



iitmadrmas

CENTRE FOR INNOVATION



Centre **For Innovation**

**ANNUAL REPORT
2019-20**



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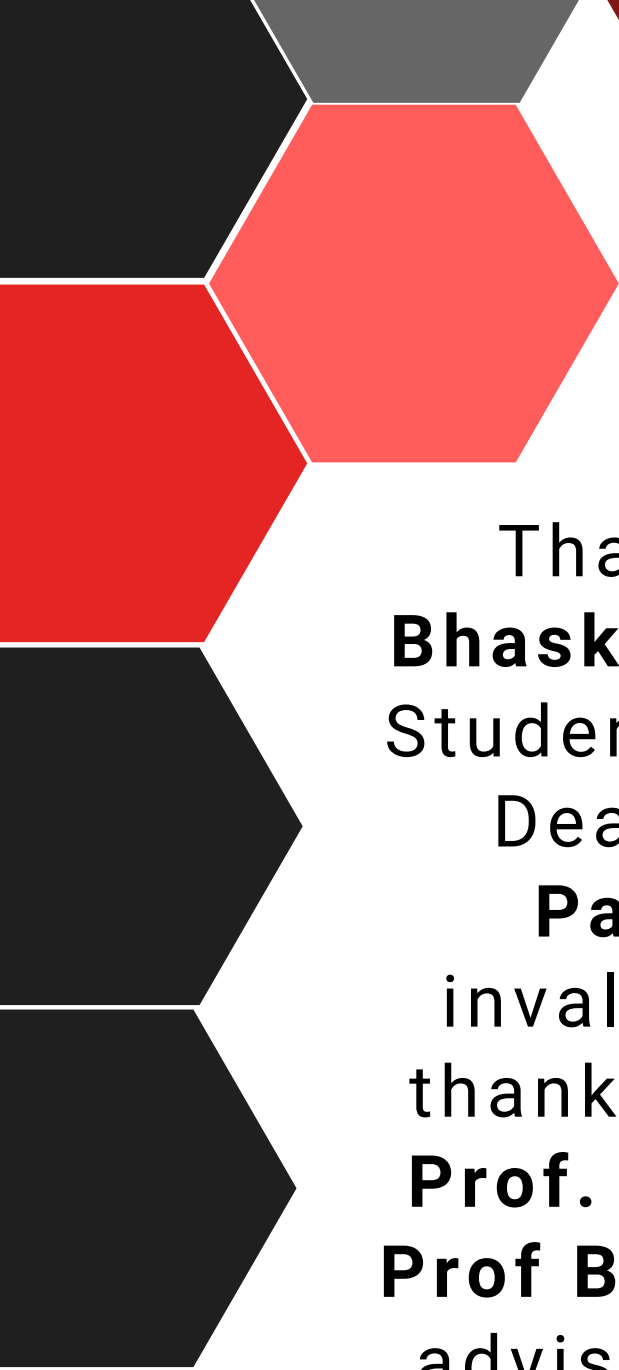
Team Avishkar Hyperloop

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Yet Another Hackathon

DbyT Dynamics

CFI Core Team



Thanks to Director **Prof. Bhaskar Ramamurthi**, Dean of Students **Prof. MS Sivakumar**, Dean I&AR **Prof. Mahesh Panchagnula** for their invaluable support. Special thanks to our faculty advisor **Prof. Satya Narayanan S** and **Prof Bobby George**. The faculty advisors of respective Clubs and Competition teams for their continuous mentorship and guidance throughout the year

Akash Anandan
Student Executive Head
Centre For Innovation
2019-20



FACULTY ADVISORS

CFI

Nirmaan

Aero Club

Analytics Club

**Astronomy and Physics
Club**

CVI Club

Electronics Club

iBot Club

Team Sahaay

Programming Club

Team Envisage

3D Printing Club

Prof Bobby George

Prof Satya Narayanan S

Prof Satya Narayanan S

Prof Ranjith Mohan

Prof Neerav Bhatt

Prof Suresh Govindarajan

Prof Kaushik Mitra

Prof. Arun Karuppaswamy B

Prof Asokan Thondiyath

Prof Anil Prabhakar

Prof Rupesh Nasre

Prof Prabhu Rajagopal

Prof G Saravana kumar

Raftar Formula Racing

Abhiyaan

Team Anveshak

Avishkar Hyperloop

Prof.A.Ramesh

Prof Satyan Subbiah

Prof Asokan Thondiyath

Prof Satya Chakravarty

CO-CURRICULAR SPHERE ORIENTATION



The Co-Curricular sphere orientation that took place on the 5th of August at the Student Activity Centre was a huge success. It is one of the earmarked events for the freshmen at the institute to get an insight into the functioning of the major student bodies under the cocurricular sphere of Insti.

With all the clubs and competition teams of CFI exhibiting some of their work in stalls, the event had a huge turnout. E-Cell, Shaastra, TechSoc and Nirmaan also marked their role in the event.

It was fun-filled with goodies, games and exciting questions. It encouraged freshmen to take a further step into the CFI Community and kickstart their own journey.

CLUB SESSION COUNT

31

ASTRO

24

AERO

7

PROGRAMMING

6

ANALYTICS

5

CVI

4

3DP

3

ENVISAGE

3

iBOT

3

ELECTRONICS

2

SAHAAY

CLUB ORIENTATIONS

Aero Club had its first introductory session which showed a footfall of nearly 200+ enthusiastic students, a large pool of whom were freshers. The Club heads explained the various projects planned to be undertaken during the semester as well as an overview of the Club and its goals. This was also coupled with an drone flying session at Hockey grounds.

