Indian Institute of Technology Kanpur
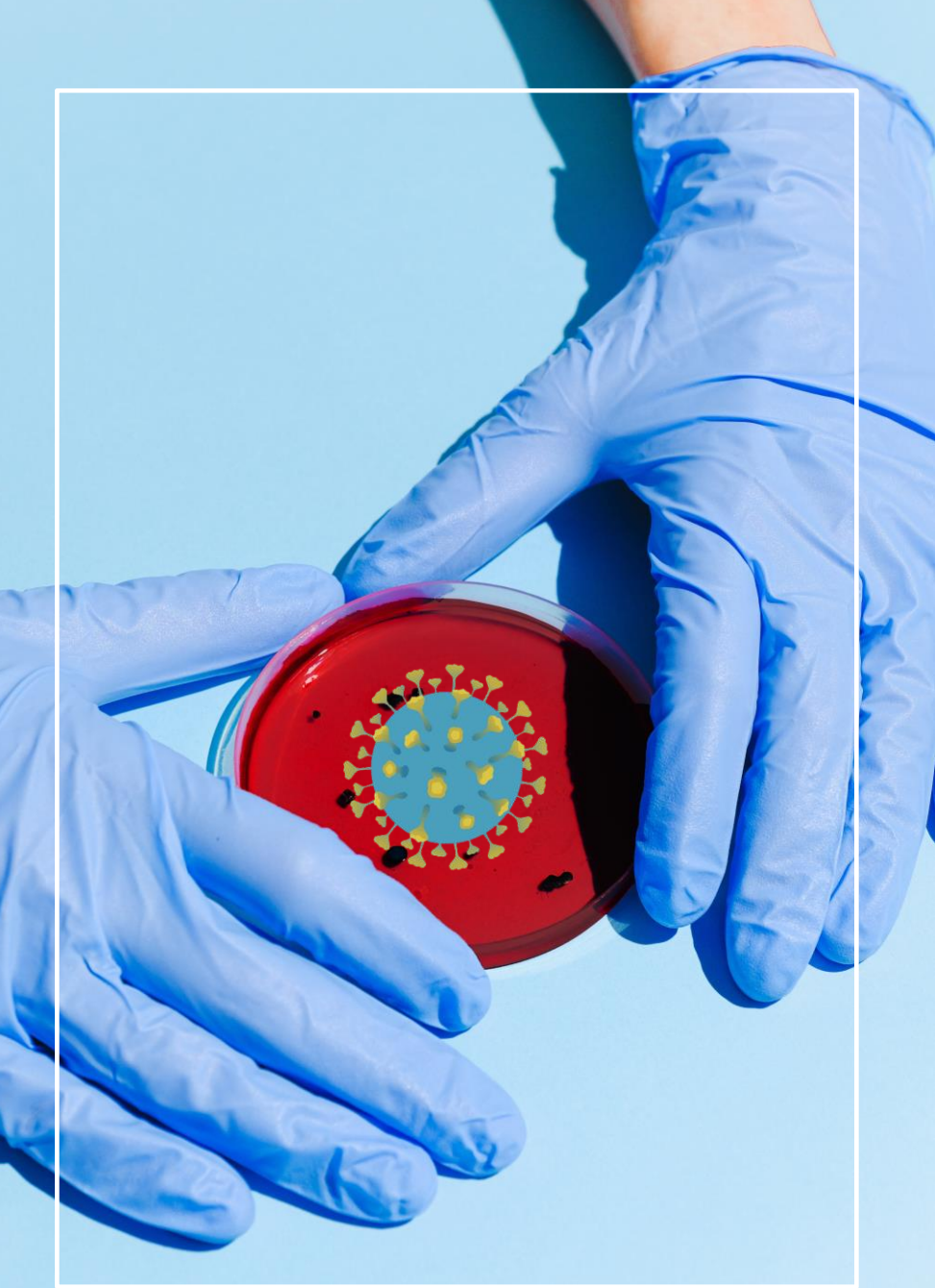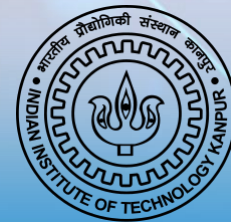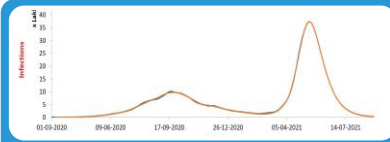
Research Efforts
to combat
Covid 19

BROAD CLASSIFICATIONS

Modelling for Covid Trajectory Prediction

Critical Treatment

Personal Protection & Primary Healthcare

Disinfection & Sanitization

Autonomous Services

# SUTRA MODEL FOR COVID-19

- IIT Kanpur played a central role in development of SUTRA model for predicting the trajectory of the Covid pandemic

- The model predicted peak for India in mid-May and for UP in April-end

- Model is also providing district level predictions that can be used to formulate vaccination and medical infrastructure strategies

