2021 Annual Report

Inaugural Issue

PathCheck Foundation

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From the Founder

To this day, we continue to live in the fog of the COVID-19 pandemic. Throughout this two year journey, many of us looked towards public health agencies to be the beacon of hope and direction that would set us on the course to overcome the pandemic and help us all return to our normal lives. Yet, the reality is that the information and direction provided by these agencies created more confusion that ultimately lead to mistrust by citizens - and a slower return to normal life. Perhaps public health agencies being the sole solution isn't the right answer.

There is no question that the billions of dollars and scientific achievements in vaccines was critical to overcome this pandemic, but there is one critical element that was missed: citizen engagement. The question now is: How do we get the information from citizens to public health agencies faster and how do we get personalized, trusted guidance to each of us when it matters most? That's our focus at PathCheck Foundation for 2022 and beyond. - Ramesh Raskar, Ph.D.

From the President

As I step into the role of President of PathCheck Foundation in 2022, I want to acknowledge the large shoes that I am filling from the hard work and dedication of Greg Nadeau, Adam Berrey and Paul Baier. Each of these gentlemen effortlessly ran an exhausting relay race starting at the first throes of the pandemic, passing the baton of President to each other, through to what will hopefully be the denouement of COVID-19.

Now that the baton has been handed to me, my goal is to lead the organization into its post-pandemic future, looking ahead to the ongoing development of privacy-first, open source technology that will enable public health engagement and communications beyond COVID while developing agency with a new generation of students and volunteers who are driven to improve public health policy ahead of the next Disease-X pandemic. - Graham Dodge

About us

Origin

PathCheck Foundation was founded at MIT in March 2020, by Ramesh Raskar, PhD and a small, passionate team of social entrepreneurs, engineers and scientists. In the first month, the volunteer community grew to more than 1,000 people and shaped the world's understanding of how digital contract tracing could help stop the pandemic without sacrificing individual privacy. PathCheck rapidly evolved into a unique, nonprofit with hundreds of professionals contributing to it open source code. PathCheck is supported by the generosity of several private donors.

Mission

Overcoming gaps in public health knowledge and coordination through the development of privacy-first, open source technology to build trust between public health agencies and their citizens.

Vision

A material increase in the rapid application and deployment of digital health solutions (open source software and analytics) in response to fast moving pathogens; in the near term through direct development, and the long term through education and workforce development.

Why?

Global health crises occur every 5-10 years while social contagions that affect the underserved are persistent. Yet, despite knowing about this frequency, gaps in public health security systems remain.

Complex interactions between health agencies and citizens lead to slower communication, untimely response activities, and loss of life - especially within underserved and front-line communities. The PathCheck Foundation was born to respond to these gaps by providing ethical, privacy-preserving health surveillance and precision public health solutions in order to improve public health outcomes and minimize the impact on human life.

At A Glance

> PathCheck fills gaps in public health with free, open source technology solutions.

$2.6M	Private Donations
$1.2M	Revenue
30+	Research Papers
6	Deployed Applications
3,500	Volunteers and Counting
200	Media Hits
4	Awards and Recognition for Pandemic Response
40+	Hosted talks and seminars on Pandemic Response

Milestones

March - May 2020

- PathCheck Foundation founded by Dr. Ramesh Raskar
- 1,000 volunteers join
- Launched SafePaths Prototype
- Teams from Salesforce, Akamai, EY, and Facebook contribute to PathCheck open source

May - Dec 2020

- Launched SafePaths for digital contact tracing with GPS, and GAEN Mobile for exposure notification (EN) with the Google/Apple framework
- Appeared in 200 media outlets

Jan-May 2021

- PathCheck partners with health departments and deploys EN and DCT solutions in Minnesota, Louisiana, Hawaii, Guam, Alabama, Cyprus, and St. Lucia.
- PathCheck launches Karuna app in India

May - Dec 2021

- PathCheck Launches DICE and ITGH
- PathCheck Releases Free Covid QR Verifier App for the State of California
- PathCheck DICE Computational Health Fellowship is announced

January - Present

- PathCheck announces Graham Dodge (Sickweather, Johns Hopkins Technology Ventures) as new President
- PathCheck partners with World Health Organization to build universal verifier application

PathCheck Programs

The Data Informatics Center for Epidemiology

A new research center under the PathCheck umbrella that focuses on building data-driven solutions for pandemic preparedness and response.