"Quarks to Quasars" -the Orientation Session conducted by Horizon, the Physics and Astronomy club of CFI took place on the 11th of August. The session introduced the club and its functionalities to the freshers. Around 150 students attended the event making it a huge success.

The club members briefed about the projects, Boltzmann sessions and the upcoming events of their club.



The Programming club pulled its bootstraps with their introductory session that took place on 14th August. The session proved to be an efficacious event with a turnout of around 200 people. This session embedded on of the building blocks of programming, covering the basics of C++.



The iBot club had their orientation on the 12 th of August. The event registered an enthusiastic participation of around 150 people. The Orientation was fun-filled and covered different aspects of the iBot club.



The Analytics Club held their inaugural session on the 15th of August which saw a footfall of more than 150 enthusiastic students. The participants were given an info into the working of the Club which was followed by a discussion on Artificial Intelligence (AI) as well as the emergence of Data Science.



The starter series progressed with yet another Orientation by the Computer vision and Intelligence club on 17th of August. The event recorded a participation of 150 students. The 2 hours session entailed applications of Computer vision and Artificial intelligence, the working of the club, current projects under the club.





The orientation session of the 3D printing club was a success on 18th August with a good turnout. The session introduced the freshers to different aspects of 3D printing and the various technologies existing in the world. A live demonstration of the club's 3D printer fascinated the participants and the session also gave insights about the various projects undertaken as a part of the club.

The Electronics Club and the iBot club collaboratively conducted a 3 day session which revolved around Microcontrollers. There was a special focus on Arduino and Arduino IDE. This was followed by a discussion on Bluetooth and Motor Drivers.



The joint session conducted by the Programming club, CVIG and the Analytics club happened on 24th of August.

The session was titled as "introduction to python programming". The session served as a good primer for programming in python language to all the 160 zealous students who turned up for the event. The crowd was engrossed for 2 hours as they were introduced to python syntax, and libraries such as numpy and matplotlib.



ASTRO WEEK

An Astounding Astro week drove us crazy with their mind boggling events. The week brimmed with a series of lectures and observation sessions transferring on a lot of info bytes. The lecture series entailed for 3 lectures.

The first lecture, unraveled the obscure topics of exoplanets and the methods to find them. The second one led the participants into the exhilarating journey to explore gravitational waves and the history of its inception. The third lecture, threw some light on the topics of Cosmology and Dark matter.

Observation sessions gave the thrills of looking at the maneuvers of Saturn, Jupiter and Moon. It was a lot of fun capturing those breath-taking moments. The sessions also elucidated the basics of working of a telescope and explored the astro coordinate system. The week signed-off by observation and discussions on stars such as Antares, vega, rigel kent, spica.



FORMULA BHARAT WORKSHOP



Formula Bharat Academy conducted a workshop at IIT Madras during the month of September. The event had an attendance of 248 students and turned out to be a grand success. The workshop was aimed at empowering participants to perform their best at Formula student events which is an engineering design competition in which students from colleges and universities all over the country compete with a life-size Formula-style vehicle in areas of engineering design, overall cost, marketability and dynamic performance.



BUTTERFLY AUTOMATIC FOOD COOKING MACHINE- BRAINSTORMING SESSION

The director of Butterfly kitchen appliances visited the Campus in October. This was to demonstrate the working of their new Automatic food cooking machine. The gathering had participation from about forty and opened up discussions about the aim and future of this product.

The director of Butterfly wanted the students to brainstorm and improve upon the design of the machine and help in developing this revolutionary product.



©



KAIST

CFI, in collaboration with KAIST (Korea Advanced Institute of Science and Technology), conducted a short term research internship program where students from the KAIST institute would work along with CFI students based on a set of topics under the theme of Sustainable Development Goals (SDG). As a pre-exposure to our institute life, these students selected under the KAIST Presidential Fellowship, visited CFI and interacted with various project groups and professors. This served as a good opportunity to not only expand their technical knowledge but also cultural awareness among the students.



KAIST

CLUB SESSIONS-

A Synopsis

CFI houses 10 clubs, gregarious fanatics of different kinds. The New session started off with the Co-curricular sphere orientation, defining the act of CFI, including its club and competition teams.

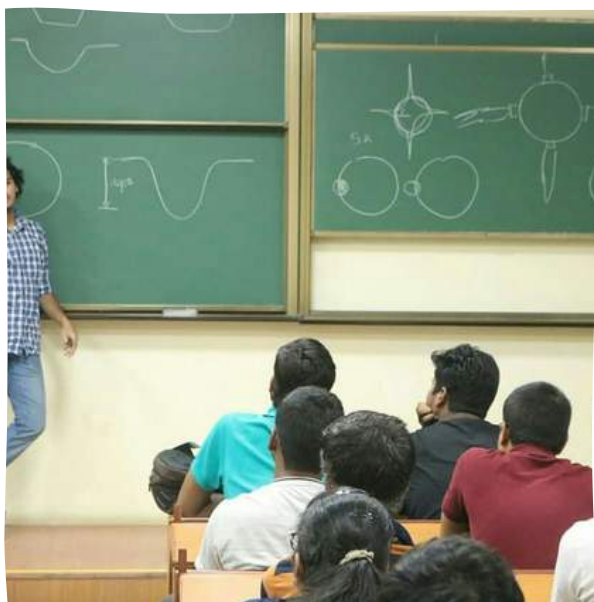
Then, the sessions of various clubs followed up. Beginning with the introductory session of aero club, coupled up with drone flying session, it beckoned many aero-enthusiasts. On the trail, Horizon, Physics and Astronomy club had its “Quarks to Quasars” session. The interactive session filled with fun quizzes was a good start for Astro-maniacs. Followed up by the ibot club introductory session, exhibiting its prodigious projects, such as hexapod, Bluetooth controlled mini robot.

