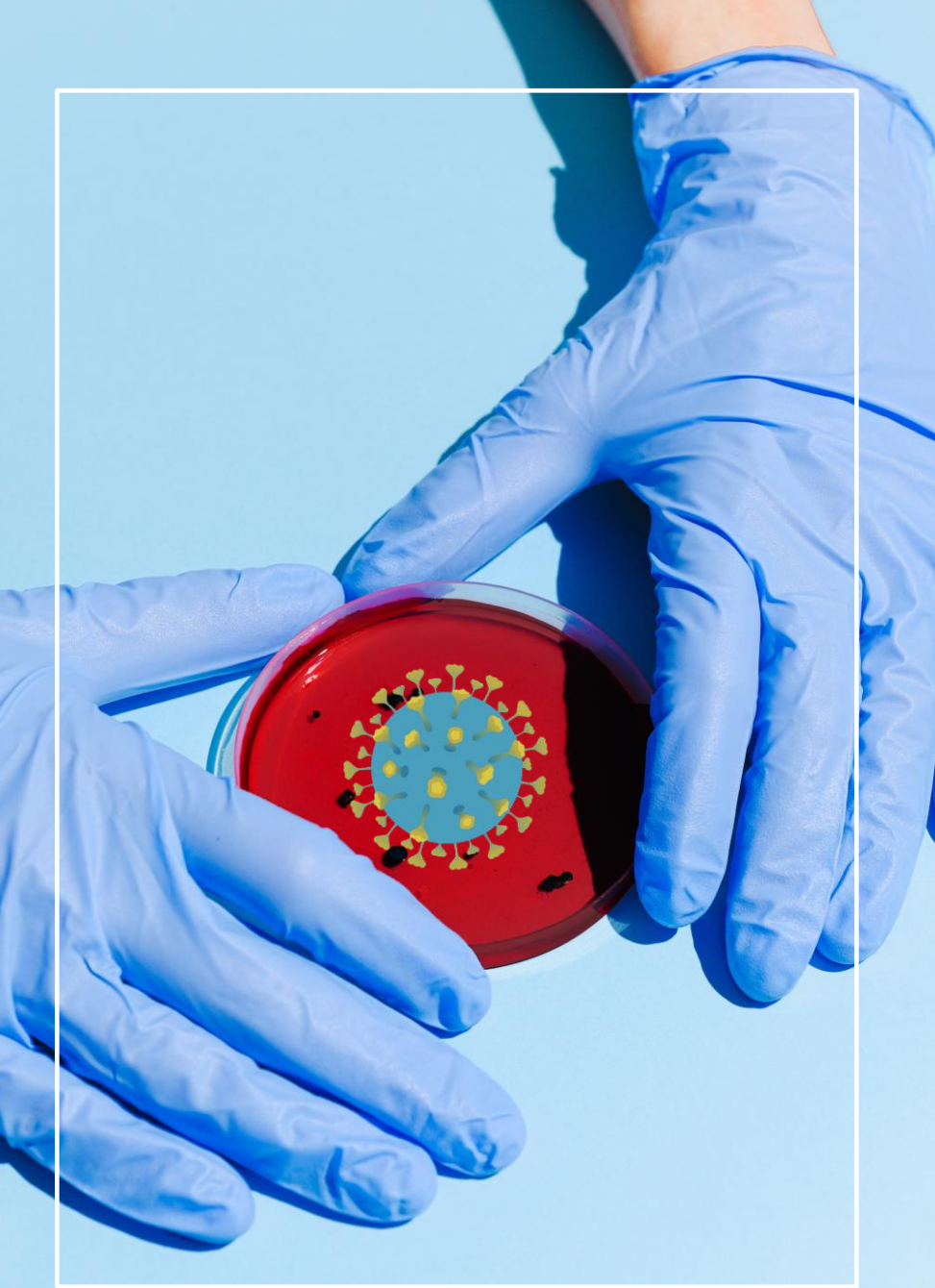


Indian Institute of Technology Kanpur

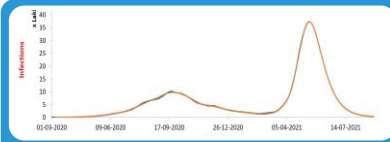


# Research Efforts to combat Covid 19



Office of Research & Development

# BROAD CLASSIFICATIONS



Modelling for Covid Trajectory Prediction