The Institute for Technology and Global Health

The Institute for Technology and Global Health is PathCheck Foundation's hub for research, innovation, and development.

Citizen Engagement

Crowdsourced citizen data can complement and connect incomplete and fragmented data that cripples pandemic responses. Large-scale participation requires citizens' trust and engagement.

Universal Verifier Software

Two open source UV products. a) mobile UV app to read Covid QR codes from State of CA, India, EU and others. b) UV SDK for software developers.

Exposure Notification (EN) Software

EN open source software used by US states and other countries.

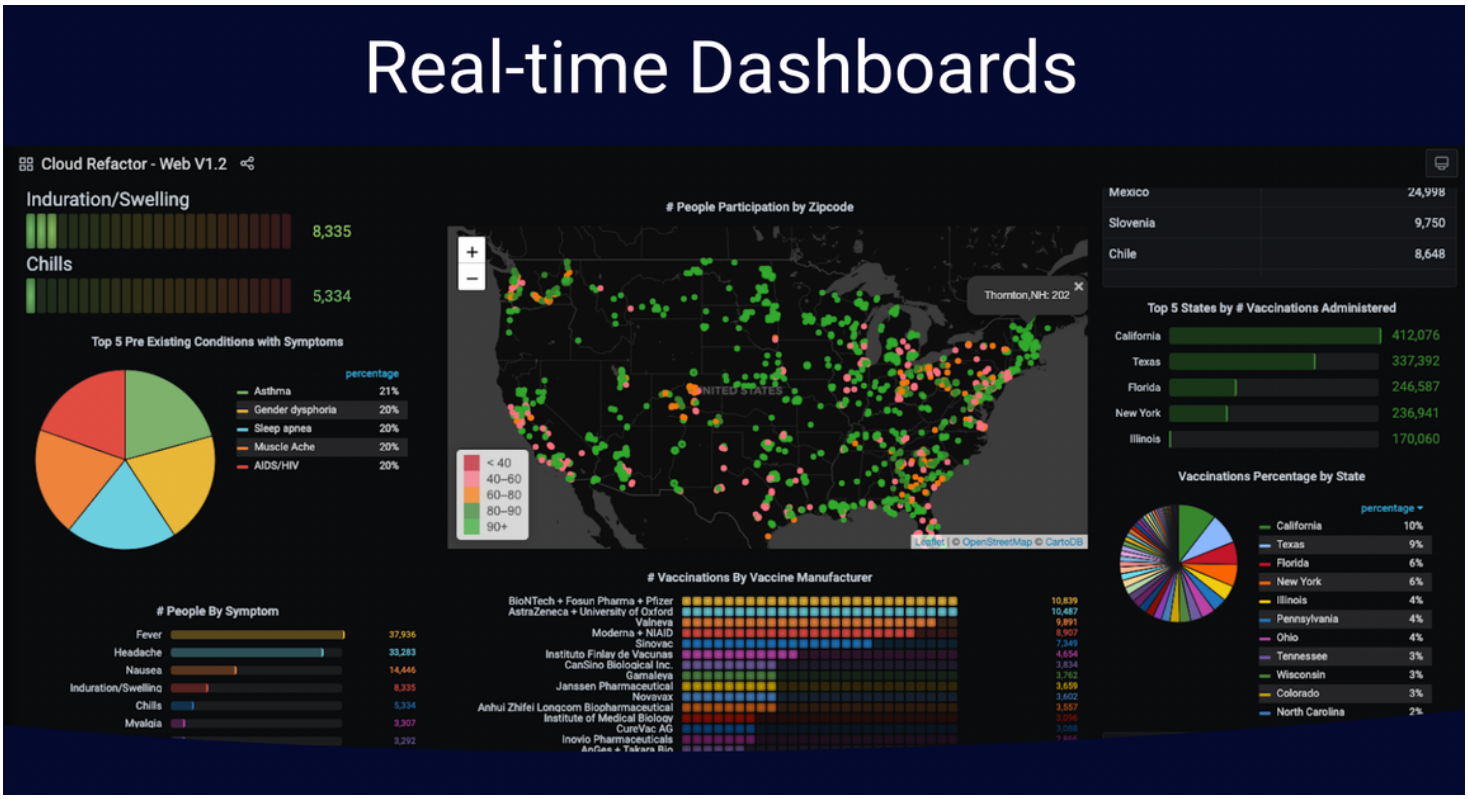
The Karuna Project

A decentralized approach to predicting, modelling and allocating resources effectively in India.

Like many countries, India was struck hard by the second wave of the COVID-19 pandemic with daily cases and deaths peaking at more than 400,000 cases and 4,000 deaths, respectively. The pandemic response there was crippled by lack of data and inefficient resource allocation. Using the privacy-preserving and exposure notification software platform created by the PathCheck Foundation, Karuna was born to ensure **reliable resource allocation** in the fight against COVID-19.

- 25 Million Users
- Real time updates of beds, oxygen and hospital supplies
- Integrated surveys to help crowdsourcing effort
- Communication with doctors and hospitals

Innovations



Media

As seen in:

1. The New York Times
2. The Atlantic
3. The Wall Street Journal
4. The Boston Globe
5. NPR
6. WIRED
7. MIT Technology Review
8. MIT News
9. Forbes
10. Fast Company
11. India Times

The New York Times

