



**S.P.B. PATEL  
ENGINEERING COLLEGE**  
SAFFRONY INSTITUTE OF TECHNOLOGY CAMPUS

Near Shanku's Water Park,  
Ahmedabad – Mehsana Highway,  
Linch, Mehsana – 384435  
Email: [info@saffrony.ac.in](mailto:info@saffrony.ac.in)  
Web: [www.saffrony.ac.in](http://www.saffrony.ac.in)  
Phone : (02762) 285721



**CYCLE 1**  
**NAAC Accreditation 2023**

# ACADEMIC YEAR 2020-21

*Submitted to*



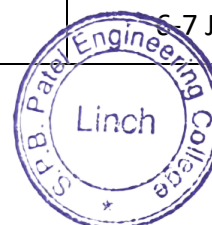
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**NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL**

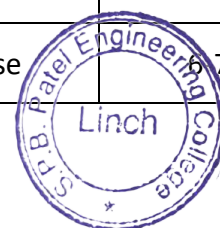
**6.3.3 Percentage of teaching and non-teaching staff participating in Faculty development Programmes (FDP), Management Development Programmes (MDPs) professional development /administrative training programs during the last five years**

**Academic Year 2020-21**

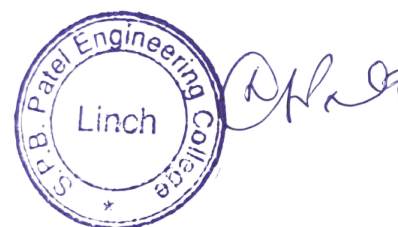
Sr. No.	Name of the participant	Title of the FDP /MDP/ professional development / administrative training program	Dates (from-to) (DD-MM-YYYY)
1	Bhupendra Lalitbhai Bhatt	NPTEL - Introduction To Fluid Mechanics	Jan - April 2020
2	Bhupendra Lalitbhai Bhatt	NPTEL - Gear And Gear Unit Design : Theory And Practice	Feb - April 2020
3	Bhupendra Lalitbhai Bhatt	NPTEL - Laws of Thermodynamics	Jan - Feb 2020
4	Karishma Panchal	MDP - Leading with purpose	6-7 July 2020
5	Krunalkumar Prajapati	MDP - Leading with purpose	6-7 July 2020
6	Ekta Pran Shanker Joshi	MDP - Leading with purpose	6-7 July 2020
7	Ravi Prakashbhai Dal	MDP - Leading with purpose	6-7 July 2020
8	Tushar Himanshubhai Panchal	MDP - Leading with purpose	6-7 July 2020
9	Jigneshkumar Vishnubhai Kadia	MDP - Leading with purpose	6-7 July 2020
10	Nirav Ratilal Joshi	MDP - Leading with purpose	6-7 July 2020
11	Chetankumar Rameshbhai Mordiya	MDP - Leading with purpose	6-7 July 2020
12	Kapil Kantibhai Dayma	MDP - Leading with purpose	6-7 July 2020
13	Kumkum Bhattacharya	MDP - Leading with purpose	6-7 July 2020
14	Akhil Venkat Patnaik	MDP - Leading with purpose	6-7 July 2020
15	Ankitkumar Ravat	MDP - Leading with purpose	6-7 July 2020
16	Kishan Ajaykumar Vaghela	MDP - Leading with purpose	6-7 July 2020
17	Rajkumar Tarachand Rajai	MDP - Leading with purpose	6-7 July 2020



Sr. No.	Name of the participant	Title of the FDP /MDP/ professional development / administrative training program	Dates (from-to) (DD-MM-YYYY)
18	Jaimin Harshadray Jani	MDP - Leading with purpose	6-7 July 2020
19	Prashant Bhagwan Parashar	MDP - Leading with purpose	6-7 July 2020
20	Anurag Rajender Chandnani	MDP - Leading with purpose	6-7 July 2020
21	Yuvrajsinh Dharmendrasinh Parmar	MDP - Leading with purpose	6-7 July 2020
22	Dr. Narshi Khodabhai Sherasia	MDP - Leading with purpose	6-7 July 2020
23	Kunalsinh Ranjitsinh Kathia	MDP - Leading with purpose	6-7 July 2020
24	Dr. Pooja Jayeshbhai Mehta	MDP - Leading with purpose	6-7 July 2020
25	Jay Paragbhai Parikh	MDP - Leading with purpose	6-7 July 2020
26	Avinash Vikrambhai Patel	MDP - Leading with purpose	6-7 July 2020
27	Piyush Dineshbhai Mistry	MDP - Leading with purpose	6-7 July 2020
28	Palak Rajeshbhai Godhani	MDP - Leading with purpose	6-7 July 2020
29	Yashkumar Pareshbhai Patel	MDP - Leading with purpose	6-7 July 2020
30	Dr. Arun Shreeprakash Pandey	MDP - Leading with purpose	6-7 July 2020
31	Jagdish Mohanbhai Mevada	MDP - Leading with purpose	6-7 July 2020
32	Chintan Tuljashankar Mehta	MDP - Leading with purpose	6-7 July 2020
33	Utsav Minesh Shah	MDP - Leading with purpose	6-7 July 2020
34	Pranoti Chandrashekhar Kale	MDP - Leading with purpose	6-7 July 2020
35	Nisarg Vijaykumar Prajapati	MDP - Leading with purpose	6-7 July 2020
36	Navin Ramnivas Bansal	MDP - Leading with purpose	6-7 July 2020
37	Dr. Laxmanbhai Narsinhbhai Patel	MDP - Leading with purpose	6-7 July 2020
38	Nashifa Mohmadshafi Shaikh	MDP - Leading with purpose	6-7 July 2020
39	Krinaben Sanjaykumar Shah	MDP - Leading with purpose	6-7 July 2020



Sr. No.	Name of the participant	Title of the FDP /MDP/ professional development / administrative training program	Dates (from-to) (DD-MM-YYYY)
40	Dhruv Vimalkumar Bhatt	MDP - Leading with purpose	6-7 July 2020
41	Maulik Pravinbhai Patel	MDP - Leading with purpose	6-7 July 2020
42	Avani Dedhia	Applied Data Science using Python Programming & Excel	17-06-2020 to 29-06-2020
43	Akshay Kansara	Online Short Term Course on Recent Trends in Machine Learning: An Industry Perspective	08-11-2020 to 12-11-2020
44	Avani Dedhia	Emerging Software in Civil Engineering	07-12-2020 to 11-12-2020
45	Hima Soni	Five Days Workshop on AI in Healthcare Economics Outcome Research	02-04-2021 to 06-04-2021





This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL20ME22S1280829

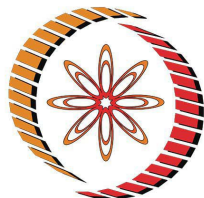
To

BHUPENDRA BHATT  
GNAN B 122, SIMANDHAR CITY, TRIMANDIR ,  
ADALAJ, GANDHINAGAR.GUJARAT  
ADALAJ, GANDHINAGAR.  
GANDHINAGAR  
GUJARAT - 382421  
PH. NO :9574009998



No. of credits recommended by NPTEL:3

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**BHUPENDRA BHATT**  
for passing the course

**Introduction to Fluid Mechanics**

with Score\* **92** %



*A. Goswami*

Jan-Apr 2020  
(12 week course)

**Prof. Adrijit Goswami**  
Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur



Indian Institute of Technology Kharagpur



\*Continuous online assessment score

To validate and check scores: <https://nptel.ac.in/noc>

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL20ME18S1020425

To

BHUPENDRA BHATT  
GNAN B 122, SIMANDHAR CITY, TRIMANDIR ,  
ADALAJ, GANDHINAGAR.GUJARAT  
ADALAJ, GANDHINAGAR.  
GANDHINAGAR  
GUJARAT - 382421  
PH. NO :9574009998



No. of credits recommended by NPTEL:2

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**BHUPENDRA BHATT**  
for passing the course

**Gear and Gear Unit Design : Theory and Practice**

with Score\* **91** %



*A. Goswami*

Feb-Apr 2020  
(8 week course)

**Prof. Adrijit Goswami**  
Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur



Indian Institute of Technology Kharagpur



\*Continuous online assessment score

To validate and check scores: <https://nptel.ac.in/noc>

This certificate is computer generated and can be verified by scanning the QR code given below. This will display the certificate from the NPTEL repository, <https://nptel.ac.in/noc/>

Roll No: NPTEL20ME20S1840902

To

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GNAN B 122, SIMANDHAR CITY, TRIMANDIR ,  
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ADALAJ, GANDHINAGAR.  
GANDHINAGAR  
GUJARAT - 382421  
PH. NO :9574009998



No. of credits recommended by NPTEL:1

An additional 1 credit may be awarded if the University deems it fit, based on the actual student effort involved.



# NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)



This certificate is awarded to  
**BHUPENDRA BHATT**  
for passing the course

**Laws of Thermodynamics**

with Score\* **100 %**



*A. Goswami*

**Prof. Adrijit Goswami**

Dean, Continuing Education & NPTEL Coordinator  
IIT Kharagpur

**Jan-Feb 2020**  
**(4 week course)**



Indian Institute of Technology Kharagpur



**\*Continuous online assessment score**

To validate and check scores: <https://nptel.ac.in/noc>





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# CERTIFICATE

## OF PARTICIPATION

This certificate is proudly presented to

*Jagdish Mohanbhai Mevada*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

Dr. Narsi Sherasia  
Principal (Degree)





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This certificate is proudly presented to

*Chintan Tuljashankar Mehta*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

Dr. Narsi Sherasia  
Principal (Degree)





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This certificate is proudly presented to

*Utsav Minesh Shah*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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Principal (Degree)





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## OF PARTICIPATION

This certificate is proudly presented to

*Pranoti Chandrashekhar Kale*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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Principal (Degree)





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This certificate is proudly presented to

*Nisarg Vijaykumar Prajapati*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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Principal (Degree)





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This certificate is proudly presented to

*Navin Ramnivas Bansal*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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This certificate is proudly presented to

*Dr. Laxmanbhai Narsinhbhai  
Patel*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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Principal (Degree)





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This certificate is proudly presented to

*Nashifa Mohmadshafi Shaikh*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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This certificate is proudly presented to

*Krinaben Sanjaykumar Shah*

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This certificate is proudly presented to

*Dhruv Vimalkumar Bhatt*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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This certificate is proudly presented to

*Maulik Pravimbhai Patel*

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This certificate is proudly presented to

*Karishma Panchal*

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This certificate is proudly presented to

*Krunalkumar Prajapati*

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This certificate is proudly presented to

*Ekta Pran Shanker Joshi*

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This certificate is proudly presented to

*Ravi Prakashbhai Dal*

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This certificate is proudly presented to

*Tushar Himanshubhai Panchal*

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This certificate is proudly presented to

*Jigneshkumar Vishnubhai Kadia*

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This certificate is proudly presented to

*Nirav Ratilal Joshi*

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This certificate is proudly presented to

*Chetankumar Rameshbhai*  
*Mordiya*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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This certificate is proudly presented to

*Kapil Kantibhai Dayma*

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This certificate is proudly presented to

*Kumkum Bhattacharya*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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This certificate is proudly presented to

*Akhil Venkat Patnaik*

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This certificate is proudly presented to

*Ankitkumar Ravat*

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This certificate is proudly presented to

*Kishan Ajaykumar Vaghela*

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This certificate is proudly presented to

*Rajkumar Tarachand Rajai*

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This certificate is proudly presented to

*Jaimin Harshadray Jani*

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This certificate is proudly presented to

*Prashant Bhagwan Parashar*

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This certificate is proudly presented to

*Anurag Rajender Chandnani*

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This certificate is proudly presented to

*Yuvrajsinh Dharmendrasinh*  
*Parmar*

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This certificate is proudly presented to

*Dr. Narshi Khodabhai Sherasia*

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This certificate is proudly presented to

*Kunalsinh Ranjitsinh Kathia*

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This certificate is proudly presented to

*Dr. Pooja Jayeshbhai Mehta*

for participating in the **MDP - Leading with purpose** program during **6-7 July 2020**, at Saffrony Institute of Technology.

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This certificate is proudly presented to

*Jay Paragbhai Parikh*

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This certificate is proudly presented to

*Avinash Vikrambhai Patel*

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This certificate is proudly presented to

*Piyush Dineshbhai Mistry*

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This certificate is proudly presented to

*Palak Rajeshbhai Godhani*

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This certificate is proudly presented to

*Yashkumar Pareshbhai Patel*

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This certificate is proudly presented to

*Dr. Arun Shreeprakash Pandey*

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SAFFRONY INSTITUTE OF TECHNOLOGY CAMPUS

## Report on Five Days STTP Recent Trends in Machine Learning : Industry Perspective

Name of Resource Person, Designation and session details :-

Day	Date and Time	Title	Speaker
1	08/11/2020 1 pm -3 pm	ML industry case studies and practical tips	Mr. Falak Shah, Lead Research Scientist/ ML Research lead at InFoCusp
	08/11/2020 4 pm -6 pm	Beyond just Algorithms: Identifying and Approaching an ML problem in Industry	Mr. Peddakota Vikash, Data Scientist, ShareChat
2	09/11/2020 1 pm -3 pm	An industry perspective on Speech Processing	Mr. Meet Soni, Researcher, TCS Research and Innovation
	09/11/2020 4 pm -6 pm	Automatic Speech Recognition: from theory to applications	Dr. Hardik Sailor, Lead Senior Engineer, Samsung Research Institute Bangalore
3	10/11/2020 1 pm -3 pm	Mining Biomedical and Clinical Texts for Efficient Retrieval of Clinical Trials	Dr. Manjira Sinha, Assistant Professor, CET, IIT Khargpur, Dr. Tirthankar Dasgupta, Scientist, Innovation Lab, Tata Consultancy Services
	10/11/2020 4 pm -6 pm	Extracting Concepts and Relations from Textual Documents	Dr. Sourish Dasgupta Founder and CEO Rygbee and Professor at DAIICT



4	11/11/2020 1 pm -3 pm	Machine Learning for Biomedical Signals	Dr. Udit Satija, Assistant Professor, IIT Patna
	11/11/2020 4 pm -6 pm	Trends in Hardware Design for Audio/Speech Neural Network Applications	Dr. Nilesh Vaishnav, Lead Design Engineer, Cadence Design Systems, Audio R&D Group
5	12/11/2020 1 pm -3 pm	Neural Text Summarization: Bridging the gap between best practices in academia and industry	Dr. Parth Mehta, NLP Research Scientist, Parmonic
	12/11/2020 4 pm -6 pm	Knowledge Extraction from Text Narratives and its Applications	Mr. Nitin Ramrakhiyani, Researcher, (TRDDC), Dr. Sachin Pawar, Researcher, (TRDDC)

**Date:** 8th November to 12th November, 2020

**Duration:** 01:00 pm to 03:00 pm & 04:00 pm to 06:00 pm

**Venue:** Online Webinar - Google Meet

**No. of Participants:** 20

### **Introduction and Objective:**

With respect to time, technology has transformed our daily lives one or other ways. Due to technology evaluations in the current industry era, we have got so many tools and resources, all the useful information at our fingertips where it has become more effective but at the same time challenging by learning and adopting different technologies.

Modern technology has covered the way for multi-functional devices. Computers are becoming faster, more portable, and higher-powered than ever before. With all of these revolutionary changes, it has become a need of time to get updated and adopt all such technological changes at all the aspects.

The main objective of attending this STTP was to get more insights about the technology evolvement in the industry with the latest technologies such as Machine Learning, Natural Language Processing, Neural Network etc., how it has changed the work environment, how it is increasing the efficiency and effectiveness at the same time and how industry is using such technologies.

### **Workshop details:**

STTP started with the orientation of all the sessions where Dr. Kamal Captain and Dr. Kirti Inamdar from the Electronics Engineering department welcomed all the participants. They gave a brief introduction about the STTP, motivations behind the STTP and introduced experts. They also explained the flow of all the sessions.



**Session - 1 (8th December 2020) : ML industry case studies and practical tips** (Mr. Falak Shah, Lead Research Scientist/ ML Research lead at InFoCusp)

The first session was about the different Machine Learning case studies and practical tips by Mr. Falak Shah where he covered following topics

- Overview of Machine Learning Project at InFoCusp
- Machine learning/Deep Learning Projects in pipeline
- Useful libraries in Python
- Industry case studies
- Kaggle environment
- Practical tips for using Machine Learning for problem solving

Mr. Falak Shah started the session with basics of AI and different categories, some legality about the documents in industry and different libraries. After that he showed different applications like Biomedical applications, Real time multiple object detection techniques, VQA (Visual Question Answering) project where he used Machine Learning and Deep Learning, based on image and question mentioned below that image machine first understands the image and question after that it gives answers. He explained the whole process, how questions breakdowns, filtering process, identification of parts from image(material, size and shape).