Critical Treatment



Personal Protection & Primary Healthcare



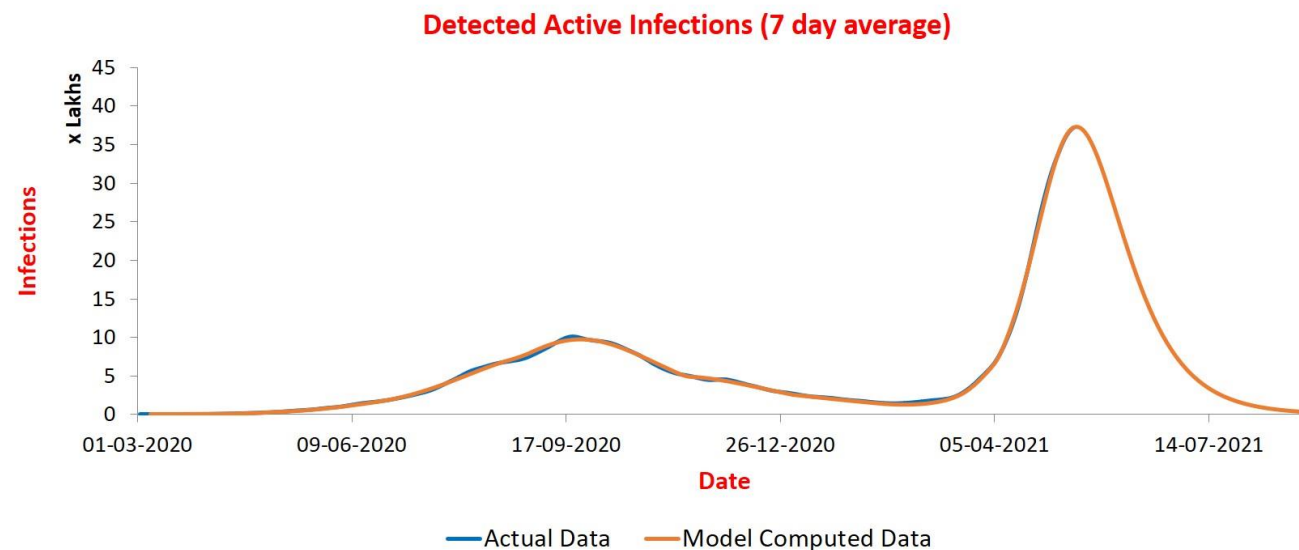
Disinfection & Sanitization



Autonomous Services

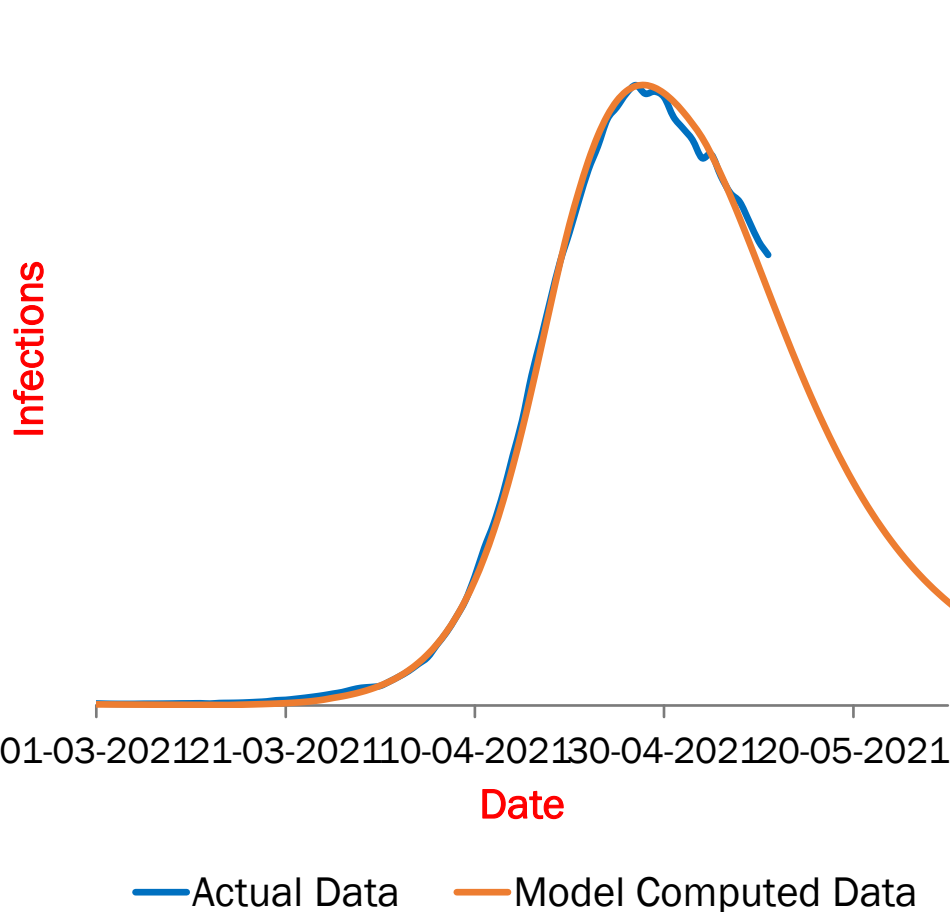
# SUTRA MODEL FOR COVID-19

- 