Detected Active Infections (7 day average)
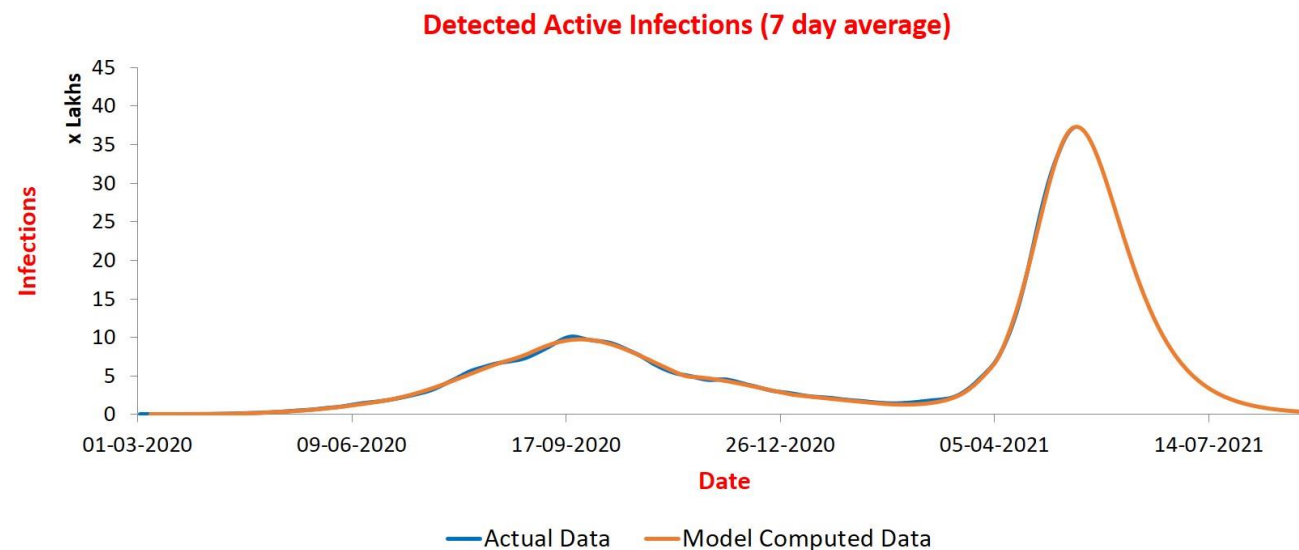
PROJECTIONS FOR COVID PROGRESSION
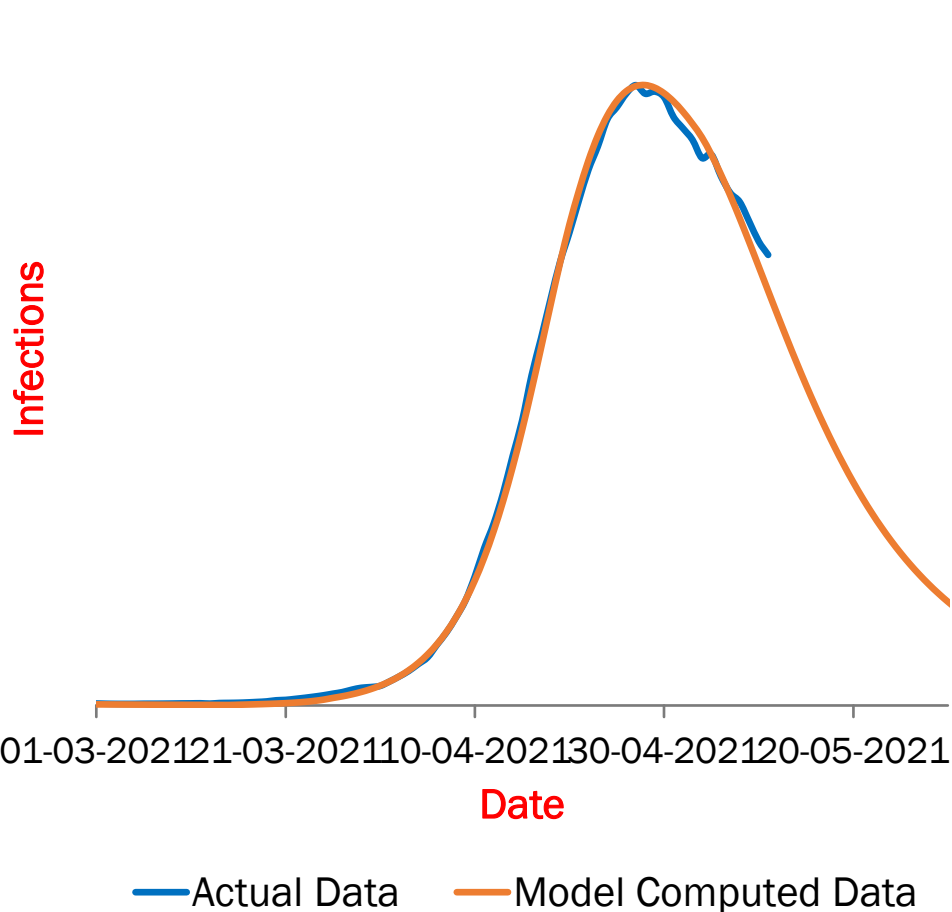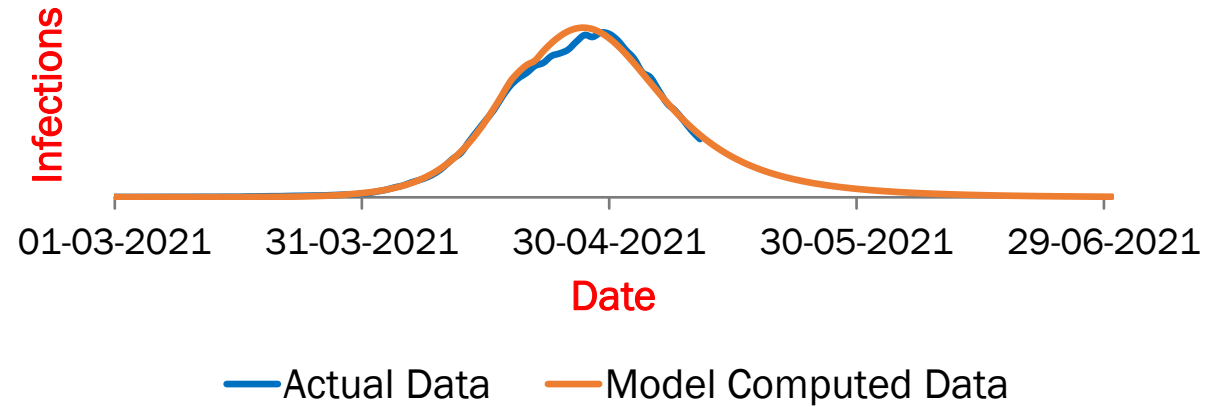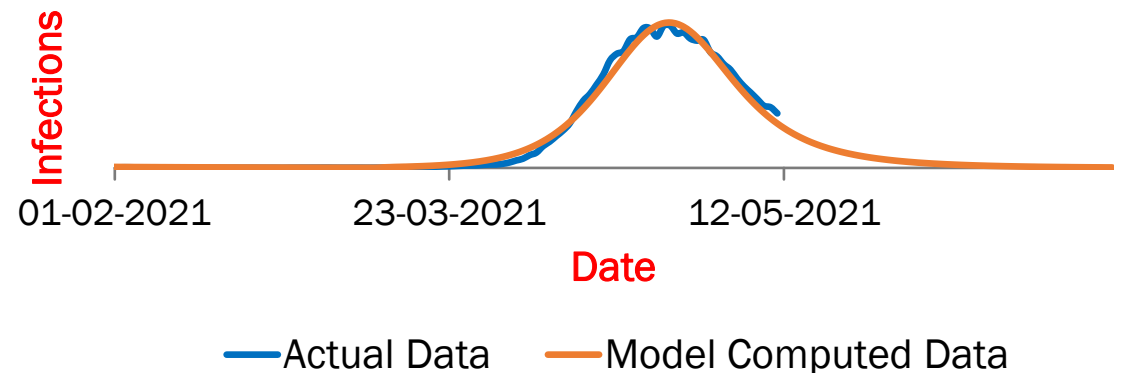
OXYGEN CONSUMPTION MONITORING PORTAL