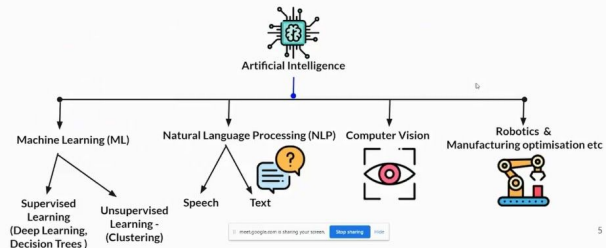


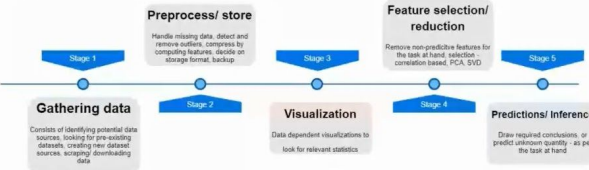
He shared about Identifying/separating recyclable polymer case study as one of the projects where he used deep learning techniques for reflectance patterns of polymer gathered. He discussed the data sets and code for that.

He discussed the Machine Learning pipeline with different stages. Then he suggested different libraries such as Scikit-learn, Pandas, Keras/ Tensorflow/Pytorch, Matplotlib/Seaborn/PyQT, NumPY, OpenCV, NLTK, PYCVx etc.

At last he shared different case studies with work flow and challenges with data models, data sets and work environments. Overall session was very informative.

My key learning from the session for me were different applications using Machine Learning/Deep Learning, projects, Python libraries, Kaggle environment and how to use and case studies with challenges. He also discussed the questions raised by all of us.



<p><b>About me</b></p> <p>---</p> <p>I'm passionate about application oriented research (and meditation :). I have 5 years of experience in using Machine Learning/ Data Science for a wide array of applications.</p> <p>I grew up in Ahmedabad, am an avid reader, and love travelling to mountains.</p> <p>Questions? Drop a message in chat/ speak up!</p> <p>Your background in python/ machine learning?</p> 	<p><b>Broad categorization</b></p> 
<p><b>Biomedical applications</b></p> <p>---</p> <p>Mix of DSP and ML</p> 	<p><b>Real time MOT/ object detection</b></p> <p>---</p> 
<p><b>Usual ML Pipeline</b></p> <p>---</p> 	<p><b>In depth industry Case Study 1</b></p> <p>---</p> <ul style="list-style-type: none"> <li>• Finance domain data</li> <li>• Get data from paid platforms (Each with their own API)</li> <li>• Technical indicators/ prices/ sentiment, etc.</li> <li>• Scrape data from websites which allow it</li> <li>• Handle partial availability/ unavailability of data</li> <li>• Compute features</li> <li>• Compute strategies</li> <li>• Test new strategies on all past data!</li> <li>• 60-70% of the task consists of getting the data right</li> </ul>
<p><b>Challenges</b></p> <p>---</p> <ul style="list-style-type: none"> <li>• Scale of data (time x stocks x fields)</li> <li>• Daily/ monthly/ intra-day</li> <li>• Changing nature of the data</li> <li>• Time constraints</li> <li>• Handle holidays/ correctness of the data</li> <li>• Run the models on the data (with possibly some missing values)</li> <li>• All infrastructure on the cloud</li> <li>• BRKA Case</li> </ul>	<p><b>In depth industry Case Study 2</b></p> <p>---</p> <ul style="list-style-type: none"> <li>• Food supply chain (company food outlets)</li> <li>• No prior work/ don't know what data to collect</li> <li>• Cannot ask for intervention from people managing it</li> <li>• Capture videos/ images</li> <li>• Tag videos (manual)</li> <li>• Gather enough data to automate it</li> <li>• Analyse what is being wasted where</li> <li>• Different outlets have some form of inventory</li> <li>• Different menus/ items at different places</li> </ul>

## Session - 2 (8th December 2020) : Beyond just Algorithms: Identifying and Approaching an ML problem in Industry (Mr. Peddakota Vikash, Data Scientist, ShareChat)

The second session was about the various approaches of Machine Learning in industry with algorithms where he started with typical business problems such as which users should be targeted, best price for a particular product at a particular time, optimal assortment in retail stores and how to optimize the budget.

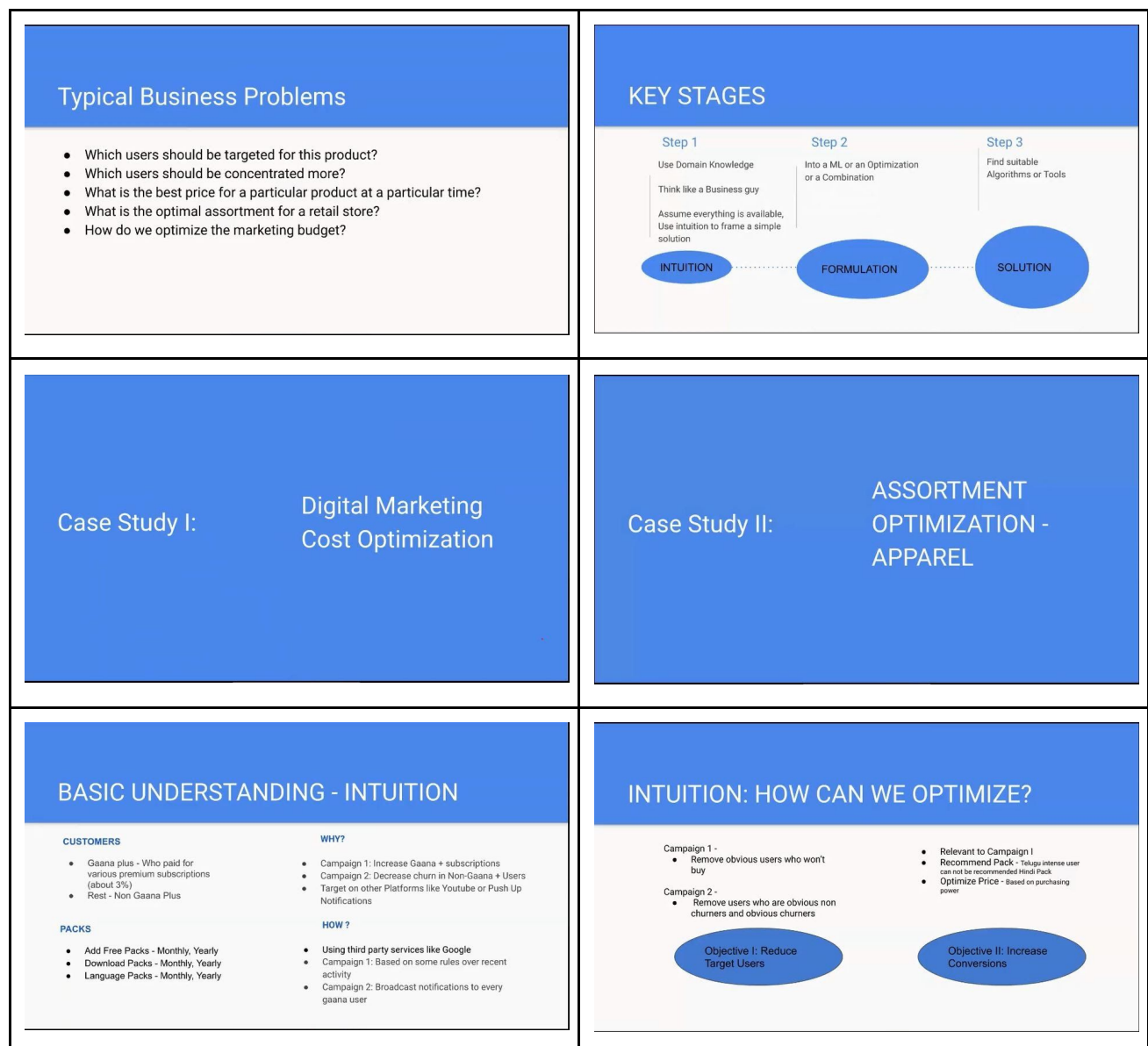


He explained key stages of machine learning solutions in the discussed problems like domain knowledge(intuition),optimization using Machine Learning(Formulation) and finding suitable algorithms (solutions) with examples where he discussed conversion model, recommendation model and Churn model using binary classifiers, muslit class classifiers .

He discussed future engineering with examples and features related to them using models. He also mentioned how to use models.Then he discussed Assortment Optimization apparel with formulation and key components. He shared different other models, candidate generators for video users,wide and deep models.

Overall session was informative and with real life examples where we can relate the applications in terms of algorithms and models implementations towards it.

My key learnings from sessions were different key stages to solve problems, both the case studies with models like Churn model, how to use Deep learning in recommendation systems, use of wide and deep models and Neural collaborative filtering with Youtube examples.





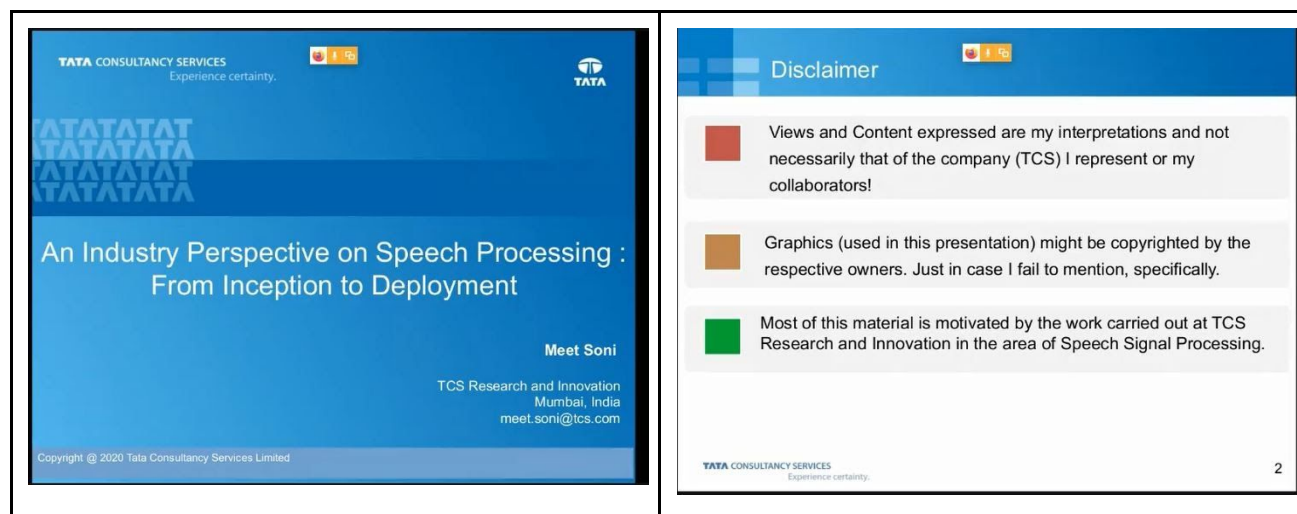
**Session - 3 (9th December 2020) : An industry perspective on Speech Processing (Mr. Meet Soni, Researcher, TCS Research and Innovation)**

The session started with the speech processing work and research so far he has gone through and different challenges. He discussed different speech recognition services like Google Assistant, Alexa, Siri etc helping in searching services.

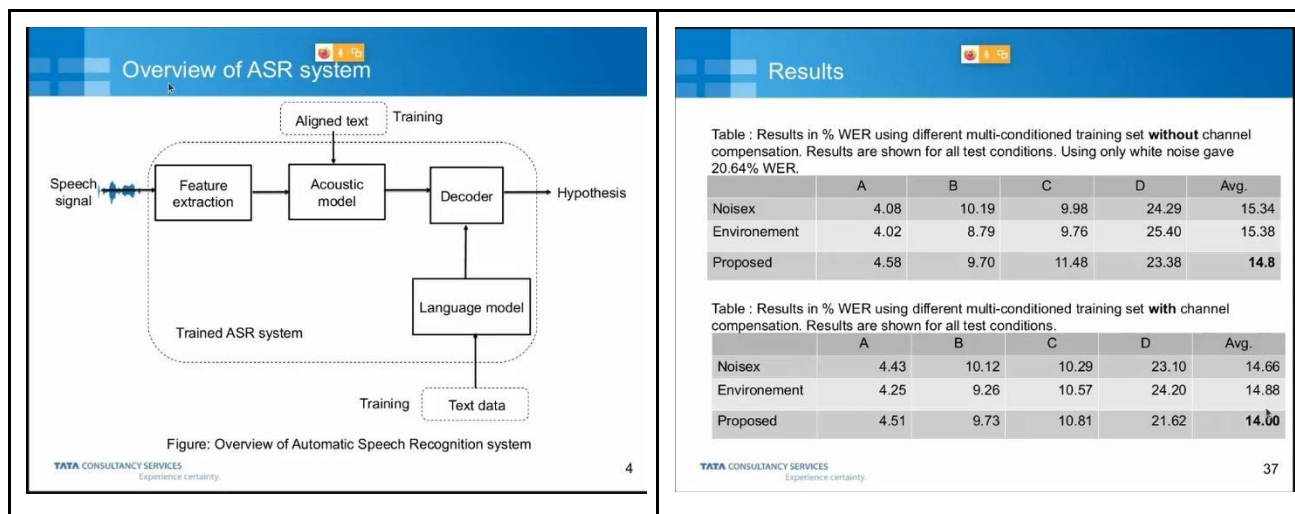
He shared how TCS and his team is working on a Speech Recognition system for different projects. He discussed the basics of Automatic Speech recognition system, identification of problems, popular approaches, potential solutions based on various research papers, limitations of current approaches. After that he explained the feature selection and extractions process using Short time Fourier Transform, Mel filtering. He discussed results based on the experiments which they have done. He discussed pipeline deployment using ASR such as Web based and Android based projects. He shared useful tools for development of ASR tools like Kaldi, ESPNet, Wav2letter. He shared useful tools for deployment like VOSK, Gstream server. He also shared technologies like Websockets and Docker containers.

Overall session was informative and we got to know how TCS is working on the ASR system. We also came to know what kind of different researches are helpful.

My key learnings from the session were ASR system, Feature selection and extraction, how to select features, Short time fourier concepts, different tools and technologies in the ASR development and at last how they have got the results about their work and their success.







**Session - 4 (9th December 2020) : Automatic Speech Recognition: from theory to applications**  
 (Dr. Hardik Sailor, Lead Senior Engineer, Samsung Research Institute Bangalore)

The session started with the basics of ASR which was discussed in the previous session and what are the missing components in that. He discussed GMM (Gaussian Mixture Model), HMM (Hidden Markov Model) in the ASR system and Language modeling used in Google search. After that he introduced the impact of Deep Learning on ASR systems, history of Neural Network in ASR, how Deep Learning is useful with DNN (Deep Neural Network) from GMM-HMM to DNN-HMM.

He discussed RL (Representation Learning) and shared Lewicki's Observations for the motivation of Learning models. He discussed unsupervised deep auditory models (UDAM) in detail with applications and self supervising learning with real life examples.

After that he shared about types of ASR systems like Connectionist Temporal Classification(CTC), Encoder-Decoder and Transducer. He explained transformer architecture, challenges in ASR E2E. He shared one project details with us regarding ASR in the Mandi Project for farmers.

Overall this session had so many new concepts which I had come across for the first time. Expert was explaining in a very detailed manner. Mr key learnings from this session were Limitations in ASR, different types of model working (GMM, HMM, DNN), supervised and unsupervised learning in speech recognition system, recurrent neural network and about the Mandi project work related to different languages and approaches.



## What are we missing in classical ASR?

Pros	Cons
Mathematically rich framework	Poor discrimination capability
Efficient learning and decoding methods	Requirement of distributional assumptions
Better at sequence learning considering the temporal aspects of the speech signal	Phones and subword are assumed to be follow the Markov assumption
Flexible HMM topology for statistical phonetics and syntax	Assumption of the uncorrelated acoustic features

- ASR is a difficult problem!

## GMM-HMM ASR

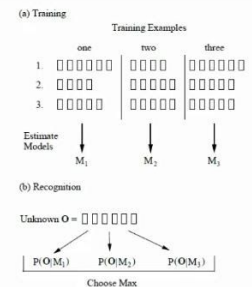


Figure 3: Overview of GMM-HMM ASR.

## History of Neural Networks for ASR

### Neural Networks in ASR (prior to the rising of deep learning)

- Temporal & Time-Delay (1-D Convolutional) Neural Nets
  - Atqui, Horrocks, and Marks, "An Artificial Neural Network for Spatio-Temporal Bipolar Patterns, Application to Phoneme Classification," NIPS 1987.
  - Waibel, Hanawa, Hinton, Shikano, Lang, "Phoneme recognition using time-delay neural networks," IEEE Transactions on Acoustics, Speech and Signal Processing, 1989.
- Recurrent Neural Nets
  - Bengio, "Artificial Neural Networks and their Application to Speech/Sequence Recognition," Ph.D. thesis, 1991.
  - Robinson, "A real-time recurrent error propagation network word recognition system," ICASSP 1992.
- Hybrid Neural Nets-HMM
  - Morgan, Bourlard, Benali, Cohen, Franco, "Hybrid neural network/hidden Markov model systems for continuous speech recognition," IPRA, 1993.
- Neural-Net Nonlinear Prediction
  - Deng, Harsanyi, Elzohry, "Analysis of correlation structure for a neural predictive model with applications to speech recognition," Neural Networks, vol. 7, No. 2, 1994.
- Bidirectional Recurrent Neural Nets
  - Schuster, Paliwal, "Bidirectional recurrent neural networks," IEEE Trans. Signal Processing, 1997.
- Neural-Net TANDDEM
  - Hernandez, Ellis, Sharma, "Tandem connectionist feature extraction for conventional HMM systems," ICASSP 2000.
- Bottle-neck Features extracted from Neural-Nets
  - Morgan, Zhu, Stoichev, Sennar, Sivasub, Shinozaki, Ostendorf, Jain, Hernandez, Ellis, Doolittle, Chen, Griffin, Boardman, Adhikari, "Pushing the envelope - inside [speech recognition]," IEEE Signal Processing Magazine, vol. 22, no. 5, 2005.
  - DAIRPA EARS Program 2002-2004: Novel Approach!
  - Graci, Karafiat, Kontar & Cemocky, "Probabilistic and bottle-neck features for VCSR of meetings," ICASSP 2007.

