



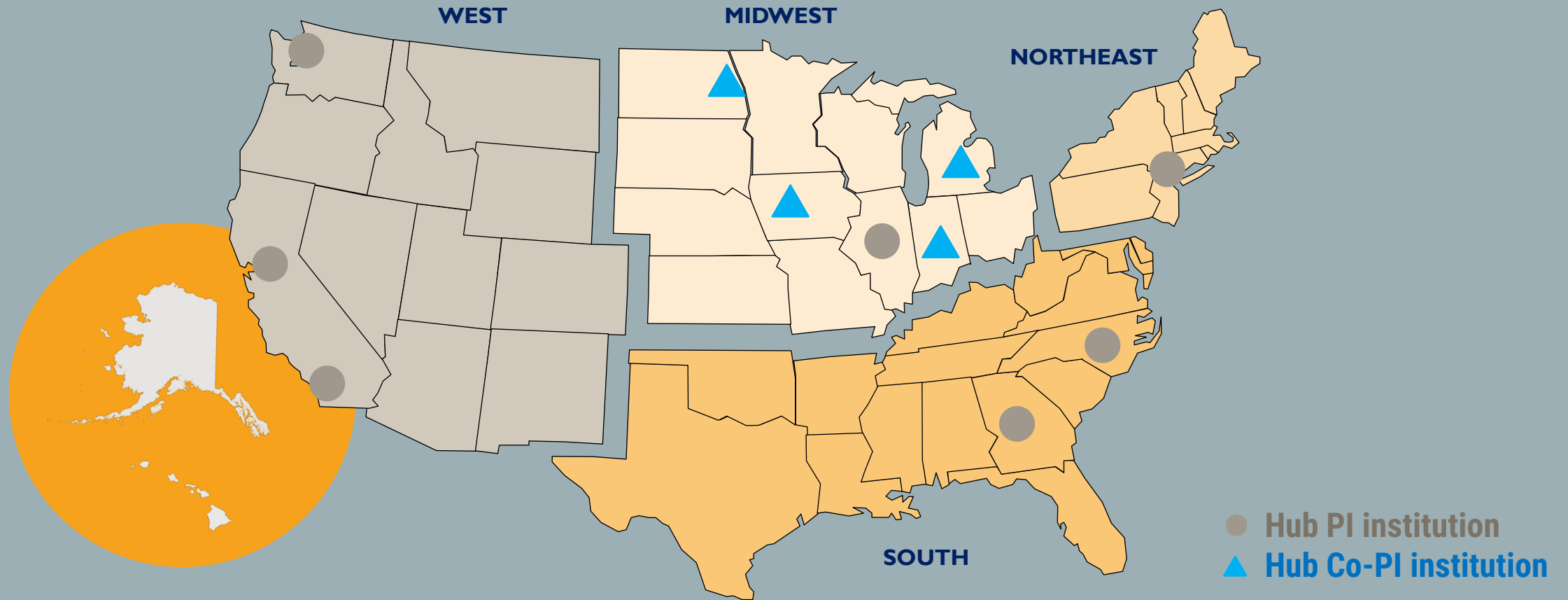
ADVANCING THE DATA ECOSYSTEM: PROJECTS AND PARTNERSHIPS

Melissa Cragin, Executive Director

Alice Delage, Program Liaison

March 14, 2019

Four hubs, one mission.



BUILD + STRENGTHEN PARTNERSHIPS

across industry, academia, nonprofits, government

**to address societal + scientific challenges,
spur economic development,
and accelerate innovation in the national big data ecosystem**

MIDWEST BIG DATA HUB

Accelerating the Big Data innovation ecosystem

- Catalyze new projects – especially to address NSF’s “*Harnessing the Data Revolution*” programs
- Grow our networks of experts, data resources, infrastructure and tools
- Develop collaborations to address regional and national Grand Challenges
- Amplify and develop Data Science education and training activities
- Participate in coordination efforts of the national network of Big Data Hubs

