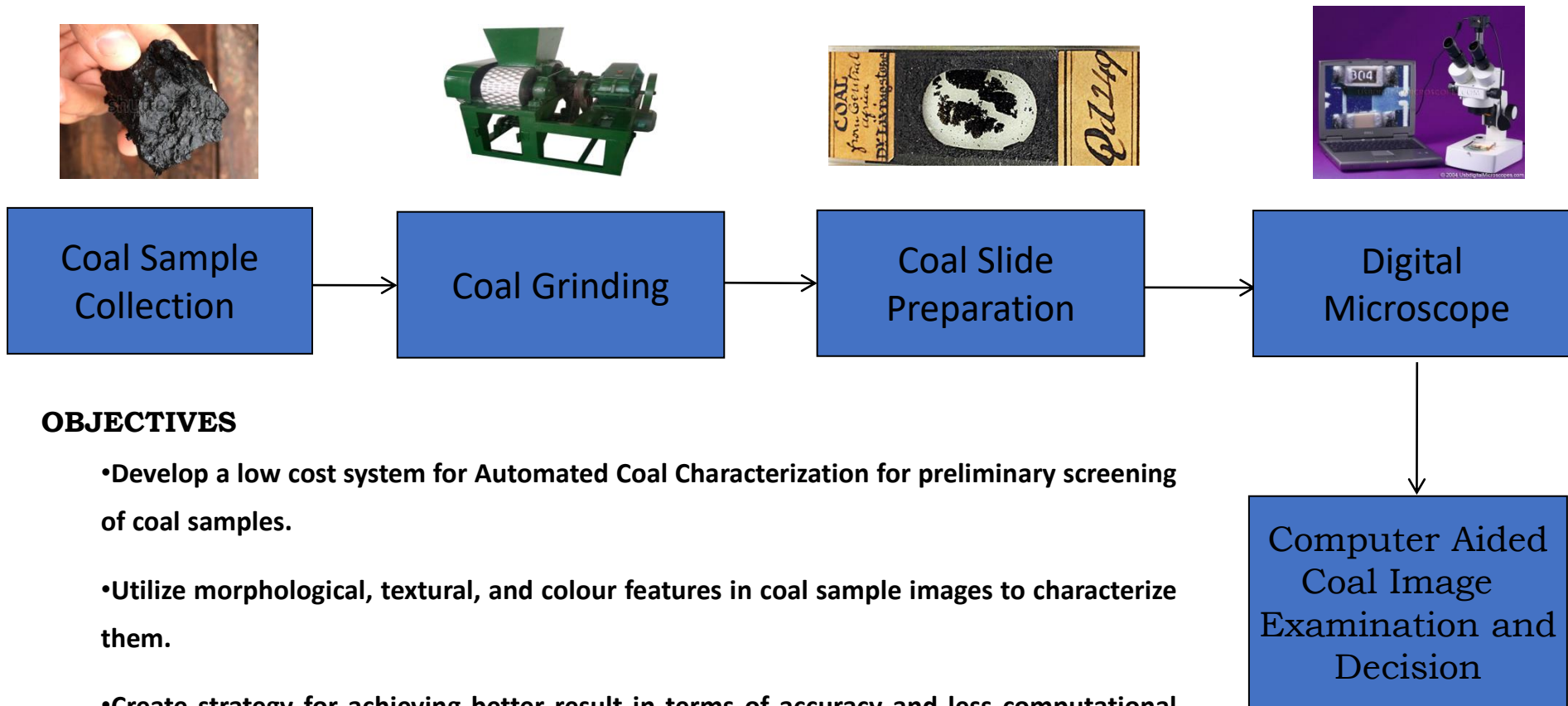
Bladder

Normal Prostate

Enlarged Prostate
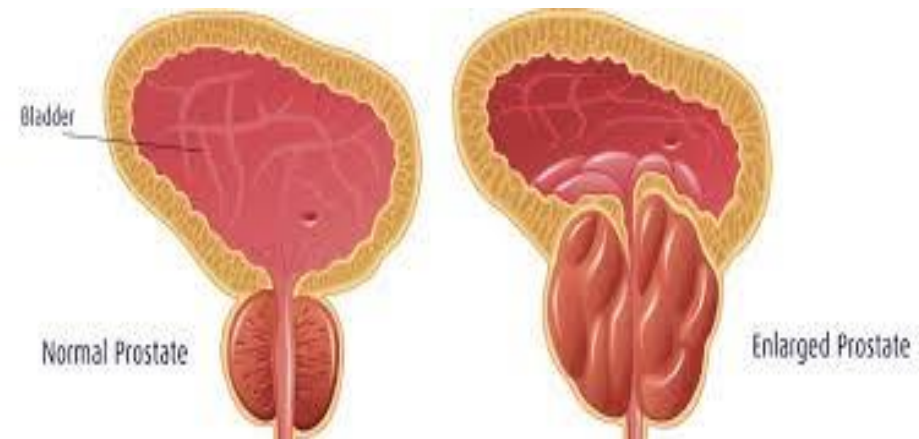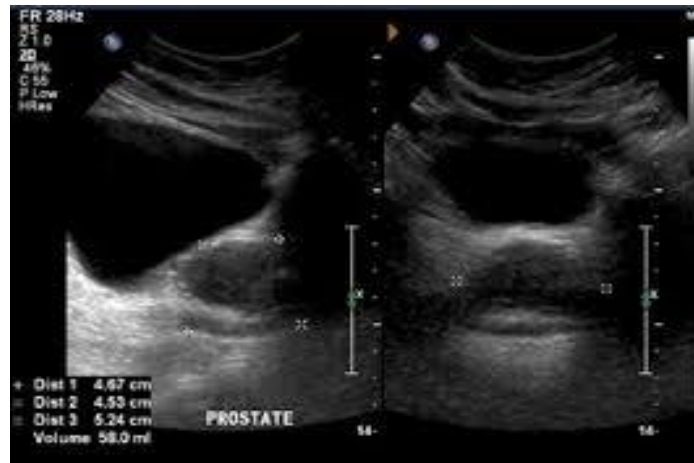
- Image Doctoring: Separating real images from embedded images

- Image Assembling: Satellite Image sequencing

- Image Analysis: All formats genuine checking

- Two International Conference papers are presented on Bone Mark Analysis and Identification of human through teeth morphology.