Next, the introductory session of Programming club gathered almost 150 freshman, elucidating competitive programming. Then, the inaugural session of Analytics club grabbed the stage of freshman, introducing AI and Data science to forums. The Computer vision and intelligence club amazed the code-freaks with its algorithm for creation of panorama and detection of images of animals in its first orientation session. Followed up by the Astro week, it was fun-filled for Astro Enthusiasts, filled with lectures on dark matter and cosmology, observatory sessions for looking at maneuvers of Saturn, Jupiter and moon and ended with affable discussions on various stars.





Next in series, the orientation session of 3D printing club, demonstrating their projects and the amazing 3D printer to crowd. Then, the combined session of Electronics and ibot club took place, explaining freshmen the topic of microcontrollers, focusing on Arduino and Arduino IDE, followed by Bluetooth and motor drivers. Followed by the joint session of Programming club, CVIG and Analytics club, leading the crowd towards python programming, including some of the useful libraries. Then, we had Team Envisage's game development session introducing unity software to the freshmen, developing a block jumping game. Horizon had its next session entailing the details of evolution of astronomy, coordinate systems, perturbations and photometric concepts to the freshmen gathered. The year progressed with mind-boggling sessions of various clubs, thus forming a new team with freshmen.



OPEN HOUSE-2019

Open House 2019, our flagship event, a display of all the recent work and achievements of our in-house teams and project members was a grand success with a turnover of more than 2000 people.

The event was a first of its kind, with CFI being relocated to the New Academic Complex (NAC), had the most number of working prototypes till date and also drew tremendous attention from leading investors and industrialists across the nation.





The CFI community had pulled tremendous effort to showcase the event despite the challenges they faced in the relocation. This marks a new phase for the CFI with a newer face, new ideas and bigger projects. We also extend our sincere appreciation to all the professors, institute students, alumni, industry experts, the media and the citizens of Chennai for making the event what it was.



The event has given us much needed criticism, motivation and a heightened sense of satisfaction seeing the efforts throughout the year congregate and come to fulfilment.

ALUMNI INTERVIEW SERIES

As a part of the 11th edition of the Open House, we present a series of interviews given by the alumni of our institute. The inspiring words from our alumni would help us grow as a community. In the future years, we aim to create a social impact and correctly realize the spirit of engineering thereby.

The first interview of the series was given by Gaurav Lodha (CFI Head 2017-18). The Second interview of the series was by Suyash Singh: Founder member, Team Avishkar Hyperloop



HUMAN CENTRIC DESIGN

WORKSHOP

CFI and Nirmaan conducted the "Human-Centric Design Workshop" under the aegis of Prof. Blair Kuys, director of the Centre for Design Innovation. Centre for Design Innovation, a lab in Swinburne University of Technology's Hawthorn Campus builds upon existing research strengths to enable human scale, user focused, design led innovation. The event was attended by a selected group of 30 students, scholars, professors etc. and the event focussed extensively on case studies and out of the box solutions. Each of the session was handled by dividing the attendees into groups of three for better coordination and the first session was about industries and their needs for accurate designs of the products. James Tyson himself has designed around 5000 prototypes in his career and talked in length for the need of iterations of successive designs to reach the suitable target. The talk also focused on how simple designs can be successful due to 'human factor' alone without cutting edge technology involved.





Professors Satyanarayan and Siva Subramaniam, who handles various creative courses in the institute was in the audience and gave very constructive opinion about the same while admitting great strides are needed in the design approach for greater efficiency in Indian industries. A lot of researchers involved with the IIT-M research park also contributed to the diversity of the attendees.

The second session involved a hands-on approach to the various transportation issues faced by the students especially inside the campus. An analysis was done to break down the problem and an ideal prototype was designed. Next an interactive approach was done to design a gift suitable for corporate offices, taking into account the intrinsic value of the object as well as a method to pitch the product. The event was concluded by 5 in the evening and the attendees learned quite a lot with how products ought to be designed from the users point of view with a varied array of real life examples.

ALUMNI REUNION

The Alumni Reunion Day celebrations were held on the 27th of December. Hundreds of alumni joined together to reminisce about their good old insti days. CFI had put up various stalls exhibiting their innovative projects. The competition teams also portrayed their models at the occasion. The alumni were fascinated by the various projects put together by the students. They appreciated the students' innovations and assured them of their continued support. The community received an amazing opportunity to interact with the alumni and learn from their thoughtful insights.



ENVISAGE



The most awaited techno-entertainment show of Shaastra 2020, Envisage hit a home run once again. For the past 7 years, Envisage has gathered a huge crowd by delineating its mind-blowing entertainment aspects. This year they conducted 2 shows, dazzling its huge audience which was indeed a great performance.

