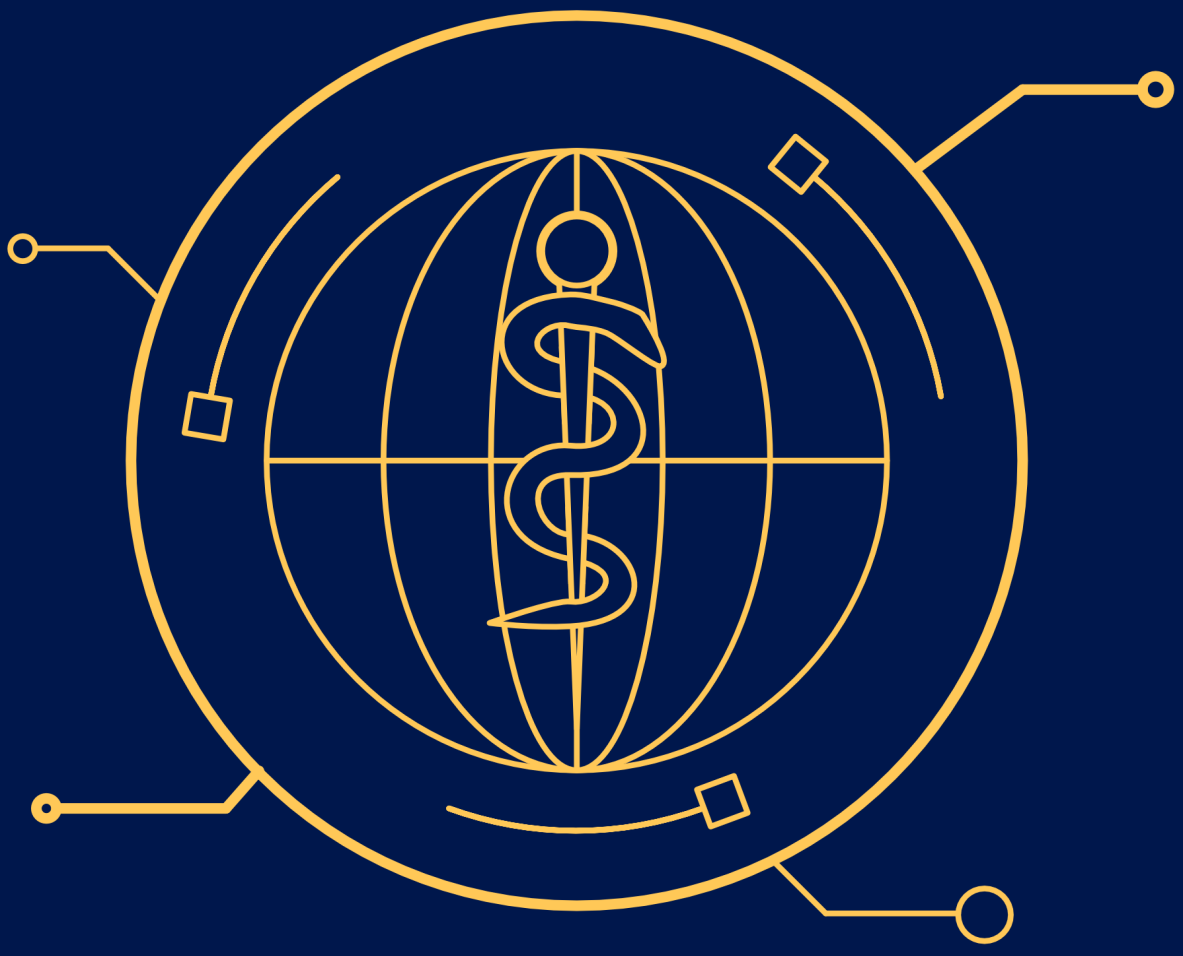
Executive Summary

THE ROLE OF SPACE DURING PANDEMICS



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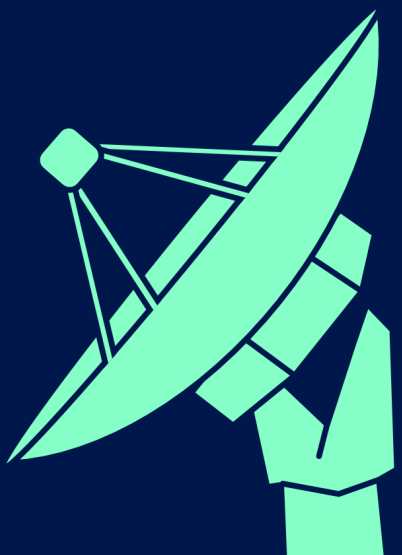