Petrographic Characterization of Coal using Image Analysis
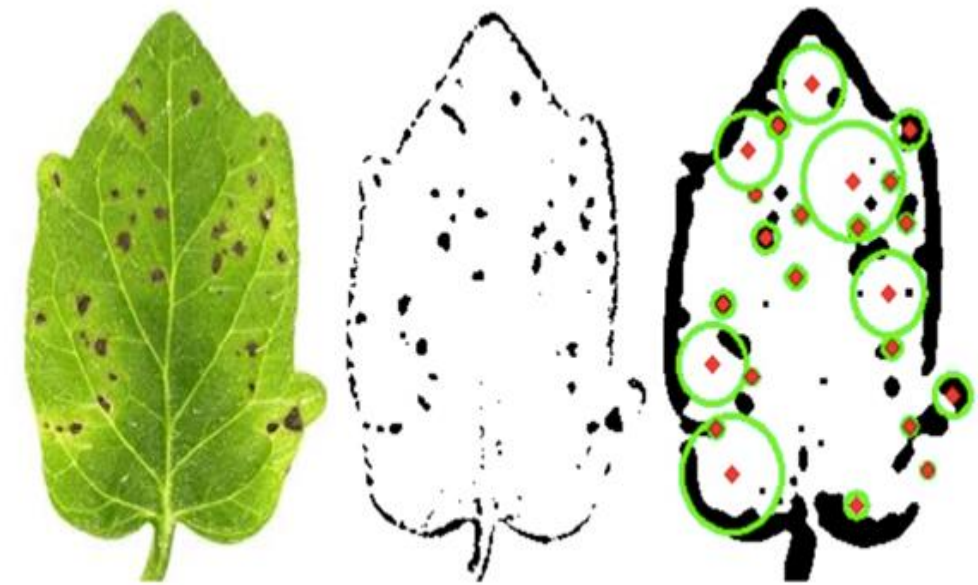
Computer Aided Coal Petrography

Coal Sample Collection → Coal Grinding → Coal Slide Preparation → Digital Microscope → Computer Aided Coal Image Examination and Decision

OBJECTIVES

- Develop a low cost system for Automated Coal Characterization for preliminary screening of coal samples.