<https://www.microsoft.com/en-us/research/wp-content/uploads/2016/07/interpeech-tutorial-2015-11-09-sept6a.pdf>

## Representation Learning



Figure 4: Traditional approach for speech signal processing.

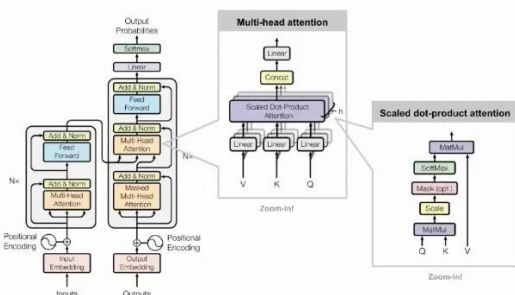
- Traditional approaches require excellent domain knowledge to develop the model
- Perceptual and physiological experiments



Figure 5: Representation Learning (RL) for speech signal processing.

- RL approaches: Automatically learning meaningful representation
- Little domain knowledge for detailed analysis of the model

## Transformer architecture



Vaswani, Ashish, et al. "Attention is all you need." Advances in neural information processing systems. 2017.

## Application in ASR Mandi Project

- MeitY Consortium project: Speech-based access of agricultural commodity prices and weather information in 12 Indian languages/dialects
- A consortium project initiated by MeitY, Govt. of India, New Delhi.
- Speech Research Lab, DA-IICT → Gujarati language
- Agricultural information access to the farmers in native language

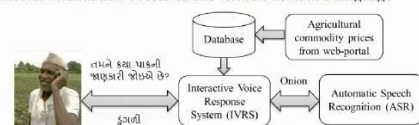


Figure 7: A speech-based access system for an agricultural commodity in Gujarati.

**Session - 5 (10th December 2020) : Mining Biomedical and Clinical Texts for Efficient Retrieval of Clinical Trials** (Dr. Manjira Sinha, Assistant Professor, CET, IIT Khargpur, Dr. Tirthankar Dasgupta, Scientist, Innovation Lab, Tata Consultancy Services)

This session had two experts where both had discussed the Machine learning aspects in biomedical and clinical trials. Session started with Dr. Tirthankar Dasgupta where he discussed how machine learning is useful in clinical trials using case study, IR search engine, research problems, how matching criterias are working, different manifestations on the same criterias, how to choose clinical



trials, factors affecting drug reactions in trials, observations from Covid 19 trials, He explained in detail BiLSTM CNN Attention Network for Inclusion/Exclusion criteria of identifications, results, Stanford Annotation tools.

In his whole session he shared clinical trial case studies with Machine Learning and Deep Learning concepts. Key learnings from this session are how data is going to be learned by machine and identifies the results based on the given criterias, Automatic mapping for the same, problems of NLP. and text mining.

The second expert was Dr. Manjira Sinha, she discussed relevant problems in Natural Language Processing. She started with example, problem definition, methodology for clinical trials. She discussed relation aware attention models for uncertainty detection in text where she explained uncertainty based on lack of information regarding the data set. She also explained model architecture: ReMC - CNN - TLSTM. She also took her session based on case studies.

Overall both the speakers shared very relevant information based on the current scenario and how Machine Learning helps to make more effective to identify the patients details.

My key learning were two models which they had used and there were some points which I had come across first time like ReMC - CNN - TLSTM technique, text mining in the trials.

**Task-2: Given a patient detail, find its relevant trials**

Patient Details

Disease: Colon cancer  
Gene: Microsatellite Instability (high); MLH1 methylation positive  
Demographic: 65-year-old male  
Other: Hypercholesterolemia, hypertension

**Task-3: IR Search Engine**

- Search engines are unable to capture the semantic complexity and granularity of sophisticated queries
- "Cancer trials that accept 54+ year old HIV+ male patients."
- Approximating this by searching for "cancer AND HIV" returns approximately 15000 studies that mention both cancer and HIV,
- Manual review of the eligibility criteria from a random sample reveals that the majority of them explicitly exclude patients with HIV.

**BiLSTM-CNN-Attention Network for Inclusion/Exclusion Criteria Identifier**

True label for Sentence

Fully connected layer with activation

Relation Aware Self Attention Mechanism

Bi-Directional LSTM

CNN with Max-pooling

Word embeddings

Character Embeddings

Intravenous azithromycin induced ototoxicity

Question: Kilauea in Hawaii is the world's most continuously active volcano. Very active volcanoes characteristically eject red-hot rocks and lava rather than this?

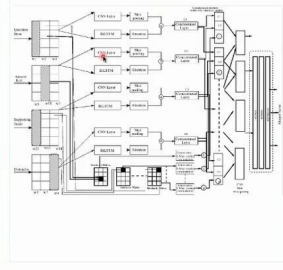
Distractor1: greenhouse gases,      Distractor2: carbon and smog,      Distractor3: magma,      Correct-answer: smoke and ash

(Support): "Example 3.5 Calculating Projectile Motion: Hot Rock Projectile Kilauea in Hawaii is the world's most continuously active volcano. Very active volcanoes characteristically eject red-hot rocks and lava rather than smoke and ash. Suppose a large rock is ejected from the volcano with a speed of 25.0 m/s and at an angle 35.0° above the horizontal, as shown in Figure 3.40. The rock strikes the side of the volcano at an altitude 20.0 m lower than its starting point. (a) Calculate the time it takes the rock to follow this path. (b) What are the magnitude and direction of the rock's velocity at impact?"



### Methodology

- We first convert each element of the tuples into a semantic representative vector, using the semantically informed CNN+BiLSTM model.
- Then, an inverted pair wise semantic vector is computed by taking the element-wise inverted difference of each vector in the word sequence representations.
- The resulting difference is the discriminating representative vector of each of the qi, ki, si, Di pairs.



### Results

Results of experiments demonstrating ranking performance (rounded off to next integer) in terms of precision (P@3), mean average precision (MAP@10), normalized discounted cumulative gain (NDCG@10), and mean reciprocal rank (MRR) across the three datasets.

Model	Embeddings	Dataset-1				Dataset-2			
		P@3	MAP@10	NDCG@10	MRR	P@3	MAP@10	NDCG@10	MRR
CNN	GLOVe	14	15	15	16	16	17	17	18
	FastText	17	18	19	19	18	20	20	21
	ELMo	18	18	19	21	18	16	17	21
BiLSTM	GLOVe	16	17	19	19	16	16	17	19
	FastText	19	19	22	22	17	17	18	20
	ELMo	34	37	38	37	18	17	19	21
CNN+ BiLSTM-att	GLOVe	27	27	29	27	27	26	28	32
	FastText	31	33	38	37	31	29	32	33
	ELMo	45	44	44	47	37	39	38	42
S-CNN+ BiLSTM-att	GLOVe	34	33	41	47	33	39	38	42
	FastText	47	45	45	51	37	39	46	48
	ELMo	53	47	49	60	49	53	56	58
BERT-base	ELMo	51	43	43	57	43	51	53	53

## Session - 6 (10th December 2020) : Extracting Concepts and Relations from Textual Documents (Dr. Sourish Dasgupta Founder and CEO Rygbee and Professor at DAIICT)

The session started with the foundation of Information Extraction, what is Information Extractions, key challenges and solving the problems. He explained what kind of problems need to be solved, how we break down complex problems and setting the context. Then he discussed simplified event calculus, semantic role representation: knowledge graph, LSTM based Embedding with example.

He also shared how predictive models work in this scenario with the example of Smart TV. He discussed different alternative models with the same example.

After that he discussed how to select domains, techniques and differences between core and peripheral concepts.

The main point of this session was information extraction techniques and how Machine Learning can be used for that. Expert had good commands on topics and experience. His explanation was very much informative especially he used the same example for all the different techniques.

My key learnings were what exactly information extraction, how to work on complex problems, LSTM(Long Short term memory) based embedding.

### Setting the context

- "The smart TV costs 75,000 INR. John has 25,000 INR with him."
  - How much money should John borrow from Joe to buy the smart TV?
- "John is currently with RAX Labs Inc."
  - Which company does John work in?
- "John is fifteen miles away from his home. He is currently in Manhattan, New York."
  - In which city does John live?

### "The smart TV costs 75,000 INR.": Shallow parsing

The smart TV                      costs                      75,000 INR.  
NOUN                                      VERB                                      PROPN

- Rule 1 (naive):  
verb(Wi) & noun-phrase(Wi-1) & proper\_noun\_phrase(Wi+1) & SUFFIX(Wi+1, CURRENCY) → cost(Wi-1, PRICE(Wi+1))
- Rule 2: buy(X, Y) → costs(Y, PRICE(Z))
  - X: John
  - Y: Smart TV
  - Z: 75,000 INR



### "The smart TV costs 75,000 INR.": Deep Parsing

Rule 1:  $\text{subject}(\text{verb}(W_i), \text{noun-phrase}(W_{i+1}))$  &  $\text{object}(\text{verb}(W_i), \text{noun-phrase}(W_{i+1}))$  &  $\text{SUFFIX}(W_{i+1}, \text{CURRENCY}) \rightarrow \text{cost}(W_{i+1}, \text{PRICE}(W_{i+1}))$

Rule 2:  $\text{buy}(X, Y) \rightarrow \text{costs}(Y, \text{PRICE}(Z))$

- X: John
- Y: Smart TV
- Z: 75,000 INR

### "The smart TV costs 75,000 INR.": LSTM-based Embedding (1)

The "passing the ball" game

$$f_t = \sigma(W_f \cdot [h_{t-1}, x_t] + b_f) \rightarrow \hat{C}_t = \tanh(W_C \cdot [h_{t-1}, x_t] + b_C) \quad C_t = f_t * C_{t-1} + i_t * \hat{C}_t$$

$$i_t = \sigma(W_i \cdot [h_{t-1}, x_t] + b_i)$$

### "The smart TV costs 75,000 INR."

More sophisticated and powerful (alternative) models

### Identifying the domain on-the-fly

## Session - 7 (11th December 2020) : Machine Learning for Biomedical Signals (Dr. Udit Satija, Assistant Professor, IIT Patna)

The session started with the basics of Machine Learning concept and features related to data Machine Learning evaluation, types of machine learning. He discussed Artificial neuron, forward and backward propagation methods with examples. After that he explained the Complete Neural Network chart in detail. Then he started Machine Learning for Biomedical signals with the context of unsupervised manner, typical machine learning structure, training for ML model.

He discussed Convolution layer, Relu layer, Stacking. He shared one example of 1-Dimension CNN based metal tasks classification from EEG signal and features in that, main parameters for the same like Stride and padding, activation function.

Overall session had two main parts like the basics of Machine Learning and the second part was how to use machine learning models for biomedical signals. Exerts had explained very well with relevant examples.

My key learnings were Complete architecture of Neural network, artificial neural concepts, working of different layers like Relu and convolution layer and how to define activation function for the given problem.



### Machine Learning and its Evolution

**Problem Space:**

- To deal with real-life matters or situations through computer
  - Challenging for human but simple for computer e.g. chess
  - Challenging for computer but simple for human e.g. object recognition
- To develop intelligently behaving systems

**Turing test for intelligence:** Alan Turing stated "To be called intelligent, a machine should produce responses that are indistinguishable from those of a human"

Figure 2: Evolution of Learning a Machine

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### Machine Learning Evolution

#### The simplest hypothesis set: Perceptron (Artificial neuron)

- Basic building block of a neural network, inspired from biological neuron.

Figure 6: Analogy between biological neuron and artificial neuron [1]. Here,  $X_1, \dots, X_n$  are the inputs to neuron,  $W_1, \dots, W_n$  are the respective weights and  $Y$  is the output.

**Universal Approximation Theorem:** Any function can be arbitrarily approximated by a feedforward network with only one hidden layer.  
Ref: Vera Kůrková, Kolmogorov's theorem and multilayer neural networks, Neural Networks, Vol. 5 (3), 1992, Pages 501-506.

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### Machine Learning Evolution

#### Complete Neural Network Chart

A visually complete chart of Neural Networks

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### ML for Biomedical Signals

#### Typical ML Structure

Figure 9: Typical ML Structure

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### Deep Neural Network: Convolutional Neural Network

#### An example architecture for 1D-CNN based mental tasks classification from EEG signal

Figure 19: An example architecture of 1-D CNN for classification of mental tasks from EEG signal. Conv1D denotes 1-D convolution layer, Maxpool1D denotes max pooling 1-D layer, ReLU denotes rectified linear unit, and M denotes the number of classes.

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### Deep Neural Network: Convolutional Neural Network

#### Activation functions-contd. [7, 8, 9]

**ELU**

- Hidden layer.
- More robust.
- Gradient gradually decreases.

**Swish**

- Hidden layer.
- Non-monotonic.
- Better for deeper networks.

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## Session - 8 (11th December 2020) : Trends in Hardware Design for Audio/Speech Neural Network Applications (Dr. Nilesh Vaishnav, Lead Design Engineer, Cadence Design Systems, Audio R&D Group)

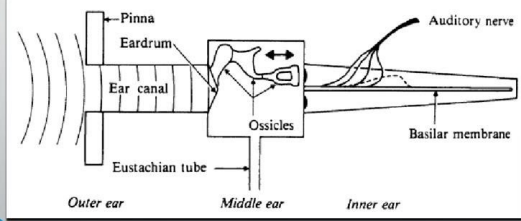
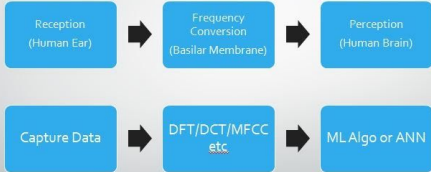
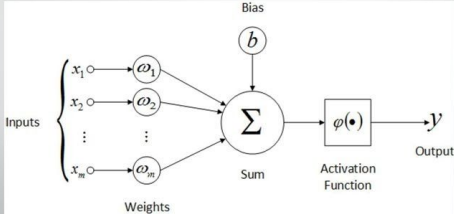
The session started with introduction of sound and human hearing patterns where he discussed sound production, propagation and reception. He explained the Human Auditory system in detail with different parts how it is working and getting the data. Then he explained the human auditory system with a basilar membrane and its frequency characteristics.



After that he discussed processing of speech and audio where he talked about process for the simplified view of hearing in that he explained the process from reception to perception and capturing data to Machine learning algorithm (ANN).

He discussed the difference between audio/speech and Image in the context of frequency transform and asynchronous processing. He also discussed emerging trends in speech processing. Then he explained Artificial Neural Network, basic building block of Neuron, ANN - training and evaluation, ANN architecture, ANN edge computing, difference between cloud computing and edge computing. At last he discussed the design and role of CPU in the ANN. This session touched many areas very effectively. Experts had explained everything in detail with examples. The session was very informative.

My key learnings from this session were basic speech recognition system (hearing and sound) , basics of neuron and artificial neural networks with architecture, edge computing which was new to me and the role of CPU while working with ANN.

