CS 77 11 – Creative and Innovative Project Laboratory

VII Semester (Group I)

Prepared by Ms.V.Suganya

CS 7711 - Creative and Innovative Project Laboratory

The laboratory course 'Creative and Innovative Project' would an opportunity for you to explore an interesting problem of your choice in the context of a real-world data set. You can either choose one of the suggested projects we provided or pick your own topic. Do not hesitate to discuss your project with the instructors to get feedback on your ideas.

Course Objectives

- To identify the problem based on societal needs
- To interview people on societal problems that require computerization
- To suggest creative solutions to societal problems
- To explore possible alternative solutions
- To estimate risk and develop a prototype

The aim of this course is to encourage the students to identify projects that help in exploring variables that promote creativity and innovation. Each student is expected to choose a real life or socially relevant problem. At the end of the project, students should be familiar with the state of art in their respective fields. They would be able to apply the concepts learnt to relevant research problems or practical applications. This course is to motivate them to learn concepts, models, frameworks, and tools that engineering graduate need in a world where creativity and innovation is fast becoming a pre-condition for competitive advantage.

Course Outcomes

Upon completion of this course, the students will be able to

- Convert user requirements to a software architecture diagram
- Identify and specify the pre-processing necessary to solve a problem
- Suggest optimum solutions by comparing the different solutions from an algorithmic perspective
- Discover the research implications in any societal problem
- Design and use performance metrics to evaluate a designed system
- Perform SWOT and PESTEL Analysis

General Guidelines

The CIP Laboratory would follow a typical SDLC approach. Review I would cover **Analysis and Initial level of Design.** Review II concentrates on **selection of appropriate (!) algorithm** for the project and getting started with Implementation. Review III coerce **100% implementation and Initial Testing** activities, Lastly, after Test Analysis, the project would be **presented before a panel** for Evaluation.

The project shall be done as a **Team of size n, where n not exceeding two**. You are appreciated to do Individually without consideration of team size while complexity is considered during evaluation. Choose your partner (Project !) wisely, you may not change later.

The assignments should be submitted (both Online & Offline) before the deadline. If submission is delayed penalties apply as follows:

- up to 24h - 10% penalty
- up to 7x24h - 50% penalty
- more than 7x24h - 100% penalty

Important Dates

S.No	Type	Date	Deliverables
1.	Review I	27.07.2018 #	Domain / Tentative Title Problem Statement (creative & Innovative !!) Architecture Preliminary Experiment set-up
2.	Review II	31.08.2018 #	Algorithm and Methodologies 60 % Implementation
3.	Review III	28.09.2018 #	100% Implementation Test Plan
4.	Viva-Voce	26.10.2018 #	Metrics & Test Analysis Performance Evaluation Power Point Presentation

Mail your submissions to **creativeazzign@gmail.com** on or before 12.00 PM on the mentioned date (Two hours before the contact laboratory)

Schedule

#	Date	Activity	Deliverables
1.	06.07.2018	Idea Generation Scenario Modelling Requirement Validation Dataset Identification	
2.	13.07.2018	Stakeholders (Use Cases) Module Segregation Block Diagram with Input and Output	Title Technique & Dataset Significance Report
3.	20.07.2018	Feasibility Study Tools and Techniques Platform for Experimentation	SWOT & PESTEL analysis Detailed design (Frameworks/ Models / Concepts) Literature Survey
4.	27.07.2018	Review I	Experiment Set-up Presentation
5.	03.08.2018	Identifying Existing approaches to the Problem Proposed/ Modified solution Identify relevant Algorithm to solve the problem	Suggestion of Review I to be included under relevant topics
6.	10.08.2018	Implementation	Justification for the selected algorithm(s)
7.	17.08.2018	Implementation	20% Completion
8.	24.08.2018	Implementation	40% Completion
9.	31.08.2018	Review II	60% Completion Presentation & Demo
10.	07.09.2018	Implementation, Testing	80% Completion
11.	14.09.2018	Testing	100% Completion Test Plan
12.	21.09.2018	Holiday (Muharram)	
13.	28.09.2018	Review III	Integration of modules Preliminary Demo
14.	07.10.2018	Performance Evaluation & Metrics	Test Analysis /Demo
15.	14.10.2018	Holiday (Vijaya Dasami)	
16.	21.10.2018	Viva Voce	Presentation

4 golden rules of Ideation

RULE #1 / THERE ARE NO BAD IDEAS

Indeed, often times, initial ideas just sound absurd - and "this can't work" is the first thing you may have in mind. However, great business concepts are an unusual combination of (not-so) crazy ideas that become meaningful when combined together.