- Utilize morphological, textural, and colour features in coal sample images to characterize them.

- Create strategy for achieving better result in terms of accuracy and less computational time.

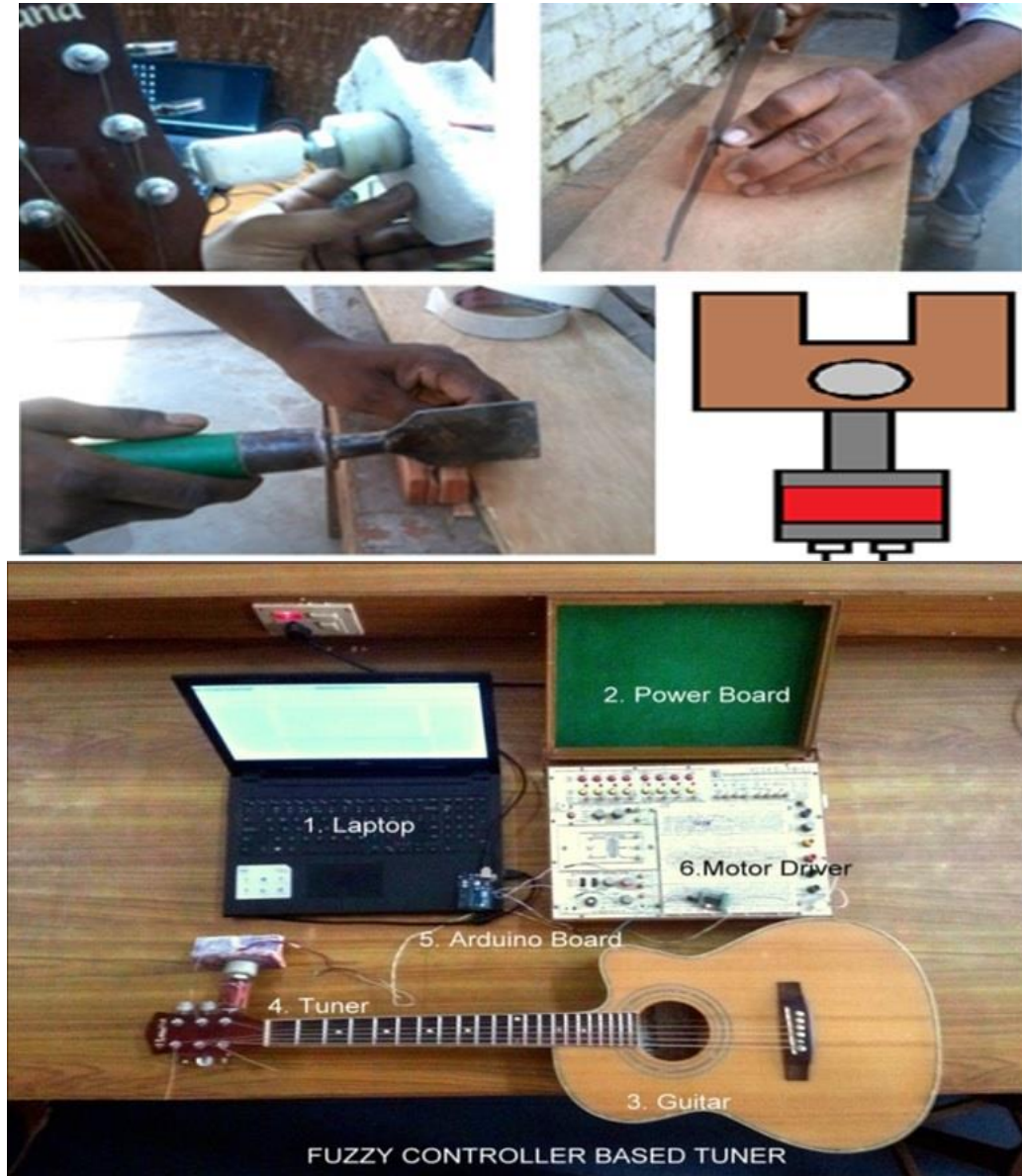# Application of Speech in Automobile Industry for Automatic Seat Adjustment

- Smart system can learn on their own by capturing data from environment. With the growth of smart phones and their high computational abilities with internet connectivity, they are widely used as an interface mechanism between a user and a mechanical device.