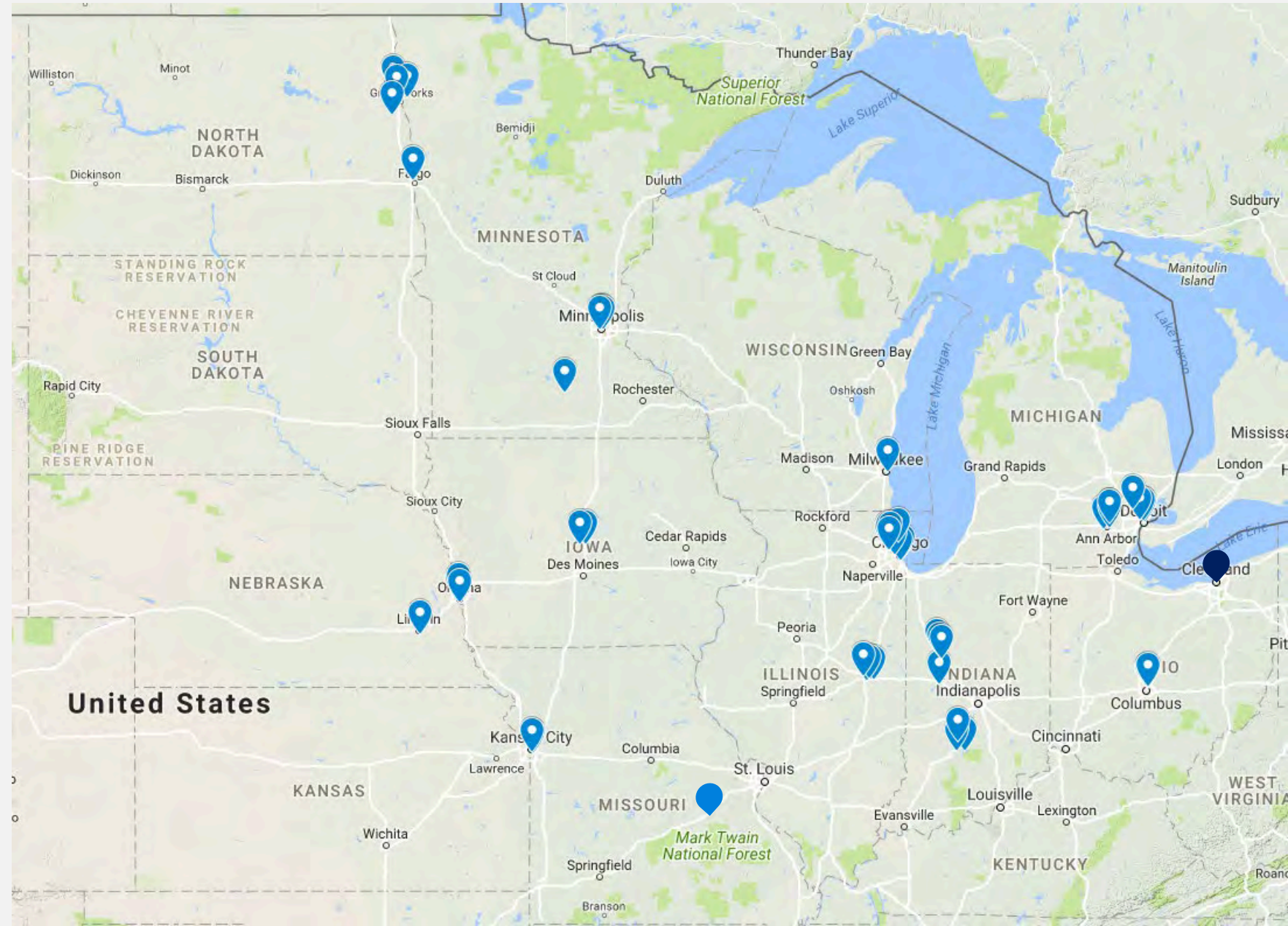


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REGIONAL ENGAGEMENT AND NETWORK DEVELOPMENT

- **Engaging stakeholders**
- **Developing community** through campus visits and event participation and investments
- **Match-making** and facilitating collaborations
- **Capacity building** for a “data savvy” workforce (training, workshops, knowledge sharing)



PRIORITIES AREAS FOR THE MBDH



Digital Agriculture



Water Quality



**Smart & Resilient
Communities**



Health & Biomedicine



**Materials &
Manufacturing**

Cross-cutting areas

- Data science education and training
- Data Infrastructure: tools, CI, methods & services
- Data policy: access, use, governance