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

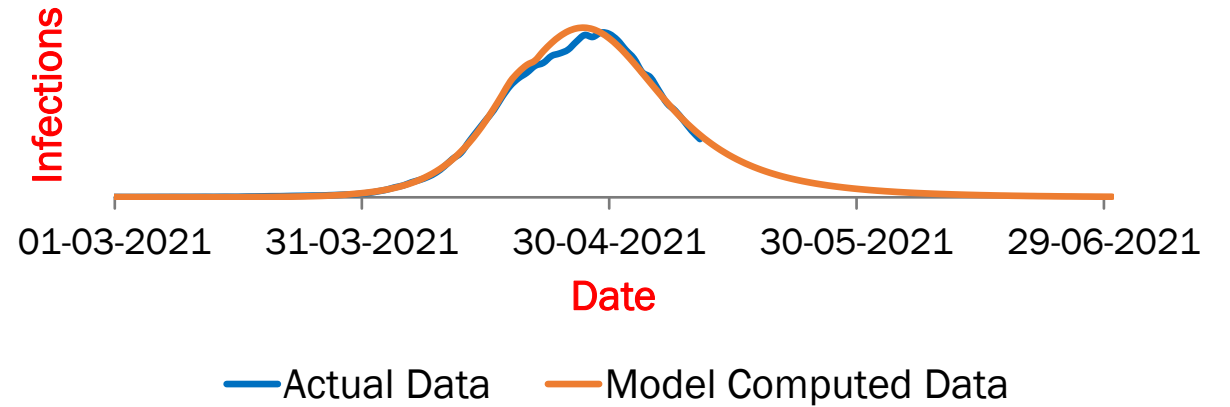


# PROJECTIONS FOR COVID PROGRESSION

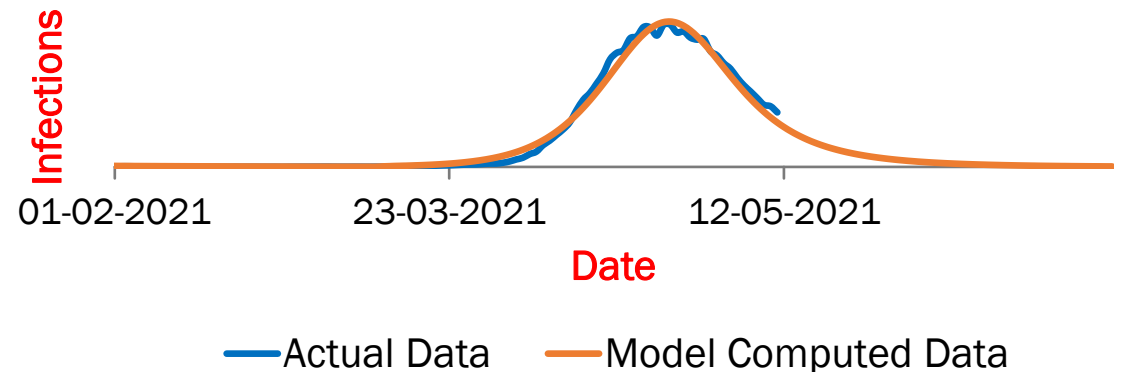
## UP: Detected New Infections



## Kanpur: Detected New Infections

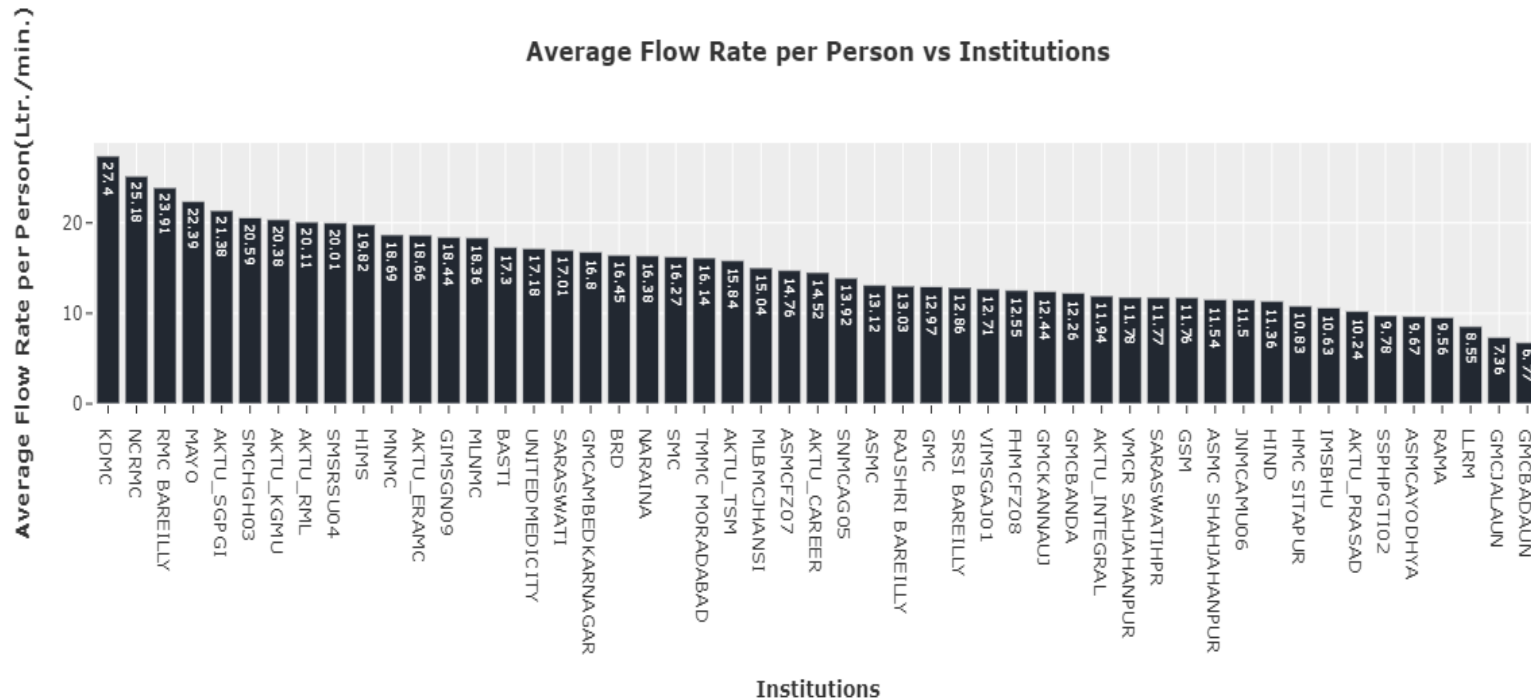