- The main concerns while adjusting the position of the driver seat are: The driver should reach the pedals and controls comfortably without over stretching. There should be enough room between the driver's head and the roof. Seat should be adjusted to properly see the front and side mirrors. The driver should comfortably reach the steering wheels without stretching their arms. There should be a proper gap between driver's chest and steering wheels. This will enable air bags and seat belts to provide maximum safety during accidents. device.
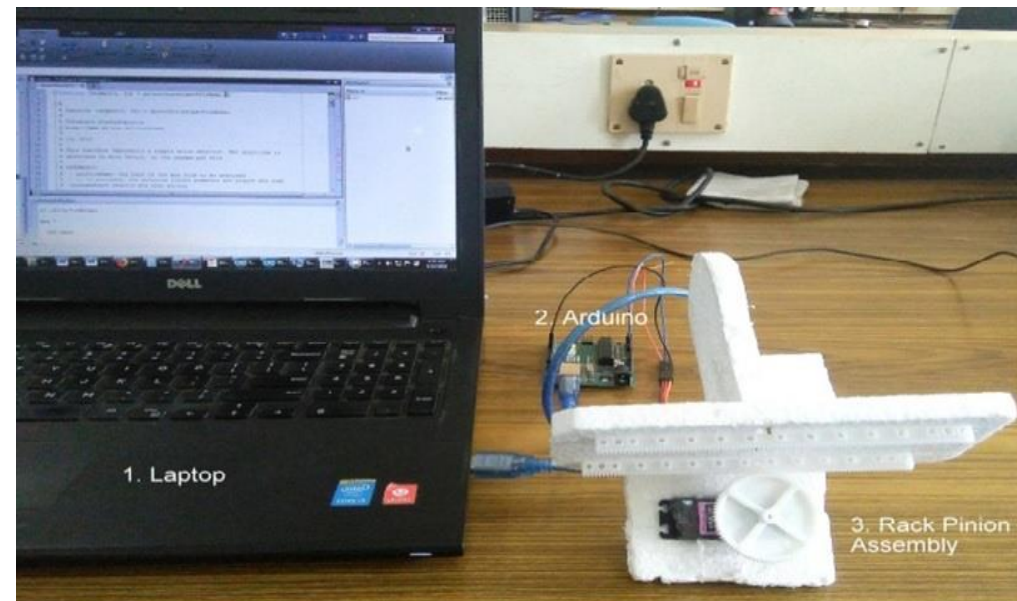
Automatic Guitar Tuner Using Acoustic Features

- Since the time string instruments are invented, tuning of the guitar has been a manual task.

- People have either used an electronic tuner or their music expertise to compare the reference note with the played note. Both these methods involve mechanical action on the part of the user to tune the string which requires a lot of time and may involve human error.

- An automated guitar tuner will not only aid the musician in tuning the guitar with much precision but will also save time by doing it more quickly.

