COVID-19
Weekly Summary
Vol. 10 June 11, 2020

MIT | Corporate Relations

MIT ILP UPDATES // COVID-19 RELATED

This is a very brief collection of current resources and information from MIT's Industrial Liaison Program covering a range of issues related to COVID-19 and is offered to help us all navigate during this unprecedented and disruptive time.

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UPCOMING EVENTS

MIT ILP WEBINARS
https://ilp.mit.edu/attend

11 June – Innovations in Management (3 of 4)
12 June – Supply Chain Resiliency and the Need for Stress-Tests
16 June – COVID-19 & Manufacturing: Digital Twins
18 June – 2020 MIT Regional Webinar Series #2
18 June – Innovations in Management (4 of 4)
22 June – 2020 MIT Regional Webinar Series #3
23 June – Voting in the Midst of COVID-19
25 June – An Analytics Approach to COVID-19
30 June – Back to the New Workplace Post COVID-19

FRIDAY, 19 JUNE, 7:00 PM: MIT COVID-19 CHALLENGE: LATIN AMERICA VS. COVID-19 VIRTUAL HACKATHON

48-hour event to build solutions that address the most pressing issues of the COVID-19 crisis in Latin America
http://calendar.mit.edu/event/mit_covid-19_challenge_latin_america_vs_covid-19#.Xtaqw1B7nCA

WEDNESDAY, 24 JUNE, 10:00-11:00 AM: KEEPING OUR TEAMS AND OUR FAMILIES CYBERSECURE

MIT Sloan Executive Education INNOVATION@WORK Webinar Series
Keri Pearlson, Executive Director of the Cybersecurity at MIT Sloan: The Interdisciplinary Consortium for Improving Critical Infrastructure Cybersecurity (IC)3
https://executive.mit.edu/webinars
Register: https://mit.zoom.us/webinar/register/2115906111735/WN_bAFuqcZPSmSmzyq-5jhFaVA

THURSDAY, 25 JUNE, 10:00-10:30 AM: DRIVING DATA — USING VEHICULAR SENSOR NETWORKS TO LEARN FROM OUR CITIES

Senseable City Lab Webinar
Simone Mora (Senior Postdoctoral Associate, MIT Senseable City Lab),
Sebastiano Milardo (Postdoctoral Fellow, MIT Senseable City Lab),
Thomas Matarazzo (Postdoctoral Researcher, MIT Senseable City Lab)
http://senseable.mit.edu/webinars/Driving-Data

PROJECTS, INITIATIVES, RESEARCH

HEALTH / GAMES: THE GUARDIANS

Rosalind Picard, Sara Taylor, Craig Ferguson, Fengjiao Peng
Affective Computing Group, Media Lab
https://www.media.mit.edu/projects/guardians/overview/

The Guardians Project aims to use the same game design principles used in mobile games to help people form beneficial long-term habits and improve their overall wellbeing.

Forming positive health habits can be difficult. Whether it's getting enough sleep, sticking to a diet, or going for a run, it's tough to commit to a new schedule long enough to make it stick. This process is even harder when the habit focuses on long-term goals with no immediate noticeable benefits. Mobile video games, on the other hand, use common design techniques and mechanics to produce a loop that draws players to return on a regular schedule and encourages them to watch ads or pay a fee for special rewards within the game.

We have already used these same design principals to show that embedding a daily Patient Reported Outcome within a mobile game can drastically increase response rate and data quality in adolescents.

Now we are shifting our focus to show that games can be a beneficial therapeutic tool for those suffering from depression and anxiety. Oftentimes, people with depression struggle to find motivation to do even the most basic tasks. And yet, people with depression are motivated by video games just as much as anyone else. We aim to leverage this fact to use in-game rewards to motivate people to stick to therapeutic interventions.

We are launching The Guardians, a new mobile game that provides immediate and gratifying rewards for using a therapeutic technique known as behavioral activation. Behavioral activation is a therapy that asks people to choose and perform a meaningful and positive task, then reflect on it. By rewarding players for completing and reflecting on these real-life activities, we hope The Guardians will help people handle depression and live more fulfilling lives through the power of mobile games.