Apart from the Envisage show, the team has presented its projects through multiple avenues such as Ignite, Samparks, Alumni Reunion, Freshie nite, Shaastra theme launch etc. The team has also ventured into different opportunities outside IIT Madras to reach out a variety of audience at a larger scale. The team has conducted shows and exhibitions in various institutes including IIM Bangalore

Envisage also conducted several game development sessions. They revealed about various aspects entailed in game development. They geared up the crowd by introducing them to different varieties of game engines and teaching them to create one from the scratch on their own. These sessions also involved various aspects of AR and VR

INTER IIT TECH MEET



The 8th Inter IIT Tech Meet, at IIT Roorkee, conducted from 20-22 December 2019 recently drew to a close. Our contingent from IIT Madras returned with an impressive tally of three gold medals, three silver and two bronze medals respectively, securing an overall fifth place. Our highlights from the meet are summarized as below:

Coding Hackathon - Gold

The problem statement was to develop a system which can simplify the road leasing and maintenance operation through crowdsourcing

NeenOpal's Case Study Competition - Gold

Our Team came up with a Go-to-Market-Strategy for launching a brand and it was expected to capture the consumer emotions and understand the entire buying behaviour.

BARC India TV Audience Challenge - Gold

The participants were supposed to arrive at a technology idea by which the audience's psychographic profile can be captured, without infringing into his/her privacy. The solution is expected to change the future of Television Audience Measurement in India

Television Audience Measurement in India.

DIC's Terrace Farming Robot for Hilly Areas - Silver

The team was required to develop a lightweight robot that can do the work of ploughing, seeding, watering, or harvesting considering the various challenges for terrace farming, as well as demonstrate a working prototype.

BOSCH's Route Optimization Algorithm - Silver

Our team developed a route optimization algorithm that caters to the real-time changing demand of customers to determine the route and schedule of buses depending on the constraints.



Payatu's Infosec Information Security Challenge - Bronze

The team solved a set of given tasks based on reverse engineering, web application exploitation, cryptography and other categories of information security.

Asokha's Tech for change, Social Entrepreneurship challenge - Bronze

With the vision, “Technology is not an end in itself, it’s a means to an end”, participants were supposed to develop a product using technology to solve an existing societal problem.

BITGRIT'S Data Science competition - Silver Medal





STUDENT INNOVATION PROGRAMME

The Student Innovation Program was aimed at increasing the involvement of students in the field of innovation. Under SIP, students work under the guidance of mentors who will help them organise their ideas and make them function practically. A team can have SIP status for one year under any club. This helps in increasing the student participation in the technical fields and helps them to embark on their own CFI Journey.

We got immense response from students for SIP program and 50+ different project ideas were proposed. Through careful selection process we have selected 15 SIPs for the year 2020-21 under different clubs in CFI

TEAM ABHIYAAN

Abhiyaan is a group of enthusiastic students who build autonomous, intelligent, robust, precise, and safe ground navigation systems to negate human risks. VIRAT, our vehicle, can navigate autonomously through various obstacles in a path with the help of sensors like LIDAR, IMU, etc. Using the concepts of computer vision and deep learning, it plans the path for the given start and end coordinates.

The team finished as the First Runner up in Intelligent Ground Vehicle Competition (IGVC) 2019, held in Oakland University, Michigan, USA, amongst 45 other teams from different universities across the globe.



Abhiyaan was one of the 30 finalists of KPIT Sparkle held in February 2020 at Pune, India. Abhiyaan's VIRAT was one of the promising ideas shortlisted for the finals among 3000 other ideas submitted for the competition.

Abhiyaan is also one of the five Asian and one of the two Indian teams to have qualified to Round 2 of the Indy Autonomous Challenge (IAC), a \$1.5 million university prize competition to win the world's first head-to-head, high-speed autonomous race with clocking average around 120mph at the famed Indianapolis Motor Speedway. Abhiyaan has also been rated exceptional by the juries based on performance in Round 1 of the competition. Team is now geared up for Round 2 and Round 3 of the competition, competing with 36 other universities among 10 different countries and 4 different continents.

The team has planned to participate in the Self-drive challenge of IGVC in 2021, which challenges the participants to develop an autonomous electric vehicle and test it in real life like urban environments. The team has procured the vehicle and has started the work on converting it into an autonomous vehicle.

TEAM ANVESHAK

Team Anveshak placed 5th in the Indian Rover Challenge 2020, after facing numerous challenges throughout the competition. The experience provided the team with the necessary know-how to perform well in URC 2020.



Anveshak performed exceptionally well in the Extreme Retrieval and Delivery Task, and were able to test the capabilities of their new modified Carbon Fibre Rocker-Bogie Mechanism, scoring 96/100.

Team Anveshak is one among the top 21 teams, from 4 countries, qualified for the finals of the Indian Rover Challenge 2020. The team scored a whopping 91/100 points in the system acceptance review of URC 2020

TEAM AVISHKAR

HYPERLOOP



Team Avishkar Hyperloop is an interdisciplinary student team of IIT Madras, comprising 35+ students, working on developing technologies for future modes of transportation. The team focusses on developing the Hyperloop Pod and participating in the SpaceX Hyperloop Pod Competition competing against 1600+ teams from across the globe. Started in 2017 by 4 MTech students, the team has already achieved great success and featured in several media fronts.

Avishkar Hyperloop had a top 10 finish in debut attempt at the SpaceX Hyperloop Pod Competition 2019.

Only Asian Finalist out of Top 21 teams at the 2019 Competition.

Secured sponsorships and developed the Hyperloop Pod in 4 months.

RAFTAR FORMULA RACING

Raftar Formula Racing accelerated to new heights in the 2019 edition of Formula Student Germany. They significantly improved their performance and were ranked 39th out of the 60 teams who participated in the competition. They were the 2nd best Indian team in the competition, falling behind Stallion Motorsport. The team secured 3rd place in the Cost event and 11th place in the Business Plan Presentation event.