- Earlier work in this field involves the use of the FFT algorithm for note detection which is not very reliable for guitar signal.
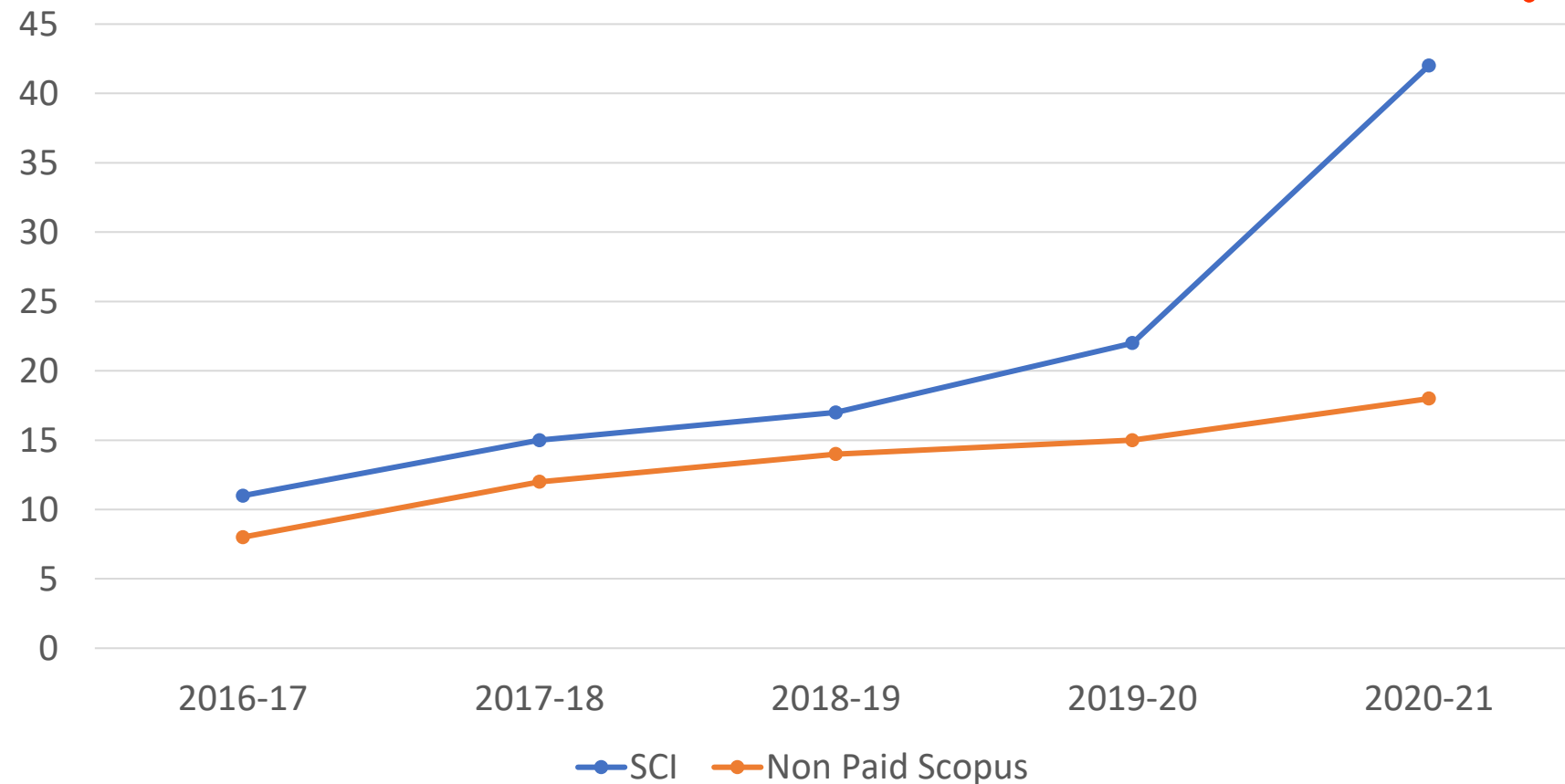
The Path forward