<h3>A Hardware Perspective on Artificial Neural Networks for Speech and Audio</h3> <p>Dr Nileshekumar Vaishnav, Lead Design Engineer, Cadence Design Systems</p>	<h3>Human Auditory System</h3> 
<h3>A Simplified View of Hearing</h3> 	<h3>Basic Building Block: Neuron</h3> 
<h3>Cloud Computing vs Edge Computing</h3> <ul style="list-style-type: none"> <li>• Cloud Computing <ul style="list-style-type: none"> <li>• Data is transmitted by a terminal device (eg smartphone) to a cloud</li> <li>• Processing using ANN takes place in cloud</li> <li>• Result of processing is transmitted back to terminal device</li> </ul> </li> <li>• Edge Computing <ul style="list-style-type: none"> <li>• Data is processed at the terminal device without interaction with cloud/server</li> </ul> </li> </ul>	<h3>Neuron O/P Evaluation on Custom CPU</h3> <ul style="list-style-type: none"> <li>• Set accumulator A = 0</li> <li>• Loop 4 times: <ul style="list-style-type: none"> <li>• LOAD2: Load <math>x_i</math>s into register R1 (16-bit)</li> <li>• LOAD2: Load <math>x_i</math>s into register R2 (16-bit)</li> <li>• LOAD4: Load <math>w_i</math>s into register R3 (8-bit)</li> <li>• MAC_H: Compute A using R1 and R3</li> <li>• MAC_L: Compute A using R2 and R3</li> </ul> </li> <li>• RELU: Compute <math>A = \text{ReLU}(A)</math></li> <li>• STORE: Store relevant 16-bits from A to y</li> </ul> <div style="border: 1px solid blue; background-color: #007bff; color: white; padding: 5px; text-align: center;"> Cycles &lt; 25 4X GAIN </div>



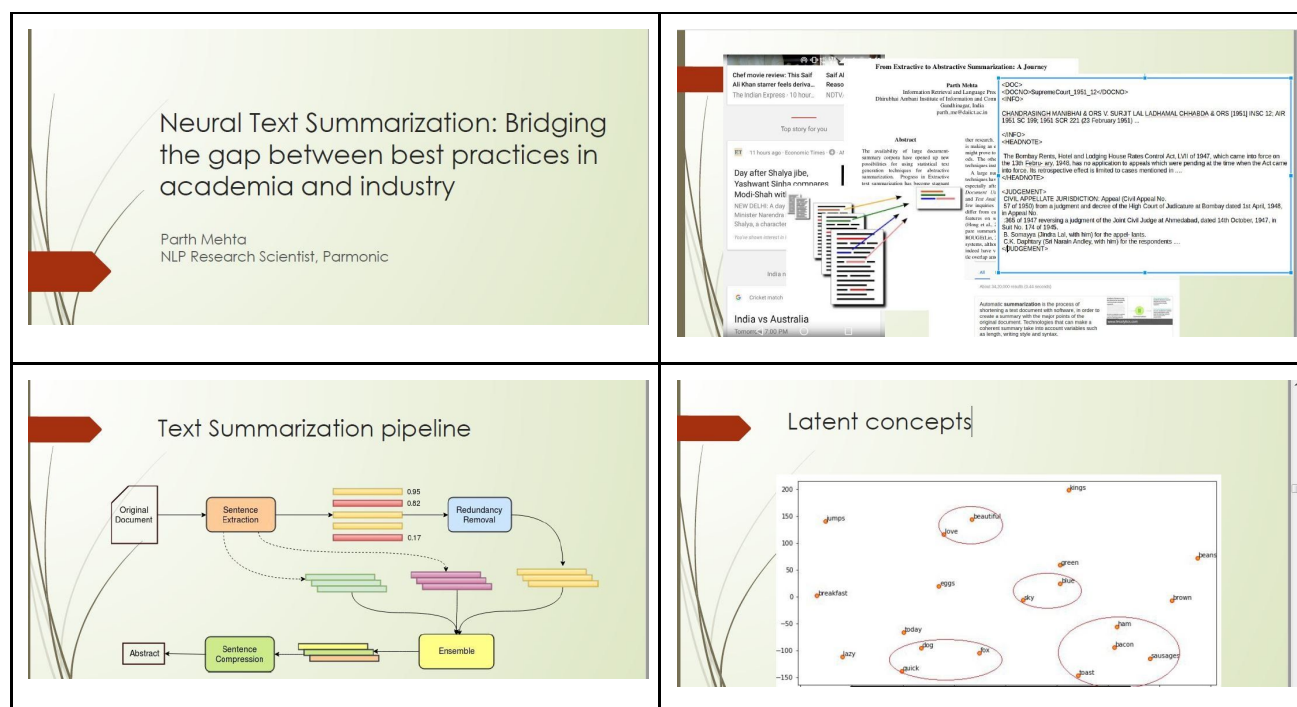
## Session - 9 (12th December 2020) : Neural Text Summarization: Bridging the gap between best practices in academia and industry (Dr. Parth Mehta, NLP Research Scientist, Parmonic)

The session started with an automatic summarization process where he explained from basic and how it creates a subset which represents the most important or relevant information within the original content with example. Then he explained about Extractive and Abstractive summarization techniques.

He discussed the Text Summarization pipeline process in detail where he explained how the original document goes to the different process or steps like sentence extractions based on the given parameters, redundancy removal to ensemble, sentence compression and last abstract data. He discussed numeric representation of text, use of one hot encoding and tf-idf vectors, latent concepts.

After that he shared how recurrent neural networks, sequence to sequence modeling, In the second part he explained about the Evaluation and benchmarking in academia, types of errors and the whole process of data creation to model training and two different approaches like evaluation & benchmarking to publish and beta testing to production. He also shared priority with respect to industry, challenges in deploying to production.

The whole session was new to me with all the context. Everything was the key learnings for me from the session. Expert was confident and informative with his way while explaining with real life examples.







**Session - 10 (12th December 2020) : Knowledge Extraction from Text Narratives and its Applications** (Mr. Nitin Ramrakhiyani, Researcher, (TRDDC), Dr. Sachin Pawar, Researcher, (TRDDC))

Session started with basics of knowledge extraction from text and examples. First Mr Nitin Ramrakhiyani discussed SRL (Semantic Role Labelling) where he shared how SRL and semantic work on sentences and arguments. Then he discusses lexical databases- WordNet, where nouns, verbs, adjectives and adverbs are grouped into sets of cognitive synonyms.

He also discussed Synsets which are interlinked by means of conceptual semantic and lexical relations hypernymy, hyponymy, meronymy and holonymy. Then he discussed open information extractions.

After that Dr. Sachin Pawar explained Knowledge Representation:Message Sequence Charts(MSC) with simple message sequence chart and events for MSC using precedence graph where he also discussed how to extract form text, interaction identification, message creation and temporal ordering with research paper reference.

He shared about the basic actor mention identification with type and synets. Then he gave background for MLN(Markov Logic Networks) with first order logic to write rules, MLN networks for example.

Both the experts were very impressive and full of knowledge in their fields. Again the whole concepts new to me so whatever they had explained, everything was key learnings to me.



### Semantic Role Labelling (SRL)

- SRL  $\in$  Semantics Layer of the NLP Pyramid
- Limitations of syntax / grammar based representation
  - John broke the window.
  - The door opened.
  - Syntactic subjects (John, The door) are not necessarily semantic subjects (Agents)
- Semantic Role Labelling:** Shallow semantic representation of text in the form of predicate-argument structures
  - Predicates: represent events / interactions (e.g., *break*, *open*)
  - Arguments: represent various semantic roles such as **Agent** (John), **Theme** (the window, The door)
  - More Arguments: Experiencers, Locations, Times, Manner, Purpose
- Try your hand at it: <https://demo.allennlp.org/semantic-role-labeling/>

### MSC as a Knowledge Representation

Visual abstraction of interactions among entities in a scenario

Formal representation with inference and reasoning facility

### Markov Logic Networks (MLN): Example

- First-order Logic Rules:
  - $Smokes(x) \Rightarrow Cancer(x)$ ,  $wt = 1.1$
  - $Friends(x, y) \Rightarrow (Smokes(x) \Leftrightarrow Smokes(y))$ ,  $wt = 1.5$
- Domain: {A,B}

$P(Smokes(B) | (Cancer(A) \wedge Friends(A, B)) = ?$

### SRL based approach : B2

- B2** maps each verbal predicate (in the SRL output) corresponding an interaction verb to a set of messages.
- Senders:** Actors corresponding to A0 arguments of a verbal predicate
- Receivers:** Actors corresponding to other arguments (A1, A2, ...)
- e.g., Peter *described* John as very polite.
- Message:** (Peter, *described*, John)

1	Peter	peter	NNP	2	SBJ	—	A0
2	described	describe	VBD	0	ROOT	describe.01	—
3	John	john	NNP	2	OBJ	—	A1
4	as	as	IN	2	ADV	—	A2
5	very	very	RB	6	AMOD	—	—
6	polite	polite	JJ	4	PMOD	—	—
7	.	.	.	2	P	—	—

### Application:

Extracting MSCs from Software use-cases

### Results (1/2)

Query	R-Precision (R-Prec)			
	B1	B2	B3	M1 M2
q1: Which are the cases where a husband has set his wife on fire?	0.13	0.00	0.50	0.63 0.63
q2: Which are the cases where the appellant has attacked the deceased?	0.21	0.10	0.24	0.28 0.45
q3: Which are the cases where the respondent killed the deceased?	0.00	0.00	0.0	1.00 1.00
q4: Which are the cases where the appellant demanded money?	0.06	0.13	0.0	0.56 0.75
q5: Which are the cases where the respondent has forged signatures?	0.00	0.00	0.25	0.75 0.75
q6: Which are the cases where the appellant accepted bribe?	0.00	0.00	0.17	0.33 0.50
q7: Which are the cases where an appointment was challenged?	0.14	0.14	0.00	0.43 0.57
q8: Which are the cases where an election was challenged?	0.08	0.31	0.08	0.38 0.46
q9: Which are the cases where the complainant was beaten by wife?	0.00	0.00	1.00	1.00 1.00
q10: Which are the cases where the respondent has admitted the charge?	0.00	0.00	0.00	1.00 1.00
Average over all queries	0.06	0.07	0.22	0.64 0.71

All the sessions were very well organized and full of knowledge. All the experts also had good knowledge and effective mode of presentations where we were able to understand all the points even if it was new to me. There were points which were new to me but I was able to connect with all those topics. They all also cleared all the doubts of ours during the sessions. Even they have shared their Email ID with us for further discussion. I would like to give my sincere thanks to all of them.

I would like to thank Dr. Kamal Captain, Dr. Kirti Inamdar and Electronics Department of SVNIT-Surat for organizing such kind of STTP. Both the faculty members were very supportive throughout the sessions.

I would like to thank all the participants who made the whole STTP interactive and fruitful by sharing their experience and knowledge.

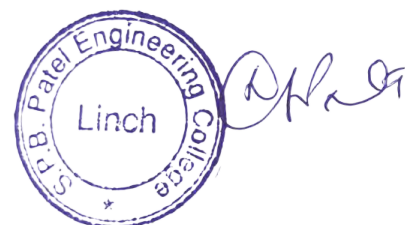
Last but not the least, I would like to thank Prof. Chitralekha Nahar (Vice Principal), Dr. Gulab Bhambhaniya (Management Representative) and the Management for motivating and allowing me to attend such kind of STTP where I can share my knowledge with the department and students of our



college. Once again thanking you for granting me permission to attend this STTP which helped me to open up the vision in the latest trends and technologies with respect to industry perspective.



Yours Sincerely,  
Prof. Akshay Kansara







**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Graduate School of Engineering and Technology**



**CERTIFICATE OF PARTICIPATION**

Certi. No.: GTU/GSET/2020/10/027/005

*This is to certify that*

*Dr. / Mr. / Ms.* Avani K Dedhia ,

*has successfully participated in*

Online Short Term Training Program on "Emerging Software in Civil Engineering"

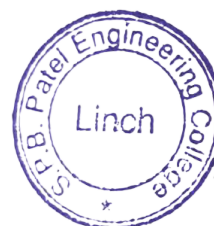
*in association with*

Center of Excellence - Design Center

during 07<sup>th</sup> December 2020 to 11<sup>th</sup> December 2020

**Prof. (Dr.) Sanjay Chauhan**  
**Director - DIC, GIC**

**Prof. (Dr.) S. D. Panchal**  
**Director - GSET, GTU**







**Saffrony Institute of Technology**  
**S.P.B. Patel Engineering College**  
**Linch-Mehsana-384435**

*ATAL - FDP*

**Report on 'Five Days Workshop on AI in Healthcare Economics Outcome Research'**

**Name of Resource Person:**

1. Prof. Pramil Tiwari (NIPER SAS Nagar)
2. Prof. Shankar Prinja (PGIMER Mohali)
3. Ms. Richa Goyal (IQVIA)
4. Dr. D. Prabhakaran (Vice President (Research and Policy) and Director, Centre for Control of Chronic Conditions, PHFI)
5. Dr. Kavita Lamror, Director, RWI, Sanofi, Mumbai
6. Dr Sameer Dhingra, Associate Prof, NIPER Hajipur
7. Dr. Javed Shaikh, Novartis Healthcare Private Limited, Hyd
8. Dr. Mahendra Rai, Evarsana, Mumbai
9. Dr. Jane Reed, IQVIA
10. Dr. Kashif Siddiqui, Parexel, Panchkula
11. Dr. Santosh Tiwari, Novartis Healthcare Private Limited
12. Dr. Dr. M. Karthikeyan, NCL, Pune
13. Dr. Ashutosh Kumar, NIPER Kolkata
14. Mr. Varun Upadhyay, National Project Coordinator, Arts of Living, Bengaluru

**Date:** April 2<sup>nd</sup> to 6<sup>th</sup>, 2021

**Duration:** 10:30 am to 4:00 pm

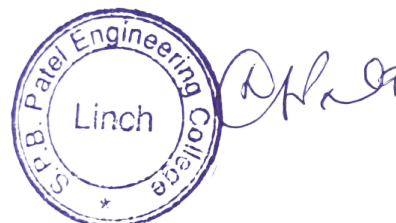
**Venue:** Virtual Mode

**No. of Participants:** 80+ participants

**Team Member from Saffrony Institute of Technology:** Hima Soni (Assistant Professor)

**Introduction and Objective:**

This workshop was aimed to raise awareness about the emerging technology called Artificial Intelligence, Machine Learning & Deep Learning in Health Economics Outcome Research (HEOR). The flow of the workshop was from basic to the very high end. The main objective of the workshop was to make participants aware of all the tools and technologies, which can be used to develop projects related to AI/ML for Health Care dataset and domain. To give an idea about, in which areas, we can apply this technology.





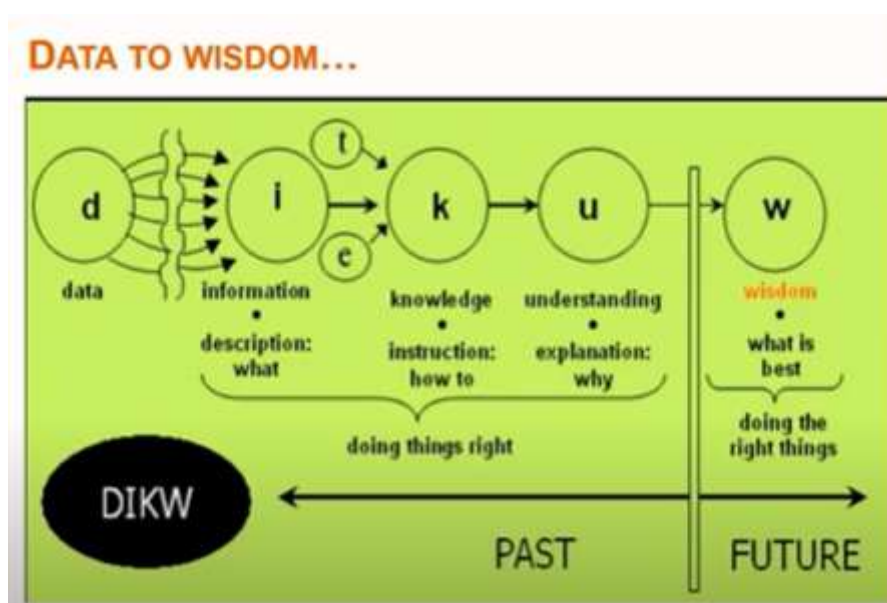
## Workshop Details:

**Day – 1 (August 2<sup>nd</sup>, 2021)**

### First Session [Prof. Pramil Tiwari (NIPER SAS Nagar)]

The very first session was on the Real-World Evidence in Healthcare Systems. To understand the domain knowledge which provides enough ideas and problem definitions, first we need to be aware about terminologies of HEOR and its use cases, which are also of equally important.

The best part was that Prof. Pramil Tiwari started with a very basic element and focused more on making our base strong. Data to Wisdom pyramid was explained in detail by using flow diagram shown below:



Prof. Pramil Tiwari has started his presentation with the basic elements of medicine and history of the same. He concluded this session by integrating all the concepts of Pharmacy, Health care and case studies.

**Skill to be noted:** Case study-based presentation!

### Second Session [Prof. Shankar Prinja (PGIMER Mohali)]

His session was on Health Economics Outcome Research: An Overview. This session was A to Z of HEOR.

**Skill to be noted:** Very well-structured information has been presented.

### Third Session [Ms. Richa Goyal (IQVIA)]

Her session was mainly on fundamentals of Machine Learning and Deep Learning. Ms. Richa Goyal has shared types of Machine Learning techniques such as Supervised Learning,



Unsupervised learning, and Reinforcement learning. Also, she shared an introduction to neural networks. She did not stop there and also shared various algorithms of Machine Learning and its applications. HERO in IQVIA was her main focus.

## Artificial Intelligence: Basics

### Overview

Human brain is the most complex structure and has several capabilities including perception, reception, learning and problem solving, decision making, linguistic abstraction and generalization, creativity, pattern recognition, forecasting and more.....



Intelligence is the ability to understand an issue or problem, and by applying previous knowledge and solve it



Artificial intelligence (AI) is the use of machines to perform processes that mimic this capability. AI integrates multiple cognitive functions to sense, cognize and perform tasks



IQVIA

### Natural Language

To establish the structure between word in text (Syntax)

To help understand the semantics (meaning) & pragmatics (context)

Data segregation is facilitated by supervised machine learning (Deductive) i.e., linking the statements to cluster as per 'code book' & unsupervised machine learning (Inductive)

### Machine Learning

Machine learns from 'experience' and tunes the algorithm over time

To transform data into intelligent action and perform a specific task

Vast data based on patient's history, epidemiology, disease etiology, treatment courses, diagnostic interventions and compliance record need to be put as 'experience'



### Text Data Analysis

To reduce the unstructured data complexity

Bring uniformity for everyone's understanding.

