

Problem statements from C-DOT

| S. No. | Problem Statement | Area of Telecom | Type |
|--------|--|--|-----------------------|
| 1 | To Develop Automation Test tool for Verification and testing of 5G features/use cases or any related solutions. | 5G | Hardware and software |
| | <p>Description</p> <p>Any solution deployed for use by public should be testable on a large-scale using automation so that once the basic functionality tests are done, the same may be tested extensively through automation. Automation in testing the features will help in testing the solution in a time bound manner and may also aid in the certification of the 5G product or any solution being offered.</p> | <p>Reference of Technologies to Build</p> <p>5G</p> | |

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| 2 | Develop the scheme (algorithm) to intelligently manage the spectrum for 5G Network | 5G | Software |
| | <p>Description</p> <p>Spectrum management in for multi-band communication (5G, 4G, licensed, unlicensed) must be possible to offer best utilization and enhance the performance. This application may be AI/ML based which use data from different parts of the network like UE, RAN and Core network.</p> <p>A network operator has a set of network bands for various types of services (2G/ 3G/ 4G/ 5G etc). Multiple network operators must be able to tune its base station power management algorithm using input from this application which may use a central repository.</p> | <p>Reference of Technologies to Build</p> <p>Spectrum sensing, cognitive radios and software.</p> | |

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| 3 | App Development for Android Box | Broadcasting Technologies | Software |
| | <p>Description</p> <p>Following are broad features for the App:</p> <ol style="list-style-type: none"> 1. App should act as launcher for android STB with appropriate UI 2. App should interact with a content portal for different operations like sign- up/login/fetching content list etc. 3. App should have a DASH player to play C-DOT DRM protected content. 4. App should be able to process commands from a server and display in-app notifications. 5. App should be easy to control using IR remote. | | <p>Reference of Technologies to Build</p> <ol style="list-style-type: none"> 1. Android OS and its app development using Android SDK and Android Studio 2. REST and JSON. 3. Database 4. React, HTML, XML, JAVA, Kotlin and Gradle 5. UI development using XML and JSON 6. Android Interactivity and UI framework 7. Publishing of mobile apps on Play Store |

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| 4 | To design and develop model and techniques for fast detection of images from a huge database of 125 crore plus images. | .Image processing | Software |
| | <p>Description</p> <p>Solution for</p> <ol style="list-style-type: none"> 1) Fast Storage and model training of 125 crore passport size face images. 2) Model to search a single image in the above images database within a second <p>Challenge here is that number of classes for classification is too high and data is unlabeled.</p> <p>Improvement in detection speed. The database will increase in size in future. The rate of injection will be around 2 lakh per day. There can be deletions also. The system should be able to manage the metadata in DB and actual images files in file system. System should provide reports and capable of backup and restore.</p> | | <p>Reference of Technologies to Build</p> <p>Python, Tensorflow, keras, Pytorch, Parallel computing over GPU, Image Processing, RDBMS</p> |

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| 5 | To develop algorithm for image quality enhancement of low resolution/ blurry images (Consider human faces) | .Image processing | Software |
| | <p>Description</p> <p>The video quality may be poor depending on source of image, movement of target, other environmental conditions etc. The application should enhance the image quality using techniques like SRGAN, so that face is recognizable. It may have to fill in missing information i.e. build partial faces. Image enhancement of objects, scenes.</p> | | <p>Reference of Technologies to Build</p> <p>Python, Tensorflow, keras, Pytorch, Parallel computing over GPU, Image Processing</p> |

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| 6 | To develop mechanism/algorithm for Audio quality improvement in Video Conferencing mode. | Quality improvement in VC | Software |
| | <p>Description</p> <p>Audio quality improvement in Video Conferencing solution. During video conferencing, many times the audio quality is very poor. There are various reasons, but how can the quality of audio be improved.</p> | | <p>Reference of Technologies to Build</p> <p>Web Technologies, Signal Processing, Audio Bridging, AI, Audio Filters</p> |