RULE #2 / CAPTURE EVERYTHING

In the heat of the action, brilliant ideas might get lost ("it is such a good idea, tomorrow we'll remember it for sure". You won't). There is only one way to solve this: capture every idea on your note.

RULE #3 / GO FOR HYBRID BRAINSTORMING

In the heat of the action, brilliant ideas might get lost ("it is such a good idea, tomorrow we'll remember it for sure". You won't). There is only one way to solve this: capture every idea on a note.
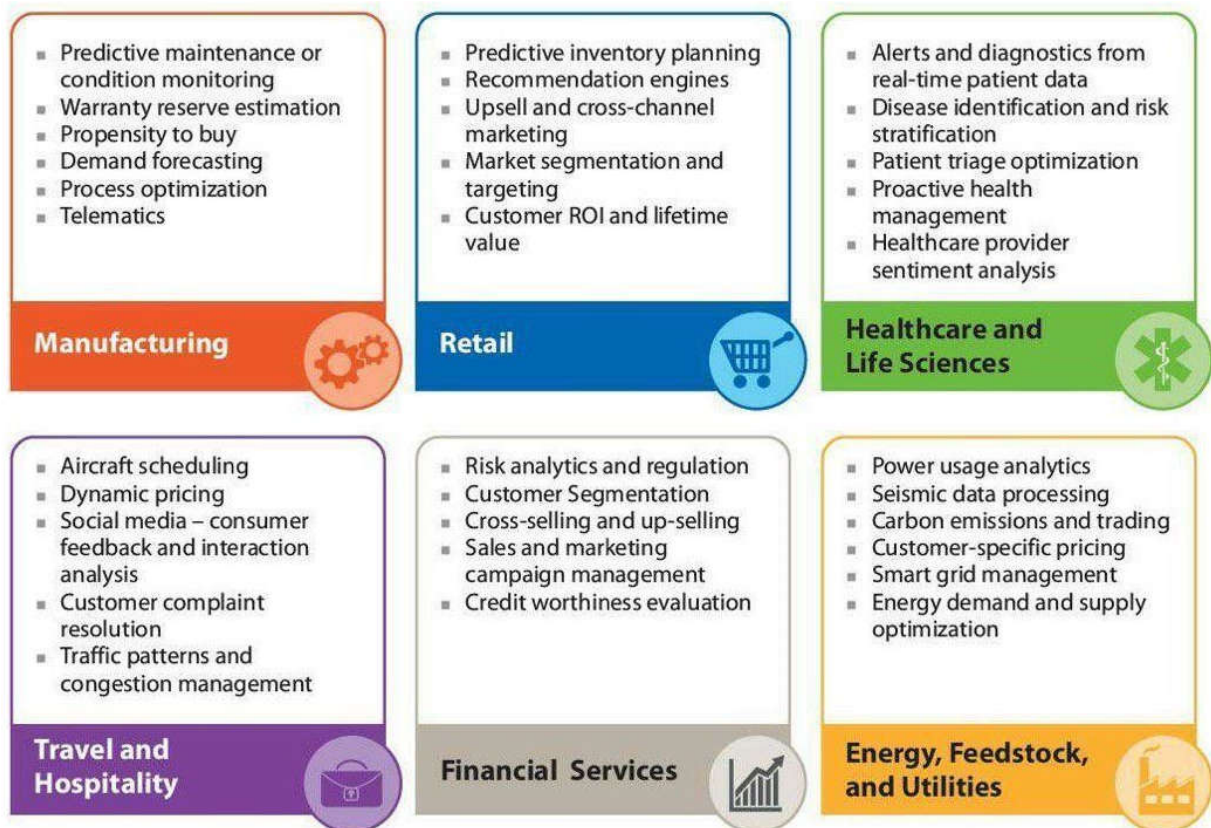
RULE #4 / QUANTITY OVER QUALITY