This MIT app makes self-care as addictive as a video game

Collect cute monsters and make your brain feel better.
By Mark Wilson, Fast Company, 29 April 2020

https://www.fastcompany.com/90497450/this-mit-app-makes-self-care-as-addictive-as-a-video-game

VIRUS / MEMBRANE PROTEINS: HONG GROUP

Mei Hong, Professor of Chemistry
https://chemistry.mit.edu/chemistry-news/combating-covid-19-with-chemistry/
https://chemistry.mit.edu/profile/mei-hong/
http://news.mit.edu/2020/structure-influenza-b-protein-unveil-0203
Group Lab: http://meihonglab.com/

Since mid-March, Professor Mei Hong's research group has directed its membrane protein expertise to investigate the structure of an essential SARS-COV-2 protein, the envelope protein E. The E protein is one of the three SARS coronavirus membrane proteins, and is involved in several aspects of the coronavirus lifecycle, including virus assembly, budding, and pathogenesis. The protein forms a cation channel in the lipid membrane, which can be blocked by several small-molecule drugs. In addition, it causes membrane curvature, which is required for releasing new progeny viruses from the Golgi membrane of the cell. The envelope protein's channel activity has been implicated in the ability of SARS-COV-2 to over-stimulate the inflammation pathways of the host cell, with deadly consequences. Deletion of the E gene from the virus has been shown to reduce virus titers, attenuate infection in animal models, and confer protection in hamsters and mice.

Currently, little is known about the three-dimensional structure of the E protein in lipid membranes. Knowing this structure will allow rational design of E-targeting antiviral drugs to stop virus propagation. The Hong group is cloning and purifying the E protein and will employ multidimensional NMR spectroscopy to determine its membrane-bound structure.

Atomic structures of closed and open influenza B M2 proton channel reveal the conduction mechanism
V.S. Mandala, A.R. Loftis, A.A. Shcherbakov, **B.L. Pentelute, and M. Hong**, Nat. Struct. Mol. Biol., 27 (2), 160-167 (2020). https://www.nature.com/articles/s41594-019-0371-2
https://doi.org/10.1038/s41594-019-0371-2

The influenza B M2 (BM2) proton channel is activated by acidic pH to mediate virus uncoating. Unlike influenza A M2 (AM2), which conducts protons with strong inward rectification, BM2 conducts protons both inward and outward.

Here we report 1.4- and 1.5-Å solid-state NMR structures of the transmembrane domain of the closed and open BM2 channels in a phospholipid environment. Upon activation, the transmembrane helices increase the tilt angle by 6° and the average pore diameter enlarges by 2.1 Å. BM2 thus undergoes a scissor motion for activation, which differs from the alternating-access motion of AM2.

These results indicate that asymmetric proton conduction requires a backbone hinge motion, whereas bidirectional conduction is achieved by a symmetric scissor motion. The proton-selective histidine and gating tryptophan in the open BM2 reorient on the microsecond timescale, similar to AM2, indicating that side chain dynamics are the essential driver of proton shuttling.

COMMUNITIES / HEALTH: RESILIENT COMMUNITIES & COVID-19

Kent Larson, City Science Group, Media Lab
https://www.media.mit.edu/projects/resilient-communities-and-covid19/overview/

The City Science group is collaborating on several projects in response to the COVID-19 pandemic. In addition to the projects/papers below, the team is working to adapt existing City Science themes to address resilience.

Social Distancing in a Pandemic

https://www.media.mit.edu/projects/social-distancing-in-a-pandemic/overview/
http://curveflattening.media.mit.edu/

What anonymized geolocation data can tell us about the effectiveness of social distancing

The World Health Organization has officially declared COVID-19 a pandemic. The number of new confirmed cases and deaths from coronavirus continues to grow exponentially in many regions of the world. Across the globe, nations are enacting extraordinary policies to reduce the spread of the coronavirus. In several countries, notably China, South Korea, and Singapore, these policies have been extremely effective in reducing the growth rate of the virus.