The Coronavirus Pandemic › | Coronavirus Map and Cases | Timeline of a BA.2 Infection | Endemic Diseases, Explained

ON TECH

For Vaccine Passports, Less Tech Is Best

We need dumb technology that does as little as possible and knows as little about us as possible.

est

The Atlantic

IDEAS

The Technology That Could Free America From Quarantine

For privacy advocates, "Waze, but for the sick" might seem harvested from their darkest nightmares. But Raskar is emphatic that his code is open source —"every part of the code should be visible to everybody, every day"—and that no government or tech company would have exclusive control over a centralized database that it could abuse. Users wouldn't learn anything else about the infected person, such as age or sex.

THE WALL STREET JOURNAL.

English Edition ▾ | Print Edition | Video | Podcasts | Latest Headlines

U.S. Politics Economy Business Tech Markets Opinion Books & Arts Real Estate Life & Work

"Stopping epidemics is a game of numbers. It's not about getting everybody or nobody (quarantined)," said Dr. Raskar, who has a doctorate in computer science. "The models show that even at 10% there will be gains." He also said it is critical to develop contact-tracing strategies in locations before the virus takes hold.

PathCheck Global Health Innovator Series

Hosted by Rohan Sukumaran

The Global Health Innovators Talk Series hosts speakers creating an impact on Healthcare, AI, Privacy, Digital response for Pandemics, Agent-Based Modelling and more.

- Over 40 Industry Expert and Academic interviews
- Nearly 10K views and listens

Series include talks with experts from Google, MIT, Harvard, Boston University, New York Institute of Technology, University of Philadelphia and more!

