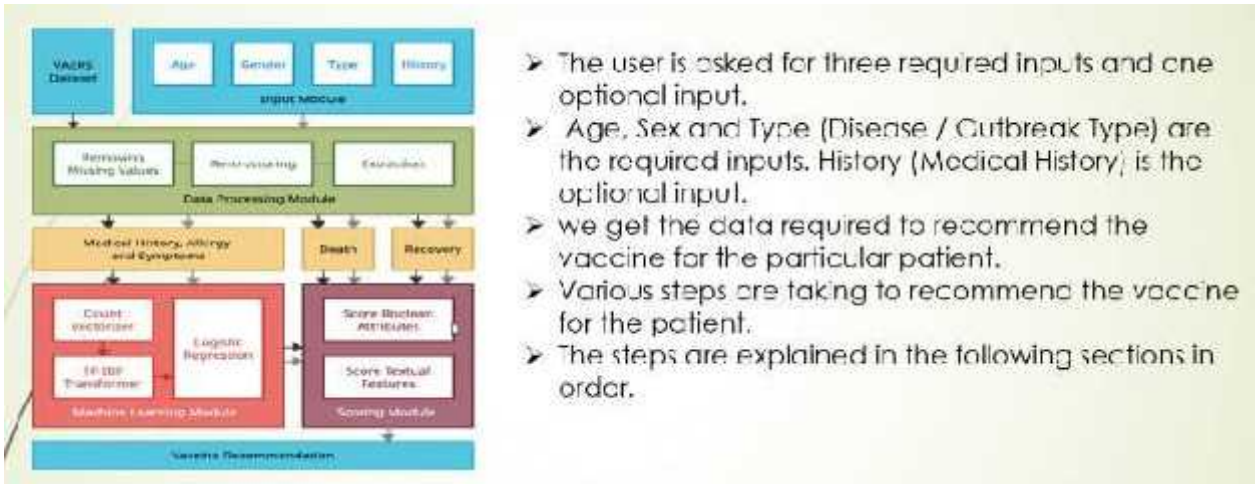
CollegeName:CMRTechnicalCampus
Region:V
EventDate:15-02-2022
Event Title: Transform Businesses Through Design Thinking

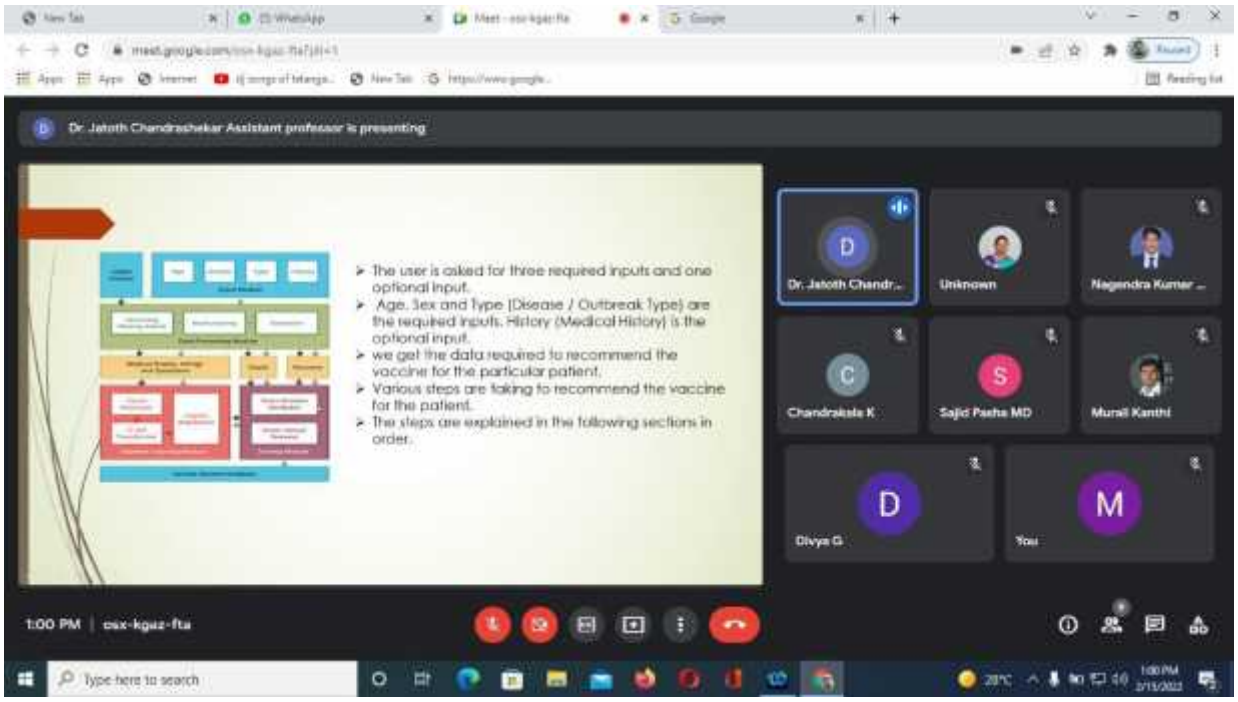
PROFILE

Dr.Chandrashekar Jreceived his B.E in Information Technology from Osmania University,M.TechinArtificialIntelligencefromUniversityofHyderabad,Ph.D.formUniversityofHyderabad,Hyderabad,Indiain2008,2010,and2018respectively.Hecurrentlyisworkingasan Assistant Professor atNational Institute of Technology Raipur, India. Prior to join this NITRaipur he was worked as an Assistant Professor atNational Institute of TechnologyHamirpur.He was published various research articles in Reputed Journals like IEEE Transactions onServices Computing, Future Generation and Computer Systems, Soft Computing, Swarm andEvolutionary computation and etc.He is a Member of IEEE and ACM. His current fieldsofinterests are Cloud/Fog Computing, Energy Informatics, Artificial Intelligence, Blockchain,andComputationalIntelligenceTechniques.

Abstract

Vaccinology is a great boon brought by medical science. With the advancements in the medicalfield, both non-infectious and infectious diseases are now within the realm of vaccinology. Forvarious diseases and outbreaks including COVID-19, multiple manufacturers produce vaccines.The efficacy rate of these vaccines varies from person to person and geographic area. Overthe years researchers have developed various recommendation systems for drugs usingdifferent techniques. However, the literature has various drug recommendation systems withthe common goal to help doctors in making decisions for drug prescription. Nevertheless,recommendationsystemforvaccinesisanunexploredareathatrequiresextensivec onsideration of factors to recommend the vaccine that provides a high efficacy rate. In thispresentationwewilldiscussvariousrecommendationsystemsindifferentapplications.


VAERS Dataset
Age
Gender
Type
History
Input Module
Data Processing Module
Medical History, Allergy and Symptoms
Death
Recovery
Count Vectorizer
TF-IDF Transformer
Logistic Regression
Machine Learning Module
Score Boolean Attributes
Score Textual Features
Scoring Module
The user is asked for three required inputs and one optional input.
Age, Sex and Type (Disease / Outbreak Type) are the required inputs. History (Medical History) is the optional input.
we get the data required to recommend the vaccine for the particular patient.
Various steps are taking to recommend the vaccine for the patient.