The old adage "Quality over Quantity" doesn't hold during ideation exercises. There is nothing like thinking about the quality or feasibility of ideas to stop the creative juice from flowing.
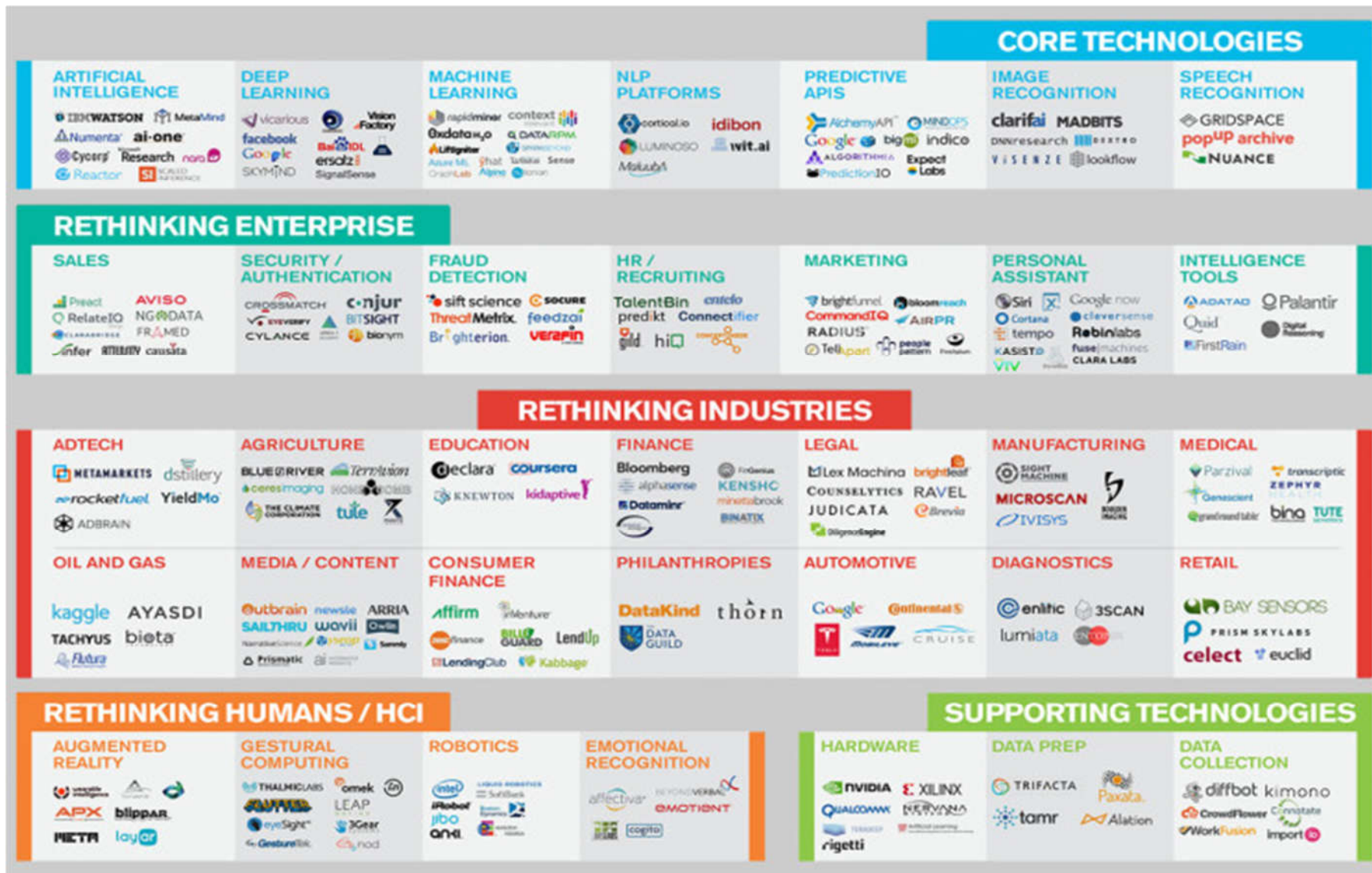
Choosing a Problem