- A portal developed for oxygen consumption in 56 hospitals of the state

- Data updated everyday

- Allows tracking of usage according to types of oxygen support, hospitals, and patients

Average Flow Rate per Person vs Institutions

Average Flow Rate per Person vs Institutions
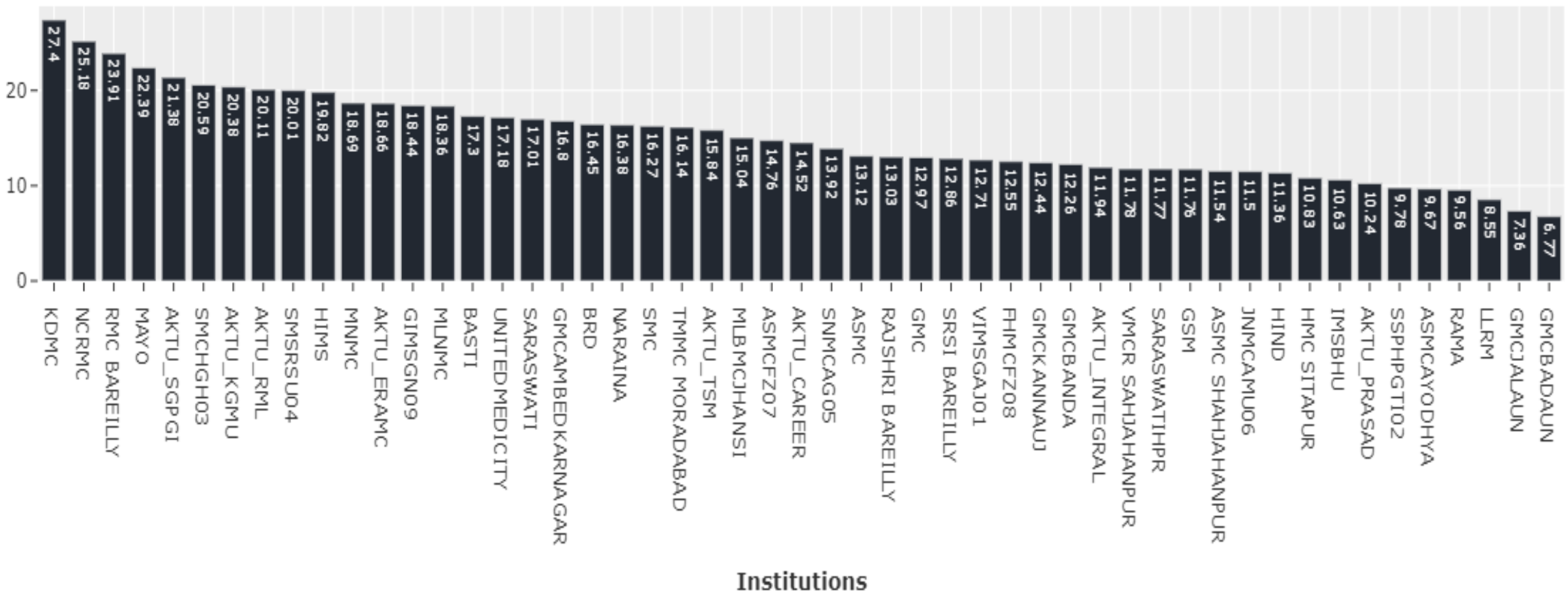
SIR – COVID-19 PREDICTION MODEL