In the US, social distancing has been encouraged and implemented with school closures and strict "stay-in-place" policies. The intention of social distancing policies is to reduce the speed at which the virus spreads by reducing interpersonal contact. By reducing the immediate burden on healthcare systems, social distancing is intended to save lives.

With respect to social distancing policy: what is the effect of social distancing on the spread of coronavirus? Second, how well are people practicing social distancing? Using epidemiological models and high-precision mobility data, we aim to understand how policies are affecting people's behavior and if those changes are impacting the spread of coronavirus.

Assessing Disease Exposure Risk with Location Histories and Protecting Privacy

https://www.media.mit.edu/projects/assessing-disease-exposure-risk-with-location-histo-ries-and-protecting-privacy/overview/

Governments and researchers around the world are implementing digital contact tracing solutions to stem the spread of infectious disease, namely COVID-19. Many of these solutions threaten individual rights and privacy. Our goal is to break past the false dichotomy of effective versus privacy-preserving contact tracing. We offer an alternative approach to assess and communicate users' risk of exposure to an infectious disease while preserving individual privacy.

Contact Tracing Technologies: Methods and Trade-offs

Alex Berke and Kent Larson, City Science group, MIT Media Lab (2020)
https://www.media.mit.edu/publications/contact-tracing-technologies-meth-ods-and-trade-offs/
White paper: https://dam-prod.media.mit.edu/x/2020/05/19/contact_tracing_tech-1_V5.pdf

Many organizations are working on technology for contact tracing, and the landscape is changing rapidly. This is an overview of existing contact tracing technologies, along with different methods and trade-offs to consider when building new ones.

Governments around the world are considering the deployment of contact tracing technologies to help contain the spread of COVID-19 and mitigate its economic impacts. Combined with increased testing, effective contact tracing offers the opportunity to improve policy decisions by providing information to help safely re-open economies and intervene only when new outbreaks are detected. In particular, governments and communities may use contact tracing technology to:

• Target quarantines to mitigate the economic impacts of stay-at-home orders
• Understand transmission trends
• Better use limited testing resources
• Conduct targeted serology testing in order to expedite the return of a workforce
• Improve traditional labor-intensive contract tracing efforts

However, it is not yet known whether contact tracing technologies will have the impact so many of us desire. They will need to be widely adopted and accurate in order to be effective, and they will need to provide enough information about their users to health authorities or governments in order to guide future policy decisions. These challenges raise both technical issues and societal issues, as deploying effective contact tracing technologies may jeopardize individual privacy rights and freedoms.

PROJECT ALPHA (ANALYTICS FOR LIFE-SCIENCES PROFESSIONALS AND HEALTHCARE ADVOCATES)

Andrew W Lo, MIT Laboratory for Financial Engineering (LFE)
https://projectalpha.mit.edu/

Project ALPHA (Analytics for Life-sciences Professionals and Healthcare Advocates) is an initiative of the MIT Laboratory for Financial Engineering (LFE) with the main objective of providing more timely and accurate estimates of the risks of clinical trials and related metrics. To provide greater transparency to drug developers, investors, policymakers, and patients regarding the risks of biomedical R&D, the LFE will publish and regularly update the analytics developed as part of its research agenda. In doing so, we hope to allow all stakeholders to manage their resources more efficiently, leading to fewer failures, faster drug approval times, a lower cost of capital, and more funding for developing new therapies.

The Challenging Economics of Vaccine Development in the Age of COVID-19, and What Can Be Done About It
Jonathan T Vu, Benjamin K Kaplan, Shomesh, Chaudhuri, Monique K Mansoura, Andrew W. Lo, May 2020,
https://globalforum.diaglobal.org/issue/may-2020/the-challenging-economics-of-vaccine-development-in-the-age-of-covid19-and-what-can-be-done-about-it/

A weak and uncertain market demand led to a lack of interest in developing vaccines against EIDs [emerging infectious diseases] prior to the current COVID-19 crisis. This indifference has left the global community increasingly vulnerable to repeated outbreaks of these viruses. The challenges of EID vaccine development are troubling issues for vaccines more generally, since there are only four remaining major pharmaceutical companies engaged in vaccine development.