The steps are explained in the following sections in order.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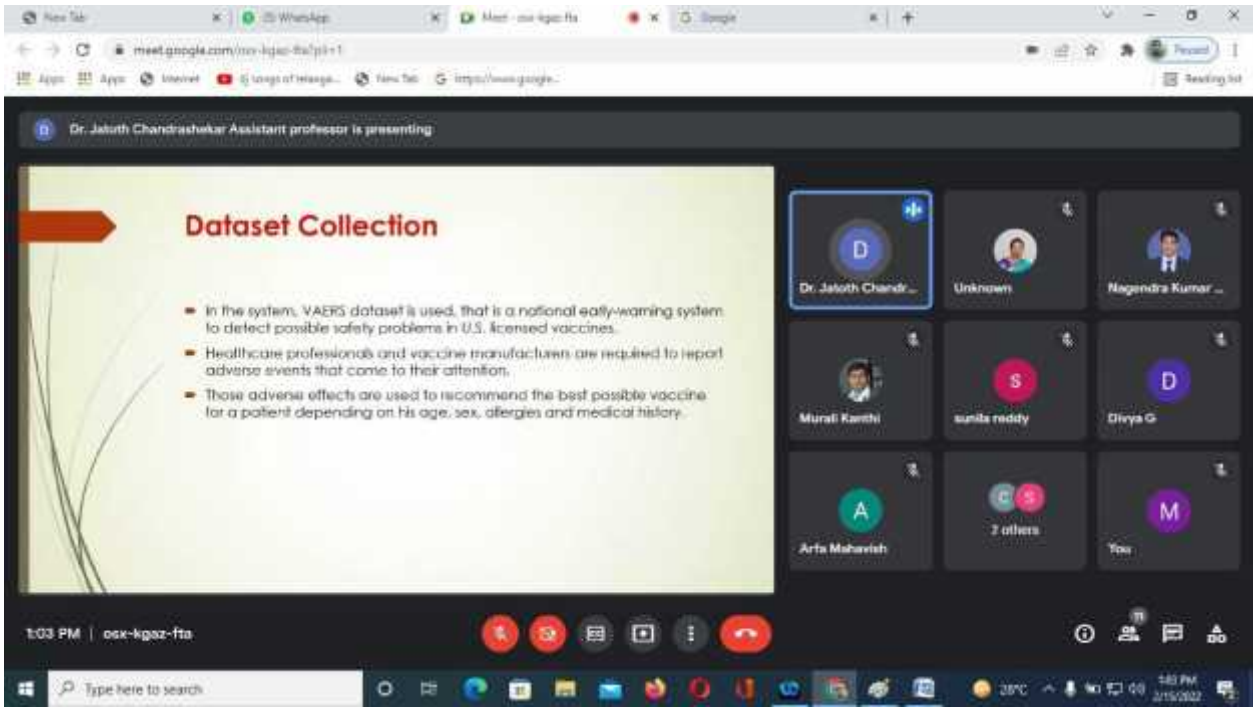
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Dataset Collection
In the system, VAERS dataset is used, that is a national early-warning system to detect possible safety problems in U.S. licensed vaccines.
Healthcare professionals and vaccine manufacturers are required to report adverse events that come to their attention.
Those adverse effects are used to recommend the best possible vaccine for a patient depending on his age, sex, allergies and medical history.
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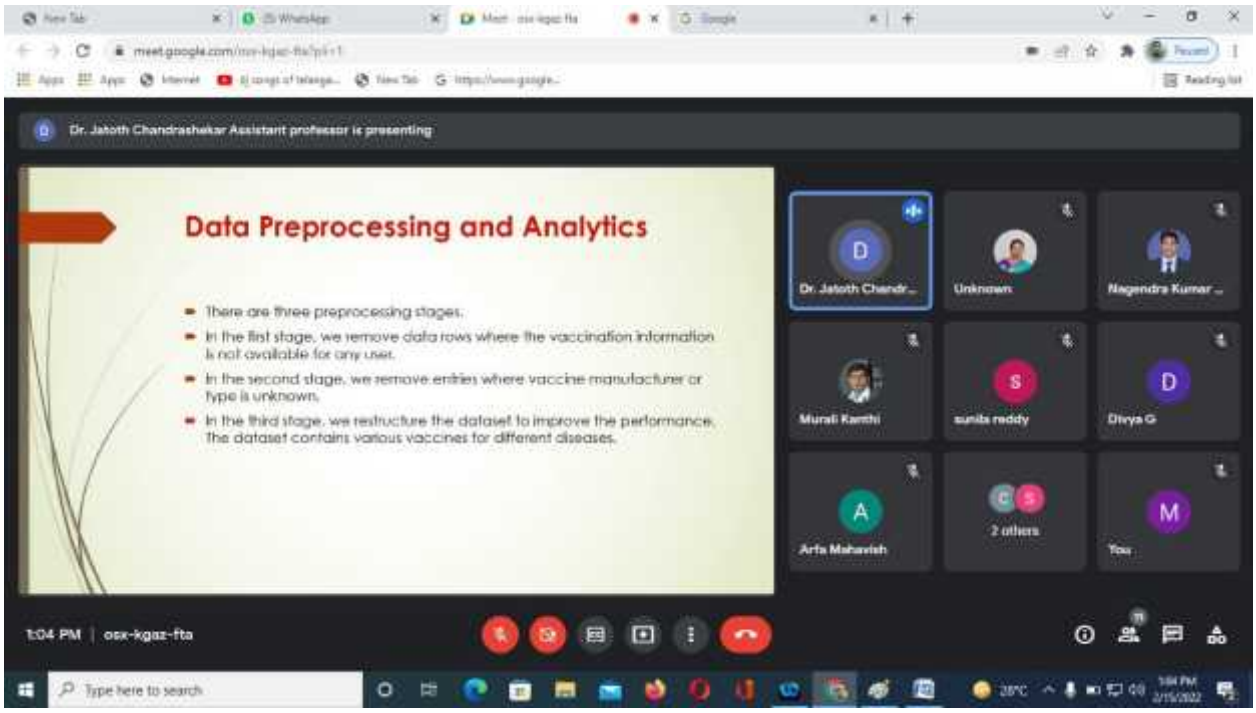
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Data Preprocessing and Analytics
There are three preprocessing stages.