❑ IIT Kanpur team has developed SIR (Susceptible-Infected-Removed) Model to estimate the peak.

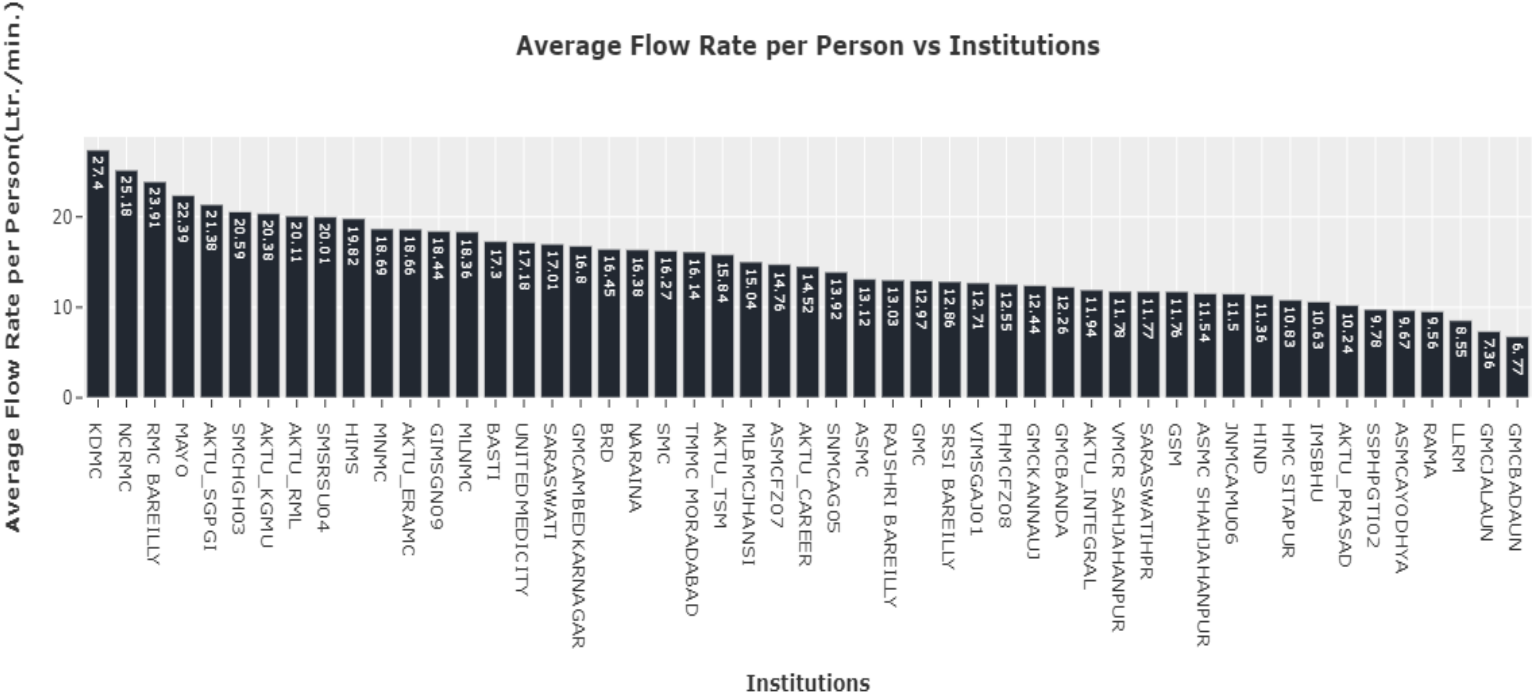❑ A data-driven approach based on past outbreaks is used to predict the decline of the epidemic.