Vaccines sell for a fraction of their economic value, in some cases for only a few dollars per dose despite often offering a lifetime of protection from a given disease. The low price may benefit individuals and regions with lower incomes, but in the long run, it has had the opposite effect, causing them to be medically underserved due to a lack of vaccine investment. Pharmaceutical companies and investors now direct their resources to projects in which the estimated return on investment is more predictable and lucrative.

However, the societal value of vaccines is enormous, and the investment required to reduce the global risk from EIDs is actually within reach. Securing these resources will require governments to strengthen their commitments to supporting EID vaccine markets.

STUDENT / ALUMNI: PROJECTS / INITIATIVESETC. / COVID-19

Rapidly engineering ventilators for the Covid-19 pandemic
Erwin Franz's experiences with MIT System Design and Management had a major effect on his work with the rapid response team at Philips Respironics.

Naomi Gutierrez | System Design and Management / MIT News, June 1, 2020
http://news.mit.edu/2020/erwin-franz-rapidly-engineering-ventilators-covid-19-0601

In January, Philips Respironics, a major manufacturer of mechanical ventilators, put together an engineering response team to rapidly scale production and meet the needs of hospitals to deploy this lifesaving technology. Erwin Franz, a master's student in MIT's System Design and Management (SDM) program and senior research and development engineer at Philips, was selected to join this team of engineers and developers. He quickly realized he could use lessons from SDM's core class to help his team meet this challenge.

One of the actions Philips took in response to the critical hospital ventilation shortage was to design the Philips Respironics E30, an emergency use ventilator. Erwin described this as a platform strategy problem, similar to those taught by Bruce Cameron in the SDM core.

The Philips Respironics E30 ventilator was built from the company's trusted bilevel positive airway pressure (BiPAP) platform to be used as an emergency-use ventilator during the current Covid-19 pandemic. It was intended for mass production, with fewer — though still present — alarm and monitoring capabilities, as well as different pressure settings than traditional hospital ventilators. It is approved for invasive and non-invasive ventilation during the current pandemic and must be disposed of or returned following the pandemic.

The response team is also handling an influx of companies approaching Philips to partner by scaling production and increasing the number of ventilators and similar machines that can be built at the same time. Erwin is using his research and development background to work on part of a hospital-grade ventilator at home, figuring out how to get it to interface with these new partners' technologies. Once he completes this work, partner companies will be able to use his work for calibrating and producing new ventilators safely and quickly.

Training Clinicians to Spot Heart Failure in Covid-19 Patients
By Julie Fox, Slice of MIT, May 6, 2020, https://alum.mit.edu/slice/training-clinicians-spot-heart-failure-covid-19-patients

By early February, the health care system in Washington—the first US state to have a confirmed case of Covid-19—was bracing for the spread of the novel coronavirus. When local hospitals began asking for frontline volunteers, 70-year-old cardiologist **Florence (Huang) Sheehan '71** felt obliged, but disappointed, to decline.

"Being elderly was clearly identified as a risk," explains Sheehan. "But as a physician, I just felt I ought to be doing something more. So when I got an email asking about Covid training, I immediately threw myself into that. I felt so glad that there was something I could do, that only I could do, that I had unique technology to provide help."

Over the past decade, as a senior investigator at the University of Washington, Sheehan has developed a line of diagnostic medical ultrasound simulators. These devices—consisting of a computer, a mannequin, a mock ultrasound transducer, and a tracking system that tells the computer where the transducer is—are used to train fellows, residents, and medical and pre-med students in performing ultrasound procedures. On March 13, she received an email from the University of Washington Medical Center citing multiple requests from hospitalists for training in bedside cardiac ultrasound so that they could monitor their Covid-19 patients for heart failure, a dangerous complication of the virus.