Raftar Formula Racing emerged victorious in the recently conducted Formula Bharat 2020, the ultimate Formula Student competition in India. The event judged the car on various aspects, which is divided into statics and dynamics. In statics, the team broke its own record of scoring the highest number of points in a Formula Student event by scoring 320 points out of 325. The team secured the top position in the Design and Business Plan Presentation events.





In the Dynamic events (i.e on-track events), the team gave an impressive performance by winning the Fuel Efficiency event and were placed 3rd in the Autocross, Skidpad and Endurance events. They won the competition with a 100 points lead from the runner-up team, thus justifying their dominance in the competition.

Raftar Formula Racing emerged victorious in the recently conducted Formula Bharat 2020, the premiere Formula Student competition in India. The event judged the car on various aspects, testing it not only in its design and manufacturability but also on its performance on track. This is divided broadly into Statics and Dynamics. In the Static events, the team broke its own record by bagging 320/325 points, the highest ever total in the static events in the history of Formula Student internationally. The team secured the apex position in the Design and Business Plan Presentation events.

YET ANOTHER HACKATHON

Team Blackbuck were runners-up in the Yet Another Hackathon conducted this year, and won a cash prize of Rupees 10,000.

Yet Another Hackathon is an annual Tech-competition hosted by Sri Venkateswara College of Engineering, Chennai. It provides a platform for hundreds of participants across the city to showcase their technical know-how by identifying and addressing a particular social issue, such as erratic water supply or public health.





Team Blackbuck from IIT-M created a 'Sign Language to Text Translator', which assists deaf and dumb people in enhanced communication.

The Translator is an application that can be downloaded on one's phone. It decipheres and translates sign language gestures. When the camera of the phone is kept facing the speaker, it translates their hand movements into letters.

Programs that convert written text to sign language already exist. The present application enables the reverse, thus simplifying communication. The time limit assigned for the teams was 24 hours. Several major companies like Wipro were present at the competition.

DbyT Dynamics



DbyT Dynamics develops electric personal mobility 2-wheelers for the faster adoption of cleantech and turns down the dependency on fossil fuels consequently move towards a sustainable and healthy future.

Their product is a smart indigenously developed E- bike with first of a kind bevel geared power transmission, Real-time health monitoring, IoT based system, cost-effective sensor array, robust in-house controller and improved battery life is something which differentiates us from the competitors in the E-bike segment. The team aims at making the urban commute easier and adds smiles to miles.

CFI PROJECTS

3D PRINTING CLUB

FOOD PRINTER:

A 3 D printer which uses food materials (like chocolate) to print to 3D shapes which can be consumed. The printer has an extruder which heats up the chocolate inside. Using a syringe pump mechanism, the chocolate is deposited at specified locations to build any 3D model. It also has a cooling mechanism which is used to solidify the chocolate in a short time so that the next layer of chocolate can be printed.

FILAMENT EXTRUDER:

Lot of waste is generated while printing complex objects with overhangs and also when the print fails because of many other reasons. Using the extruder these wastes can be converted back to filament and can be used again to print again.

3D PRINTED MECHANISMS:

The team aims to directly print mechanisms thus avoiding the time to assemble later thus cutting the time by great amounts. Assemblies which are hard to assemble manually can now be directly printed and used directly. For example, ball and socket joint: Usually and ball and socket parts are printed separately and ball should be inserted into the socket. Instead the whole assembly can be printed and used directly. Also, some mechanisms are printed as a single part, for example few 2-directions switches, pliers, clip, etc.

STRIDEX - ERGONOMIC NEW-AGE CRUTCHES:

The novelty of the crutch design lies in a simple height adjustment mechanism that allows patients to quickly shift between the three given heights – for walking, to climb stairs and to sit while they are still on the crutch. The shifting of heights is an effortless process which is as easy as pressing a button and pushing the tube down to the height designed for the specific task. The crutch locks itself automatically when the rod reaches the desired height, and the user will have to press the button again for the crutch to spring back to its standard height. The users will not even have to remove their crutch for this, and the shifting takes hardly a second or two. Additionally, the crutch provides an extra degree of freedom at the elbow joint by using a ball and socket joint hence allowing the users to access objects around them and don't menial activities without having to remove their crutch.

Notable Achievement: Participated in Global Student Innovation challenge, the only Indian team to participate in history of the event

ENVISAGE TECHNO ENTERTAINMENT CLUB

LED SCULPTURE

LED Sculpture is a 3D spectrum of LEDs which react to music and create amazing patterns. Any music is first converted to the corresponding electrical signals using Fourier transform. The thousands of LEDs are controlled using a principle called multiplexing which minimizes the power requirement and ensures bright display.

LIGHT PAINTING BOT

Light Painting Bot is an innovative idea where an automated bot engraves a light painting on a scintillated screen with the help of lasers. The bot takes any image or video as an input and converts it to the corresponding movement of small mirrors which guide the laser in a systematic fashion so as to form an image on screen.

AR/VR ZONE

This project is the manifestation of Virtual and Augmented reality which is a completely new dimension of technology. The project is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information and interactive animations.

INTERACTIVE SOUND TABLE

Interactive sound table is an image processing-based entertainment project. A camera mounted on top scans the surface and identifies the different objects placed on it. Music is generated based on the position of different objects. The user can move around the different objects on the table to modify and change the music.

TECHNO ORCHESTRA

The main idea of this project is to create music by dropping marbles on musical instruments like xylophone, guitar and drums. The dropping of marbles is controlled using solenoids (which are hard coded to play certain notes).