In the first stage, we remove data rows where the vaccination information is not available for any user.
In the second stage, we remove entries where vaccine manufacturer or type is unknown.
In the third stage, we restructure the dataset to improve the performance. The dataset contains various vaccines for different diseases.
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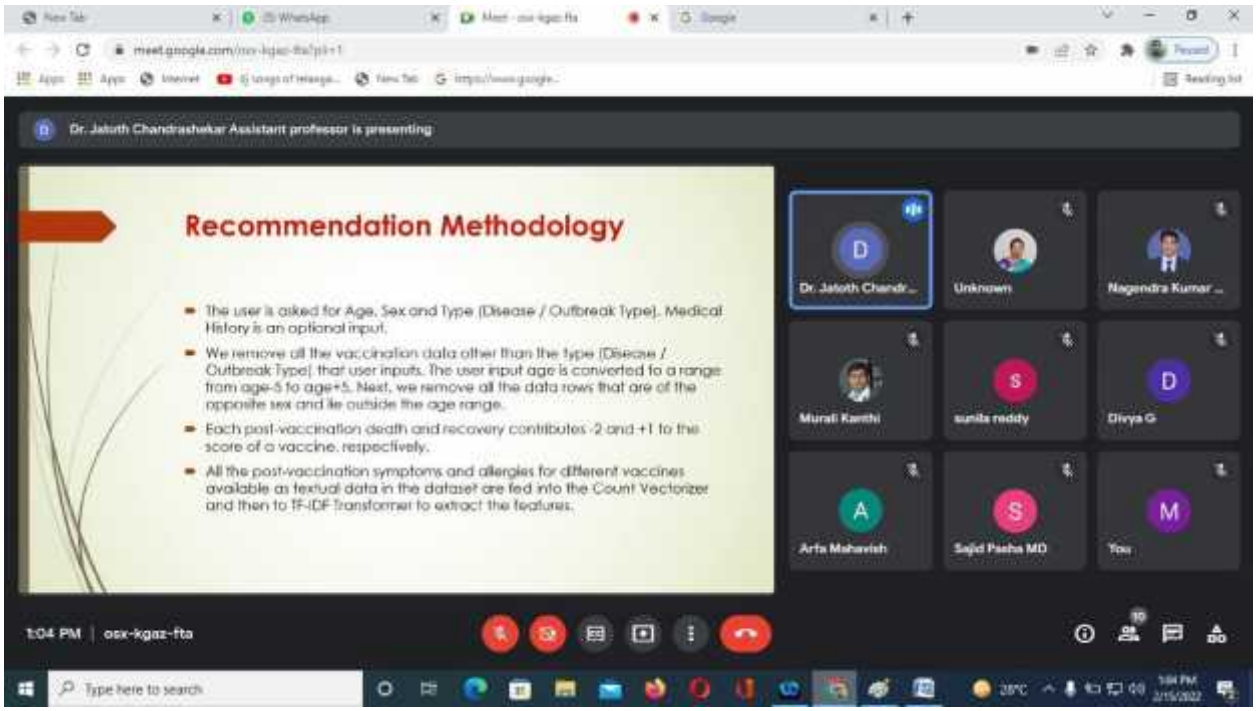
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Recommendation Methodology
The user is asked for Age, Sex and Type (Disease / Outbreak Type). Medical History is an optional input.