VARIETY OF PARTNERSHIPS

- The Engagement and Performance Operations Center
- Council of the Great Lakes Region
- The Carpentries / Data Carpentry
- National Data Service
 - MBDH community access to hardware/software test-bed environments
 - Inclusion in the NDS Labs Workbench catalogue
- ESIP (Earth Science Information Partners)
- Microsoft Azure Cloud Services Partnership (all hubs)
 - providing \$ 3M in credits across Hubs + technical support + training
 - Projects underway at Indiana Univ. (2), Univ. of Minnesota (1), and Iowa State (1)



“SPOKE” & PLANNING AWARDS FROM NSF

10 Awards - \$6.3M

- Digital Agriculture - Unmanned Aircraft Systems, Plant Sciences and Education (UND; IA State; GPN; UN-L)
- Collaborative: Advanced Computational Neuroscience Network (ACNN) (UM; OSU; CWRU; UI)
- Collaborative: Integrative Materials Design (IMaD) - Leverage, Innovate, and Disseminate (UC; UIUC; UM; UW-M; NWU)
- Collaborative: An Integrated Big Data Framework for Water Quality Issues in the Upper Mississippi River Basin (U. of IA; UIUC; ISU)
- Smart Big Data Pipeline for Aging Rural Bridge Transportation Infrastructure (SMARTI) (UN-O)
- Community-Driven Data Engineering for Substance Abuse Prevention in the Rural Midwest (OSU; Nationwide Children’s Hospital; Wright State; U Chicago)

Data Science for Food, Energy and Water: A Workshop Report

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ABSTRACT

At the 22nd ACM SIGKDD conference on Knowledge and Data Discovery, a workshop on Data Science for Food, Energy and Water (DSFEW) was held to foster an interdisciplinary community intersecting data science and societally important domains of food, energy and water. The workshop included keynotes, panel discussion, presentations and posters, and introduced the emerging area of DSFEW to ACM SIGKDD audience, and triggered interdisciplinary idea-sharing in DSFEW research. The workshop website is <https://sites.google.com/site/2016dsfew>.

Keywords

food, energy and water nexus; data science

1. BACKGROUND

In the coming decades, the world population is projected to grow significantly (Fig. 1). Thus, securing the essential resources of food, energy and water, is one of the most pressing challenges the world faces today. The challenge is made harder due to climate change, rising economies and interactions among food, water and energy systems.

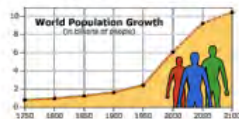


Figure 1: Projected world population growth [8].

It is difficult to consider food, water or energy security in isolation due to their complex interactions. For example, energy production needs water for cooling and may use bio-fuels. Conversely, food production requires energy and water as shown in Fig. 2. Trying to achieve energy security in isolation may lead to unanticipated surprises for food and water security [13]. For example, food prices rose in many parts of the world in 2008 coincident with increased subsidies for biofuels. Similarly, incentives for growing crops have depleted water resources (e.g., Aral Sea, Ogallala aquifer) and

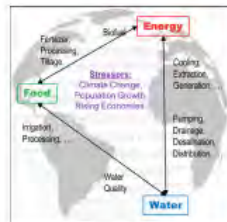


Figure 2: Interactions among Food, Energy, Water Systems (best in color) [3]. For example, food production not only needs water for irrigation and energy for fertilizer but also may degrade water quality due to run-offs.

affected water quality (e.g., dead zone in Gulf of Mexico). To reduce such unanticipated consequences, the nexus approach jointly considers the interactions among food, energy and water systems [11]. Understanding the FEW nexus is among the highest priorities at the United Nations [9] as well as many countries. In 2011, Stockholm Environment Institute initiated a conference on "The Water, Energy and Food Security Nexus, Solutions for the Green Economy" to better understand the nexus [1]. In 2014, U.K. funded a set of research proposals on FEW (e.g., WEFEBs at University of Glasgow) [2]. In U.S., a recent National Intelligence Council report identified it among the greatest challenges facing our world in the coming decades [12]. The US National Science Foundation has also started a multi-year cross-directorate initiative titled Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) [5]. More international research efforts are in need to address global FEW challenges (e.g., global FEW choke point in China, US and India [4]).