## Lucknow: Detected New Infections

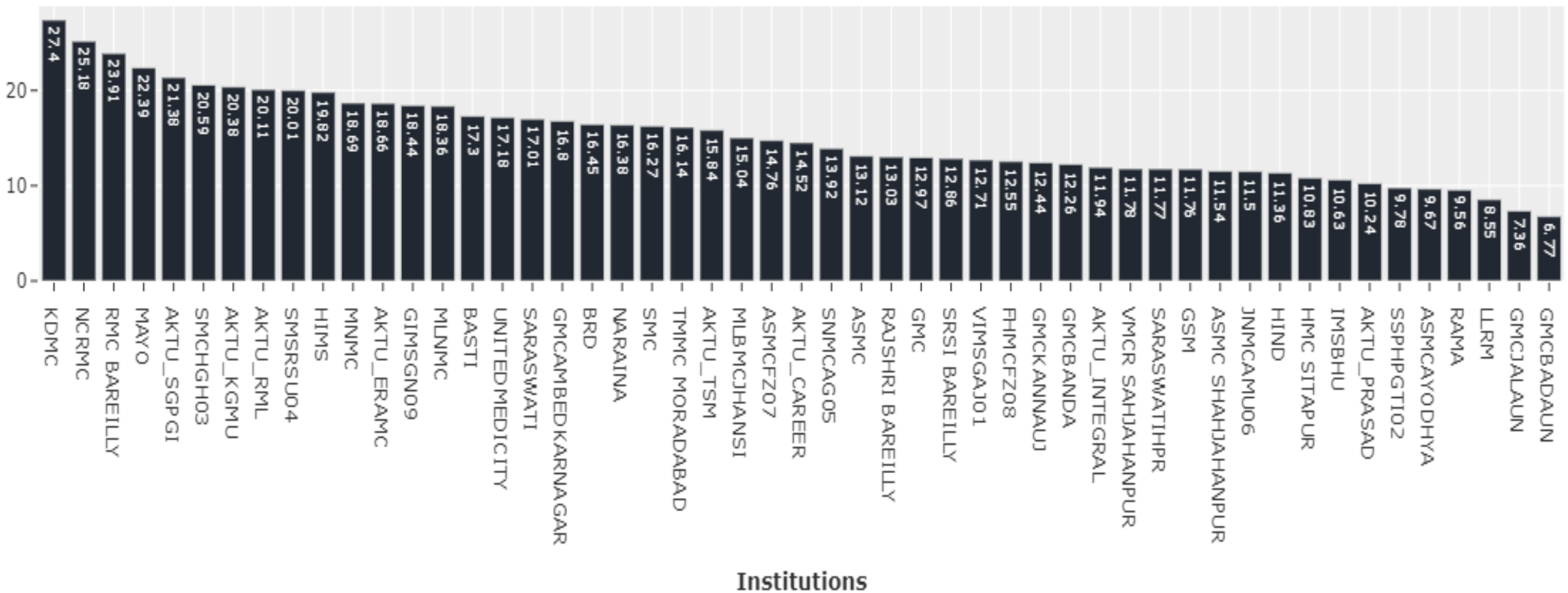


# OXYGEN CONSUMPTION MONITORING PORTAL

- 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**

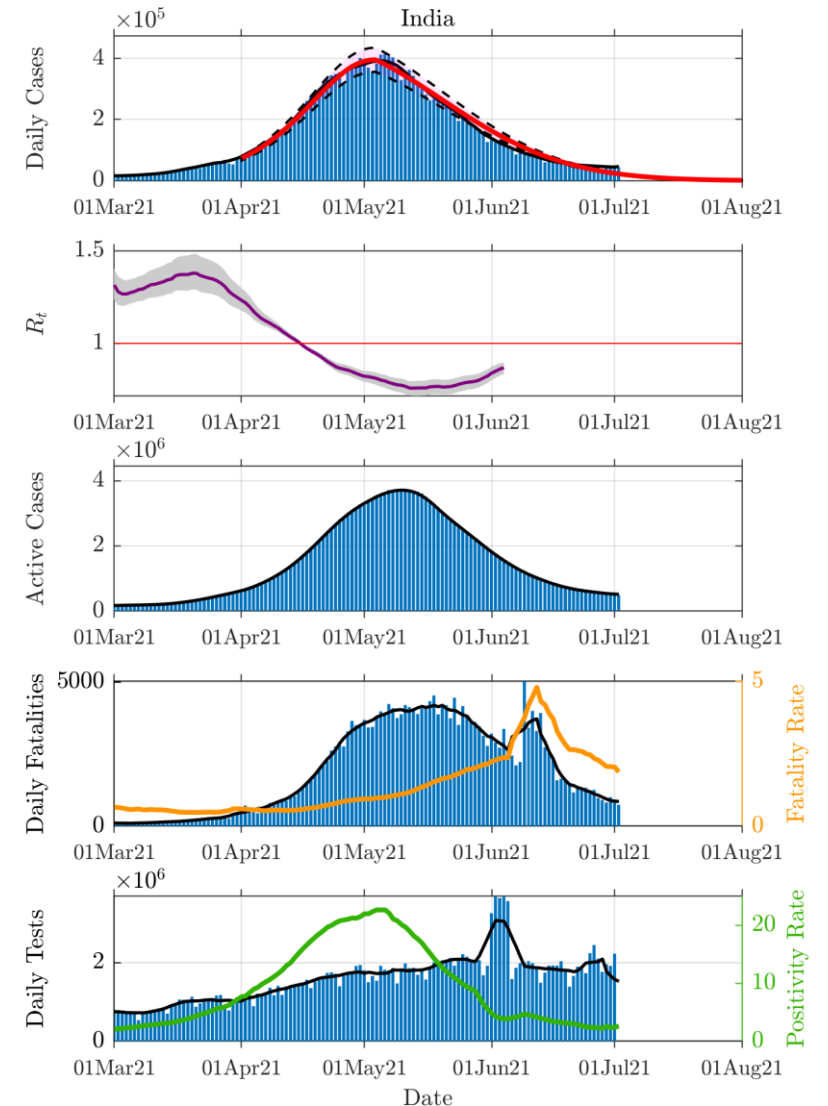




# SIR – COVID-19 PREDICTION MODEL

- ❑ 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>



# 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





Unprecedented Times.  
Unprecedented Efforts

IIT Kanpur has been fighting against COVID-19 pandemic from the frontline.