Partnerships

hood medicine™ public health guerrillas

World Health Organization

DEPARTMENT OF HEALTH

GOVERNOR'S SEAL ISLAN GUAHAN

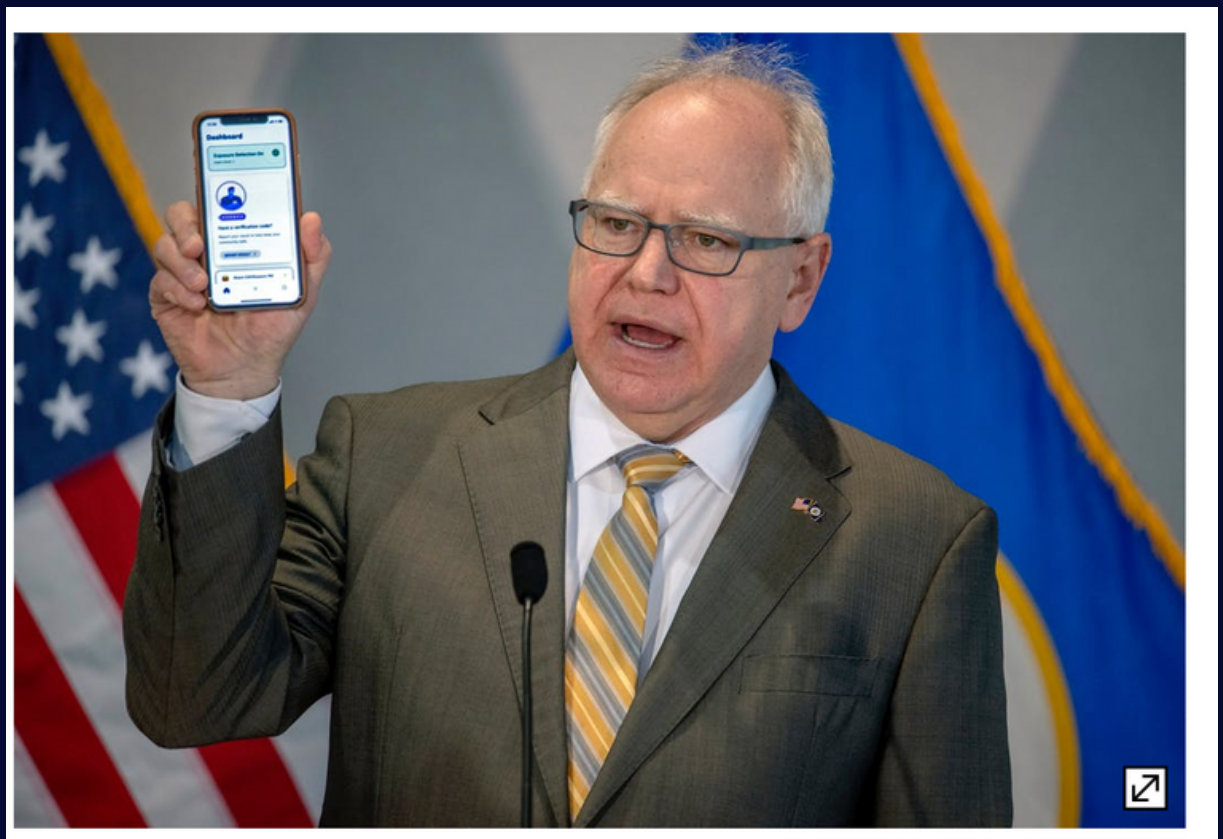
STATE OF HAWAII

HAWAII STATE DEPARTMENT OF HEALTH

ALABAMA PUBLIC HEALTH

LOUISIANA DEPARTMENT OF HEALTH

Partnership Highlights



ELIZABETH FLORES – STAR TRIBUNE

Gov. Tim Walz unveiled the COVIDawareMN mobile tracking app available to Minnesotans during a press conference Monday, Nov. 23, 2020, in St. Paul.