We remove all the vaccination data other than the type (Disease / Outbreak Type) that user inputs. The user input age is converted to a range from age-5 to age+5. Next, we remove all the data rows that are of the opposite sex and lie outside the age range.
Each post-vaccination death and recovery contributes -2 and +1 to the score of a vaccine, respectively.
All the post-vaccination symptoms and allergies for different vaccines available as textual data in the dataset are fed into the Count Vectorizer and then to TF-IDF Transformer to extract the features.
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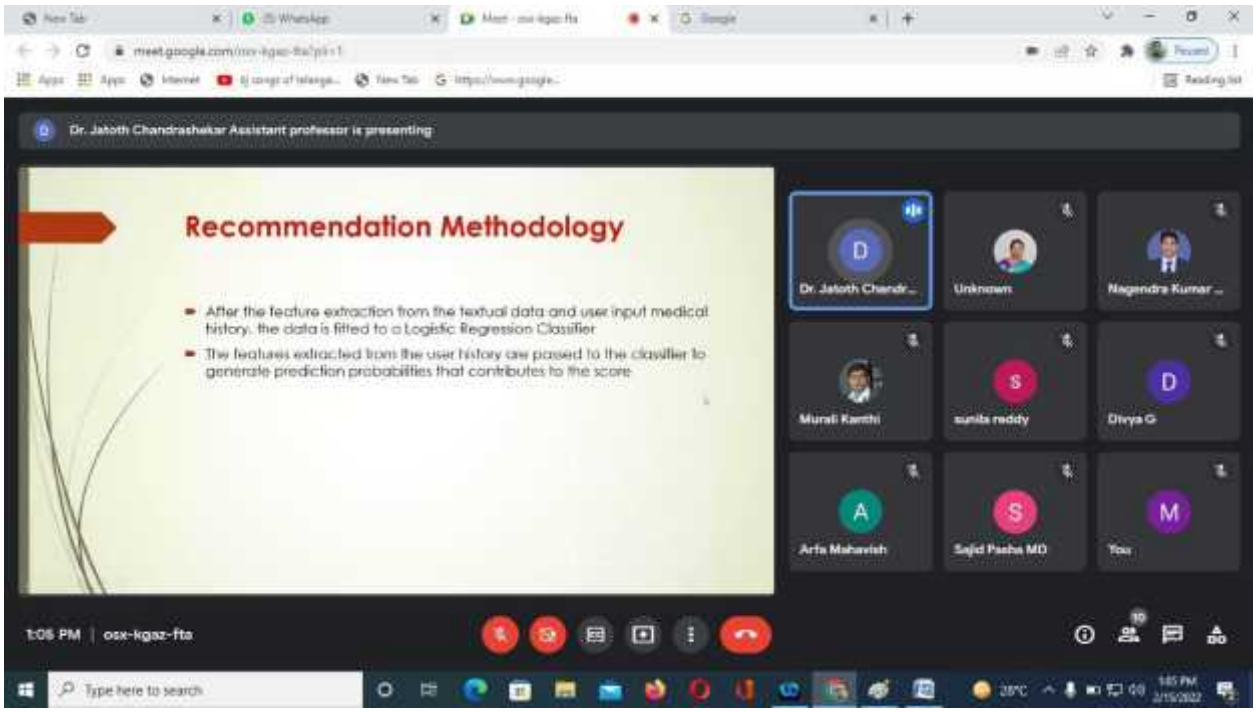
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Recommendation Methodology