### 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 O<sub>2</sub> 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

**MISSION BHARAT O<sub>2</sub>**  
— We can do it —

STARTUP INCUBATION AND INNOVATION CENTRE IIT KANPUR

OPEN MANUFACTURING CHALLENGE  
**FOR INDIGENOUS BEDSIDE OXYGEN CONCENTRATOR FOR COVID-19 EMERGENCY RESPONSE**

Inviting manufacturers across India to join hands with SIIC, IIT Kanpur.

**Apply Now!** [www.bharatO2.com](http://www.bharatO2.com)

WHAT YOU GET

- Supply chain and Quality Sourcing support
- Funding Support
- Distribution and Logistics Support

WHY SIIC?

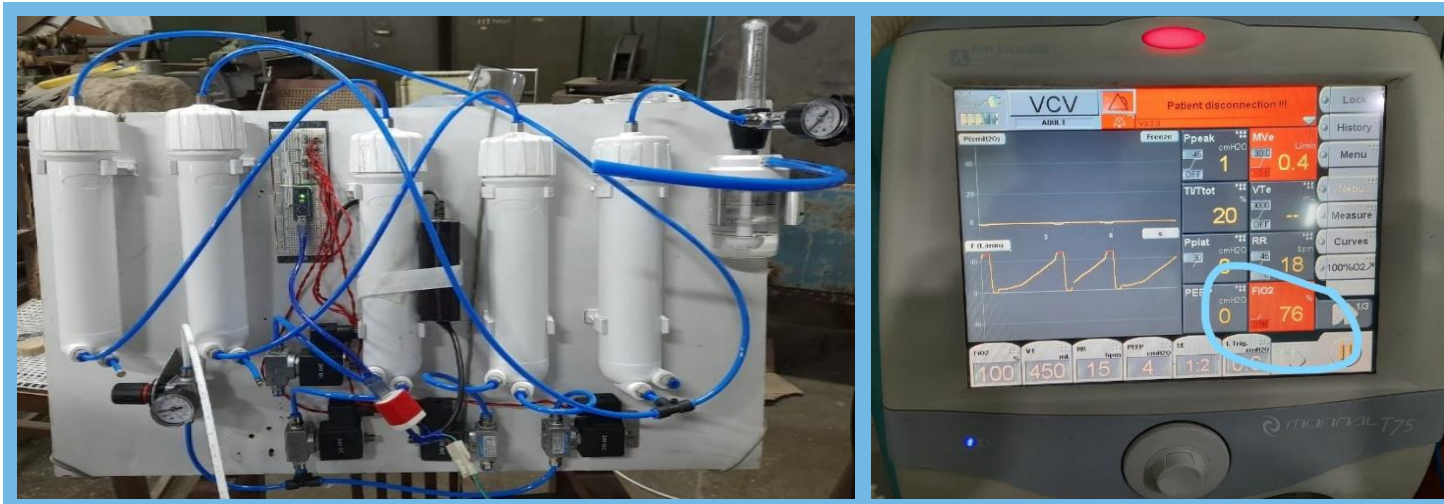
SIIC IIT Kanpur has brought together the team that delivered the ICU-Ventilator in 90-days and we believe we will be able to do it again.

