

The Future of TTP

Academic and Entrepreneurial Collaborations

September 14, 2023
TTP Workshop

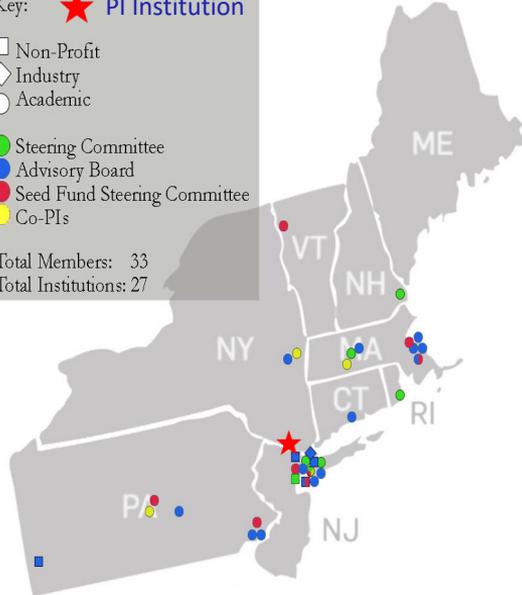
Florence D. Hudson
Executive Director and Principal Investigator
Northeast Big Data Innovation Hub at Columbia University
COVID Information Commons (CIC)
2019 TTP leader at Trusted CI, NSF Cybersecurity Center of Excellence
2016 Cybersecurity Transition to Practice (TTP) Acceleration NSF PI



Topics for discussion

- Developing and blending academic and entrepreneurial collaborations
- Creating collaboration mechanisms and communities to enable TTP
 - COVID Information Commons example for research/researcher discovery and collaboration
 - NSF Big Data Innovation Hubs – Data Sharing and Cyberinfrastructure Working Group
 - Cybersecurity Risk Initiative to share AI/ML for cybersecurity research with academia & industry
 - IEEE/UL P2933 Working Group – Clinical IoT data and device interoperability with TIPPSS (Trust, Identity, Privacy, Protection, Safety and Security)
- Ongoing multilateral and multi-institutional collaborations for future TTP

The Northeast Big Data Innovation Hub



- The Northeast Hub is a **community convener, collaboration hub,** and catalyst for data science innovation in the Northeast Region and around the world.
- We are a community of over 8,300 individuals from 1,375 organizations, all 50 U.S. States and 61 countries. Join us!
- Building a diverse, equitable, and inclusive community with accessible resources is central to our work.

Four Focus Areas guide community engagement and activities.



**Education +
Data Literacy**



Health



**Urban to Rural
Communities**



**Responsible Data Science:
Security + Privacy + Ethics**

Funded by US NSF grants #1550284,
1748395, 1916585, 2028999, 2139391;
NIH AIM-AHEAD; DOT/FHWA.

<http://nebigdatahub.org/about/>

Northeast Big Data Innovation Hub Activities

We enable researcher collaborations to support TTP

			
Education & Data Literacy	Health	Urban to Rural Communities	Responsible Data Science
			Security, Privacy & Ethics
National Student Data Corps (NSDC)	COVID Information Commons (CIC)	Smart Cities Data Exchange	Cybersecurity Risk Initiative
Opens4All - Call for Participation	CIC Student Paper Challenge	Driver Video Privacy Challenge	Responsible Data Science Comic Books
Data Science Resource Repository (DSRR)	CIC Working Groups	Transportation Projects	IEEE/UL P2933 TIPPSS Standard Working Group
NSDC Global Chapter Community	AIM-AHEAD Data Science Training Core Portal	Smart Cities and Buildings	IEEE Connected Healthcare Cybersecurity Workshops
Data Science Panel Video Series	Clinical IOT and TIPPSS at HIMSS	Urban to Rural Communities Working Group	Framework for Integrative Data Equity Systems (FIDES)
Data Science Mentorship Program	Blockchain & Data Science in Healthcare - Call for Papers	Climate and Nature	Data Sharing and Cyberinfrastructure WG
Education & Data Literacy Seed Fund Projects	Health Seed Fund Projects	Urban to Rural Seed Fund Projects	Responsible Data Science Seed Fund Projects

<http://nebigdatahub.org/about/>



COVID INFORMATION COMMONS

[About](#) [CIC Search Tools](#) [Meet the Researchers](#) [Opportunities & Resources](#) [Events](#) [News](#) [Team](#) [Contact](#)



The COVID Information Commons serves as an open resource to explore research addressing the COVID-19 pandemic.