Awards and Competitions

WINNER, ROUND 1 OF BLUETOOTH DATA CHALLENGE

Invited to talk on Challenges of DCT
NIST, US Dept. of Commerce

National Institute of Standards and Technology

FINALIST, THE COVID-19 SYMPTOM DATA CHALLENGE

Top 5, Challenge focused on developing a novel analytic approach that uses the CMU/UMD COVID-19 Symptom Survey data to enable earlier detection and improved situational awareness

Data for Good, Delphi Foundation, University of Maryland, Carnegie Mellon University

FINALIST, COVID-19 PANDEMIC RESPONSE COMPETITION

Competition aimed to harness the power of data and artificial intelligence in equipping policymakers, health officials, and business leaders with insights and guidance necessary to implement public safety measures.

XPRIZE

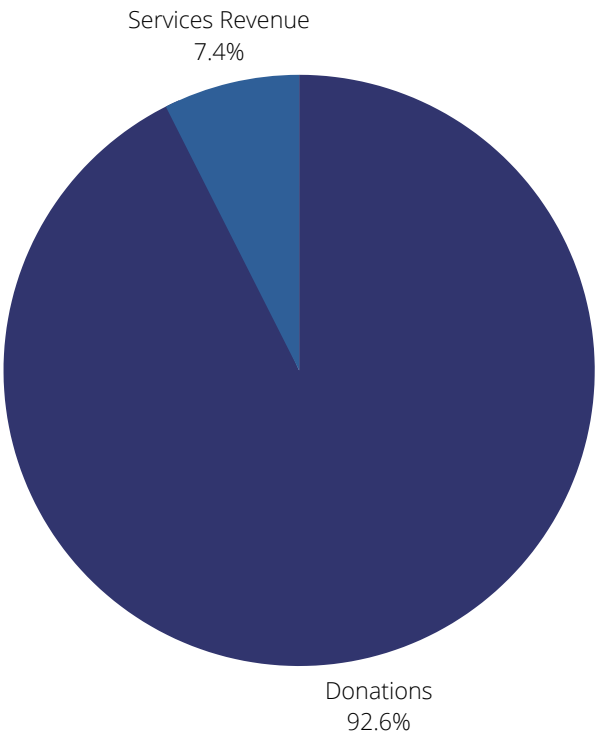
2ND PLACE, EMERGENCY RESPONSE FOR THE HEALTHCARE SYSTEM INNOVATION CHALLENGE

Focused on creating digital tools that support the health care system during a large-scale health crisis.