To enable the comparative effective research (CER) to reach a conclusion in no time.

Cost benefit analysis & cost utility analysis of HEOR

### Deep Learning

Helps in understanding large amount of data with multiple hidden layers in a neural network, increasing computer power over very large & complex datasets.

Burden of illness studies, which are aimed to determine the health care resource use, cost and humanistic impact of a given condition, will require multiple data from multiple sources, including patients, providers and health care systems.

Combinations of datasets from epidemiologic surveys or registries, claim datasets and patient surveys are used in order to achieve this goal.

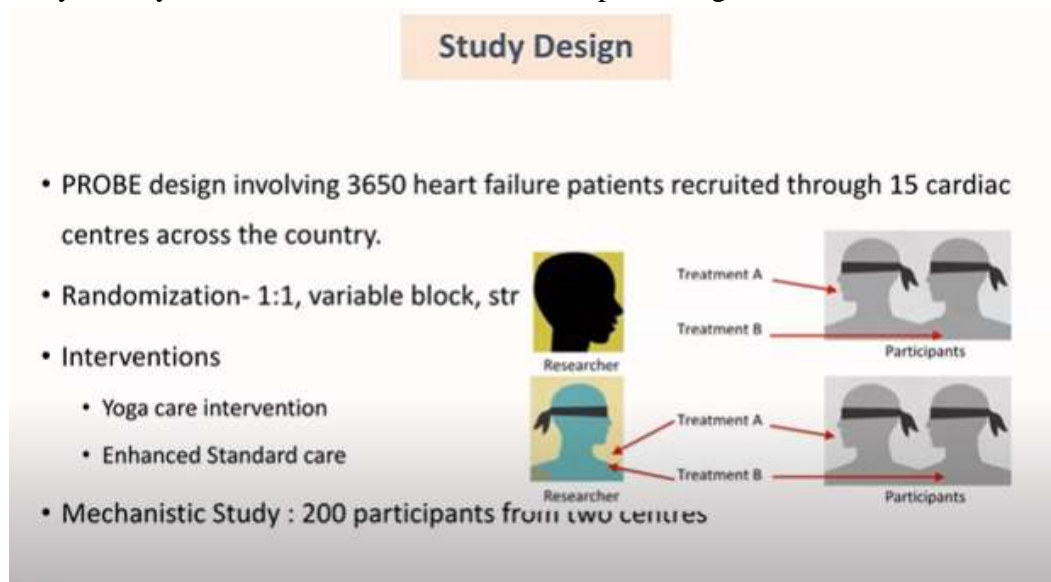
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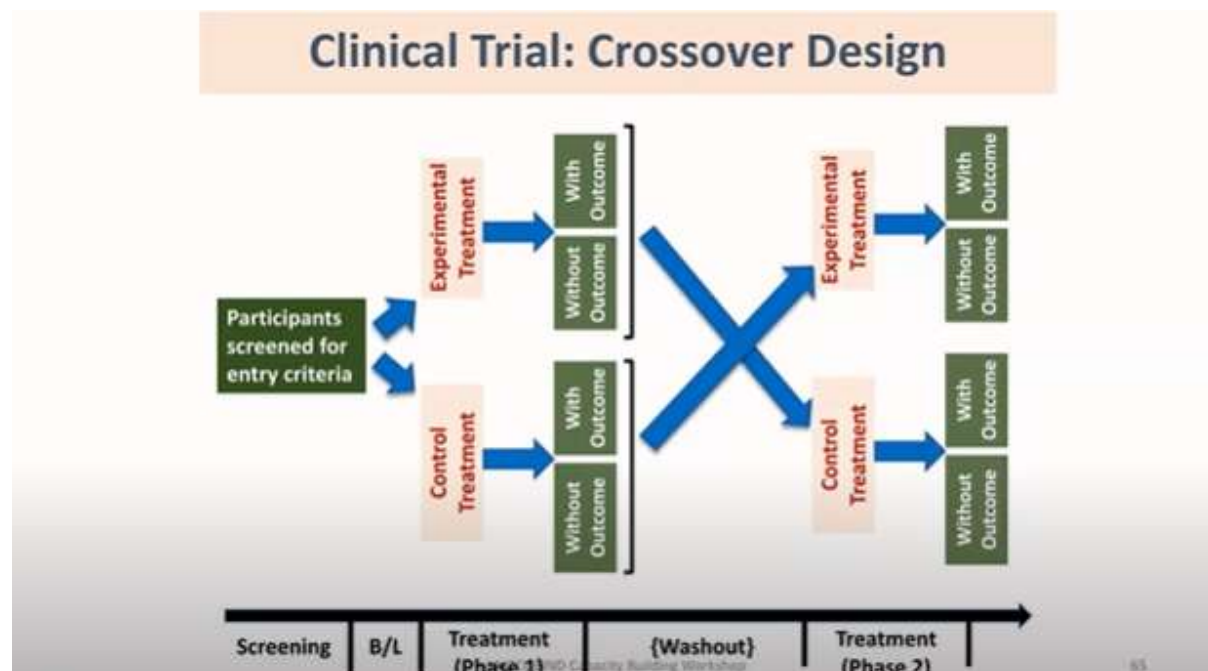
## Day – 2 (August 2nd, 2021)

### **First Session [Dr. D. Prabhakaran (Vice President (Research and Policy) and Director, Centre for Control of Chronic Conditions, PHFI)]**

On day-1, we learned theoretical aspects of AI in HEOR and then on day-2, Dr. D. Prabhakaran had explained practical aspects of the same. The session was on Nuts and Bolts of Clinical trials. Firstly, he shared about his own experiences and then shared real time projects. He gave us a clarity of why one should use clinical trials for predicting outcomes.



He concluded the session with the technological benefits, some of the pitfalls and future of Clinical Trials.





## Second Session [Dr. Kavita Lamror, Director, RWI, Sanofi, Mumbai]

It was one of the amazing contributions of Machine Learning to healthcare. The key feature of this session was totally case study based.

### Common Uses of ML in Healthcare

- Most investments are focused on EHR system management and risk predictions
- Helps with better patient engagement and improved clinical quality
- Improvement in administrative productivity
- Uncover new revenue opportunities to date
- Top 5 predicted investment:
  1. Telemedicine
  2. Process automation
  3. Delivery of patient care
  4. Clinical trials
  5. Patient diagnosis

Kavita mam has also shared why they have used algorithm. and how they have collected data for research. In this session we understood that for even collecting data we need to take contracts from different agencies.

### Supervised vs. Unsupervised vs Reinforcement Learning

Criteria	Supervised ML	Unsupervised ML	Reinforcement ML
Definition	Learns by using labelled data	Trained using unlabelled data without any guidance.	Works on interacting with the environment
Type of data	Labelled data	Unlabelled data	No – predefined data
Type of problems	Regression and Classification	Association and Clustering	Exploitation or Exploration
Supervision	Extra supervision	No supervision	No-some supervision
Algorithms	Linear Regression, Logistic Regression, SVM, GAM	K – Means, C – Means, Apriori	Q – Learning, SARSA
Aim	Calculate outcomes	Discover underlying patterns	Learn a series of action
Application	Diagnosis from imaging, cost of treatment	Discover patterns/trends in population health	Dynamic treatment regimen, Automated diagnosis, Drug discovery

Sir also explained about how different versions of the data set matter while training in the domain of healthcare and pharmacy.

A speciality of this session was this session has given a reality of various AL-ML models and its application.



### Interpretability of ML Models

- Most common models are supervised learning models
- Definition of interpretability: transparency of the machine learning system i.e., the algorithm, features, parameters and the resultant model should be comprehensible by the end user
- At the feature level, the semantics of the features should be understandable
- User trust: ML model should give an explanation of why it is making a prediction or giving a recommendation for high "user trust"
- Easy interpretability: Decision trees, regression models
- Difficult to interpret: Support vector machine, Random forest, Neural network
- Context: Interpretability to end-user generating different explanations for different end users (e.g. an explanation model for a risk of readmission prediction model to be consumed by a hospital discharge planner vs. a physician may necessitate different explanations for the same risk score)

After explaining various ways regarding how Big Pharma is Evolving, she had concluded the session.

### How is Big Pharma Evolving

- Collaboration with research universities
- Investing in emerging biopharma companies
- Collaborations with technology firms
- Expanding digital/technology functions to accommodate data, AI, and analytics skills
- Data democratization and access (EMR, claims, omics, lab tests, IoT, safety data)
- Evolving common data models
- Engaging in conversations with regulatory bodies
- Increasing patient engagement in drug development process

### Third Session [Dr Sameer Dhingra, Associate Prof, NIPER Hajipur]

He started his session with a real process of learning Pharmacovigilance. The presentation was very simple but very informative. This session was a little challenging to understand but first slide of the presentation helped to understand the need of Pharmacovigilance.





### Challenges (2/2)

- Product value is increasingly being questioned by patients, physicians, payers and policy makers
- Pharmaceutical product value is increasingly being questioned by healthcare stakeholders (patients, physicians, payers and policy makers)
- HE&OR conducts studies and develops models to quantify differential value for a pharmaceutical products

Patients	Physicians	Payers	Policy Makers
<ul style="list-style-type: none"> <li>Will this newer treatment improve my survival?</li> <li>Will this newer treatment improve my quality of life?</li> <li>Why is this treatment so expensive?</li> <li>Give me real-life examples</li> </ul>	<ul style="list-style-type: none"> <li>Show us the performance of the newer drug as an improvement in primary and secondary outcomes</li> <li>Is this a cost-effective option?</li> <li>Can you show us the real-world evidence of the newer therapy?</li> </ul>	<ul style="list-style-type: none"> <li>Is this drug therapy needed?</li> <li>How safe and efficacious is this treatment?</li> <li>Is this a cost-effective option?</li> <li>Can you show us the comparative or relative effectiveness?</li> </ul>	<ul style="list-style-type: none"> <li>Can this new treatment provide performance-based pricing?</li> <li>Can you produce any economic analysis?</li> <li>Does this treatment qualify for comparative effectiveness?</li> <li>Can you show us real-world evidence?</li> </ul>

Stepwise Drug side effects and challenges in terms of Patients, Physicians, Payers & Policy Makers have been covered at the end of this session.



## Day – 3 (August 2nd, 2021)

### First Session [Dr. Javed Shaikh, Novartis Healthcare Private Limited, Hyd]

The session was on Real World Evidence: What, Why, and How? Started with What part and covered it with all respects. Also clarifies about big data along with RWD. Research Purpose upon RWD was added. Somehow the difference between RCT and RWD is minor, but it is notable as shown below.

Differences between RCTs and RWE studies		
	RCTs	RWE studies
Outcome assessed	Efficacy, safety	Real world effectiveness and safety, HRQoL, costs, resource use, PROs, patient preference, adherence etc.
Tightly controlled?	✓	✗
Higher internal validity?	✓	✗
Higher external validity?	✗	✓
Longer follow-up?	✗	✓
Greater patient numbers?	✗	✓
Data collection	Primary, prospective	Primary or secondary, prospective or retrospective
Familiarity to decision makers	High	Lower

### PROS & CONS of RWD & RCT data

RWD		RCT data	
PROS	CONS	PROS	CONS
•Results generalizable to real-world clinical setting	•Lower reliability of data	•High reliability of data	•Results less generalizable out of controlled setting
•Less selective population	•High possibility of confounding factors and bias	•Low possibility of confounding factors and bias	•Highly selective population*
•Less time and cost	•Validation study needed to validate disease names used		•More time and cost
•Broader possible outcomes	•Less reflective on guidelines		•Narrow spectrum of outcomes

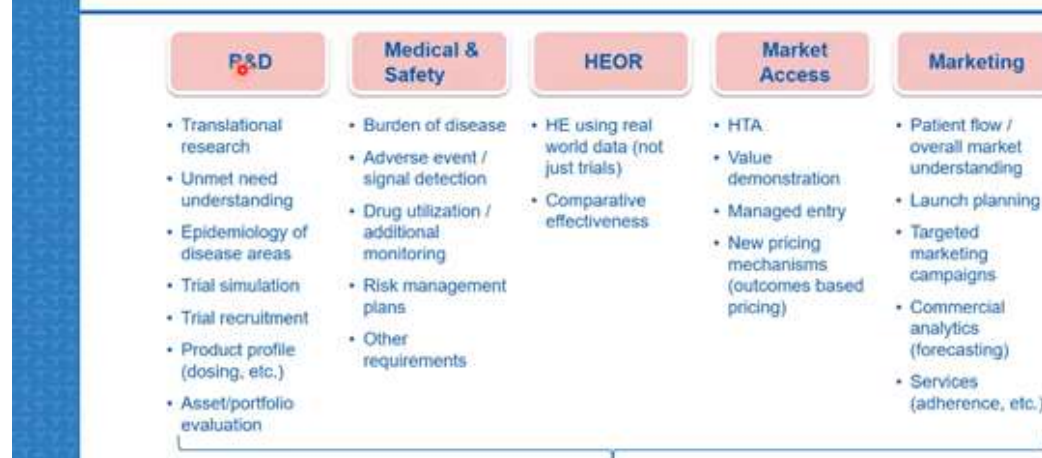


## Evidence hierarchy is not always relevant



Issues with RWD were discussed and shared relevant information for possible solutions. Also, how RWE is introduced in various pillars of Pharma such as P&D, Medical & Safety, HEOR, Market Access and Marketing.

## How RWE is leveraged in Pharma



By explaining different types of RWD, ways to generate RWE, RWE in Indian healthcare setting all those important treasures have been covered and at the end sir had concluded session with challenges in conducting RWE studies in India.



## Challenges in Conducting RWE Studies in India

### Data Quality is a big challenge in Retrospective studies

- Insulin Brand study- Missing baseline values in patient charts, follow-up data missing at some of the visits
- Antifungal- Single center, Had to find the files from Medical records department

### Prospective Studies

- No guidelines for conduct of study so lot of variability in the way these studies are conducted- some sponsors want the complete process to be followed as in a clinical trial
- Budget and effort mismatch- because of the clinical trial execution methodologies followed
- Investigators not compensated well for time and effort



## Second Session [Dr. Mahendra Rai, Evarsana, Mumbai]

It was on Real World Data in the Indian Healthcare system. Sir has started with the explanation of the National Health digital mission. Concluded the session by explaining various RWE trends & Future.

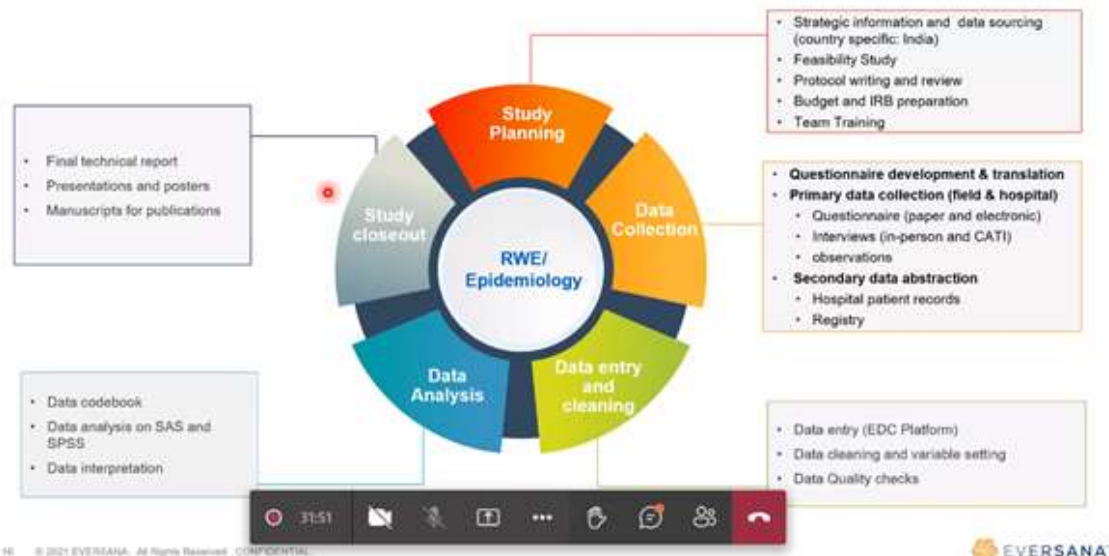
## National Digital Health Mission (NDHM)

The National Digital Health Mission (NDHM) aims to develop the backbone necessary to support the integrated digital health infrastructure of the country. It will bridge the existing gap amongst different stakeholders of Healthcare ecosystem through digital highways.