WE ARE EXPEDITION ISP20

OUR MISSION

The International Space University's 2020 Interactive Space Program is unprecedented - the first program of its kind tasked with tackling a global challenge online, utilizing the resources of an international community of 86 crew members from 20 countries. Spread across time zones, working remotely, and collaborating online, crew members have split into three crew habitats to investigate and report on innovative space-based applications and resources so that humanity can better:

prevent and prepare for global pandemics

monitor

mitigate

The findings and recommendations of each three reports are integrated within this Executive Summary. We hope this overview from space provides key stakeholders with an expanded perspective to make more informed decisions and take collaborative action to create a healthier world for all.

INTRODUCTION

As humanity has spread across the globe, infectious disease has followed. We are now more interconnected than ever. Our cities and transportation networks grow ever more complex, increasing our contact with each other across borders and expanding our encroachment upon global ecosystems.

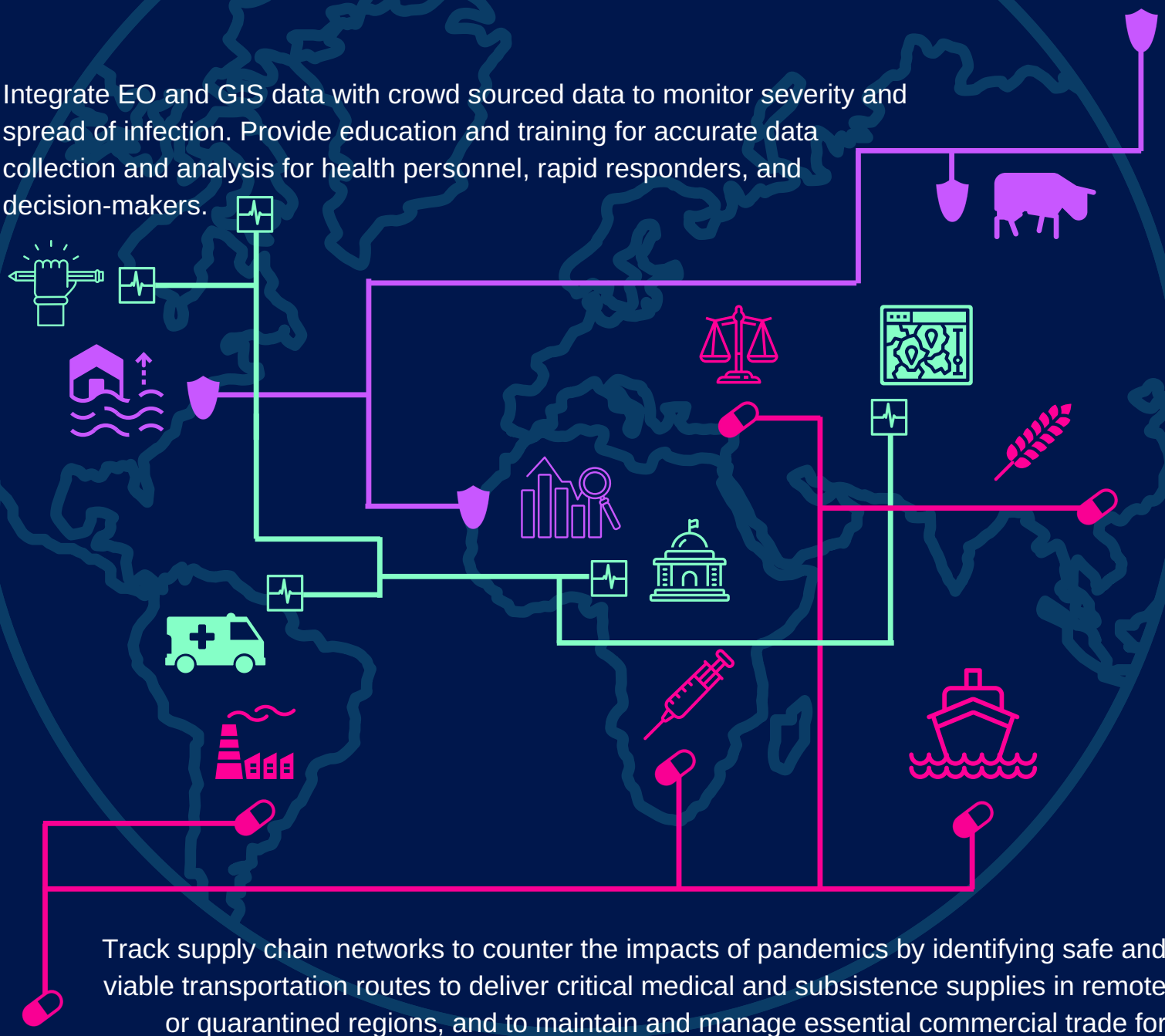
The result of this interconnectivity has led humanity toward great achievements in technological innovation, scientific understanding and international cooperation. At the same time, this interconnectedness has compounded the prevalence of global pandemics and the probability for more in humanity's future.