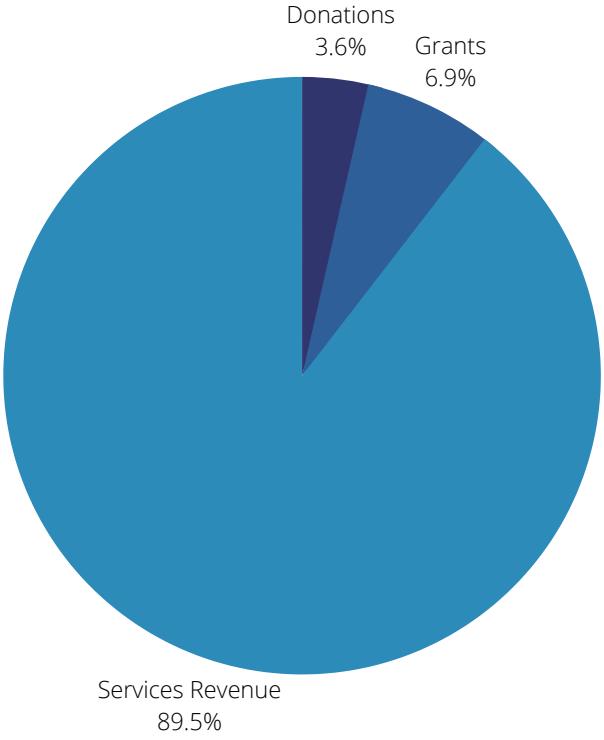
Robert Wood Johnson Foundation

Revenue

2020

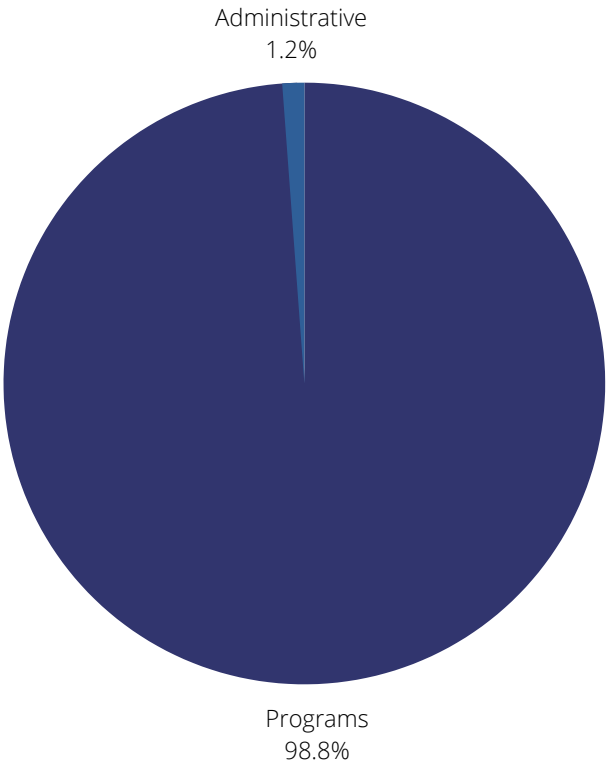


2021

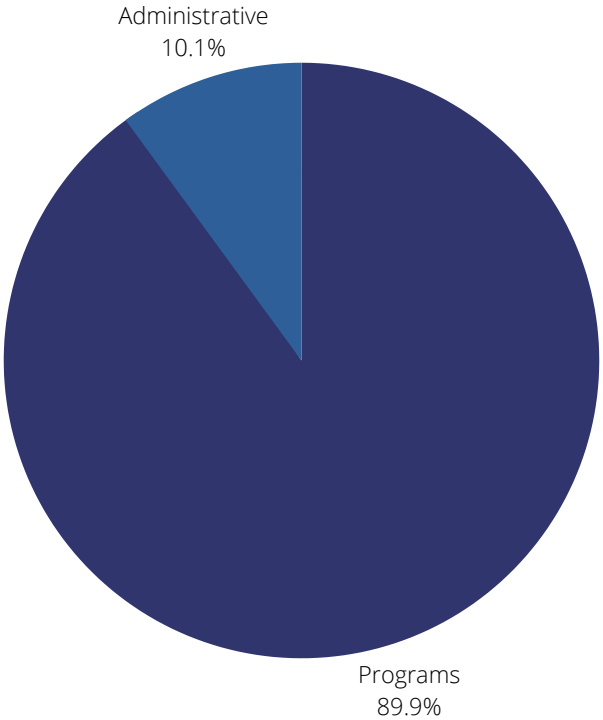


Expenses

2020



2021



Recent Papers

Privacy

- Apps Gone Rogue: Maintaining Person Privacy in an Epidemic
- Verifiable Proof of Health using Public Key Cryptography
- PPContactTracing: A Privacy-Preserving Contact Tracing Protocol for COVID-19 Pandemic

Digital Contact Tracing

- Comparing manual contact tracing and digital contact advice
- Proximity Sensing: Modeling and Understanding Noisy RSSI-BLE Signals and Other Mobile Sensor Data for Digital Contact Tracing
- Proximity Interference with Wifi-Colocation during the COVID-19 Pandemic
- Spatial K-anonymity: A Privacy-preserving Method for COVID-19 Related Geo-spatial Technologies
- COVID-19 Contact-Tracing Mobile Apps: Evaluation and Assessment for Decision Makers
- Contact Tracing: Holistic Solution beyond Bluetooth
- Contact Tracing to Manage COVID19 Spread – Balancing Personal Privacy and Public Health
- The Architecture of Trust in Contact Tracing
- Adding Location and Global Context to the Google/Apple Exposure Notification Bluetooth API