Search COVID Awards & PI Database

[COVID Research Explorer ML Maps](#)

The COVID Information Commons is supported by the National Science Foundation through awards [#2028999](#) and [#2139391](#).

COVID Information Commons (CIC) – Purpose + Plan

- NSF CIC RAPID Award (NSF [2028999](#)) funded \$200k in May 2020, portal launched July 2020.
- Designed to:
 - Facilitate knowledge sharing and collaboration across various COVID research efforts.
 - Serve as a resource for researchers as well as decision-makers from government, academia, not-for-profit and industry...
 - ... to leverage each other's findings, and ***invest in and accelerate the most promising research to mitigate the broad societal impacts of the COVID-19 pandemic (aka TTP).***
- Designed in collaboration with the 4 NSF Big Data Hubs (Northeast, Midwest, South, West), plus Columbia University Libraries and Columbia University IT.
- Initially focused on NSF-funded COVID RAPID awards
- Principal Investigator (PI) provided information is added to enable researcher collaboration, including ORCID ID, research websites, keyword searches.

COVID Information Commons – Extension

- 2021 NSF \$2M CIC Extension award (NSF [2139391](#)) funded significant expansion over 4 years.
 - ***Enabling multilateral researcher/academia/government/industry collaboration.***
 - ***10x corpus growth*** - now has 10,000+ NSF ***and NIH*** COVID awards, RAPID, SBIR, STTR.
 - ***10x community growth*** - 250 to 2,930 individuals at 736 organizations in US + 35 countries.
 - ***11K views of 128 researcher lightning talks in 26 webinars available on the CIC website.***
 - Global CIC Student Paper Challenge Winners from US and South Africa, undergrad and grad
 - English and Spanish transcripts/translations created with students and volunteers.
- Plan for advanced COVID data and metadata search and discovery tools to enable further research discovery and collaboration.
- Plan to leverage DRYAD to archive the CIC corpus - <https://datadryad.org/stash>

COVID Information Commons Portal & Community

“Your site and the ability to come together is marvelous. I thank you especially for thinking about this and bringing us together. People will be able to use your [CIC] site as a proper, safe, true information source.” – Nora Garza, Laredo College

September COVID-19 Research Lightning Talks: Webinar and Q&A



July 2020 launch webinar

- 178 attendees + 2 PI lightning talks
- 40 more PIs offered to do lightning talks

Created CIC Community

- Now 2,930 CIC Community Members
- Members across the US + 35 countries

Ongoing CIC Community Webinars

- 26 CIC hosted webinars to date
- 128 researcher lightning talks
- 11,000+ total views (live + YouTube)

COVID Awards & Researcher (PI) Database Search

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Search
 epidemiology

Showing 829 results.

Download Results as CSV (up to 1,000 awards)
CLEAR FILTER

Awards	Principal Investigator	Award Amount
Retaining the diverse CANDLE cohort to advance ECHO Cohort solution-oriented research and identify early-life modifiable risk factors for obesity and mental health problems in children Over 25% of children suffer from mental health problems and/or develop obesity. Mental health problems often emerge early through a broad range of symptoms before canalizing into disorders like depression, which affects over 15% of adolescents in th... SHOW MORE	Nicole Renee Bush	\$1,505,914
Leveraging Longitudinal Survey and EHR data to Dissect the Impact of COVID-19 related Stressors and Infections on Child Mental Health and Suicide Risks The adverse impact of the COVID-19 pandemic on child mental health has become a public health priority. Suicidal ideation and suicide attempts among children increased by 70-130% in 2020-2021 compared to the pre-pandemic period. Pre-existing social ... SHOW MORE	Yunyu Xiao	\$3,231,590
Collaborative Research: Non-Parametric Inference of Temporal Data This project is driven by the need to address inquiries in diverse fields, including environmental sciences, epidemiology, and economics among others. The study of extreme weather events, such as tropical storms, requires meteorologists to determine... SHOW MORE	Hongyuan Cao	\$173,740

CIC Database includes 10,000+ NSF & NIH COVID-related awards.