"Patients were developing heart failure even when they looked like they were recovering from their lung infection," Sheehan explains.

Within a week, she reworked her standard curriculum and launched coronavirus-specific training in two local hospitals, expanding to a third hospital shortly after. The course is simplified due to the urgent nature of the pandemic; for instance, where the standard course covers seven views of the heart, the Covid curriculum includes only the four that are needed to identify heart failure.

PAPERS, ARTICLES, PRESENTATIONS, TALKS

VIEW MIT'S COVID-19 IMPACT IN INTERACTIVE MAP

MIT System Design & Management & MIT Innovation Initiative
June 2020, https://sdm.mit.edu/view-mits-covid-19-impact-in-interactive-map/

MIT SDM has collaborated with the MIT Innovation Initiative to offer an interactive map on Kumu showing the relationships between the many groups at MIT working to fight the COVID-19 pandemic. For a quick tutorial, watch this video on YouTube. Check out the map!

The visualization builds on the COVID-19 Rapid Innovation Dashboard, MIT's entry point to the efforts to respond to the pandemic, with additional perspectives from the Greater Boston ecosystem. To learn more about the range of projects, join a group, or submit an opportunity, visit the RID website.

DATA ANALYSIS / ECONOMICS: REOPENING UNDER COVID-19: WHAT TO WATCH FOR

Jeffrey E. Harris, Professor of Economics, Energy Studies Advisor
National Bureau of Economic Research Working Paper 27166, 12 May 2020
http://web.mit.edu/jeffrey/harris/HarrisJE_WP3_COVID19_WWF_6-May-2020.pdf

We critically analyze the currently available status indicators of the COVID-19 epidemic so that state governors will have the guideposts necessary to decide whether to further loosen or instead retighten controls on social and economic activity. Over reliance on aggregate, state-level data in Wisconsin, we find, confounds the effects of the spring primary elections and the outbreak among meat packers. Relaxed testing standards in Los Angeles may have upwardly biased the observed trend in new infection rates. Reanalysis of New Jersey data, based upon the date an ultimately fatal case first became ill rather than the date of death, reveals that deaths have already peaked in that state. Evidence from Cook County, Illinois shows that trends in the percentage of positive tests can be wholly misleading. Trends on emergency department visits for influenza-like illness, advocated by the White House Guidelines, are unlikely to be informative. Data on hospital census counts in Orange County, California suggest that healthcare system-based indicators are likely to be more reliable and informative. An analysis of cumulative infections in San Antonio, Texas, shows how mathematical models intended to guide decisions on relaxation of social distancing are severely limited by untested assumptions. Universal coronavirus testing may not on its own solve difficult problems of data interpretation and causal inference.

ECONOMICS: PERSPECTIVES

https://economics.mit.edu/covid19policy

Don't Lose the Thread. The Economy Is Experiencing an Epic Collapse of Demand
The New York Times, 6 June 2020

Iván Werning, Robert M. Solow Professor of Economics
https://www.nytimes.com/2020/06/06/upshot/coronavirus-economic-crisis.html

"Hotels are locked down, so people buy fewer cars because they don't need to travel as much," said Veronica Guerrieri, an economist at the University of Chicago Booth School of Business. "Restaurants are locked down, so people don't need fancy clothes because they don't want to go out as much."

The result is that what started as a disruption to the supply side of the economy has metastasized into a collapse of the demand side, she and co-authors say in a recent working paper. They call it a Keynesian supply shock: an inversion of the demand-driven crisis of the Great Depression described by the great economist of that era, John Maynard Keynes.

"Demand is interrelated with supply," said Iván Werning, an M.I.T. economist and a co-author of the paper. "It's not a separate concept.

Related paper: Macroeconomic Implications of COVID-19: Can Negative Supply Shocks Cause Demand Shortages?
(click for slides and video)
(with Veronica Guerrieri, Guido Lorenzoni and Ludwig Straub)

Also: https://economics.mit.edu/faculty/iwerning/papers

Which Jobs Will Come Back, and When?