After the feature extraction from the textual data and user input medical history, the data is fitted to a Logistic Regression Classifier
The features extracted from the user history are passed to the classifier to generate prediction probabilities that contributes to the score
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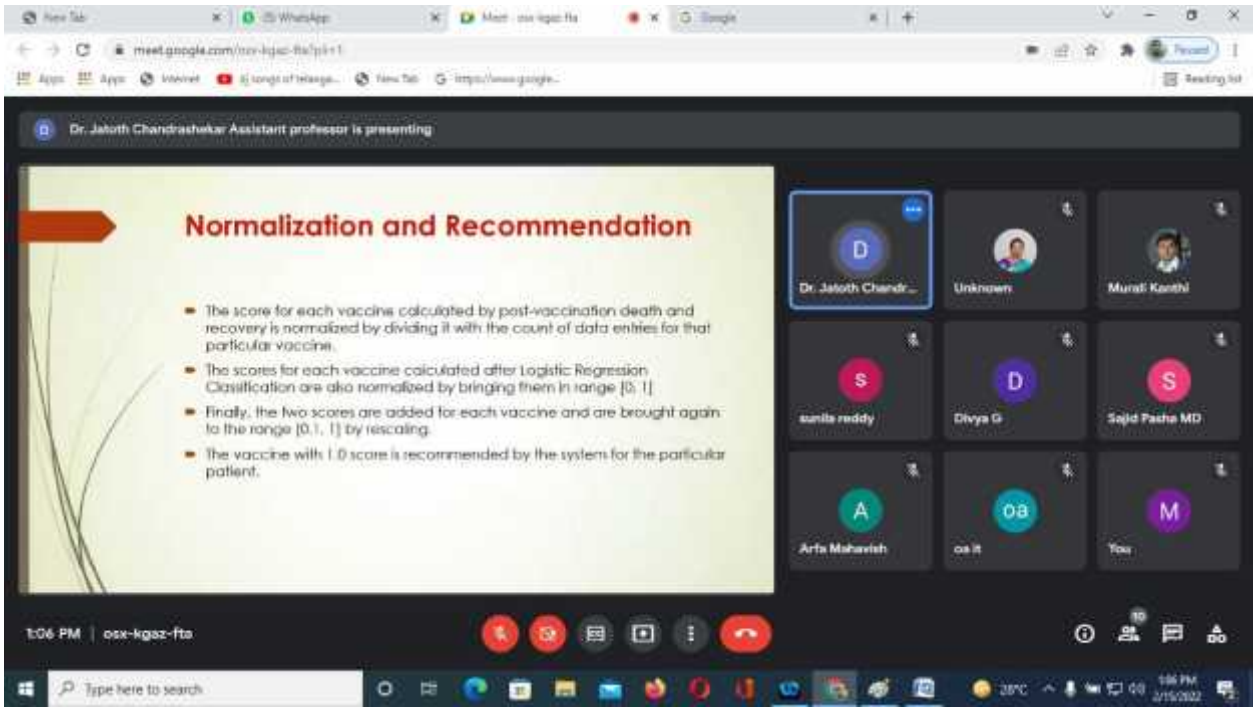
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Normalization and Recommendation
The score for each vaccine calculated by post-vaccination death and recovery is normalized by dividing it with the count of data entries for that particular vaccine.
The scores for each vaccine calculated after Logistic Regression Classification are also normalized by bringing them in range [0, 1]
Finally, the two scores are added for each vaccine and are brought again to the range [0.1, 1] by rescaling.