WIREMAP	It is basically projection on an array of layers of threads arranged in particular fashion. By projecting different videos on different layers, we can create a 3-D projection which looks like a hologram.
RADIANT TROUPE	Radiant Troupe is a project in which dancers wear suits fitted with electroluminescent wires (EL wires) that glow to show different patterns in sync with the song. Commonly referred to as Tron dance.
SPLASH PAINTING BOT	As the name suggests, the goal of the project was to create images by splashing paint balls on a white screen. The paint balls are shot using a paintball gun using a completely automated mechanism. The direction of the paintball gun is controlled using motors coupled to the gun and it is triggered using a solenoid.
SAND ART TABLE	This project is all about making an automated sand art machine, which draws any design as per the input given to it. There is a table filled with a layer of sand over which a metal ball is made to roll and create different patterns. The movement of this metal ball is controlled by the magnet below the table which is in turn controlled by stepper motors.
PERSISTENCE OF VISION	This is an illusion-based project. A board which is connected to a one dimensional array of LEDs fixed on to a high speed motor. This board is made to rotate at high speeds to exploit the human persistence of vision while the LEDs are controlled through an arduino to form an image or an animation.
PID STABILIZER	The principle of PID stabilization was used to balance a ball over a board. The board was controlled using motors, basically when the ball is disturbed it rolls back to the center.

PROGRAMMING CLUB

TAXI ROUTING

The aim of this project is to calculate the optimum taxi fleet size required in a city to finish trips, such that none of the given trips are delayed. Each trip's pickup point, destination and time are known. We solve this using an implementation of Hopcroft-Karp Algorithm. Note that this isn't just useful for calculating the minimum number of taxis, but is also applicable to finding the minimum fleet of cargo vehicles, delivery drones, etc. and in many other transportation logistics.

COMPUTER VISION AND INTELLIGENCE CLUB

EYE IN THE SKY

The project tries to make AI and Computer Vision driven UAVs for Disaster Management and Defense purposes. We propose to use a team of drones which can scan the entire disaster-affected region in just a few minutes, analyze, and provide critical data that could potentially save lives. The final aim of our startup is to make end-to-end drone software solutions which can be used by any Disaster Response Force of the world and thus help in saving thousands of lives. Our solution package has AI, robotics, cloud linked with a robust communication system.

Notable Achievement: Winners of Indian Innovation Growth Programme raising 10 lakhs funding from the same.

Chosen among the top 10 innovative startups in India.

Winners of Microsoft Code Fun Do++ competition raised 5 lakhs from the same.

AUTONOMOUS DRIVING IN A SIMULATED ENVIRONMENT

The aim of this project is to use a simulated environment to train an agent(a car) to navigate through complex traffic scenarios including dealing with crossings without signals, random pedestrians, slow moving cars and traffic rule breakers. The images are first segmented to extract information on the lanes, signals and other cars, along with depth information. Following this, control algorithms are used to maintain the car's position in the lane, identify intersections and perform lane changes.

SANSDEEPSLAM	Simultaneous Localization and Mapping (SLAM) is a rather useful addition for most robotic systems, wherein the vision module takes in a video stream and attempts to map the entire field of view. This project aims to create a Clean implementation of direct SLAM methods and a platform for experimenting on new Deep SLAM ideas.
TEXTILE QUALITY ANALYSIS	Using CV to analyze fabric texture, thread density, quality, tears etc. Develop a prototype that is deployable for use in the current textile industry, which is dominated by manual labor. A camera first takes an image through a pick-glass which provides a 1inch by 1inch magnified area of the cloth. Following this, the cloth area is segmented to isolate just the cloth region, and then we create a dot matrix which marks all the weaves on the cloth, and based on the counts of the dots, we estimate the quality.
ATTENDANCE SYSTEM	The aim of the project is to develop an automated attendance system using facial recognition using one camera facing the classroom. A model to detect and align faces, MTCNN, is first used following which we have explored methods using FaceNet and dlib to obtain features of the face and we use a KNN classifier to identify the faces. Initially a database of a handful of students was collected, to be tested on.
COMPUTER VISION FOR THE TRAFFIC MANAGEMENT	The project currently focuses on vehicle recognition using LPR, a speed detector and a helmet detection system. The next stage of the project aims at deploying the system in the city.

ANALYTICS CLUB

HATE SPEECH DETECTION	Project aims at extracting data from popular social media sites and performing sentiment and statistical analysis on the same to obtain the overall Sentiment and Temperament regarding a particular keyword or tweet. And further enhancing the solution with hate speech detection.
GRAVITATIONAL WAVES ANALYSIS	The Gravitational waves' strain signal obtained from the detectors is correlated with a template signal, performing an operation called 'Matched filtering'. A template is basically a clean GW signal, without noise, obtained from simulations assuming Einstein's GR is correct. The template generators have independent parameters like mass ratio of the two objects, and the spin of the two objects. Thus, by obtaining the template which best fits the signal, one can get these parameters out. ML was first used here: train a network with input as your signal (simulation + noise), and output as your parameters (mass ratio, etc.). And then, feed in the real signal to obtain the corresponding parameters.
COMPANY SUCCESS PREDICTION	Startup success prediction using CrunchBase statistical data, using basic success parameters related to funding and growth of the company.