the Ventilator Project

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

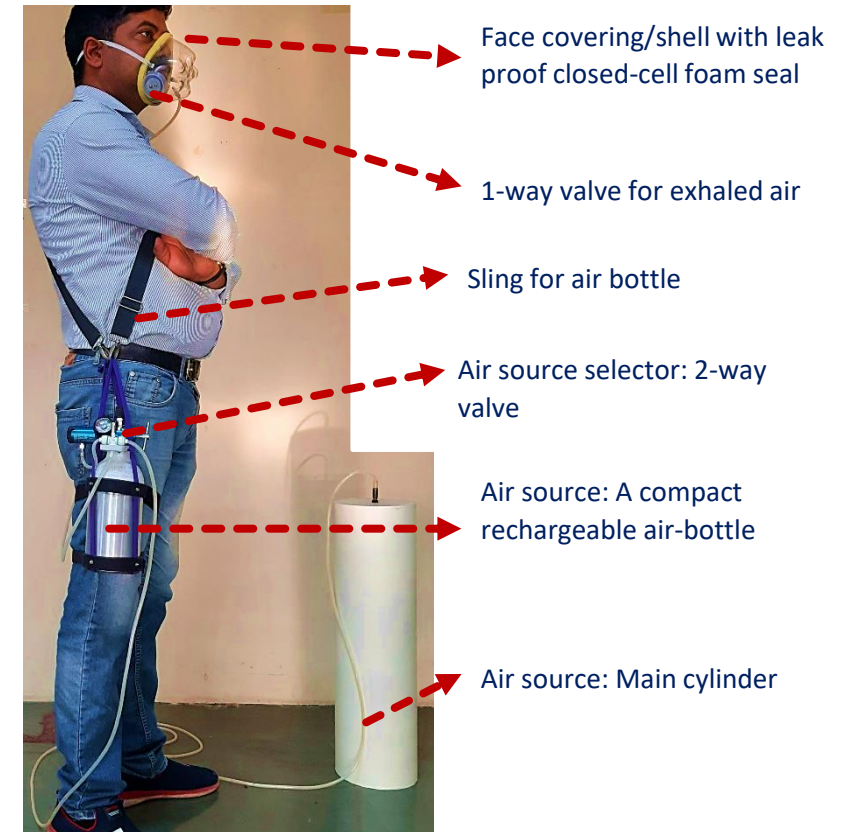
# FUEL-CELL BASED OXYGEN GENERATOR AND VENTILATOR

- 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.



# 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.



# SWASA N95 MASK BY ESPIN

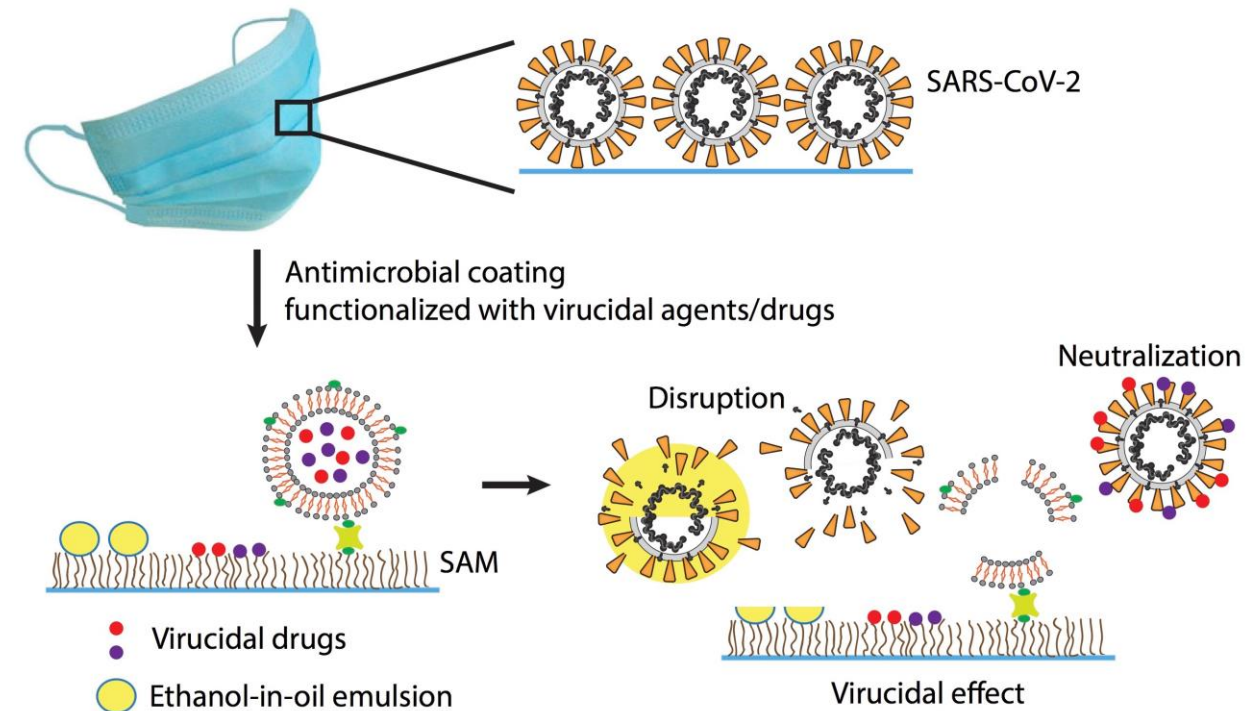
- Swasa mask manufacturing facility with capacity to produce 25,000 masks daily
- Tested various available filter media and developed a low-cost protective respirator.
- Testing rig equipped with an aerosol laser spectrometer for non-woven polypropylene based 3-4 layer material.