## Study Cycle for RWE Hospital Based Studies in India



## RWE Trends & Future

**RWE Trends & Future**

**Real-world evidence is changing the healthcare industry and impacts across the entire value chain—From improving the protocol designs for clinical trials to optimizing the distribution of care**

- ❖ FDAs worldwide are encouraging to use RWE to expedite the clinical development of newer drugs
- ❖ RWE is gaining more significance in this pandemic where many drugs have been repurposed for COVID-19. For the Emergency Use Applications, RWEs are important to collect data post launch of the vaccines and drugs
- ❖ Use of RWD as synthetic control arms (SCA) in phase 3 studies- Roche Alectinib got approval in 20 EU countries based on synthetic control arm
  - ❖ SCAs have the potential to reduce the number of patients required in traditional control arms, especially active-comparator or standard-of-care arms, thereby decreasing the study cost, accelerating the speed to result, and boosting the overall attractiveness of clinical trial participation for prospective patients.
  - ❖ Regulators have become increasingly open to accepting the results of SCAs as the basis for decisions and are supporting efforts to test their use.
- ❖ Adding to these catalysts, the COVID-19 pandemic is expected to accelerate efforts to expand the use of real-world evidence in the ph

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## Third Session [Dr. Jane Reed, IQVIA]

Dr. Jane Reed along with her assistant conducted this session and it was totally based upon case studies as well as hands on. Every slide of this session was important and well-structured, so I have kept all the slides below.

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### Data-driven decision support is critical



**Lilly CEO:** Lilly is looking for a paradigm shift in their data usage; aiming to half the time taken for a drug to get through clinical trials from the oft-quoted 6-8 years

**Sanofi CDO:** "We have an endemic problem within the industry and that is really because of the silos that have often been created over a period of time."

**AZ EVP:** "We are looking for transformational change; our aspiration is to double or triple productivity in next 10 years."

**Novartis CEO:** "Our odds at Novartis of finding bad decisions, then making the right decisions, go up when we are powered by these machine capabilities and artificial intelligences"

Take control

17:02

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### Effective use of real world data can impact healthcare & pharma

*Real world evidence is critical for healthcare decision making*

- Real world evidence can inform all phases of drug development and commercialization
- Derived from real world data
  - Huge variety of data sources
  - Structured data is tractable for analytics
  - Much data locked in unstructured, uncoded text
- Hiding within those mounds of data is knowledge that could change the life of a patient, or change the world."



Take control

18:11

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Atul Butte, MD, PhD, associate professor of pediatrics, Stanford University.  
<http://hm.stanford.edu/archive/stanford2012/jmmr/article3.html>

Business model type structure of Real-World Evidence helped everyone to understand the implementation side of Natural Language Processing.



## Real World Evidence brings Broad Business Benefits



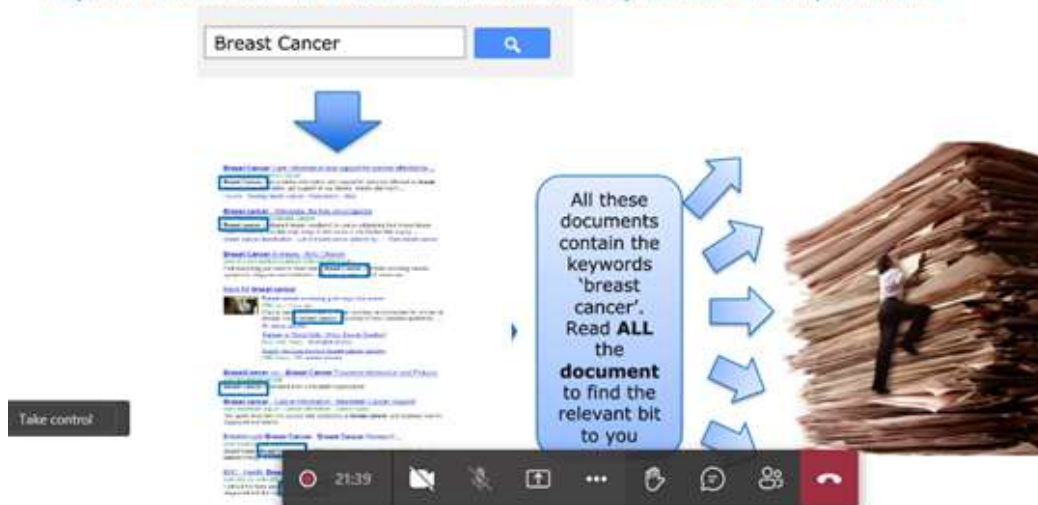
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## The Challenge with Standard Search

Keyword search is limited, resource intensive, not systematic or comprehensive

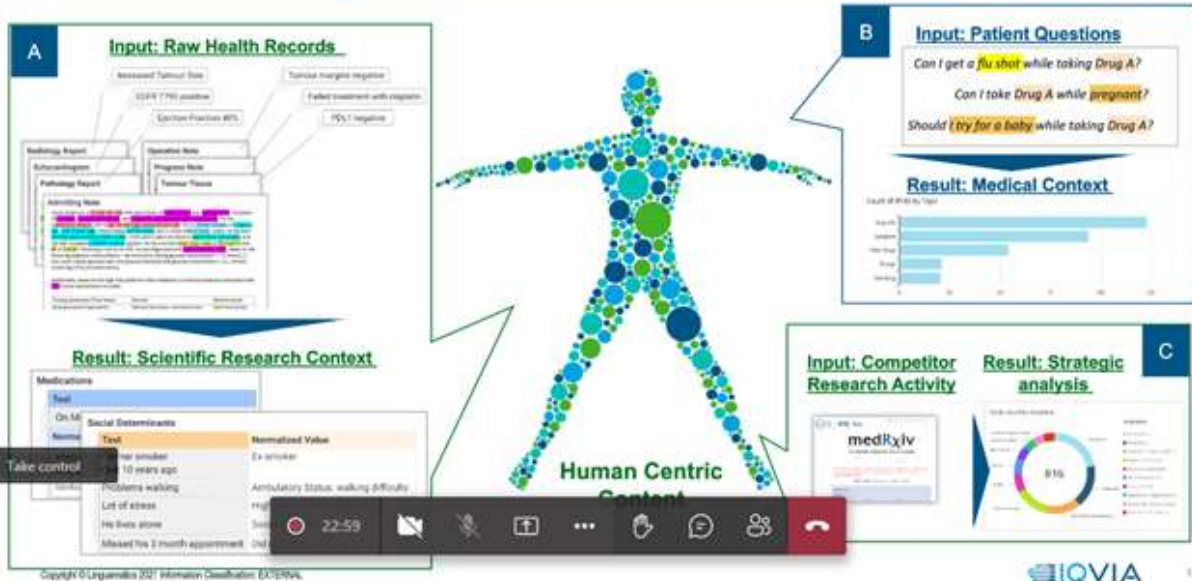


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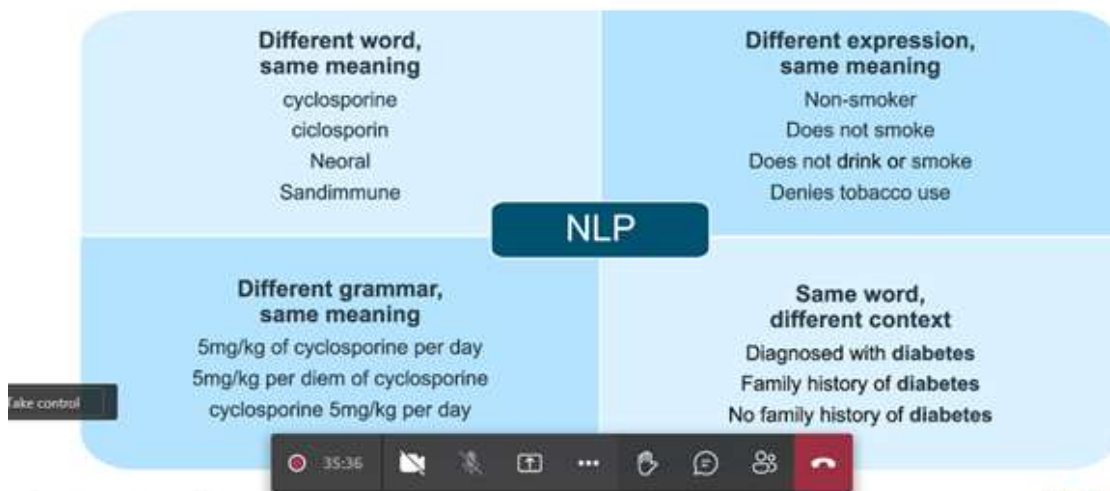


## Uncover scientific, medical and business context with NLP



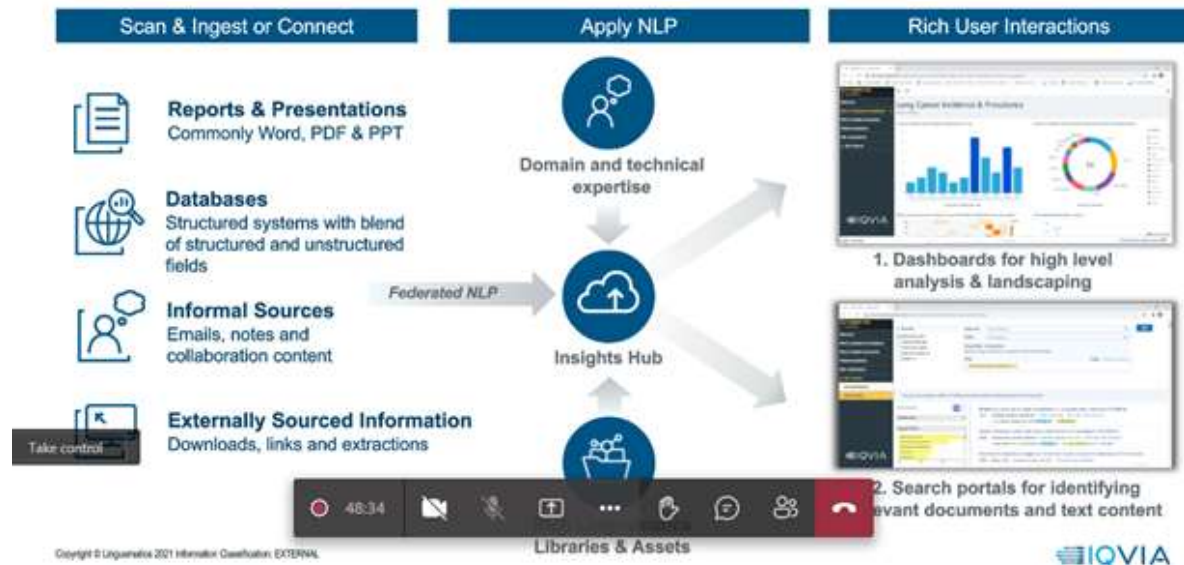
## Natural Language Processing

*Finds information however it is expressed*





## NLP Insights Hub allows users to interact intuitively with unstructured data from across sources



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## NLP brings value for health economics and outcomes

*Accelerate data point and evidence discovery and analysis*



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## NLP Text Mining Approaches for HEOR

- The availability of increasing amount of data on patients, prescriptions, markets, and scientific literature combined with the wider use of comparative effectiveness make traditional keyword based search techniques ineffectual
- Linguamatics NLP provides the starting point for efficiently performing evidence based systematic reviews over very large sets of scientific literature, mining textual data to filter and extract according to different factors. For example:
  - People, patients, cohort size, demographics, geographical location
  - Disease and related topics
    - › Such as disease/condition, medication/treatment
    - › Disease severity and comorbidity
    - › Genetic information
  - Categorization of HEOR and currency amounts
    - › Using thesauri of pre-defined healthcare outcome terms
    - › Pattern- & Rule-based approaches for currency and cost information



Take control  
Citation information e.g. title, date and type



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## Client use cases for NLP transformation to actionable RWE

*Rapid systematic comprehensive extraction of knowledge from streams of unstructured text*

- Top 10 Pharma: Evidence literature landscape for prostate cancer
- Top 10 Pharma: Evidence Landscape from Literature for Drug Economics in LatAm
- Top 10 Pharma: An NLP Insights Hub for influenza in China
- Novo Nordisk: Using NLP to Generate Actionable Insights from Real World Data
- Janssen: RWD for Patient Reported Outcomes from Customer Call Feeds
- Top 10 Pharma: NLP and Machine Learning for Novel Claims for OTC drugs
- Large mid-West Health System; Evaluation of heart failure device performance

Take control



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## Case Studies:

Case studies were explained by Her assistant, and it was demonstrated even. Their software consists of one type of platform.

### Novo Nordisk: Using NLP to generate actionable insights from real world data

**Situation**

- Novo Nordisk wanted to **identify healthcare market trends** and detect patterns from disparate RWD sources
- Sources included **medical information requests, MSL notes, scientific literature, conference abstracts, news and social media**
- Manual scanning** and extraction processes are **labor intensive** and inefficient

**Solution**

- Novo Nordisk wanted an **automated, scalable, and cloud-based** solution
- Linguamatics NLP used to extract key information from all key sources
- Data was visualized in Tableau dashboards, and the workflow automated in AWS for automation and global access

**Results**

- The Linguamatics NLP data extraction workflow replaced the need for manual scanning of RWD and other sources
- With the new system, Novo Nordisk has **reduced manual work** by FTEs, **reduced vendor spend**, **automated the process** of generating insights, and **significantly broadened** access to these insights across a global team.

**Insights**

**Medical Affairs: Oral Semaglutide Insights**

**Insights**

Category	Count
Hyperglycemia	28
Diabetes	15
Gastrointestinal Events	8
Diabetes Complications	7
Insulin Resistance	7
Weight Gain	5
Interactions	5
Renal Issues	3
Insulin Use (Insulin Factor)	3

**Over Time**

**Subcategory**

Subcategory	Count
TM MANAGEMENT	72
SYSTEMIC	43
ESOPHAGITIS	38
PROBLEMS	35
DIABETES STATE	30
PROBLEMS	25
DIABETES MANAGEMENT	15
OTHER NEW PRODUCTS	5

**HCP Type**

HCP Type	Count
PHARMACISTS	209
MD-LEVEL PHARMACISTS	66
PHARMACEUTICALS	36



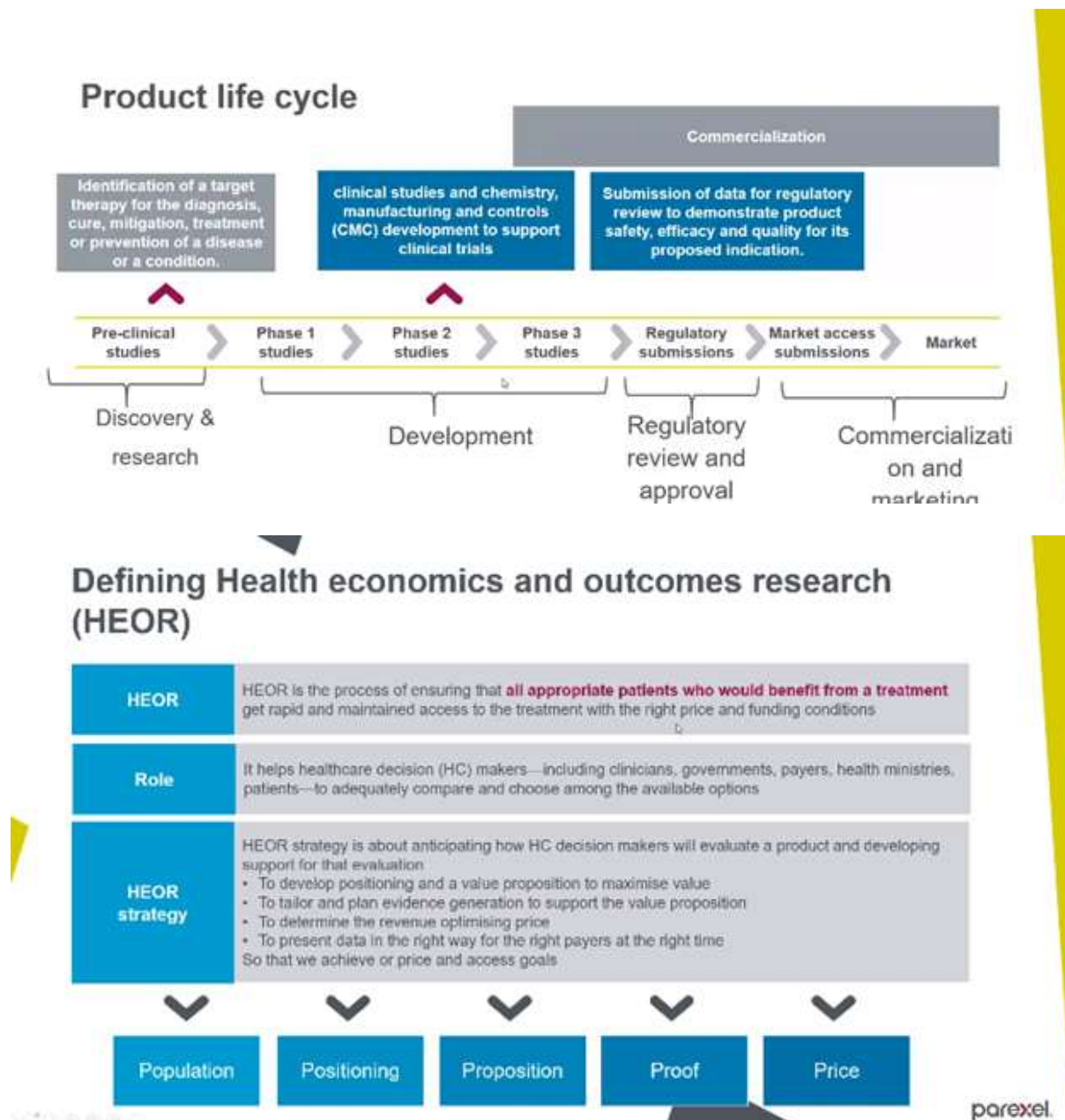
**Day – 4 (August 2nd, 2021)**

## **First Session [Dr. Kashif Siddiqui, Parexel, Panchkula]**

Dr. Kashif Siddiqui had conducted a session on Early product value assessment in HEOR

As there are few design challenges of the existing AI system, to build a new design we have few goals like design should be flexible, modular, confidential & scalable. He has described HEOR Goals, definition of HEOR, various optimize product value, etc.