BIG DATA, BETTER ANALYTICS

Satellite technologies have come a long way since Sputnik. Data from Earth Observations (EO) and Geographical Information Systems (GIS) is growing exponentially. Better coverage and higher quality information means a rich data set. Yet we need to put that data to work, shaping data analytics to address issues related to global pandemics and making that data accessible to the public. With better analytics, we can develop sophisticated models to track the risk of outbreaks, monitor the spread of disease, and assess impacts of global pandemics.

Create predictive risk models to prevent and prepare for disease outbreaks, including tracking animal and human population interactions for disease transmissions and spread, and monitoring environmental factors predictive of disease outbreaks, such as measuring air quality or monitoring flood regions.

Integrate EO and GIS data with crowd sourced data to monitor severity and spread of infection. Provide education and training for accurate data collection and analysis for health personnel, rapid responders, and decision-makers.



Track supply chain networks to counter the impacts of pandemics by identifying safe and viable transportation routes to deliver critical medical and subsistence supplies in remote or quarantined regions, and to maintain and manage essential commercial trade for economically resilient communities.

INFRASTRUCTURE SUPPORT FOR HEALTHCARE AND ECONOMICS

Automated Transportation using GNSS and an extensive wireless communication network backed by LEO satellite constellations and 5G will enable an automated transportation network guided by geofencing to create virtual boundaries where automated transport can be used.

Automated identification system (AIS) for maintaining records of critical resources (PPE, food, medication) to assess potential shortages or accumulations due to interruptions in the supply chain during a pandemic, allowing for redistribution.

Automated Medical Kiosk combining auto-temperature checks with the purchase of PPE using network connectivity to flag suspected Covid-19 cases by storing and transmitting data on PPE purchases.

Unmanned aerial vehicles (UAV), with zero emissions, full autonomy and the combination of vertical take-off and landing (VTOL), long-distance UAVs to be implemented for smart quarantine.

Dedicated Public Connect using Space involving a small satellite constellation to deliver public health education and guidelines with a Multi-System Satellite Communication Phone to ease and accelerate access to a satellite communication system.