Browse the Database:
<https://bit.ly/cic-award-search>

Faceted search by Funder, Directorate/Institute/Center, Institution, PI, Program Officer

NSF + NIH COVID Awards and PI Profiles

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COVID INFORMATION COMMONS

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NSF
Award Abstract #2139391
CIC-E: COVID Information Commons Extension for Pandemic Recovery

[See grant description on NSF site](#)

Program Manager:
Mike Pozmantier

Active Dates:
Oct. 1, 2021 -- Sept. 30, 2025

Awarded Amount:
\$2,000,000

Investigator(s):
Florence D Hudson
Jeannette Wing

Awardee Organization:
Columbia University
New York

Funder Divisions:
Technology Innovation and Partnerships (TIP)

Abstract:
The COVID Information Commons, CIC (<http://covidinfocommons.datascience.columbia.edu/>), was established in May 2020 via an NSF COVID Rapid I from all COVID-related projects funded by the various Directorates across NSF in order to create a easily searchable corpus. In addition to the publicly COVID RAPID research projects. The CIC Extension will extend this initial CIC effort to also include all projects funded by NSF related to the pandemic bringing together information about a diverse set of COVID-related projects into a single place, thereby enabling interested users to efficiently search include projects in the pandemic recovery phase, and will additionally incorporate contemporary ways of interacting with the information such as via COVID Information Commons, which pulls together publicly available information along with voluntary self-report information on NSF-funded COVID collaborations among researchers from diverse scientific disciplines and from different parts of the country drawn together by their common interest facilitate networking among researchers engaged in COVID-related research. The CIC Extension will also build upon and expand the successful research Law 117-2). This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual

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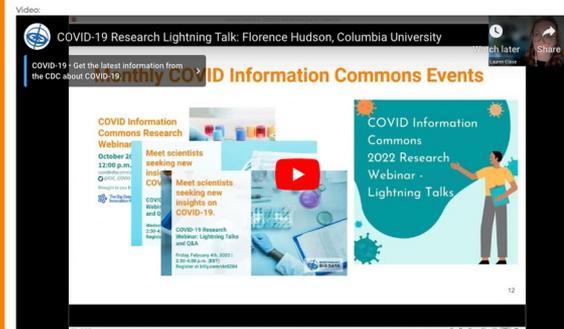
COVID INFORMATION COMMONS

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ORCID ID:
<https://orcid.org/0000-0003-0896-2127>
Websites:
<https://covidinfocommons.net>
<https://nebigdatahub.org/about/>



Awarded COVID Grants:
CIC-E: COVID Information Commons Extension for Pandemic Recovery

RAPID: COVID Information Commons (CIC)

Keywords:
Data science analytics health COVID coronavirus cybersecurity connected healthcare Medical Internet of Things IoT TIPPSS Trust Identity

CIC Research Explorer Machine Learning (ML) Maps for Researcher Discovery & Topical Visualization

Analyze

Doc clusters map treemap list Topics treemap list Labels list

Export Experiments Fields

find settings, e.g. 'overlap'

ANALYSIS SCOPE

Defines the set of documents to process.

Query

Limit scope size

Query parser

enhanced

DOCUMENT MAP

Configuration of the documents 2d map.

Document similarity type

Label embedding centroids

More Like This similarity

0ms total time

10.2k docs in scope

3.57k labels

99.9% labeled docs

325 cluster sets

950 clusters

99.7% docs clustered

20 cluster sets shown

26 clusters shown

203 docs shown

Doc clusters map treemap list Topics treemap list Labels list

Export Experiments Fields

Find COVID research and researchers by Principal Investigator (PI) name, institution, state, award number

Adapting KS-Detect technology to high-throughput COVID-19 screening

The COVID-19 pandemic represents a worldwide infectious disease challenge that disrupted our economic, educational, and social norms in a way that was largely unimaginable just months ago. At present the most efficacious method of limiting the spread of the disease has been to test those that exhibit symptoms – typically by nucleic acid based viral identification methods – and isolate those that are positive. Even at this early stage this approach has put significant strain on the diagnostic...