Select a project such that it is Socially Relevant! The framework/ model or tool developed as a product after the course should be useful to public or a specific focus group. You may choose your project relatively close to the following domain listed below -

- Healthcare
- Education
- Transport & logistics
- Public Services
- Finance
- Retail
- Energy

Manufacturing
- Predictive maintenance or condition monitoring
- Warranty reserve estimation
- Propensity to buy
- Demand forecasting
- Process optimization
- Telematics

Retail
- Predictive inventory planning
- Recommendation engines
- Upsell and cross-channel marketing
- Market segmentation and targeting
- Customer ROI and lifetime value

Healthcare and Life Sciences
- Alerts and diagnostics from real-time patient data
- Disease identification and risk stratification
- Patient triage optimization
- Proactive health management
- Healthcare provider sentiment analysis

Travel and Hospitality
- Aircraft scheduling
- Dynamic pricing
- Social media – consumer feedback and interaction analysis
- Customer complaint resolution
- Traffic patterns and congestion management

Financial Services
- Risk analytics and regulation
- Customer Segmentation
- Cross-selling and up-selling
- Sales and marketing campaign management
- Credit worthiness evaluation

Energy, Feedstock, and Utilities
- Power usage analytics
- Seismic data processing
- Carbon emissions and trading
- Customer-specific pricing
- Smart grid management
- Energy demand and supply optimization

Thanks to https://www.pinterest.co.uk/pin/805792558301340394/

CORE TECHNOLOGIES

ARTIFICIAL INTELLIGENCE
IBM WATSON · MetaMind · Numenta · ai-one · Cycorp · Research · nara · Reactor · SCALED INFERENCE

DEEP LEARNING
vicarious · Vision Factory · facebook · Google · SKYMIND · BeDL · ersatz · SignalSense

MACHINE LEARNING
rapidminer · context · Oxdata · H2O · DATARPM · Liftigniter · Azure ML · skytree · Talla · Sense · OracleLabs · Alpine · kensho

NLP PLATFORMS
cortical.io · idibon · LUMINOSO · wit.ai · Maluuba

PREDICTIVE APIs
AlchemyAPI · MINDOPS · Google · big ML · indico · ALGORITHMIA · Expect Labs · PredictionIO

IMAGE RECOGNITION
clarifai · MADBITS · DNNresearch · DEXTRO · VISENZE · lookflow

SPEECH RECOGNITION
GRIDSPACE · popUP archive · NUANCE

RETHINKING ENTERPRISE

SALES
Preact · AVISO · RelateIQ · NGDATA · CLARABRIDGE · FRAMED · Infer · ATTIV.IO · causata

SECURITY / AUTHENTICATION
CROSSMATCH · conjur · EYEVERIFY · BITSIGHT · CYLANCE · bionym

FRAUD DETECTION
sift science · SOCURE · ThreatMetrix · feedzai · Brighterion · verafin

HR / RECRUITING
TalentBin · entelo · predikt · Connectifier · gild · hiQ

MARKETING
brightfunnel · bloomreach · CommandIQ · AIRPR · RADIUS · Telepathy · people pattern

PERSONAL ASSISTANT
Siri · Google now · Cortana · cleversense · tempo · Robin labs · KASISTO · fuse machines · VIV · CLARA LABS

INTELLIGENCE TOOLS
ADATAO · Palantir · Quid · FirstRain · Digital Reasoning

RETHINKING INDUSTRIES

ADTECH
METAMARKETS · dstillery · rocketfuel · YieldMo · ADBRAIN

AGRICULTURE
BLUE RIVER · TerrAvion · ceres imaging · THE CLIMATE CORPORATION · tule

EDUCATION
Declara · coursera · KNEWTON · kidaptive

FINANCE
Bloomberg · FinGenius · alphasense · KENSHO · Dataminr · minetabrook · BINATIX

LEGAL
Lex Machina · brightleaf · COUNSELYTICS · RAVEL · JUDICATA · Brevia · DiligenceEngine

MANUFACTURING
SIGHT MACHINE · MICROSCAN · IVISYS · SIXGILL

MEDICAL
Parzival · transcriptic · Genescient · ZEPHYR · ground truth labs · bina · TUTE