PHYSICS AND ASTRONOMY CLUB – HORIZON

SPECTROSCOPY AND STELLAR CLASSIFICATION	This project involves obtaining stellar spectra of various stars from SDSS, analyzing the spectrums and classifying the stars into OBAFGKM. Other objectives of the projects are to 1. Plot color magnitude diagram for different star clusters and draw conclusions about types of stars in different clusters.
DSLR PHOTOMETRY	DSLR Photometry involves obtaining images of variable stars over a prolonged period of time. By estimating their apparent magnitudes and time period using open source software and some Fourier analysis, light curves depicting their brightness variation with time are obtained. The kind of variable star is examined from the light curve. Estimation of distance to Cepheid variables (a kind of variable star) is also done.
INTERPLANETARY MISSION ANALYSIS TOOL	The objective of this project to develop a software which can calculate and simulate trajectories of interplanetary spacecraft and satellite missions. Design of maneuvers and transfer orbit optimization will also be embedded in the software. Perturbations of various sorts (perturbations occurring due to solar radiation, Oblateness of planets, asteroid and comet influence) would be considered while designing the software. The accuracy of the software will be verified using GMAT (NASA's open source space mission analysis tool). The preliminary stage of the project will be coded in MATLAB and the final software will be written in Mathematica or Python.

SKY WATCH ARRAY NETWORK

SWAN (headed by RRI Bangalore) involves design and development of a broad band array network to facilitate Very Long Baseline Interferometry in Radio Astronomy. The setup of 8 tile antennas currently located at Gauribidanur observatory is to be shifted at 8 different Institutes across the country for the purpose of interferometry.

LAGRANGE POINT SIMULATOR

Lagrange point simulator is a project to simulate the Lagrange points (stable potential points) of a stable planetary system such as the solar system. The main application of Lagrange points is that they can serve as 'parking spots' in space, where spacecraft can be placed and astronomical studies can be carried out. The orbit of James Webb Space Telescope, which will be centered around one of the Lagrange points of the Earth-Sun system will also be simulated.

ELECTRONICS CLUB**CLOUD BEACON**

The team conceptualized an IoT device that can transmit information locally without the need to connect to any external network. The product is supported by two android applications developed by our team that cater to the hosts and the users. The user application gets continuous feed about what is there around it and the user can choose which piece of information he/she wishes to read. The information can be in the form of a picture, video or a pdf document. The mini-server provides a win-win solution to both, the users and the hosts. The hosts get to dispense info locally conveniently at a cheap rate and the users can be connected to them without any connection requirements which could be a security risk or time consuming.

POWERED EXOSKELETON	<p>The team aims to make a robotic arm in a ROS environment that moves based on real world arm movement, through EMGs, rotary encoders and flex sensors. This serves as a stepping point for several further projects, one of which we shall be actively pursuing post Open House. A full-fledged exoskeleton can be developed from the framework created in ROS. After talks and mentorship from relevant labs, we aim to build an exoskeleton assisting the rehabilitation of the elbow</p>
TEXT TO BRAILLE CONVERTER	<p>The major impetus of this project being providing a viable solution for the lack of availability of Braille reading devices and the non-existence of text in Braille. To improve and to economize the existing solutions, the team has engineered a portable Text-to-Braille Interactive Device that uses image scanner and Deep Learning algorithms to convert text into Refreshable Braille and also allows for Audio Feedback.</p>
IOT FOR AIR QUALITY MANAGEMENT	<p>The team has developed a module that collects outdoor air quality data and uploads it to a cloud, making the Air Quality Index accessible through a website or an app. This Sensor module is mobile thus covering a large area and providing results of air quality index of wherever the module goes, and uploads it to a cloud service. The location is simultaneously tracked making it a factor of the analysis.</p>

VR HEADSET	<p>The team is making a VR Headset that will incorporate extra features through which the Peripheral Vision will be tested to reduce car accidents. It has an LCD screen on which a virtual environment using Unity3D will be displayed. It will also have an ESP eye sensor to track the eye movement and Raspberry Pi to send the recorded data to a computer which plots the graph with blind spots using a Python code.</p>
IRIS CONTROLS	<p>We make Advanced Driver Assistance systems tailor-made for Indian road conditions in order to save lives and to decrease commute time. We use radar, camera and android app-based solutions for implementing advanced safety features for Indian road users. Making the automobile smarter with the above sensors give additional eyes (hence we call "Iris" controls) for your automobiles to watch for the potential dangers ahead. Our android app-based navigation and route optimization give you and your vehicle safer and pleasurable experience on the road thanks to the real-time traffic updates. This is also our first step to prepare Indian vehicles for autonomous driving.</p>
iBot CLUB	
HANDYMEN PROSTHETICS	<p>Project Handyman aims to develop comfortable, efficient and ultralight arm prosthesis (artificial limb) for amputees and the physically challenged. The team employs soft robotics for the fingers to make gripping more bionic and effective.</p>

**UNMANNED
GROUND VEHICLE
(UGV)**

The objective of this project is to design an unmanned ground vehicle that can perform reconnaissance, attack and defense missions with the soldiers giving commands to it in a control centre far off from the border, thus preventing loss of lives. Right now, we have designed the first prototype which is remote- controlled and capable of reconnaissance activities.

V-KLENETRIX

The team is designing an autonomous robot which will collect the garbage using ram filter feeding methods. This technique is inspired from the feeding mechanism of some fishes who thrust forward with their mouths open for consumption of smaller fishes. Same technique can be used to deal with eutrophication. The team plans to integrate a science box to deal with sewage waste and feed real time data about the water quality.

SWARM ROBOTICS

This project attempts to use a swarm of robots to automate search operations for post- disaster rescue in confined locations with poor communication and mapping facilities such as mines. It aims at creating a network of small robots that locate neighboring robots' position and creating a chain that would give rescuers a path to rescue people trapped and act as a communication channel.

Notable Achievement: Participated in Anveshan 2020 (Analog Devices) and got selected in top 15 teams out of 500 teams for quarterfinals.