At last, he stated some research challenges for security and privacy.





## HEOR goals can be expressed simply ...



## Various services are provided to optimize product value and return on investment



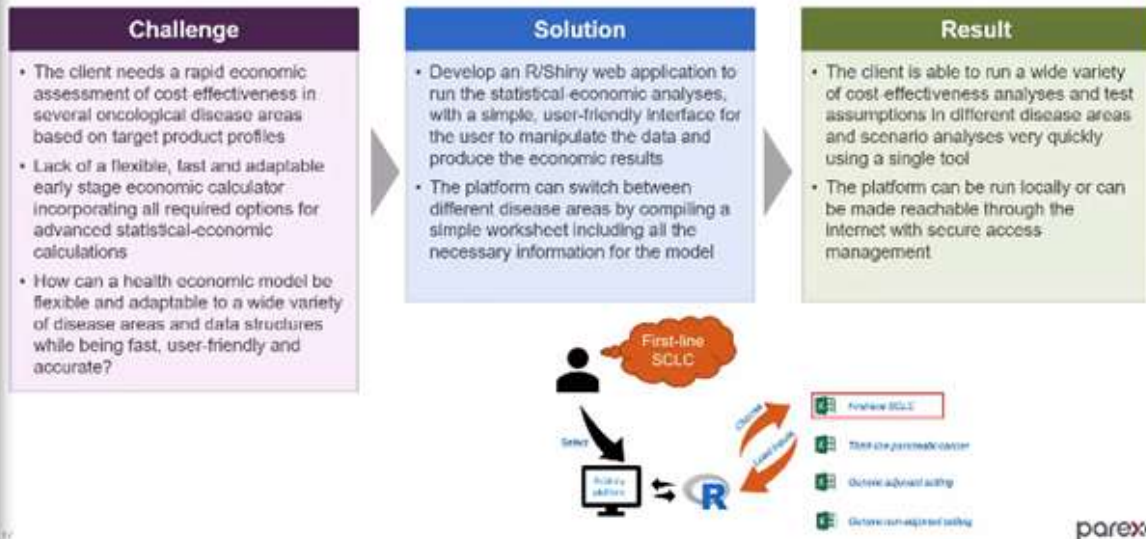
## HEOR strategy needs to answer some critical questions



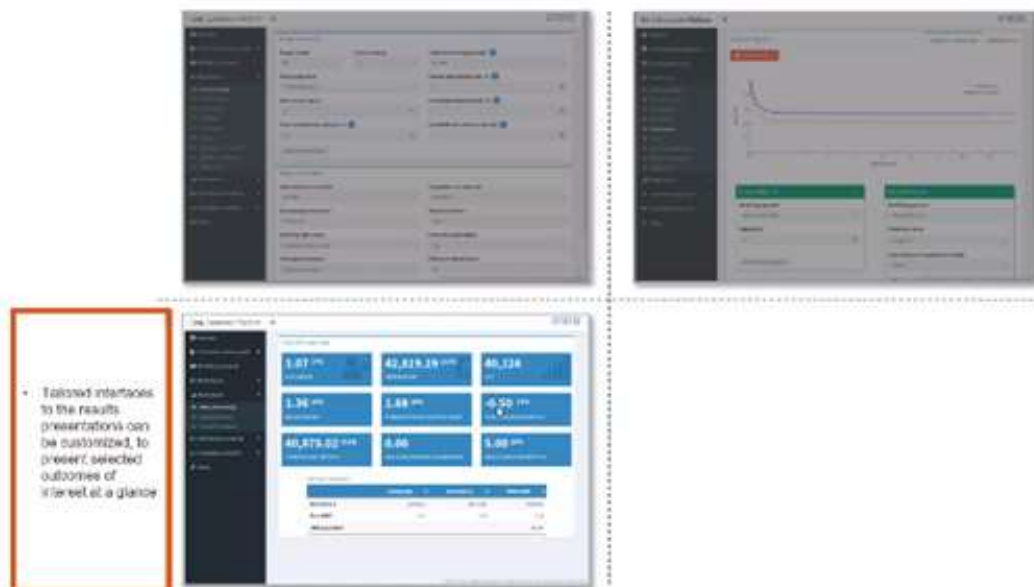


Total three case studies sir has covered as shown below. Dr. Kashif Siddiqui has joined me on LinkedIn as sir is very much interested in guiding students to take on projects related to HEOR or Pharma.

## Case study: Early Economic web application in oncology

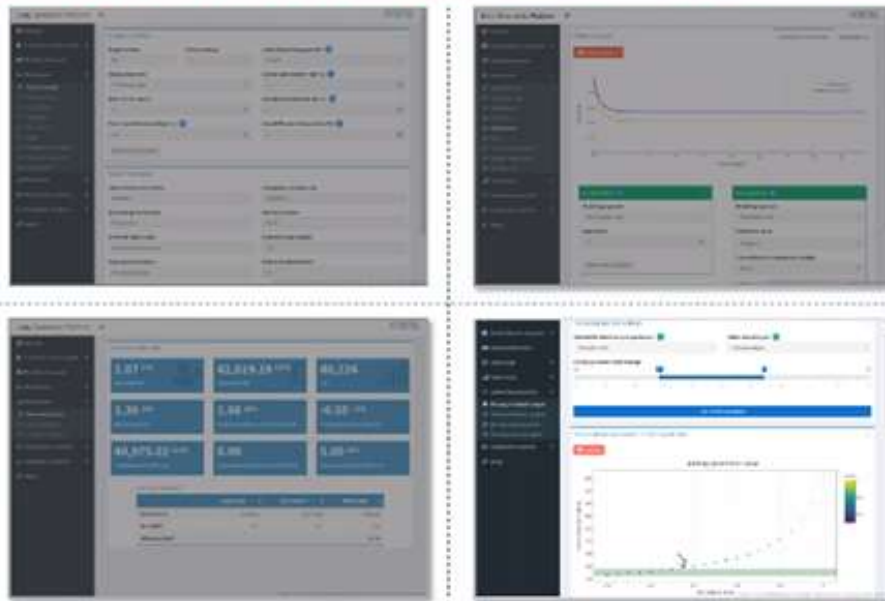


## Case study: Early Economic web application in oncology





## Case study: Early Economic web application in oncology



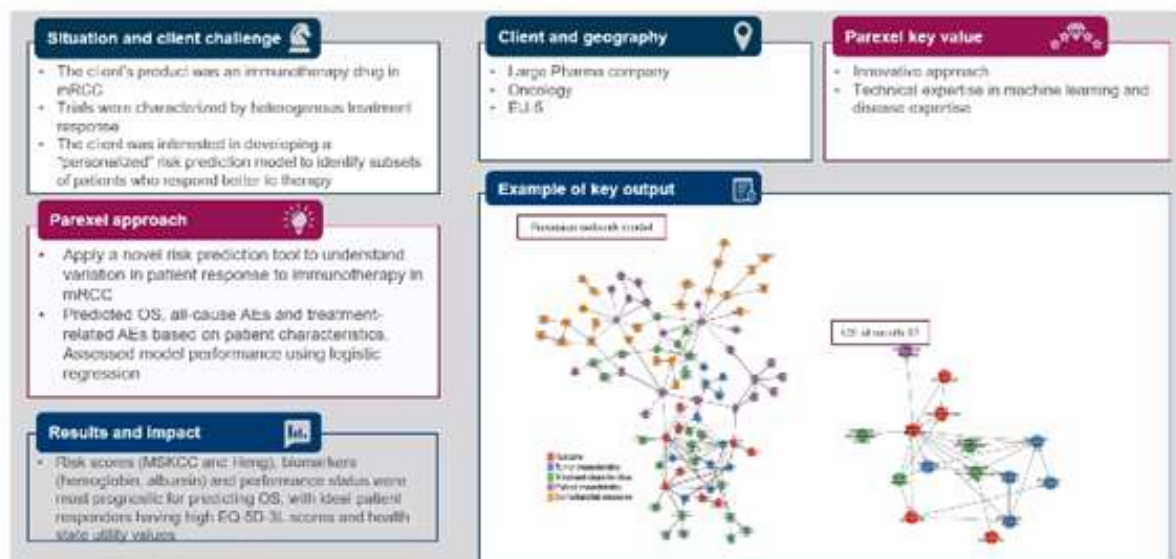
Complex deterministic and probabilistic sensitivity analyses can be performed quickly, including

- one- and two-way threshold analyses
- probabilistic analyses, including value of information

12/06/2018

parexel.

## Bayesian networks predictive modelling: machine learning approach for individualized risk prediction



12/06/2018

parexel.



- Parexel support included comparator identification, data synthesis, and strategic advice

Age Group	Percentage
18-24	35%
25-34	25%
35-44	15%
45-54	10%
55-64	5%
65-74	3%
75-84	2%
85+	1%

**Second Session** [Dr. Santosh Tiwari, Novartis Healthcare Private Limited]

## Applications of AI in HEOR

+ = less applicability; ++ = high applicability

Source: Ruoda JJ et al. 72



## ACTICS: Leveraging AI to deliver end-to-end commercial success for life science

- **ACTICS** – Leverages proprietary AI and machine learning technologies to address critical challenges across the product life cycle and improve patient outcomes
- It helps to
  - Create informed strategies from early in development to launch with speed and certainty
  - Inform healthcare and clinical decision-making at launch and accelerate access for patients
  - Improve patient outcomes and identify opportunities to lower total cost of care
  - Generate regulatory-grade evidence to quantify the economic and clinical value of healthcare interventions to payers, providers, and patients



Source: <https://www.biorxiv.org/content/10.1101/202105.01.202105.01>

Confluence of HEOR and AI will lead to Precision HEOR.

## Challenges and the way forward

### Challenges

- **Resistance to change:** HCPs independently make treatment decisions using their own clinical judgment rather than protocols AI-based applications
- **Resistance to uncertain returns:** It should be viewed from an experimental and research side
- **Resistance to face new challenges** related with privacy and deal with many players, technologies and data sources

### Way Forward

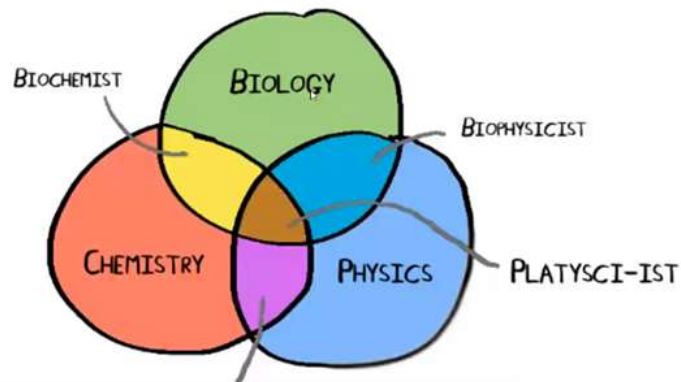
- **Change their mindsets:** not intended to replace them, they just try to complement the decision-making process
- **Manage their expectations:** raise awareness of the risks and benefits of adopting the AI-related tools
- **Motivate and equip:** Provide relevant resources that enables them to remove the barriers and embrace the technology

## Third Session [Dr. M. Karthikeyan, NCL, Pune]

Dr. M. Karthikeyan has delivered a session on AI for drug design which can help in making personalised medicine. Dr. M. Karthikeyan has shared one of the research papers on “The role of Artificial Intelligence in achieving the sustainable development goals. Sir has emphasised more on multidisciplinary skills and how integration of one subject with other results in the fruitful combinations. As shown in the below example explained by him,



...IN SCIENCE



## Today Job Requirement



A person with Multipotentiality “thrives on learning, exploring, and mastering new skills.” As innovators and problem solvers, the multi-passionate have the need to discover anything and everything to satisfy their curiosity.





## AI in Drug Discovery

- Target Selection and Validation
- Compound Screening and Lead Optimization
- Preclinical studies
- Clinical Trials
- Targets related to specific disease:
- -Cellular and Genetic Target evaluation
- Genomic and proteomic analysis
- Bioinformatics predictions
- Hit identification, Combinatorial chemistry, HTS and VS
- Structure Activity and insilico studies
- Cellular functional tests
- Pharmacokinetics
- Toxicity

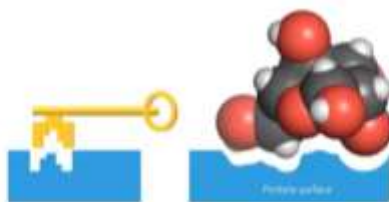


- Model Drug Properties for the disease of interest
- Design Molecules to meet the Drug Properties
- Algorithms and molecular modelling
- NCE for disease of Interest
- Chemical Data
- Unstructured / Structured Data
- NLP, Data Mining, Molecular Mining
- QSAR

29:43 [Icons] actions planning (Retro)

## Drug discovery in the age of AI

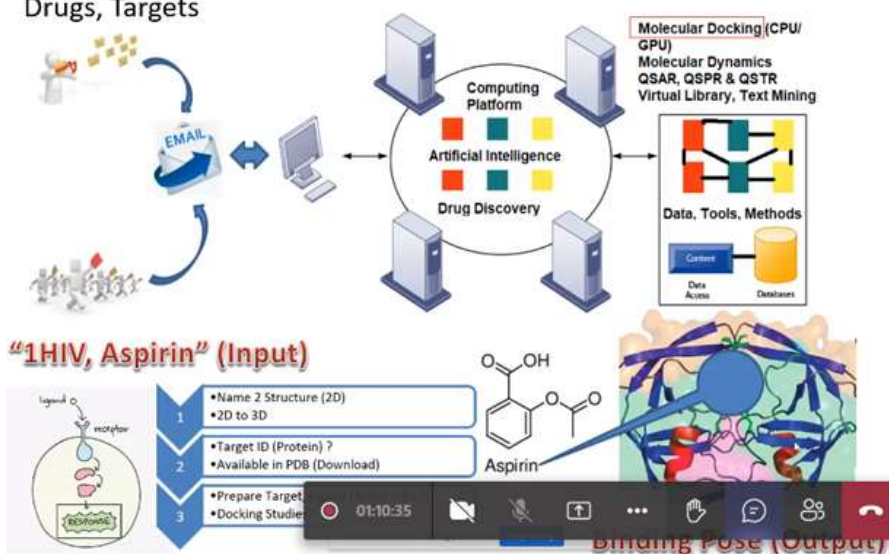
"Artificial intelligence and machine learning allow us to construct computational models that learn from known information about a target protein and infer the features required for a corresponding drug".



Own Product:

## Email Processing Robot (patented!)

Drugs, Targets



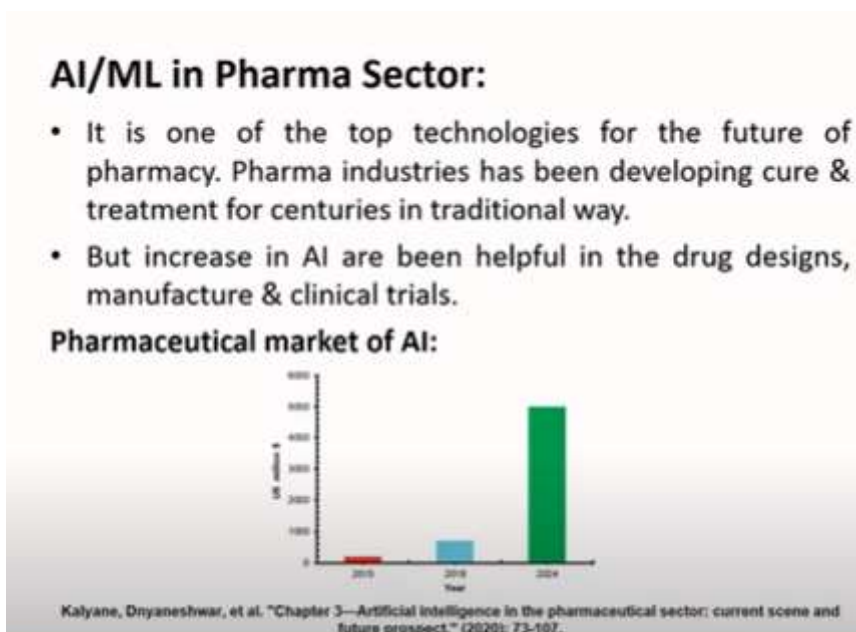


## **Day – 5 (August 2nd, 2021)**

### **First Session [Dr. Ashutosh Kumar, NIPER Kolkata]**

This session was full of tools and technologies used for Artificial Intelligence and an introduction about various programming languages used for AI/ML.

As a computer engineer, we must be having a question that how this AI/ML is useful in Pharma industries? But Dr. Ashutosh has given an abstract vision towards it.