OIL AND GAS
kaggle · AYASDI · TACHYUS · biota · Flutura

MEDIA / CONTENT
Outbrain · newsle · ARRIA · SAILTHRU · wavii · Onion · NarrativeScience · prismap · Summly · Prismatic · ai

CONSUMER FINANCE
Affirm · inVenture · finance · BILLGUARD · LendUp · LendingClub · Kabbage

PHILANTHROPIES
DataKind · thorn · DATA GUILD

AUTOMOTIVE
Google · Continental S · Tesla · MobilEye · CRUISE

DIAGNOSTICS
enlitic · 3SCAN · lumiata · ENTOPSIS

RETAIL
BAY SENSORS · PRISM SKYLABS · celect · euclid

RETHINKING HUMANS / HCI

AUGMENTED REALITY
Magic Leap · APX · blippar · META · layar

GESTURAL COMPUTING
THALMIC LABS · omek · FLUTTER · LEAP · eyeSight · 3Gear · GestureTek · nod

ROBOTICS
intel · LIQUID ROBOTICS · SoftBank · iRobot · jibo · ANKI

EMOTIONAL RECOGNITION
affectiva · BEYOND VERBAL · EMOTIENT · cogito

SUPPORTING TECHNOLOGIES

HARDWARE
nVIDIA · XILINX · QUALCOMM · NERVANA · rigetti

DATA PREP
TRIFACTA · Paxata · tamr · Alation

DATA COLLECTION
diffbot · kimono · CrowdFlower · Connotate · WorkFusion · import io

Thanks to http://airesearch.com/ai-blog/ai-startups-companies-in-the-landscape-of-machine-intelligence/

MACHINE LEARNING IN EMOJI

SUPERVISED   UNSUPERVISED   REINFORCEMENT

SUPERVISED — human builds model based on input / output

UNSUPERVISED — human input, machine output / human utilizes if satisfactory

REINFORCEMENT — human input, machine output / human reward/punish, cycle continues

BASIC REGRESSION

LINEAR linear_model.LinearRegression()
Lots of numerical data

LOGISTIC linear_model.LogisticRegression()
Target variable is categorical

CLASSIFICATION

NEURAL NET neural_network.MLPClassifier()
Complex relationships. Prone to overfitting
Basically magic.

K-NN neighbors.KNeighborsClassifier()
Group membership based on proximity

DECISION TREE tree.DecisionTreeClassifier()
If/then/else. Non-contiguous data
Can also be regression

RANDOM FOREST ensemble.RandomForestClassifier()
Find best split randomly
Can also be regression

SVM svm.SVC() svm.LinearSVC()
Maximum margin classifier. Fundamental
Data Science algorithm

NAIVE BAYES GaussianNB() MultinomialNB() BernoulliNB()
Updating knowledge step by step with new info

CLUSTER ANALYSIS

K-MEANS cluster.KMeans()
Similar datum into groups
based on centroids

ANOMALY DETECTION covariance.EllipticalEnvelope()
Finding outliers
through grouping

FEATURE REDUCTION

T-DISTRIB STOCHASTIC NEIR EMBEDDING manifold.TSNE()
Visualize high dimensional data. Convert
similarity to joint probabilities

PRINCIPLE COMPONENT ANALYSIS decomposition.PCA()
Distill feature space into components that
describe greatest variance

CANONICAL CORRELATION ANALYSIS decomposition.CCA()
Making sense of cross-correlation
matrices

LINEAR DISCRIMINANT ANALYSIS lda.LDA()
Linear combination of features that
separates classes

OTHER IMPORTANT CONCEPTS

BIAS VARIANCE TRADEOFF	
UNDERFITTING / OVERFITTING	
INERTIA	
ACCURACY FUNCTION	$(TP + TN) / (P + N)$
PRECISION FUNCTION	$TP / (TP + FP)$
SPECIFICITY FUNCTION	$TN / (FP + TN)$
SENSITIVITY FUNCTION	$TP / (TP + FN)$

@emilyinamillion made this

Thanks to https://www.pinterest.com/pin/240661792390071368/

How to Read a Paper?