Publications

- **Quality and Quantity:**
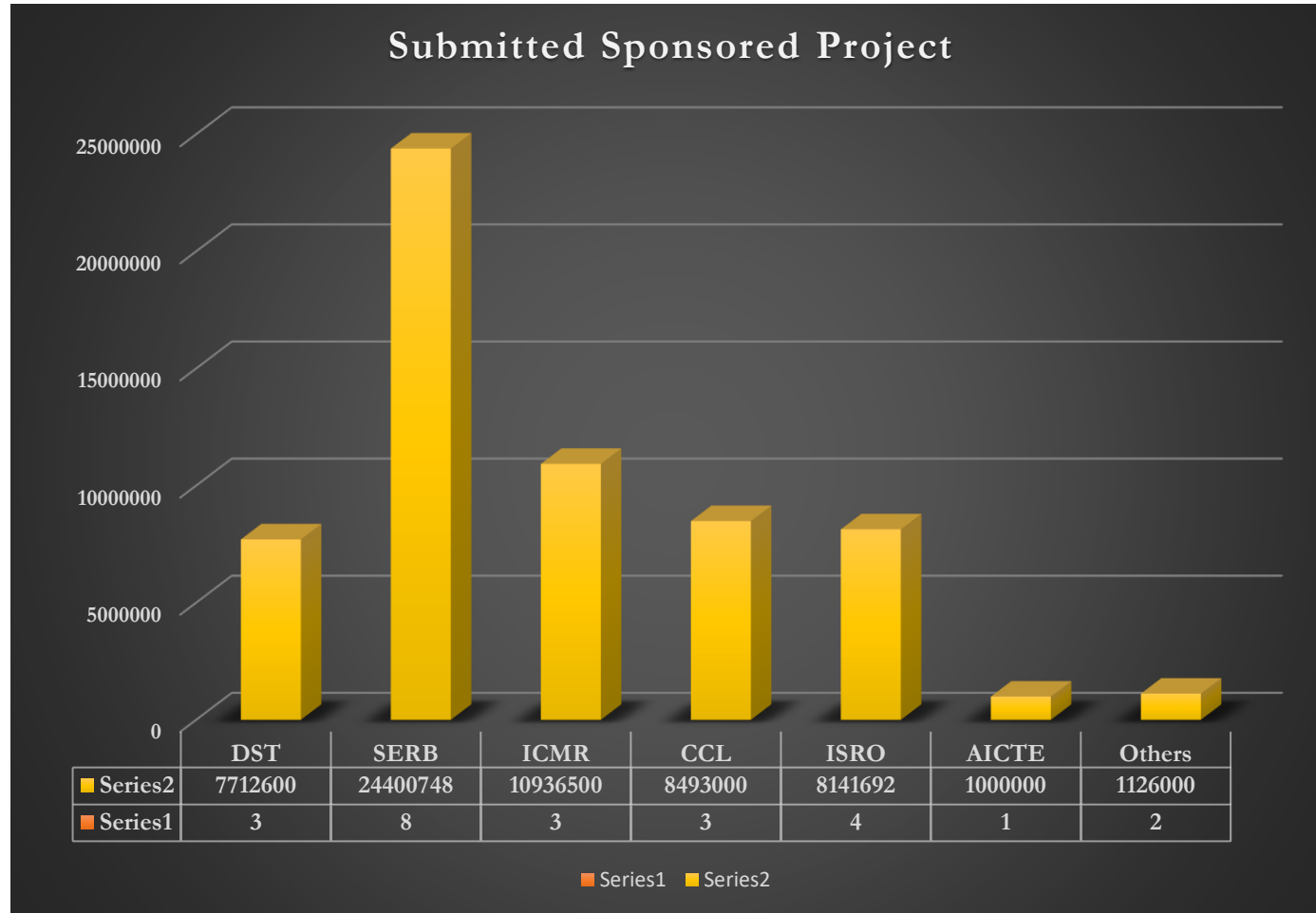 - ➢ **Encouragement to publish papers annually and compliant to NIRF requirements**

Legend: SCI — Non Paid Scopus

Proposed New Courses 2022 onwards…

Specialization	Program	Intake
Cyber security	B.Tech.	60
Machine learning	M.Tech.	20
Internet of Things	M.Tech.	20
Image Processing & Computer Vision	M.Tech.	20

- Short term and executive training courses:
  - Pertaining to the high demand of courses like AI/ML/IoT; intent to offer online executive and certification courses.

Sponsored Projects Submitted during 2021

Submitted Sponsored Project

	DST	SERB	ICMR	CCL	ISRO	AICTE	Others
Series2	7712600	24400748	10936500	8493000	8141692	1000000	1126000
Series1	3	8	3	3	4	1	2

# Project Submitted	Total Budget(INR)
24	6,18,10,540

- **External Funding:**
➢ **Identification of specific funding agencies vis a vis identified thrust areas.**

Dept. of CSE: Moving towards Target 2025

Further steps....

Infra structure Development – offices for newly joined faculty members and labs

Establishment and development of research laboratories – for specializations in UG and PG programs

For better placements of PG students

- Industry tie-ups and focus on students' feedback regarding course syllabi and course conducting
- Personality / Communication improvement programme / coding competitions to be organized regularly.

Accrediting ALL programs

Thank you