Clustered by topic using Machine Learning

award_id: 3UH3CA202723-05S1
 principal_investigator: David Carl Erickson
 awardee_organization: Cornell University
 number_of_investigators: 1
 state: NY

Input domain areas or keywords to limit the view to target areas

● nucleic acid (3) ● high-throughput (3)
● acid (3) ● virus (2) ● viral (2)
● acid (7), nucleic acid (7), detection (6) @ 0.21

Mount Sinai IMPACC COVID-19 Cores

As part of an NIAID/DAIT initiative we have been selected to participate in a multicenter project, namely Immunophenotyping assessment in a COVID-19 Cohort (IMPACC), aimed to collect and distribute patient samples and to analyze the immune

CIC Query by Keyword – Research Topical Visualization & Researcher Discovery

Lingo4G Explorer Analyze

find settings, e.g. 'overlap' Filters

ANALYSIS SCOPE

Defines the set of documents to process.

Query

epidemiology

Limit scope size

Query parser

enhanced

DOCUMENT MAP

Configuration of the documents 2d map.

Document similarity type

Label embedding centroids

More Like This similarity

386ms total time **413** docs in scope 320 labels 100% labeled docs 19 cluster sets 46 clusters 99.8% docs clustered 199 docs shown Export Experiments

Doc clusters map treemap list Topics treemap list Labels list Docs list Fields

Top 10 of 413 docs in scope

COVID-Inspired Data Science Education through Epidemiology

The ongoing COVID-19 pandemic provides a starting point for empowering young people to understand uses of data science through epidemiology. Through this program, 400 underserved youth nationwide will engage in a 15-hour out-of-school multimedia program centered on a project-developed text, The Case of the COVID Crisis, which is integrated with data activities, modeling, animations, and career exploration. Participants will: 1) Learn to use data tools and models to track the spread of infectious diseases; 2) Develop an understanding of how to ask and address their own questions of data; and 3) Gain confidence in their ability to use data to study and communicate to local audiences about... and artifact analysis. The research will contribute to the field of data science education by: 1) Elucidating the ways in which youth use datasets and data tools to ask epidemiological questions, examine patterns, and make predictions; 2) Studying how youth become motivated to engage in work in the intersection of data science and epidemiology; and 3) Examining the affordances of a multifaceted intervention integrating pedagogical strategies, including the use of narrative, inquiry-based data activities, accessible data tools, animations, and career exploration. The project also will make an

CIC Research ML Explorer - View by PI or Institution

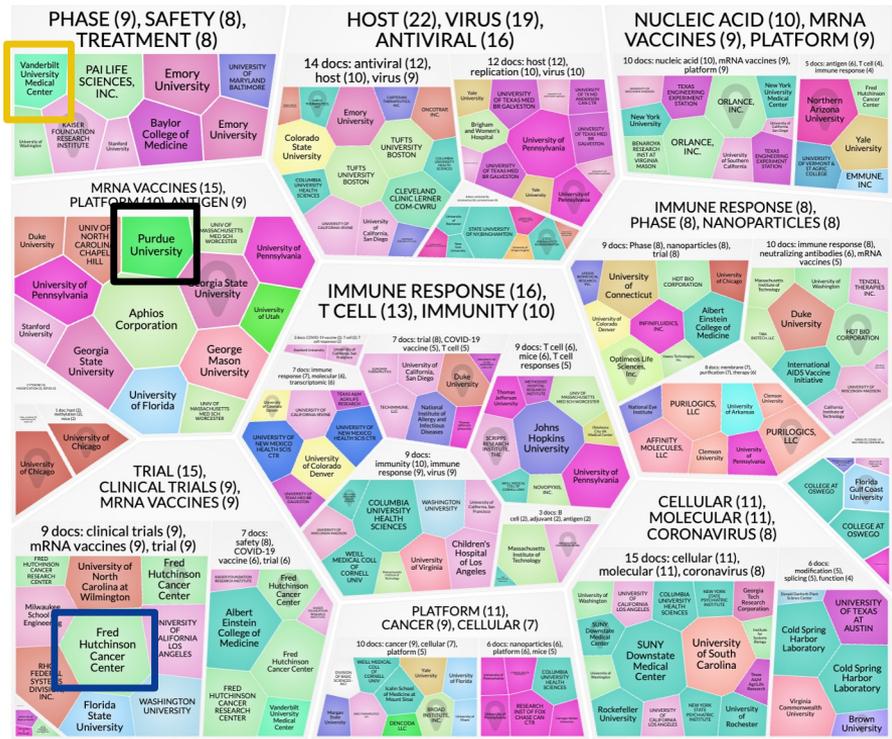
Oms 214 195 100% 11 26 100% 200
 total time docs in scope labels labeled docs cluster sets clusters docs clustered docs shown