# 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

विज्ञान एवं प्रौद्योगिकी विभाग  
DEPARTMENT OF  
SCIENCE & TECHNOLOGY

- 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



Schematic diagram of the proposed mask

Nonwoven Filter, Coarse Filter, Nanofiber Filter, Supporting Layer

@drharshvardhan @drharshvardhanofficial @drharshvardhanofficial www.drharshvardhan.com

- 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

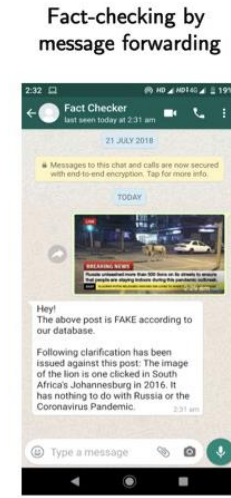
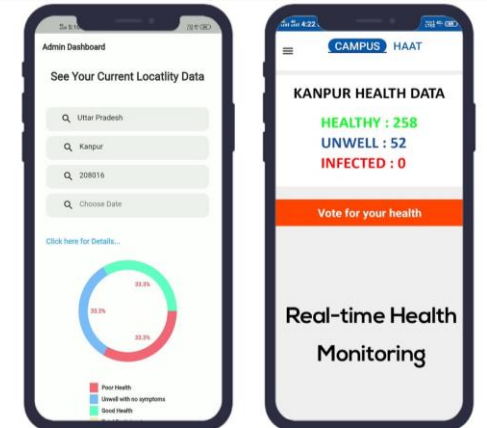
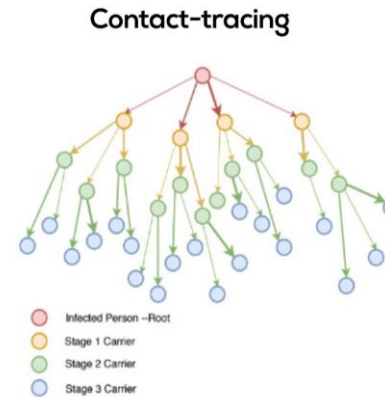
PI: Prof. Nitin Gupta, Prof. Raju Gupta, Prof. Saikat Ghosh, Prof. Saumen Guha, Prof. Shilpi Gupta

- 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](http://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.



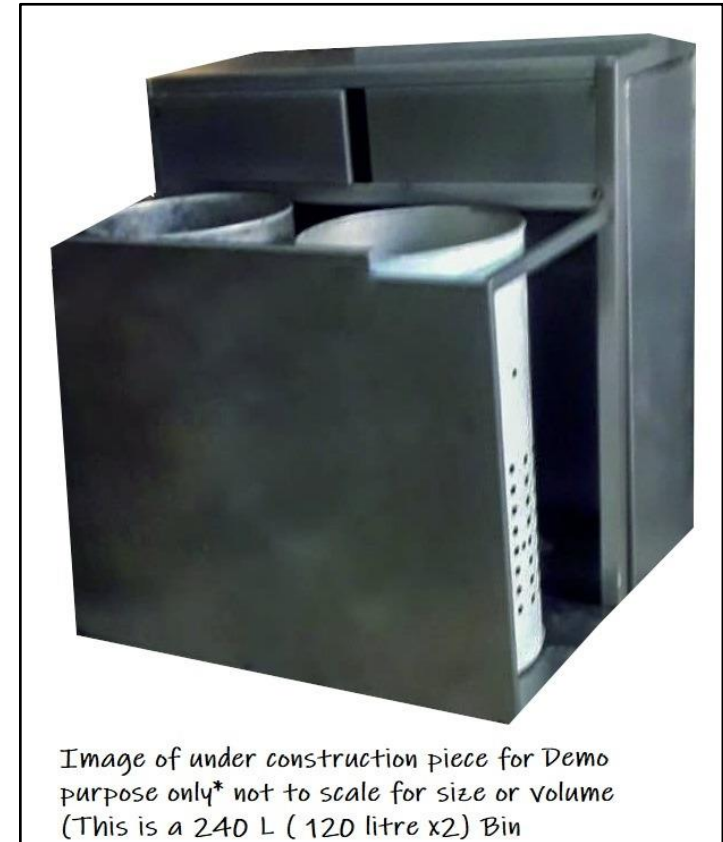
# CHEMICAL AND THERMAL DISINFECTING SYSTEM

- 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.





# 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.