The vaccine with 1.0 score is recommended by the system for the particular patient.
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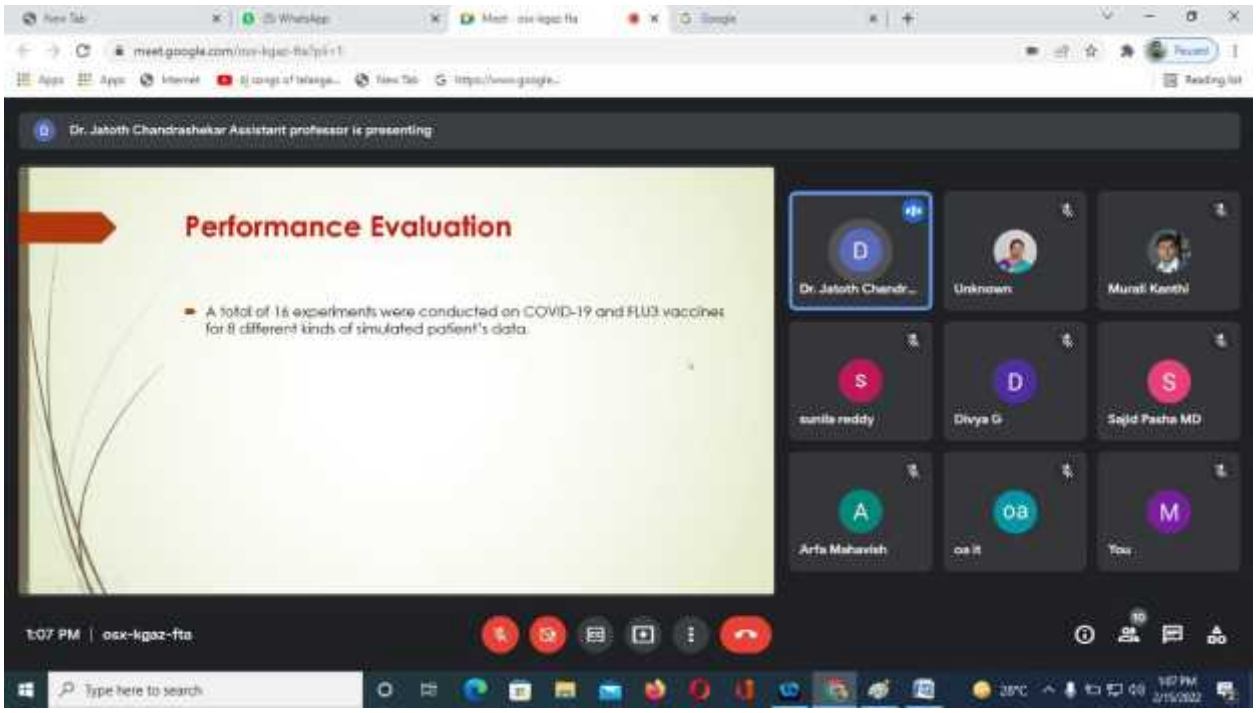
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Performance Evaluation
A total of 16 experiments were conducted on COVID-19 and FLU3 vaccines for 8 different kinds of simulated patient's data.
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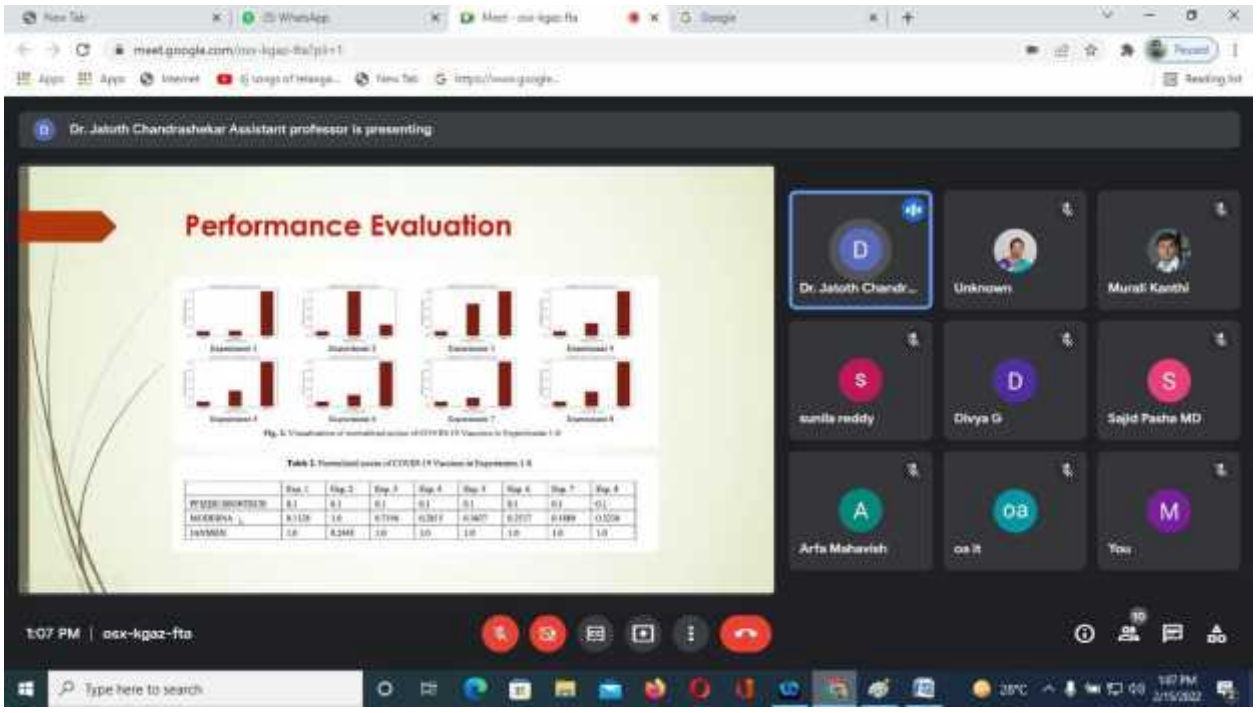
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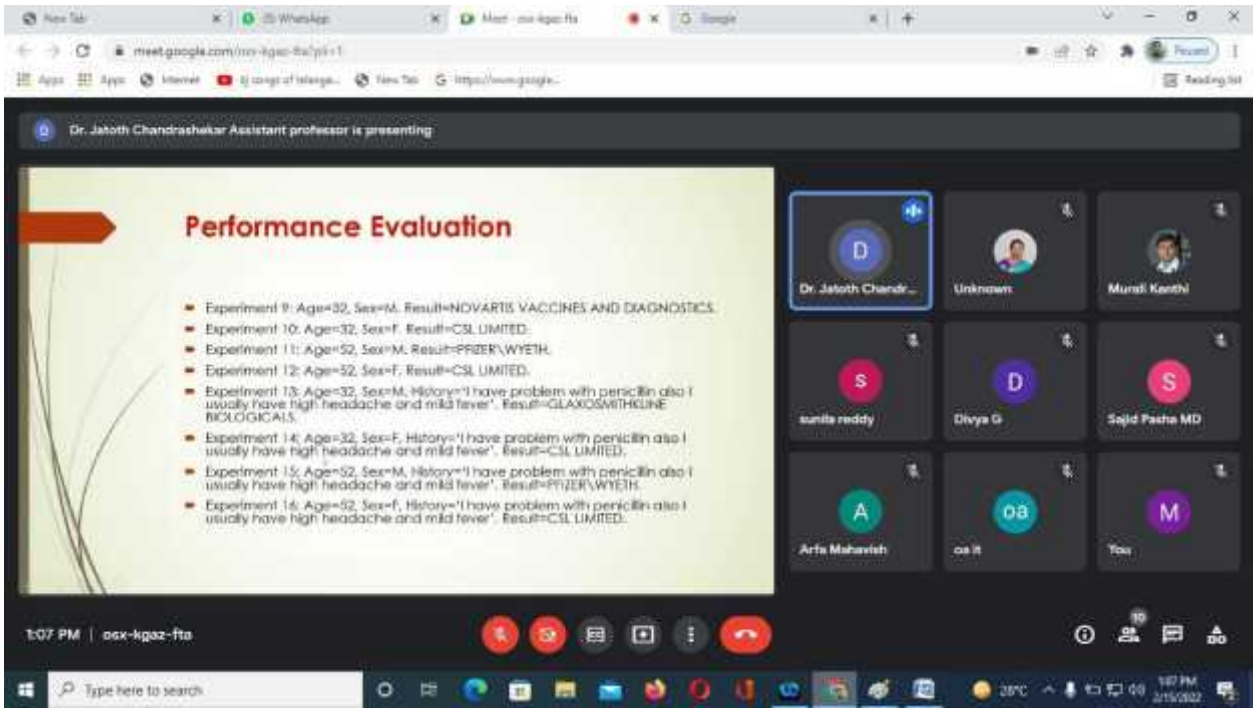
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Performance Evaluation
Experiment 9: Age=32, Sex=M, Result=NOVARTIS VACCINES AND DIAGNOSTICS.
Experiment 10: Age=32, Sex=F, Result=CSL LIMITED.
Experiment 11: Age=52, Sex=M, Result=PFIZER\WYETH.
Experiment 12: Age=52, Sex=F, Result=CSL LIMITED.
Experiment 13: Age=32, Sex=M, History='I have problem with penicillin also I usually have high headache and mild fever', Result=GLAXOSMITHKLINE BIOLOGICALS.
Experiment 14: Age=32, Sex=F, History='I have problem with penicillin also I usually have high headache and mild fever', Result=CSL LIMITED.
Experiment 15: Age=52, Sex=M, History='I have problem with penicillin also I usually have high headache and mild fever', Result=PFIZER\WYETH.
Experiment 16: Age=52, Sex=F, History='I have problem with penicillin also I usually have high headache and mild fever', Result=CSL LIMITED.
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