❑ The following website has been launched for updated daily forecasts.
https://covid19-forecast.org

STARTUP
INCUBATION AND
INNOVATION
CENTRE
IIT KANPUR

IIT KANPUR | INCUBATION AND INNOVATION

INVASIVE VENTILATOR BY NOCCA ROBOTICS

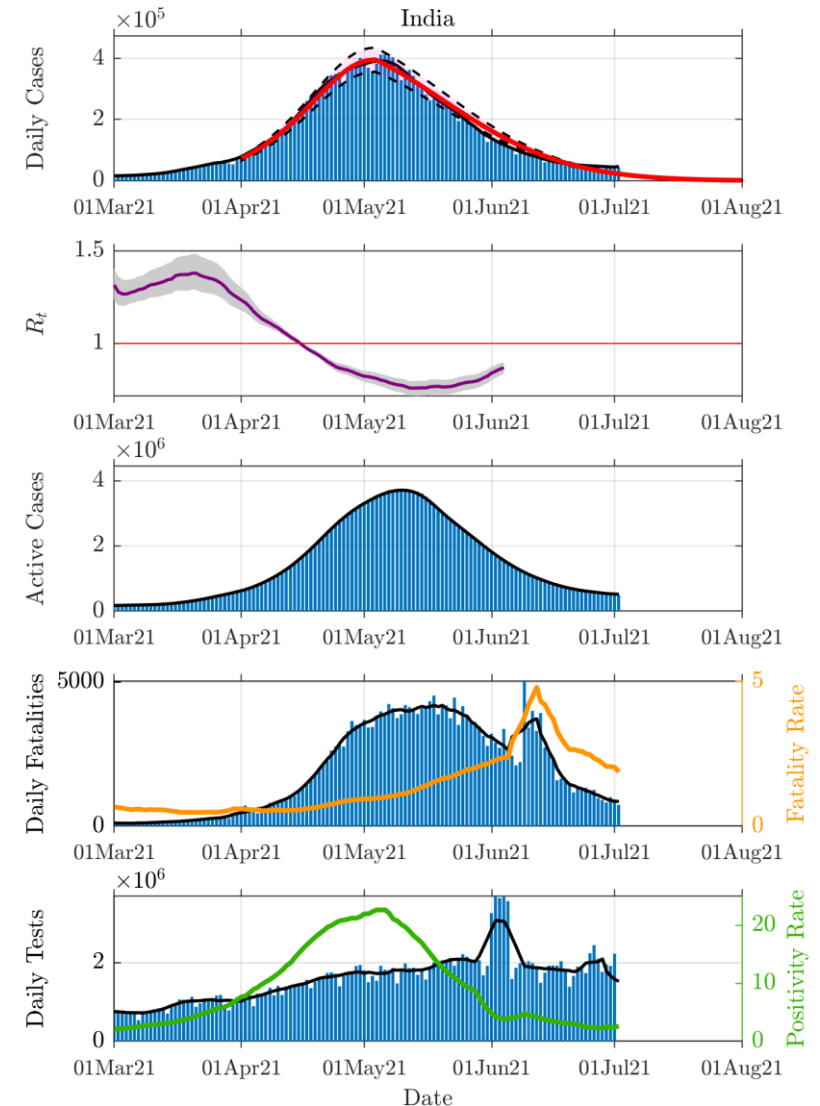- Modular design, high end ventilator.

- Rapidly manufacturable at large scale across India.

- Low Power Pressure controlled (Version 1), Pressure and Volume Control (Version 2).

- Versatile operations: works with both medical air / ambient air + oxygen.

- IoT-based system to create a Ventilator Management System.

- Easy transition from invasive to non-invasive ventilation.

ICU Ventilator in 90 days

Deployed in more than 1000 hospitals across the country

Oxygen Concentrators (8-10 LPM)

10 teams in collaborative learning & development

8 SMEs to manufacture from 70+ applications

Oxygen Plants (150 & 500 LPM)

2 teams experienced with delivering large scale government projects are setting up plants

Hydrogenated Oxygen Therapy Device

A serial innovator developing new kind of machine to help the COVID-19 patients at 6 LPM

Oxygen Saving Device

A device to save the O2 by managing the flow during the exhalation cycle is being developed in mentorship of Prof. Manu Prakash from Stanford University, an alumnus of IIT Kanpur

IIT Kanpur is also the Nodal Agency of the Consortium led by the Office of the PSA, GoI

FUEL-CELL BASED OXYGEN GENERATOR AND VENTILATOR

- Separate oxygen from the atmosphere to be used by a homemade respirator.

- The device will selectively filter out oxygen from air & compressed to serve acute respiratory problems.

- Does not require to store and carry oxygen cylinder.