Doc clusters map treemap list Topics treemap list Labels list



Oms 214 195 100% 11 26 100% 200
 total time docs in scope labels labeled docs cluster sets clusters docs clustered docs shown

Doc clusters map treemap list Topics treemap list Labels list



Query by keyword – e.g., epidemiology and security

Lingo4G Explorer Analyze

find settings, e.g. 'overlap' ×

ANALYSIS SCOPE

Defines the set of documents to process.

Query

epidemiology AND security

Press Ctrl+Enter to start analysis

Limit scope size

Query parser

enhanced

DOCUMENT MAP

Configuration of the documents 2d map.

Document similarity type

Label embedding centroids

More Like This similarity

Oms **18** 30 100% 3 3 88.9%

total time docs in scope labels labeled docs cluster sets clusters docs clustered

Doc clusters map treemap list Topics treemap list Labels list

Export Experiments

Docs list Analyze Fields

INFECTIOUS DISEASES (8), NETWORK (8), TRANSMISSION (8)

CICI:UCSS:Improving the Privacy and Security of Data for Wastewater-based Epidemiology

The field of Wastewater-Based Epidemiology (WBE) collects and analyzes data from sewage systems that relate to public health. These data include genetic and chemical biomarkers of identity, ethnicity, behavior, consumption, pollution, and pathogenic infections. Interest in WBE exploded recently, as researchers turned to wastewater samples to estimate SARS-CoV-2 infection levels in local populations and inform public health responses to the pandemic. Because data collected from wastewater are aggregated at the population level, they are typically assumed to be anonymous, and are therefore not subject to health privacy or other regulatory protections. These data are most useful when shared,...

award_id: 2115075 principal_investigator: Stephanie Forrest awardee_organization: Arizona State University funder: National Science Foundation state: AZ

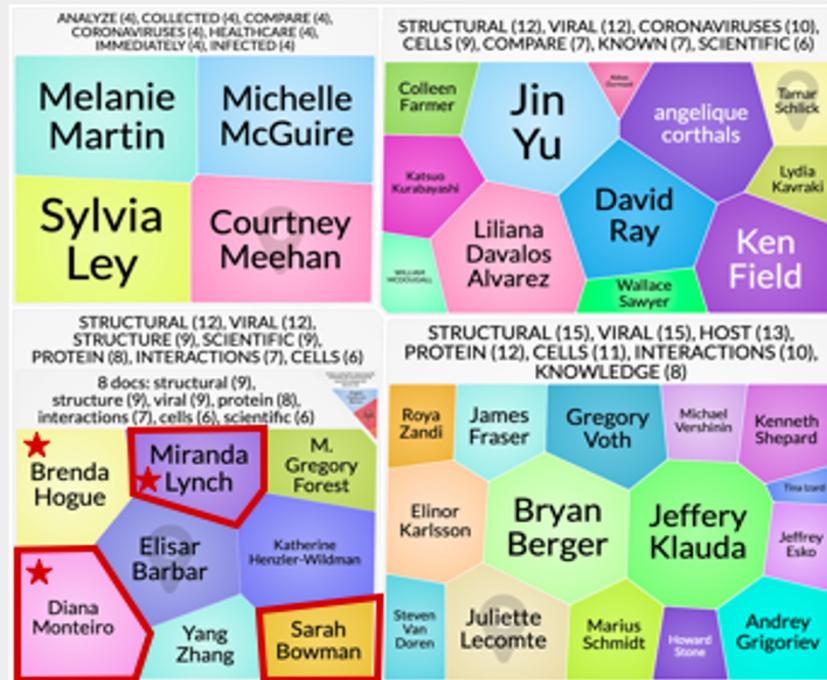
privacy (7) wastewater-based epidemiology (2)