ARTEMIS

Derailments are a serious challenge for railways and cause great loss of life. To tackle this, we have built a bot that would travel along a track and using various Non-destructive Evaluation techniques, it would detect cracks. It would then go on to analyze cracks big enough to cause derailments, transmit or save the data, and sends the exact location of the fault. The model has been designed in an innovative manner so it can be readily integrated with the current system. Added to this, the modular nature of the custom manufactured parts will ensure that future additions will be done easily and any damage to the robot can be repaired easily and sans exorbitant cost of maintenance.

Notable Achievement: Runner-Up in James Dyson Award 2018, selected for Accenture Innovation Challenge.

AEROMODELLING AND AERIAL ROBOTICS CLUB

SMARTCOPTER

The team works on their project of building a smartcopter, a full hardware and software solution that can enable a drone to be smart and perform various autonomous routines. The fully autonomous drone will have the ability to follow pre-loaded instructions, take off, land, follow a moving target, explore and map unexplored areas, avoid collisions, avoid obstacles, capture data, perform post flight analysis and store valuable information. All operators will need to do is just type in a command, wait to review and then choose the follow up actions.

RECONDRONE

This project is aimed towards building a UAV in VTOL (vertical take-off and landing) configuration for reconnaissance. VTOL is stealthy, power efficient which makes it a better substitute for fixed-wing UAVs and multi-rotors for reconnaissance. The ability of a VTOL to perform landing and take-off maneuvers like a drone and its ability to cruise like a fixed wing sums up to an ideal configuration for a reconnaissance drone for its stealth and efficiency. It doesn't need long runway strips and more power efficient, noiseless when compared to a multi-rotor.

**SMART
AGRICOPTER**

Agricopter aims to bring in complete automation to the entire pesticide spraying process, and eliminate any human contact with toxic chemicals. Aerial spraying also aims to reduce pesticide consumption by upto 40%. In the future, Agricopter will aim to explore ultra-low volume spraying to decrease pesticide usage even further. Agricopter is here to revolutionize the pesticide spraying industry, and bring in new technological advancements to the agricultural sector in India, which has been using the same old implements for the last several decades.

Notable Achievements:

4th Place at the TCTD Agricultural Challenge, Inter IIT Tech Meet 2018 at IIT Bombay.

Named in the top 10 university level start-ups in India by the IIP 2.0

3rd Place at the Waycool IDP, Shaastra IITM.

TEAM SAHAAY – THE SOCIAL INNOVATION CLUB**RIVER FILTH
CLEANER**

A bot that collects floating waste and submerged waste lying on the river bed and also capable of chemically treating water which works both on river banks and in rivers also. The design is compatible for beach cleaning purposes by collecting all kinds and sizes of wastes.

MENSTRUAL WASTE MANAGEMENT	The improper disposal of menstrual waste has been a serious concern for the health and hygiene of the society and the surroundings as the accumulation of these waste is becoming a hotbed of pathogens. The team is currently working on accessorizing normal dustbins into bins which wrap napkins based on a mechanism. Also, they are also trying to add a feature of sterilizing the napkin before actually wrapping.
COMMUNICATION DEVICE	More than 70 million people in India are speech disabled. They face many problems, communication being the major. The project aims at creating a real time texting platform with special features. A real time texting app in which the mute person can converse with an individual or a group without having to use sign language or without having to write. The platform would convert this text message to speech as well as to convert speech into text. It would also have a notification to alert the listeners. It also comes with a template feature to enable easy conversation with the general public who don't use the app.
WOMEN SAFETY DEVICE	With the recent surge in the number of crimes against women, their safety is a concern of the hour. Although the existence of various notification devices has increased, do they enhance safety? No. A notification sent to the contacts might get a response but the time lag between the response and attack is too large for things to go bad. Thus, keeping in mind the immediate safety we are designing an immobilization device to ward off attacks and thus decrease the crime rates. Combining the device with a notification alert app to the close contacts and an alarm system, we are moving forward on a vision to lower down the crime rates. Furthermore, the device can be used as a child safety device with a few changes and addition of CVI and AI, can help making the system more foolproof and effective.

CFI MANAGERIAL TEAM 2019-20



*From The Top
Top Row: Sathvik,
Mangesh, Devpriya
Middle: Akash
Bottom Row: Jeet,
Himani, Sampriti*

CFI CORE TEAM 2019-20

**Co-Curricular Affairs
Secretary**

Pravallika

Student Executive Head

Akash Anandan

3D Printing Club Head

Anirudh Chavali

Aero Club Head

**Aishwarya Ray
Nikhil Prakash**

Analytics Club Head

Pranav Pawar

Astronomy and Physics Club

**Pranav Satheesh
Nimisha Sharma**

CVI Head

**Anand Uday Gokhale
Vighnesh Natarajan**

Electronics Club Head

**Sundar Raman P
Ashwath Mukesh Bhat**

iBot Club Head

Vihaan Akshaay

Team Sahaay

**Amal Nahar P A
Bhashwar Ghosh**

Programming Club

Team Envisage

Nirmaan

**Pranav Ramakrishnan
Satkkeerthi Sriram**

**Gautam GVS
Tejas Deolasee**

Adil Khan

COMPETITION

Raftar Formula Racing

Abhiyaan

Team Anveshak

Avishkar Hyperloop

TEAMS

**Vikram
Anirudh Sundar**

**Karthik Bonda
Mahesh**

**Tarun Prasad
Pavan Vemuri
Sai Venkat**

**Pranit Mehta
Aditya Ranade
Kalpesh Pawar**

STUDENT ADVISORS

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Varun Sundar