STARTUP
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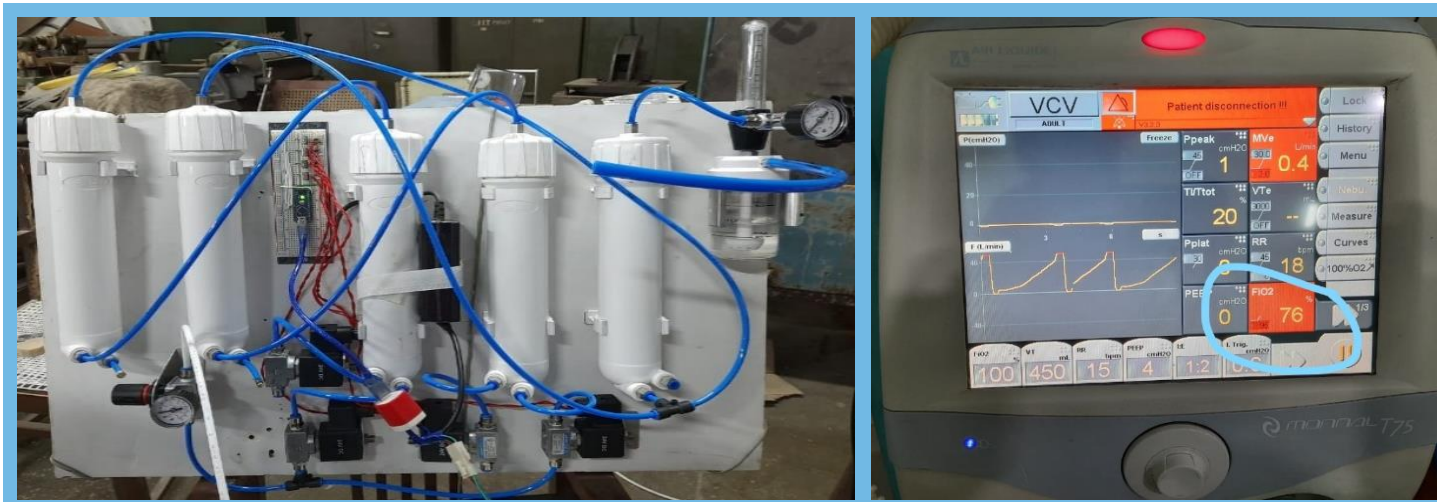
POSITIVE PRESSURE RESPIRATOR SYSTEM

- Developed a working prototype of a Positive Pressure Respirator System.

- Addresses the problem of the acute global scarcity of N95 respirators

- provides uncontaminated air and isolates the health professionals from the exposure to the virus.

- Can be built fairly quickly, using local resources & in large numbers.

Face covering/shell with leak proof closed-cell foam seal

1-way valve for exhaled air

Sling for air bottle

Air source selector: 2-way valve

Air source: A compact rechargeable air-bottle

Air source: Main cylinder
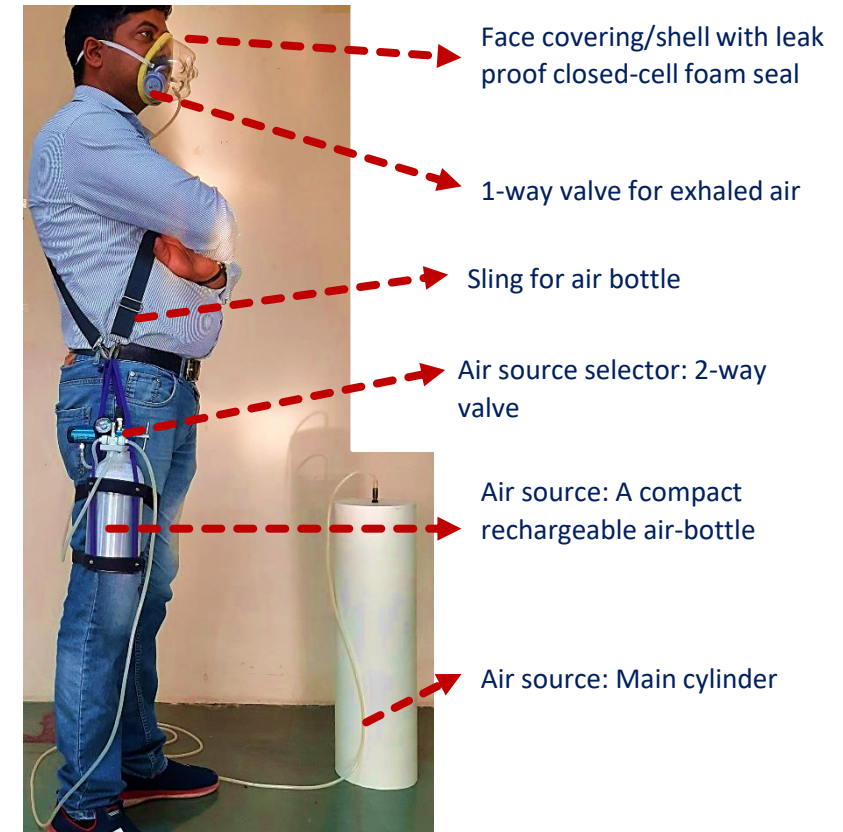
SWASA N95 MASK BY ESPIN

- Swasa mask manufacturing facility with capacity to produce 25,000 masks daily

- Tested various available filter media and developed a low-cost protective respirator.

- Testing rig equipped with an aerosol laser spectrometer for non-woven polypropylene based 3-4 layer material.