COVID Information Commons Empowers Collaboration

Unique time to do science outreach

- Interaction, collaboration, outreach
 - Meet the Researchers
 - [COVID-19 Research Lightning Talks](#)
 - 5 Questions with COVID Researchers
- Student engagement
 - Student studying open access data in South Korea
 - Bunker Hill Community College panel
 - CIC Student paper challenge

★ Active SARS-CoV-2 collaborations with Sarah Bowman's group



CIC Student & Research Working Groups enable researcher collaboration which can support TTP



Students and researchers of all educational backgrounds and experience levels are invited to join the **COVID Info Commons Working Groups!**

Student WG: bit.ly/cic-student-wg

- Next Meeting: Friday, October 6th, 11AM (ET)

Research WG: bit.ly/CICResearchWG

- Next Meeting: Wednesday, October 11th, 3PM (ET)

Email Listserv: bit.ly/wg-email-signup

Email the CIC student working group team:
cicstudentworkinggroup@columbia.edu

Annual CIC Student Paper Challenge to inspire research for potential future TTP

Undergraduate, community college, graduate students and recent graduates are invited to investigate and synthesize COVID-19 research into a short 4 to 5 page paper. Next one in 2024!

Winners receive a prize and offer to present their work at a future symposium.

Monthly virtual student mentoring sessions.

Professionals and grad students invited to be mentors and judges!

Learn more: <https://bit.ly/2023-cic-spc>

Learn more about the 2021 Undergraduate CIC Student Paper Challenge Winners:



First Place: Jane Pan,
Columbia University.
["Contradiction Detection of COVID-19 Randomized Controlled Trials via BERT Language Models"](#)



Second Place: Samson Qian,
University of California, San Diego.
["Generating Explanations for Chest Medical Scan Pneumonia Predictions"](#)



Third Place: Aditya Kulkarni,
University of Minnesota.
["Human Mobility Patterns Linked to COVID-19 Prone Locations"](#)



Learn more about the 2022 Graduate CIC Student Paper Challenge Winners:



First Place: Jiming Wan,
Binghamton University
["Multilayer Networks with Hierarchy: Interaction Reveal the Impact of Collective Behavior on Epidemic Dynamics"](#)



Second Place: Ka Ying Toby Law,
Columbia University
["The Association Between Educational Attainment and COVID-19 Vaccine Hesitancy in the United States"](#)



Third Place: Xin Zan,
University of Florida
["Data-driven Adaptive Testing Resource Allocation Strategies for Real-time Monitoring of Infectious Diseases"](#)

Learn more about the 2022 Undergraduate CIC Student Paper Challenge Winners:



First Place: Evelyn Zhou,
University of South Africa
["Advances in Machine Learning Explainability to Contextualize Equity Market Sustainability in South Africa During the COVID-19 Era"](#)



Second Place: Paige Gavin and Sarah Frieman,
George Washington University
["Tailed Liminality and Disenfranchised Grief: COVID-19 Deaths in Nursing Homes"](#)