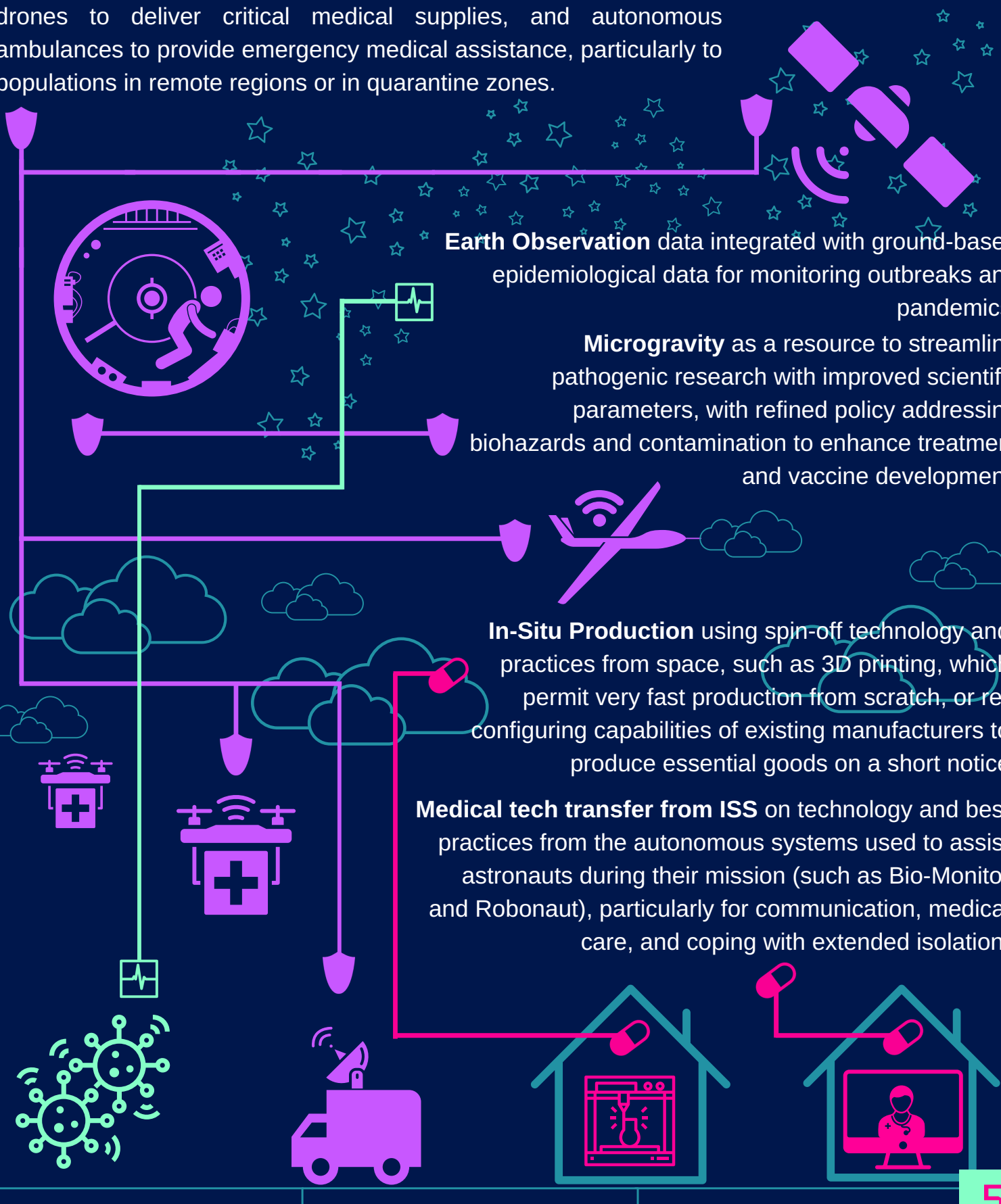
A swift [SPACE +] communication mechanism which includes a message delivery service which combines a GPS-SMS alert system to direct people with guidelines about entering areas of concern, and a live web-platform aligned with the Medical Situation Awareness tool of WHO

Telemedicine as the new first line approach to diagnose and treatment, relying on an improved triage, evaluation, and care system to maintaining healthcare services to all medical patients while mitigating the spread of Covid-19.

SPINOFF TECHNOLOGIES

Space exploration is not just for astronauts. Development of space research and technologies means we can talk to loved ones far away or get updated information about coronavirus cases in our respective geographic areas. What spinoff technologies can we leverage to address the global pandemic challenges we face today and for tomorrow?

Global Navigation Satellite System to enable rapid response drones to deliver critical medical supplies, and autonomous ambulances to provide emergency medical assistance, particularly to populations in remote regions or in quarantine zones.



Earth Observation data integrated with ground-based epidemiological data for monitoring outbreaks and pandemics.

Microgravity as a resource to streamline pathogenic research with improved scientific parameters, with refined policy addressing biohazards and contamination to enhance treatment and vaccine development.