PREVENTIVE AND COST-EFFECTIVE SURFACE COATING

- Develop virucidal coatings for inanimate surfaces used in healthcare settings such as surgical masks.

- Based on a combination of anti-microbial polymer coating and functionalized virucidal drugs/agents to attain a synergistic anti-viral effect.

- Collaborate with potential industry/ start-up for large-scale applications.
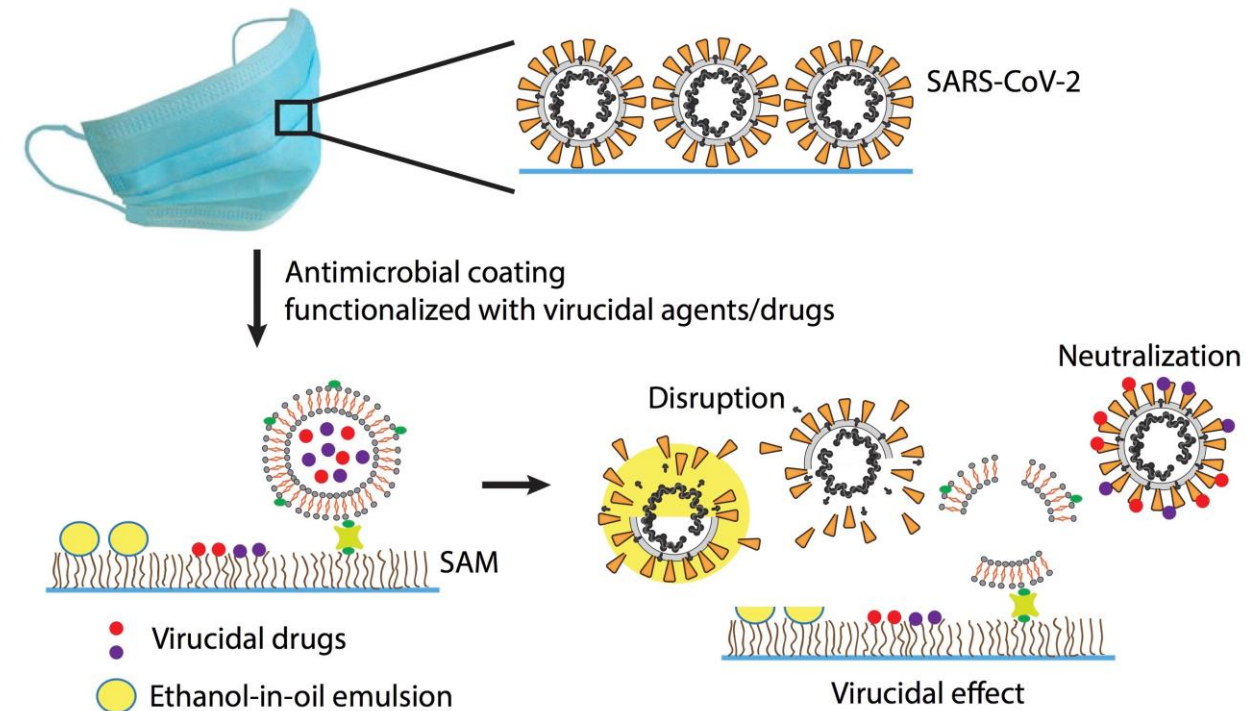
REUSABLE N95 AND N99 MASKS

- IIT Kanpur is developing affordable reusable N95 & N99 masks with the support from DST's Nano Mission
- COVID19 virus will get killed once it enters the mask filter
- The mask will eliminate the secondary source of contamination

@drharshvardhan @drharshvardhanofficial @drharshvardhanofficial www.drharshvardhan.com

Schematic diagram of the proposed mask

- These advanced masks have three filters: a Nonwoven filter, a Coarse filter, a Nanofiber filter, and a supporting layer.

- The supporting layer can kill coronavirus as soon as it enters the mask filter.

- Equipped to eliminate the secondary source of contamination.

In this project, IIT Kanpur has received assistance from DST's Nano Mission.

PERSONAL PROTECTIVE EQUIPMENT KITS

PI: Prof. Nitin Gupta, Prof. Raju Gupta, Prof. Saikat Ghosh, Prof. Saumen Guha, Prof. Shilpi Gupta

- Designed a PIPES (Polythelene-based Improvised Protective Equipment under Scarcity) Kit based on thin cylindrical rolls/pipes of Polyethylene.

- Polythene material makes airtight enclosure for required protection.

- Open source through the website pipeskit.org for anybody to make it.

- Easy to scale, cost effective and relevant particularly as imported kits are difficult to get.

CONTACT TRACING AND FAKE NEWS VERIFICATION APP

- Identification of the potentially infected individuals via contact-tracing.

- Real-time health monitoring.

- Live-tracking of home quarantined individuals.

- User-friendly fake information detection system for social media platforms.

- Fact-checked via simple message forwarding.

- Can be used with non-smart phone.