CIC lightning talk webinars enable collaboration

- **Ellen Foxman**, Yale University. [Host response-based screening for unexpected or emerging respiratory viruses](#). Funded by **NIH** National Institute of Allergy and Infectious Diseases.
- **Ioannis Paschalidis**, Boston University. [Predictive Models of COVID-19 Severity and Patient Outcomes](#). Funded by **NSF** Computer and Information Science and Engineering (CISE) PIPP Phase 1.
- **Carlos Badenes-Olmedo**, **Universidad Politécnica de Madrid**. [Drugs4Covid: Knowledge Graph about Drugs used in the Clinical Control of the Coronavirus](#).
- **Hong Qin**, University of Tennessee, Chattanooga. [PIPP Phase I: Develop and Evaluate Computational Frameworks to Predict and Prevent Future Coronavirus Pandemics](#). Funded by **NSF** CISE.
- **Evelyn Yemurai Zhou**, University of South Africa. [Advances in Machine Learning Explainability to Contextualize Equity Market Sustainability in South Africa During the COVID-19 Era](#). **CIC Undergraduate Student Paper Challenge 1st Place Winner**.

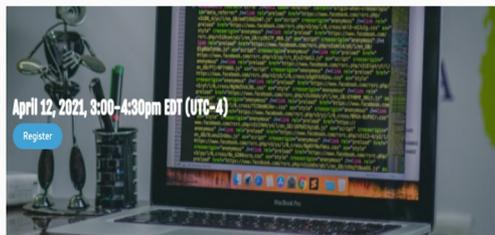
BDHubs Data Sharing & Cyberinfrastructure Working Group includes cybersecurity topics + researchers

- Big Data and Cybersecurity Risk Management presentation (Nov 2017)
- Trusted CI: NSF Cybersecurity Center for Excellence presentation (Oct 2019)
- Trustworthy Data Working Group presentation slides (March 2020)
- Guidance and Survey Results from the Trustworthy Data Working Group slides (Oct 2020)
- Cybersecurity Planning Discussion - need to view cybersecurity as a data science problem (Jan 2021)
- BDHubs + Jay Yang, RIT hosted Cybersecurity as Big Data Science Interactive Workshop (April 2021)
- Data-driven Pattern Analysis and Continual Learning of Cyber Attacks across Organizations (Oct 2022)
Panelists - Dr. Jay Yang, RIT; Chanel Cheng, RIT Undergrad; Serena Yang, Cornell Univ Undergrad
- *The Role of Natural Language Processing (NLP) in Cybersecurity Operations* (June 2023)
Panelists - Jay Yang, Professor RIT Global Cybersecurity Institute; Steve Moskal, Postdoc, MIT CSAIL; Reza Fayazzi, PhD student, RIT; Pradumna Gautam, Visiting Undergraduate Research Assistant, RIT

BDHubs funded cybersecurity workshops and student programs led by TTP researchers

Cybersecurity Risk Initiative

Cybersecurity as Big Data Science Interactive Workshop



Cybersecurity Visiting Student Research (CyberVSR) Program
Summer 2022

Applications due: Thursday, April 15th

The [Rochester Institute of Technology](#) has opened applications for the [Summer 2022 Cybersecurity Visiting Student Research \(CyberVSR\) Program](#). This program will provide international and U.S. based undergraduate and graduate students with the opportunity to gain research experiences in the broad area of cybersecurity with RIT faculty and peers of complementary skillsets and experiences and immerse in an inclusive, culturally enriched, and diverse environment for personal and professional development.

[Learn More & Apply](#)