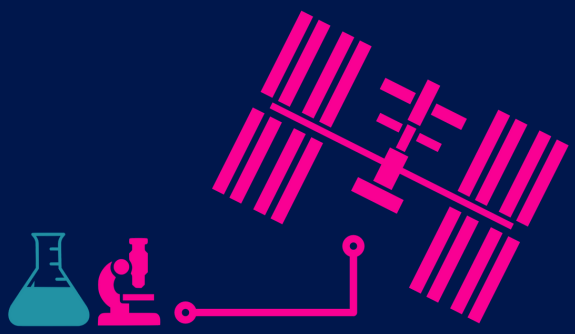
In-Situ Production using spin-off technology and practices from space, such as 3D printing, which permit very fast production from scratch, or re-configuring capabilities of existing manufacturers to produce essential goods on a short notice

Medical tech transfer from ISS on technology and best practices from the autonomous systems used to assist astronauts during their mission (such as Bio-Monitor and Robonaut), particularly for communication, medical care, and coping with extended isolation.

Policy, Partnerships and Outreach

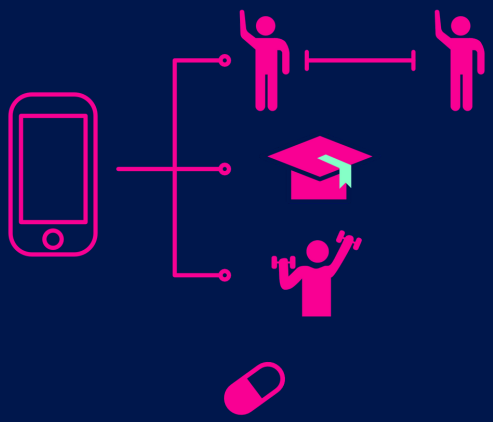
As the pandemics cross international borders, they should be dealt with by an international framework and aligned with the work of the WHO. Policy changes amend key areas such as defense, communication, and outreach for upgraded international collaboration. The current global pandemic has created an urgency for global cooperation. What policies and partnerships can we build upon that can better prepare us for pandemics?

Space Consortium at a global level - that formulates a space charter whereby satellite data is shared for the management of pandemics falling under the ambit of UN SPIDER, UNOOSA, WHO and Multi-lateral space agencies - can lead to build, strengthen, and amend policy frameworks at an international level.

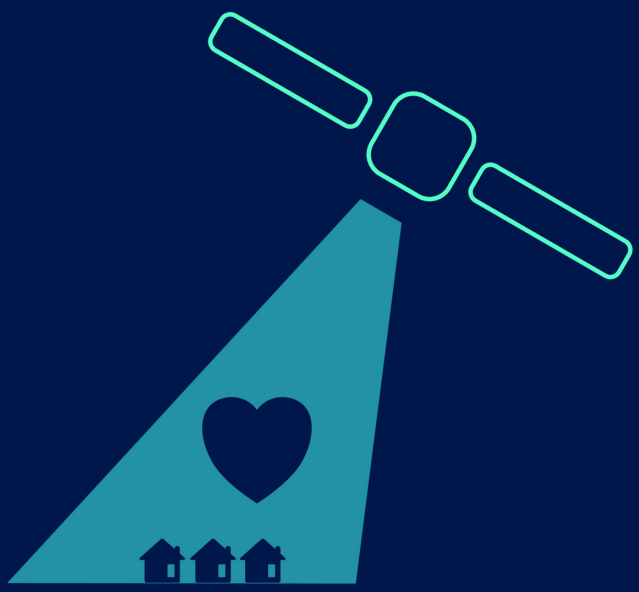


Linking the Space Station with Medical Virulence Researchers in a codified manner by streamlining the application process for speeding up vaccine development process.

Bridging the Gap by reducing international inequalities through upgraded protocols to promote sharing of information between space-faring and non-space faring nations, thus closing the gap of unequal access to outer space data.



The Spaceship Earth application will seek to digitally re-create the “overview effect” to address the isolation caused by social distancing for students and promote quality remote space education, while encouraging interaction, real world immersion, and physical activity.



THE OVERVIEW EFFECT

The cognitive shift in awareness that astronauts experience during space flight when viewing what Carl Sagan called “The Pale Blue Dot” has helped us better understand the fragile nature of our planet, inspired better stewardship of our valuable resources, and evoked a sense of awe about our place in the universe. From the vantage point of space, humanity appears united rather than divided.

Now is the time for humanity to invoke the overview effect for our latest challenge to monitor and mitigate the current global pandemic and prevent and prepare ourselves for the potential of another.