Recent Papers

Equitable Vaccine Distribution and Coordination

- Mobile Apps Prioritizing Privacy, Efficiency and Equity: A Decentralized Approach to COVID-19 Vaccination Coordination
- Challenges of Equitable Vaccine Distribution in the COVID-19 Pandemic
- Vaccination Worldwide: Strategies, Distribution and Challenges
- The Public Health Impact of Delaying a Second Dose of the BNT162b2 or mRNA-1273 COVID-19 Vaccine

Vaccine Credentials

- MIT SafePaths Card (MiSaCa): Augmenting Paper Based Vaccination Cards with Printed Codes
- Paper card-based vs application-based vaccine credentials: a comparison

"MIT and PathCheck Foundation's work is empowering citizens during a pandemic for contact tracing or vaccination. It is open-source and free. We will be delighted to conduct a pilot project in Nigeria for a pandemic preparedness solution."

- Emmanuel Benyeogor, Nigeria CDC

Recent Papers

COVID-19 Testing

- Clinical landscape of covid-19 testing: Difficult choices
- COVID-19 Tests Gone Rogue: Privacy, Efficacy, Mismanagement and Misunderstandings
- Digital Landscape of COVID-19 Testing: Challenges and Opportunities

Pandemic Prediction

- COVID-driven Risk Profile
- Can self-reported symptoms predict daily COVID-19 cases?
- COVID-19 Outbreak Prediction and Analysis using Self Reported Symptoms

Split Learning and Federated Learning

- Distributed learning of deep neural network over multiple agents, Accepted in Journal of Network and Computer Applications 116
- DISCO: Dynamic and Invariant Sensitive Channel Obfuscation, Accepted to CVPR 2021
- FedML: A Research Library and Benchmark for Federated Machine Learning, (Baidu Best Paper Award at NeurIPS-SpicyFL 2020)
- NoPeek: Information leakage reduction to share activations in distributed deep learning

Recent Papers

Split Learning and Federated Learning

- Split learning for health: Distributed deep learning without sharing raw patient data, Accepted to ICLR 2019 Workshop on AI for social good
- Detailed comparison of communication efficiency of split learning and federated learning
- ExpertMatcher: Automating ML Model Selection for Users in Resource Constrained Countries,
- Split Learning for collaborative deep learning in healthcare

Differential Privacy

- Differentially Private Supervised Manifold Learning with Applications like Private Image Retrieval
- DAMS: Meta-estimation of private sketch data structures for differentially private COVID-19 contact tracing, PPML-NeurIPS 2020

PathCheck Team

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Director of Finance and Operations

Rohan Sukumaran
Research Manager

Bethany LoMonaco
Director of Strategy and Development

Krishnendu Dasgupta
Special Projects Coordinator

Khahlil Louisy
President, ITGH

Manuel Morales
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Artificial Intelligence and Data Analytics

Sue Feldman
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Health Informatics, User Experience/Analytics

Thomas C. Kingsley
Chief Epidemiologist and Chief Health Officer

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Phil Mui, Salesforce
Riddhiman Das, TripleBlind
Fadel Adib, MIT
Kuldeep Singh Rajput, Biofourmis
Palak Patel, Akamai
Antigoni Polychroniadou, JP Morgan

Disease Experts, Tests, Vaccines
Chris Mason, Cornell University
Kevin Esvelt, MIT

QUESTIONS? CONTACT US.

"Brazil has been severely affected by the current pandemic and top-down solutions have limitations. PathCheck Foundation's bottom-up approach by incentivizing citizens in tracking symptoms, contacts and vaccination is unique. Engagement with citizens is necessary. After receiving permission from authorities, at Unifesp Federal University of São Paulo, we are eager to run a pilot with PathCheck Foundation for engaging citizens for coordination in an outbreak"

- Dr. Paulo Schor, MD, Director of Innovation, Federal University of São Paulo

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Contact