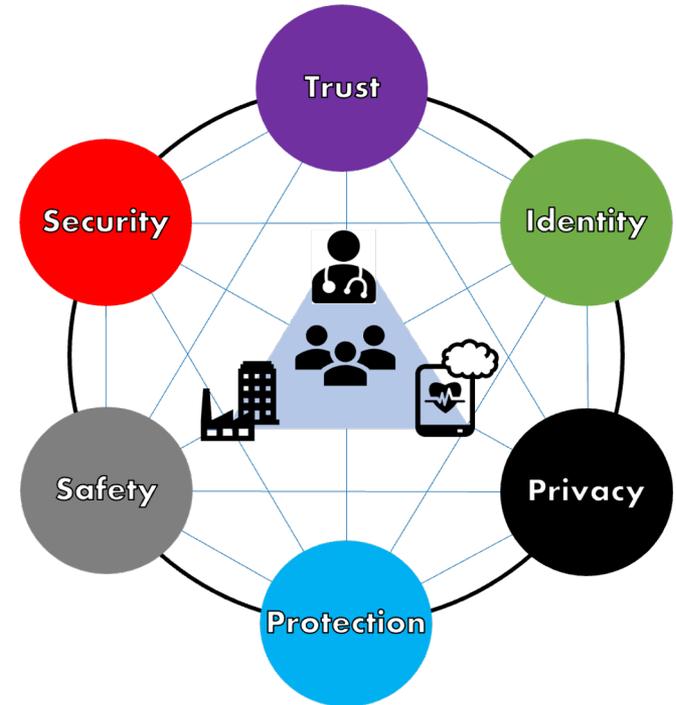
Data Sharing and
Cyberinfrastructure WG



- 2021 Cybersecurity as Big Data Science Workshop sponsored by the BDHubs led with **TTP researcher**
- NEBDHub funded **TTP researcher** to lead a 2022 Student Summer program on AI/ML for cybersecurity
- Students presented their research results on the November 2022 DS&CI WG webinar, and January 2023 NEBDHub Inaugural Student Research Symposium

Leading TIPSS standards work with IEEE/UL - Trust, Identity, Privacy, Protection, Safety, Security

- **Trust:** Devices can assume that connected devices are reliable and trustworthy partners
- **Identity:** Devices have a consistent method of identifying each other
- **Privacy:** Ensure device, personal, and sensitive data is kept private
- **Protection:** Protect devices and users from harm – physical, digital, financial, reputational
- **Safety:** Provide safety for devices, infrastructure and people
- **Security:** Maintain security of data, devices, people, etc.



TIPSS envisioned in the 2016 IEEE Trust and Security Workshop for the Internet of Things

Funded by IEEE and NSF (#1623931), the End-to-End Trust and Security for the Internet of Things Workshop held in February 2016 in Washington, DC included presentations and discussions by thought leaders in academia, industry, not-for-profits, technical organizations, consortiums, and governments from around the world.

Participants included: IEEE, NSF, DOE, PNNL, NREL, MITRE, SAE, SRI, Internet2, The Internet Society, The Aerospace Corporation, Kaspersky, 14 Universities, and the Industrial Internet Consortium.

The focus of the workshop was to address the TIPSS elements of IoT: trust, identity, privacy, protection, safety, and security in the context of physical environments such as intelligent highways, connected vehicles, and connected healthcare.

IEEE STANDARDS ASSOCIATION



MEETING RECAP

IEEE Trust and Security
Workshop for the
Internet of Things (IoT)
Washington, D.C.

4 February 2016

Launched IEEE/UL P2933 Clinical IoT data & device Interoperability with TIPPSS Working Group in 2019

This standard establishes a framework with TIPPSS principles (Trust, Identity, Privacy, Protection, Safety, Security) for Clinical Internet of Things (CIoT) data and device interoperability. Scope includes physical and virtual clinical IoT devices including wearables and interoperability with other healthcare IT systems.

250+ working group members from 22 countries including device manufacturers, technologists, providers, payers, caregivers, pharma, healthcare IT, researchers, academics, startups, regulators, etc.

- *Cybersecurity TTP researcher presented quantum tunneling timer technology to the IEEE/UL P2933 WG, creating academia, industry, entrepreneurial collaborations.*
- *AIM Institute created at their university – Artificial Intelligence (AI) and Internet of Things (IoT) for Medicine – to bring together researchers with AI and IoT expertise and clinical investigators to forge new paths to solve complex medical problems with advanced tools.*

The Future of TTP

- Develop and blend academic and entrepreneurial collaborations
- Leverage collaboration mechanisms to support research and community building to enable TTP
- Include established and new researchers, and undergrad and grad students
- Support ongoing multilateral and multi-institutional collaborations for future TTP
- Get connected ... and stay connected!
 - Create portals and communities to connect with researchers and enable them to connect too!
 - The NEBDHub collaborates with multiple cybersecurity TTP researchers!

Thank you!

Florence D. Hudson, Executive Director and PI

NSF Northeast Big Data Innovation Hub and COVID Information Commons

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