Freakonomics Radio Podcast, 3 June 2020 [scroll down for transcript of Acemoglu's comments]
https://freakonomics.com/podcast/reemployment-part-1/

Daron Acemoglu, Institute Professor of Economics
https://economics.mit.edu/faculty/acemoglu/paper
https://economics.mit.edu/faculty/acemoglu/publication

Abhijit Banerjee and Esther Duflo on how economies can rebound
The Economist, 26 May 2020, https://www.economist.com/by-invitation/2020/05/26/abhijit-banerjee-and-esther-duflo-on-how-economies-can-rebound

Abhijit Banerjee, Ford International Professor of Economics, and Esther Duflo, Abdul Latif Jameel Professor of Poverty Alleviation and Development Economics.

A pandemic is akin to a war. Countries can recover surprisingly fast with the right policies, but the poorest will need help.

ECONOMICS / ANALYSIS: EARNINGS EXPECTATIONS IN THE COVID CRISIS

Augustin Landier (Professor Finance, HEC Paris), David Thesmar, Franco Modigliani Professor of Financial Economics, MIT Sloan School of Management; National Bureau of Economic Research (NBER); Centre for Economic Policy Research (CEPR)
9 June 2020 (posted), Date Written: April 27, 2020, SSRN,
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3587394

We analyze firm-level analyst forecasts during the COVID crisis. First, we describe expectations dynamics about future corporate earnings. Downward revisions have been sharp, mostly focused on 2020, 2021 and 2022, but much less drastic than the lower bound estimated by Gormsen and Koijen (2020). Analyst forecasts do not exhibit evidence of over-reaction: As of mid-May, forecasts over 2020 earnings have progressively been reduced by 16%. Longer-run forecasts, as well as expected "Long-Term Growth" have reacted much less than short-run forecasts, and feature less disagreement. Second, we ask how much discount rate changes explain market dynamics, in an exercise similar to Shiller (1981). Given forecast revisions and price movements, we estimate an implicit discount rate going from 10% in mid-February, to 13% at the end of March, back down to their initial level in mid-May. We then decompose discount rate changes into three factors: changes in unlevered asset risk premium (0%), increased leverage (+1%) and interest rate reduction (-1%). Overall, analyst forecast revisions explain most of the decrease in equity values between January 2020 and mid May 2020, but they do not explain shorter term stock market movements.

MIT-RELATED STARTUPS

MIT Startup Exchange: https://startupexchange.mit.edu/

GATACA

Boston, MA and Madrid, SPAIN, https://gataca.io/
https://twitter.com/gataca_id
https://www.linkedin.com/company/gataca/

Gataca has built a user-centric digital identity platform with government-grade security and a simple single-sign-on to superpower your credentials. Our identity management platform enables fast, secure, and compliant data exchange between credential issuers, users, and service providers.

OMNISCI

San Francisco, CA, https://www.omnisci.com/
https://twitter.com/OmniSci

Massively Accelerated Analytics and Data Science / Interactively query, visualize, and power location intelligence workflows over billions of records.

June 23 at 1:00 pm PT/4:00 pm ET: Join OmniSci and @MicrowayHPC for our webinar "Cutting Through 16 Billion Records to Investigate COVID-19 Infection at Large Meat Processors"
Register today! #acceleratedanalytics #bigdata #datavisualization

TAMR

Offices in Boston, San Francisco, New York, Seattle and London with team members around the world, https://www.tamr.com/

Tamr helps large organizations across the globe uncover insights needed to minimize cost and optimize supply chains to address the challenges organizations are facing in light of the COVID-19 pandemic.

Tamr Launches "Data Can Help" Solutions To Drive Operating Efficiencies and Support Supply Chain Challenges During COVID-19 Pandemic
https://www.tamr.com/blog/tamr-datacanhelp/

By combining its data mastering proficiencies with the latest COVID-19 outbreak data, Tamr provides global organizations with unique insights to manage and optimize their supply chain and spend data.