Acknowledgment

The International Space University and Team Mission Expedition ISP20 wish to express their sincere appreciation to the following sponsors and partners:

Lockheed Martin Corporation (LMCO)
Eurometropolis of Strasbourg
CNES
ESA
ISRO
NASA
Association of Space Explorers (ASE)
Cosmonaut Oleg Atkov
Federal Aviation Administration (FAA)
Ilan Ramon Foundation
Israel Space Agency (ISA)
Lin and Jim Burke scholarship fund
Prof. Mike Simpson
Tohoku University
UK Ministry of Defence

The authors gratefully acknowledge the generous guidance, support, and direction provided by the ISU staff members, visiting lecturers, program officers, program staff, advisors, and experts as mentioned in the Team Reports.

Electronic copies of the Executive Summary and Team Mission Report may be found on the ISU website (httm://isulibrary.isunet.edu/).

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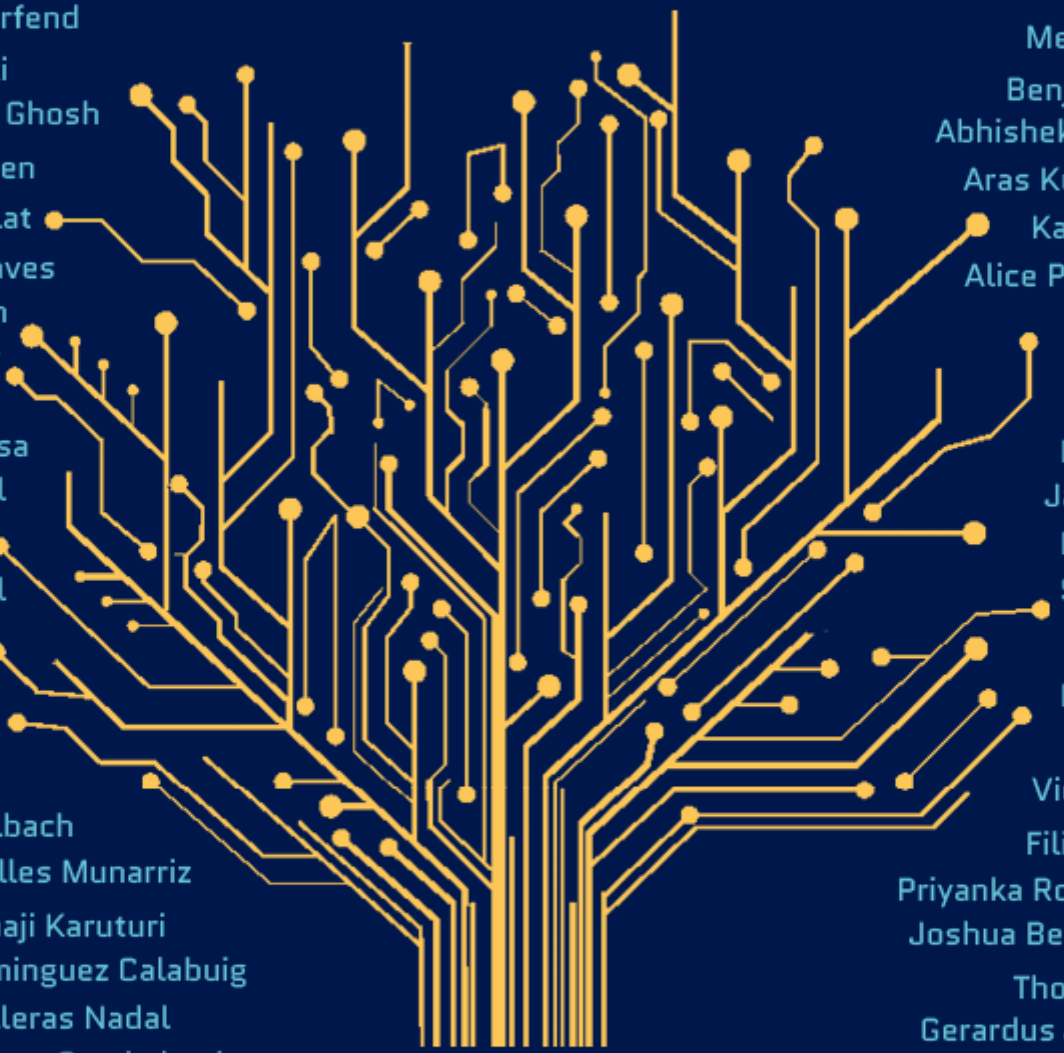

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