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| 7 | Optimizing location accuracy while minimizing number of BLE Beacons. | Software Development | Software |
| | <p>Description</p> <p>User Location can be accurately determined upto 1-2 meter by placing adequate Bluetooth Low Energy (BLE) Beacons in the indoor environment. Positioning of Beacon strongly affects the quality of localisation. Beacon density and placement of beacons controls the accuracy of the localisation. Fixed beacon placement such as uniform and very dense placement are not always feasible. Apart from that, in noisy to very noisy environments beacon signals get affected very much. The problem is to find out ideal beacon density in different kinds of building structure so that user location can be accurately localized with minimal error and with minimum number of beacons. Locate user with less number of beacons</p> | | <p>Reference of Technologies to Build</p> <p>Wireless technologies using Beacons (BLE), Bluetooth 5.0 or above, app development Android and IOS</p> |

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| 8 | To develop localization technique using VLC (visible light communication -LiFi). Also, develop corresponding mobile application for the same. | Lifi | Software |
| | <p>Description</p> <p>User Location can be accurately determined up to 1 meter by placing LED with LiFi capability. The challenge is to find LiFi transmit module that can be connected to any LED and develop the android/iOS app that use camera sensor for receiving Lifi led data. Every LED don't support LiFi driver integration. So a flexible LiFi transmit module is needed that can be integrated with most of the LED. After installing there is need of IOS/android app that read the data sent by given LED to locate user. Locate user with LiFi</p> | | <p>Reference of Technologies to Build</p> <p>Lifi protocol using camera sensors, H/w dev basics, App development using Android, IOS</p> |

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| 9 | Development of utility to monitor/track the procurement system for minimizing delays. | Track procurement | Software |
| | <p>Description</p> <p>To monitor/track the procurements, it is suggested to develop procurement tracking mechanism/utility which will perform the following.</p> <ol style="list-style-type: none"> Analyze the procurement data for a given period and determine the maximum/minimum/average time taken at different phases of the procurement life cycle Send alerts by mail to the indenter/indenting team stakeholders/purchase managers/concerned if the delay in any phase is above a specified threshold level. | | <p>Reference of Technologies to Build</p> <p>Java/ RDBMS/Mysql/ oracle/Python</p> |

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| 10 | To Develop Speaker Identification in Standalone Embedded Systems | Software Development | Software |
| | <p>Description</p> <p>The user (viewer) identification (profile: Age, Gender etc.) of a given TV channel/program using voice samples.</p> <p>Broad requirements of "Voice based user/speaker identification in an embedded system"</p> <ol style="list-style-type: none"> 1. User profile creation: Age, Gender 2. Maximum 5 profiles per embedded system: Ex: user 1, User2, Group 3. Shall require minimal initial training of the system using user's voice samples etc. (continuous updation of can be there in the background, if needed) 4. User profile matching at the start of the embedded system by using some simple key words. 5. Shall be ported on Standalone Linux based embedded system with no internet connectivity. 6. Matching at regular intervals as per the user trigger. 7. Accuracy rate shall be minimum 90 %. | | <p>Reference of Technologies to Build</p> <p>Speaker recognition Audio processing Linux embedded systems.</p> |

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| 11 | To create an IoT device to support e-health in rural areas | IoT | Hardware |
| | <p>Description</p> <p>Health care in rural area has always been a grave concern due to shortage of physicians and health care professionals. This shortage leads to high rates of critical illness and untimely deaths.</p> | | <p>Reference of Technologies to Build</p> <p>IoT enabled multipurpose diagnosis devices for monitoring health parameters such as ECG, B.P., Glucose, Spo2h, Heart Rate and BPM.</p> |

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| 12 | To develop wearable sensors for active and assisted living | Wearable Sensors | Hardware/- Software |
| | <p>Description</p> <p>Global Aging Population Statistics 2021 report expresses that all regions will see an increase in the size of the older population between 2020 and 2050. Globally, the share of the population aged 65 years or over is expected to increase from 9.3 per cent in 2020 to around 16.0 per cent in 2050. Society needs to develop an ecosystem to promote the physical and mental health and well-being of the elderly.</p> | | <p>Reference of Technologies to Build</p> <p>Active and Assisted Living (AAL) systems aim at improving the quality of life and supporting independent and healthy living of older or impaired people by using a distributed network of sensors and actuators.</p> |