- Deployable in areas of limited telecom connectivity.
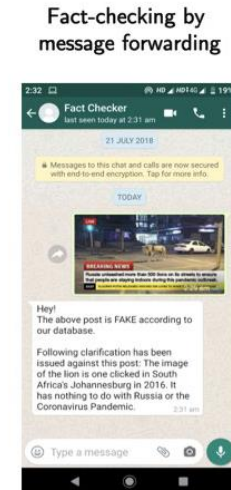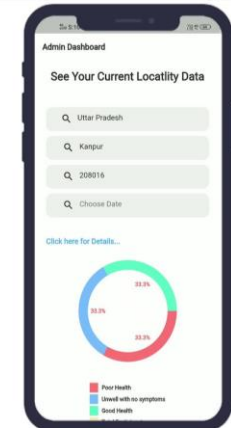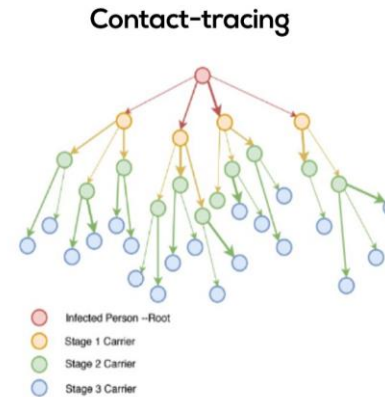
CHEMICAL AND THERMAL DISINFECTING SYSTEM

- Combined two disinfection approaches to achieve a cost-effective & rapid disinfection process.

- Deployable at various facilities where safe access control is necessary.

- Prototyped and undergoing field trials at IIT Kanpur health center.

- Utilizes two chambers, viz., atomization chamber and thermal shock chamber.

- Achieve near-complete (> 90%) personnel disinfection within 60 seconds.

SOLAR-POWERED NATURES BOX SMART BIN SYSTEM

- A smart-bin with special coating on its mouth's surface that reduces the life span of the novel coronavirus by up to 95 per cent.

- Enhances safety level during waste handling and minimises chances of secondary infection.

- Embedded with a dashboard that provides information about the amount of garbage in the bin and when it needs to be cleaned.

- Reduces the manpower and resource consumption to be engaged in the cleaning of such bins by up to 80 per cent.

Image of under construction piece for Demo purpose only* not to scale for size or volume (This is a 240 L (120 litre x2) Bin
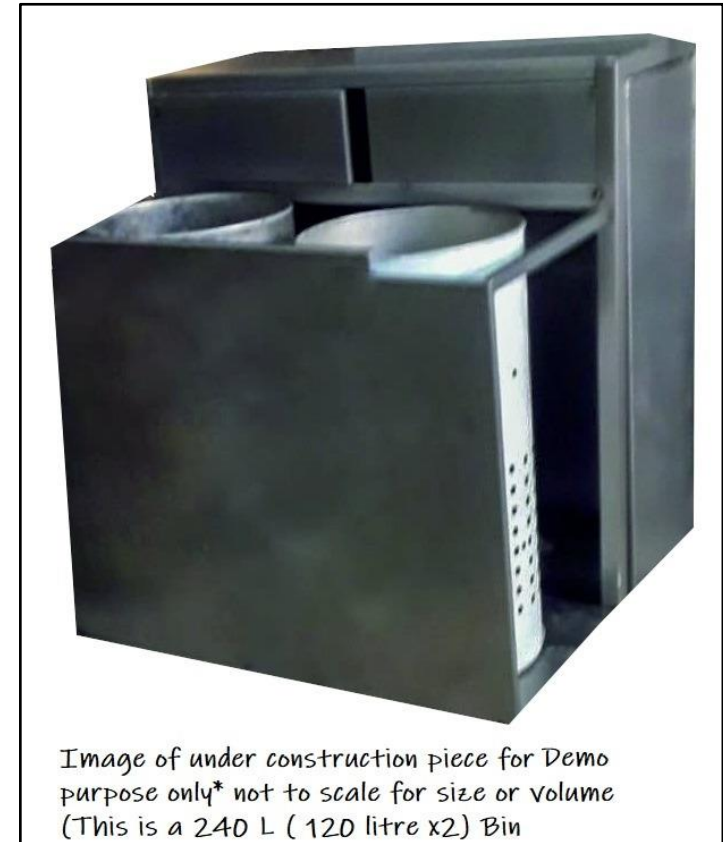
FEASIBILITY STUDY OF VACCINE DELIVERY USING DRONES

❑ conducted by IIT Kanpur and ICMR (Indian council of Medical Research)

❑ Drone has been developed by SIIC IIT Kanpur incubated company CDSpace Robotics Pvt Ltd under the mentorship of Prof. AK Ghosh

❑ Can deliver upto 5Kg vaccine boxes as a payload

❑ Soon will be deployed in remote areas for providing vaccines to the vaccination centers

UAVs FOR SURVEILLANCE OF CITIES FOR DETECTING LOCK-DOWN VIOLATIONS

- Used for surveillance of an area of radius up to 15 km.

- High-resolution camera with night vision capabilities.

- Endurance of these UAVs ranges from 1.5 to 10 hours.

- Ready for deployment.

- Use by Kanpur city police.

Play the Video