Research papers tend to follow a certain form; for the uninitiated, this may take getting used to. There are two types of research papers that we will look at:

- conference papers - shorter papers (typically 6-8 pages) generally subject to peer review, written and presented in conjunction with a conference.
- journal papers - longer and more complete papers, subject to a more thorough peer review, and published in an (archival) journal

You need not read a research paper sequentially from beginning to end. Here's one possible sequence:

- Read the title. (What is the paper about?)
- Read the abstract. (Should give you a concise overview of the paper.)
- Read the introduction. (Look for motivations, relation to other work, and a more detailed overview.)
- Look at the structure of the paper. (What do the remaining sections address? How do they fit together?)
- (Read the previous/related work section. (How does this work relate? What is new or different about this work?)
- Read the conclusions. (What were their results?)
- Read the body of the paper. You may want to skip over all the equations the first time through.

Questions to ask while reading a research paper

It is important that you learn to read research papers critically, so here are some questions to ask yourself as you read and some tips on reading.

- What problem(s) are they solving? Why are these problems important?
- What did they really do? (as opposed to what the authors say or imply they did)
- What is the contribution of the work? (i.e. what is interesting or new?)
- What methods are they using?
- Would you have solved the problem differently?
- Do all the pieces of their work fit together logically?
- What were the results? Did they do what they set out to do?
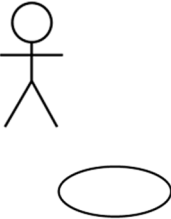
Documentation Guidelines

The following are general format elements to which the report should conform. Any deliverable not conforming to the below requirements will be considered void and claim a resubmission.

- The report should be typed using a word processor and printed on A4 paper with a 3 cm margin at the left-hand side and 2.5 cm margin at the top, bottom and the right-hand side.
- The font should be Arial, The text must be in 11-point type and the headings in 14-point type with 1.5 line spacing.
- The headings are numbered according to the decimal system. Each main heading is a whole number and the sub-heading is numbered as a decimal of that.
- Each page of the report should be numbered in the bottom right-hand corner.
- The title page must include the title of the project, the authors' name, date and place.
- All graphs should be produced using graphics software. All figures must have a caption and labels.
- Each table must have a title, and all columns and rows should have appropriate headings.
- All figures and tables must be cited in the text.
- The computations or solution procedures should be done or outlined in orderly steps with all assumptions clearly stated and their source given.
- All experiments and calculations should be reproducible.
- All units should be clearly indicated.
- The reference list should be explicit with the author's name, title, publisher and date following the IEEE Style.
- Acknowledgments should be duly conferred, and copied material should be duly credited.

> The grading of the reports is based on the format, the content, the originality, and the professional appearance. Major points of interest:
>
> · Structure & Format: Grammar, Syntax, table of contents & References
>
> · Background Material: Introduction, Significance, and Literature Survey
>
> · Methodology: Accuracy and Completeness
>
> · Analysis & Discussion including Conclusions
>
> · Presentation & Aesthetic: Figures, Tables and Overall Appearance

Project Roadmap

(Title)

(Short Description)

(Scope & Purpose)

(Tools & Technologies)

(Actors & Use cases)

(Functional Requirements)

(Non-functional Requirements)

(Deliverables, Reports)

Grading Rubric (Project objective, formulation, methodology to be followed, background)

S.No	Type	Marks (10)
1.	The objectives are well defined and prioritized. All relevant information and constraints are obtained and accurately analysed. Decision and design recommendation are well supported by the information.	7.5 - 10
2.	All major objectives are identified. Sufficient information is obtained. Appropriate analyses are selected. Decision and design recommendation are reasonable and mostly supported by the information	6 - 7.5
3.	Most major objectives are identified but one or two minor ones are missing or priorities are not established. Most constraints are identified; some are not adequately addressed or accurately analyzed. Decision and design recommendation is reasonable.	3 - 5
4.	Many major objectives are not identified. Information is collected but without any analysis. Only one solution is considered or other solutions were ignored or incompletely analyzed. Many constraints and criteria were ignored.	< 3

Further Learning

1. https://archive.nytimes.com/www.nytimes.com/interactive/2012/06/03/magazine/innovations-issue.html

2. https://www.inf.ethz.ch/research.html