**Skill to be noted:** delivered lecture without taking help of any PPT or Video, continuously for 3 hours!

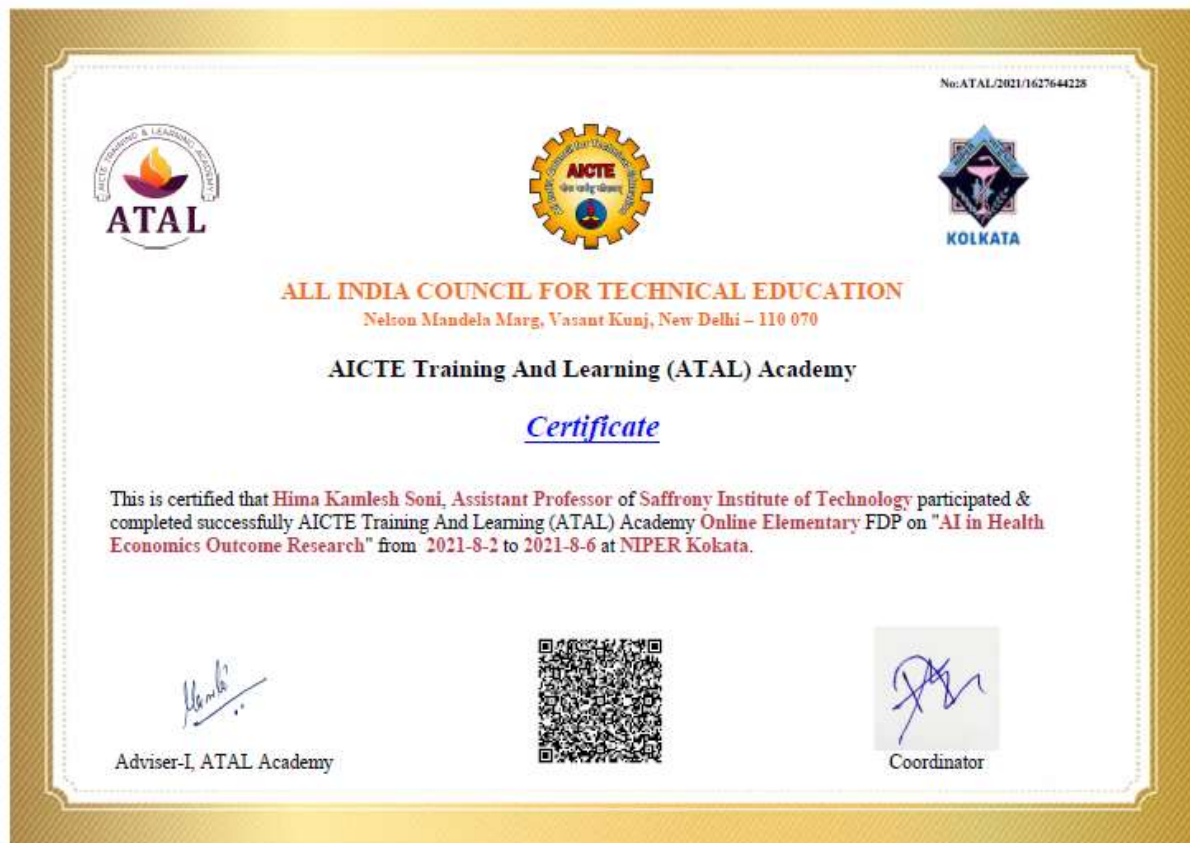
### **Second Session [Mr. Varun Upadhyay, National Project Coordinator, Arts of Living, Bengaluru]**

This session was completely non-technical. Ma'am has trained us with the in-depth

knowledge of getting stress free. Also, taught various types of Yoga steps for doing at a working place. It was a really *happy ending* :) to the five days' workshop.

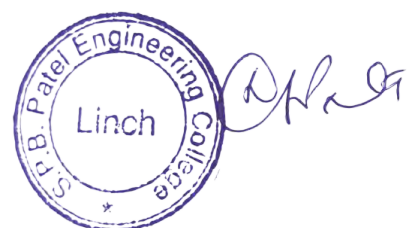


## Certificate of Completion:



Thank You,

Prepared by  
Prof. Hima Soni







# MANAGEMENT DEVELOPMENT PROGRAMME

**PEOPLE MANAGEMENT & ORGANIZATION: Leading with  
Purpose**

**S.P.B. Patel Engineering College**  
**3 Days Short Course**



## **S.P.B. Patel Engineering College**

**TYPE:** SHORT COURSE

**THEMATIC AREA:** PEOPLE MANAGEMENT & ORGANIZATION

**DURATION:** 3 DAYS

**Expert Name:** Dr. Sumit Shah

**Number of Participants:** 90

**Date:** 6-7 July 2020

### **Introduction:**

At S.P.B. Patel Engineering College, a dynamic three-day short course on "People Management & Organization" unfolds, focusing on the transformative power of purpose-driven leadership. Over the course of immersive lectures, interactive discussions, and practical exercises, participants delve into the intricacies of leading with purpose, aiming to inspire, motivate, and align teams towards collective success.

Structured around three core themes, each day offers a deep dive into essential aspects of purpose-driven leadership. Day 1 delves into "Defining and Differentiating Purpose," emphasizing the crucial role of clarity and direction in leadership. Day 2 explores "Purpose and Others," shedding light on the significance of aligning personal and organizational goals with a higher purpose. Finally, Day 3 focuses on "Purpose and Strategy," guiding participants on aligning actions and empowering teams to drive towards a shared vision.

### **STRUCTURE OF THE COURSE:**

The course is structured over a 3-day program including **3 immersive and interactive lectures**, discussions, and exercises

#### **Scheduling:**

Day 1. Defining and differentiating purpose

Day 2. Purpose and Others



## Day 3. Purpose and Strategy

### Day 1. Defining and differentiating purpose

As a leader, it's important to have a clear sense of purpose and direction. When you lead with purpose, you inspire and motivate your team to achieve their goals and work towards a common objective. Purposeful leadership creates a positive work environment that fosters collaboration, innovation, and creativity. In this article, we'll explore the importance of leading with purpose and provide tips on how to motivate your team to achieve success.

Purpose-driven leadership is a powerful lever of success. It helps organizations achieve their goals and can inspire people to do their best work. It creates a sense of shared purpose. It bridges the gap between individual and organizational values. It is the single most important factor determining if people are engaged with work. It drives people to do what they do, day in day out.

### Benefits of Purpose-Driven Leadership Training

There are many benefits to bringing purpose-driven leadership into your workplace, such as:

- **Greater awareness of leadership influence:** Whether positive or negative, understanding how our leadership influence impacts those we lead will make positive room for continuous improvement, team engagement, and employee retention.
- **Learn through activities and discussion with leaders from other organizations:** Every organization has their own challenges to work through. This course allows you to connect with leaders in other organizations, learn together, and discuss solutions to common challenges.
- **Gain practical tools to develop stronger leadership skills:** This program equips each participant with leadership tools that promote stronger influence, continuous improvement, and on going leadership skills that will positively impact your own leadership journey, your teams effectiveness, and your overall work culture.

### Day 2. Purpose and Others

In today's fast-paced and competitive world, it's more important than ever to lead with purpose. Purpose-driven leaders are those who are driven by a sense of purpose and who align their personal and organizational goals with a higher purpose. These leaders are able to inspire their teams to achieve great things, create a positive impact on society, and ultimately achieve long-



term success. In this article, we will explore why leading with purpose is essential and how you can become a purpose-driven leader.

## **Why Leading with Purpose is Essential**

- ***Provides Meaning and Fulfillment***

Leading with purpose provides meaning and fulfillment to both leaders and their teams. When leaders and teams are working towards a higher purpose, they are more likely to feel a sense of satisfaction and fulfillment in their work. This not only leads to a more positive work environment but also increased productivity and overall success.

- ***Creates a Stronger Connection with Customers and Stakeholders***

Leading with purpose also creates a stronger connection with customers and stakeholders. When a company has a clear sense of purpose, it is easier to communicate the company's values and mission to others. This creates a more loyal customer base and helps attract new customers who are aligned with the company's values.

- ***Drives Long-term Success***

Leaders who lead with purpose are also more likely to achieve long-term success. Purpose-driven leaders are able to create a culture of excellence where employees feel empowered and motivated to achieve their best. This leads to increased productivity, better retention rates, and ultimately higher profits.

## **Day 3. Purpose and Strategy**

Leading with purpose is about having a clear understanding of your values, beliefs, and goals as a leader. It's about aligning your personal and professional goals to create a shared vision for your team. Purpose-driven leaders inspire their teams by demonstrating passion, commitment, and authenticity. They lead by example and empower their team members to take ownership of their work.

### ***How to Become a Purpose-Driven Leader***

- ***Define Your Purpose***

The first step in becoming a purpose-driven leader is to define your purpose. What drives you? What are your values and beliefs? Once you have a clear sense of your purpose, you can align your goals and actions with your higher purpose.



- *Communicate Your Purpose*  
Once you have defined your purpose, it's important to communicate it to your team. This creates a sense of alignment and motivation towards a common goal. Be sure to communicate your purpose in a clear and concise manner that resonates with your team
- *Align Your Actions with Your Purpose*  
As a purpose-driven leader, it's important to align your actions with your purpose. This means making decisions that are in line with your values and beliefs. It also means creating a culture of excellence where your team feels supported and motivated to achieve their best.
- *Empower Your Team*  
A purpose-driven leader empowers their team. This means giving your team the resources they need to succeed and providing them with opportunities to grow and develop. It also means creating a safe and supportive work environment where your team feels comfortable taking risks and trying new things.
- *Measure Your Impact*  
Finally, it's important to measure your impact. Set goals and metrics that align with your purpose and track your progress towards those goals. This will help you stay focused on your purpose and ensure that you are making a positive impact on society.

### ***How to identify your leadership purpose***

Identifying your leadership purpose starts with reflecting on your values, beliefs, strengths, and passions. Ask yourself questions like: What motivates me? What do I stand for? What impact do I want to have on my team or organization? Once you have a clear understanding of your leadership purpose, you can use that as a guide when setting goals, making decisions, and communicating with your team.

### ***Ways to inspire purpose in your team***

Inspiring purpose in your team starts with creating a shared vision that aligns with the values and goals of each individual member. Encourage open communication and collaboration so that everyone feels heard and valued. Provide opportunities for professional development so that team members can grow both personally and professionally. Celebrate successes along the way to keep morale high and motivation strong.

### ***The role of feedback in leading with purpose***

Feedback is essential for leading with purpose because it helps you understand how well you're aligning your actions with your values and goals as a leader. Solicit feedback from your team members on a regular basis to understand what's working well and what could be improved. Use that feedback to adjust your approach and stay aligned with your leadership purpose.



## Identification of team's purpose and aligning it with organization's goals:

### + Identification: Team's Purpose

First, it's important to understand what drives your team members. What are their passions and goals? What do they hope to achieve in their careers? By identifying these individual purposes, you can work towards aligning them with the overall purpose of your organization.

### + Defining Organization's Goals

Next, it's crucial to define the goals of your organization. What is the mission statement? What are the values and objectives that drive your company forward? By clearly defining these goals, you can create a sense of direction and purpose for your team.

### + Aligning Individual Purpose with Organizational Goals

Once you have a clear understanding of both individual purpose and organizational goals, it's time to align them. This means finding ways to connect each team member's personal motivations with the overall mission of the company. This can be done through setting specific targets and creating a culture that values individual growth while working towards shared goals.

### + Creating a Culture of Purpose

To truly motivate your team, it's important to establish a culture that values purpose-driven work. This means recognizing and celebrating individual contributions towards shared goals. It also means fostering an environment where continuous learning and development are encouraged.

### + Providing Opportunities for Growth

Finally, providing growth opportunities is essential in motivating your team towards success. This can be done through training programs, mentorship opportunities, and career advancement paths. When employees feel valued and supported in their personal growth, they are more likely to feel motivated and committed to achieving organizational success.

## Strategy:

### Strategies for communicating purpose effectively to motivate and inspire team:

#### Know Your Purpose

Before you can effectively communicate your purpose to your team, you need to have a clear understanding of what it is yourself. Take the time to reflect on why you do what you do and how it ties into the overall goals and values of your organization.



## **Be Authentic**

When communicating your purpose to your team, it's important to be authentic and genuine. Your team will be able to tell if you're not truly invested in the purpose you're trying to convey, so make sure that you believe in what you're saying.

## **Use Storytelling**

One of the most effective ways to communicate your purpose is through storytelling. Share stories about how your organization has made a difference in people's lives or how your team has overcome challenges in pursuit of a common goal. These stories will help bring your purpose to life and make it more relatable for your team.

## **Connect with Individual Motivations**

Understand that each member of your team may be motivated by different things. Take the time to get to know each person individually and find out what drives them. Then, tie their individual motivations into the larger purpose of the organization.

## **Provide Clear Direction**

Once you've communicated your purpose, provide clear direction on how each member of the team can contribute towards achieving that purpose. Set specific goals and expectations so that everyone knows exactly what they need to do in order to help move the organization forward.

## **Celebrate Successes**

Finally, remember to celebrate successes along the way. Recognize when members of your team go above and beyond in pursuit of the organization's purpose, and publicly acknowledge their contributions. This will help build morale and motivate others on the team to strive for excellence as well.

# **The role of leading by example in achieving success through purpose-driven leadership**

## **The Importance of Purpose-Driven Leadership**

Purpose-driven leadership is a mindset that prioritizes the greater good over personal gain. It entails leading with a clear sense of purpose and aligning all team members toward achieving a common goal. Purpose-driven leaders inspire their teams to work together towards a shared vision, resulting in increased motivation, engagement, and productivity.

## **Leading by Example: What It Means**

Leading by example is a fundamental aspect of purpose-driven leadership. It involves modeling the behaviors and values that you want your team members to adopt. By setting an example, you demonstrate your commitment to the team's goals, build trust and credibility, and motivate your team to follow your lead.



## **The Benefits of Leading by Example**

When leaders lead by example, they inspire their team members to do the same. This fosters a culture of accountability and responsibility where everyone takes ownership of their work. Additionally, leading by example can help build trust among team members, increase collaboration, and create a positive work environment.

## **Tips for Leading with Purpose**

To lead with purpose effectively, start by defining your mission statement or vision for your team's success. Communicate this vision clearly to your team members and ensure that it aligns with their individual goals and interests. Additionally, practice active listening to understand each team member's strengths and weaknesses so that you can assign tasks accordingly.

Remember always to lead by example. Hold yourself accountable for meeting deadlines, following through on commitments, and demonstrating the values you expect from your team members.

Finally, celebrate small wins along the way to keep morale high and motivation levels up. A positive work environment will encourage continued effort toward achieving shared goals.

## **The importance of ongoing evaluation and adjustment to ensure that your leadership remains focused on purpose**

### **Constant evaluation and adjustment**

As a leader, it's important to consistently evaluate and adjust your approach to ensure that you're staying focused on your purpose. This means regularly assessing your team's progress, identifying areas for improvement, and making necessary changes to help everyone stay on track.

### **Staying true to your purpose**

One of the key ways to motivate your team is by staying true to your purpose. When everyone understands the overarching goals and mission of the organization, they're more likely to feel motivated and inspired to work towards those goals.

### **Communicating effectively**

Effective communication is another critical component of motivating a team towards success. This means being transparent about goals, expectations, and progress, as well as actively listening to feedback from team members. By creating an environment where open communication is encouraged, leaders can foster a sense of trust and collaboration among their team.

### **Nurturing a positive culture**

A positive company culture can also go a long way in motivating a team towards success. Leaders should prioritize creating an inclusive environment where everyone feels valued and supported.



This means investing in employee development programs, recognizing achievements, and fostering a sense of community within the organization.

### **Leading by example**

Finally, one of the most effective ways to motivate a team is by leading by example. When leaders model the behavior they expect from their team members — such as hard work, dedication, and accountability — it sets the tone for the entire organization. By embodying these qualities themselves, leaders can inspire their teams to do the same.

## **Conclusion and call-to-action for leaders to embrace purpose-driven leadership.**

### **Embrace Purpose-Driven Leadership**

Leaders must embrace purpose-driven leadership if they want to motivate their team and achieve success. This means defining and communicating a clear purpose that aligns with the company's values and inspires employees. Purpose-driven leadership involves leading with empathy, collaborating with others, and prioritizing the well-being of employees.

### **Prioritize Employee Well-being**

To lead with purpose, leaders must prioritize employee well-being. This means creating a work environment that fosters a sense of community, encourages work-life balance, and provides opportunities for personal growth. Leaders should also listen to their employees' concerns and address them in a timely manner.

### **Foster Collaboration**

Collaboration is essential for achieving success in any organization. Leaders should create an environment that fosters collaboration by encouraging open communication, setting clear goals, and recognizing the contributions of each team member. This not only leads to better outcomes but also promotes a sense of community within the organization.

### **Lead With Empathy**

Empathy is essential for effective leadership. Leaders who can put themselves in their employees' shoes are better able to understand their needs and motivations. This allows them to make more informed decisions that benefit both the organization and its employees.

### **Communicate Clearly**

Communication is key when it comes to motivating your team and achieving success. Leaders should communicate their vision clearly and often to ensure that everyone is on the same page. They should also encourage open communication among team members to promote collaboration and problem-solving.