In 2015, US NSF sponsored a set of workshops to engage a diverse set of research communities to identify research challenges and opportunities. This ACM SIGKDD workshop on DSFEW is motivated by the NSF workshop, "A Workshop to Identify Interdisciplinary Data Science Approaches and Challenges to Enhance Understanding of Interactions

Unmanned Aircraft Systems, Plant Sciences and Education

Objective Lead
Dr. Travis Desell
Assistant Professor
Dept of Computer Science
University of North Dakota

Phenomics & Genomics

Objective Lead
Joe Coletti
Sr. Assoc. Dean
Iowa State U.

Partner
Northern Plains
UAS Test Site

Partners
University of North Dakota
University of Nebraska-Lincoln
Iowa State University
Kansas State University

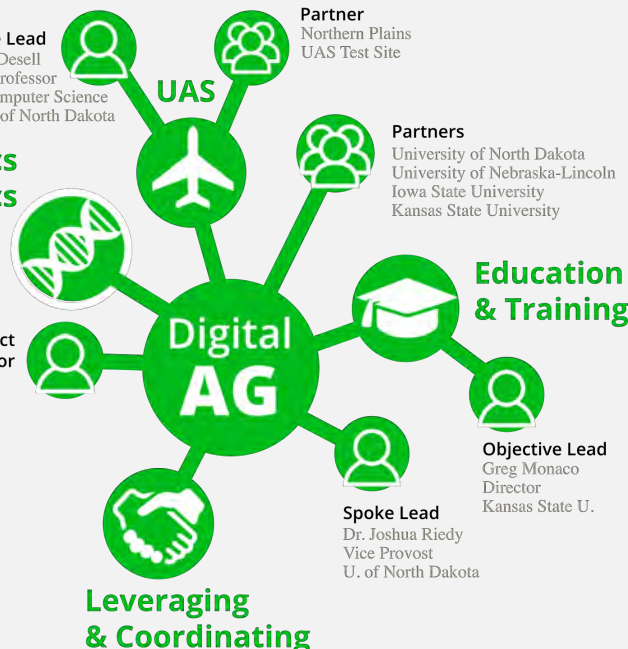
Education & Training

Objective Lead
Greg Monaco
Director
Kansas State U.

Spoke Lead
Dr. Joshua Riedy
Vice Provost
U. of North Dakota

Leveraging & Coordinating

Project
Coordinator



Machine Learning: Farm-to-Table

Agriculture Big Data (AgBD) Challenges and Opportunities From Farm To Table: A Midwest Big Data Hub Community[†] Whitepaper

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Abstract: Big data is critical to help agriculture meet the challenges of growing world population, climate change and urbanization. Recent success stories include precision agriculture, phenotyping, and global agricultural monitoring. Many of these initiatives are made possible by novel data sources such as satellite imagery, instrumented tractors and initiatives such as the Global Open Data for Agriculture and Nutrition (GODAN). This whitepaper surveys agricultural big datasets, characterizes their limitations, lists transformative opportunities and suggests a plan to engage and nurture Agriculture Big Data (AgBD) research community.

Agricultural Data Integration: From Genomics to Unmanned Systems

IMA Institute for Mathematics
and its Applications

IMA
Special
Workshop

October 26–27, 2017

Agricultural Data Integration: From Genomics to Unmanned Systems



SCIENTIFIC COMMITTEE

Sneekha Bajwa, North Dakota State University
Diana Delbottan, University of Minnesota
Travis Desell, University of North Dakota
Paul Gundersen, Lake Region State College
Mohamed Mokbel, University of Minnesota
John Nowatzki, North Dakota State University
Philip Purdey, University of Minnesota
Nathan Springer, University of Minnesota

SPEAKERS

Sneekha Bajwa, North Dakota State University
Volkan Isler, University of Minnesota
Aaron Kennedy, University of North Dakota
Oliver Qiao, South Dakota State University
Patrick Schnable, Iowa State University
Shashi Shekhar, University of Minnesota

More information is available at
www.ima.umn.edu/2017-2018/SWT10.26-27.17

DEPARTMENT OF
SCIENCE & ENGINEERING
UNIVERSITY OF MINNESOTA
INSTITUTE FOR MATHEMATICS
AND ITS APPLICATIONS

THE MIDWEST AG-BIG DATA HUB

SUPPORT FROM

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Minnesota's Discovery
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Economy

UNIVERSITY OF
NORTH DAKOTA



MIDWEST
BIG DATA
HUB

SIGKDD Explorations Volume 18, Issue 2 December, 2016

FOOD AND DATA WORKSHOP: INTEROPERABILITY THROUGH THE FOOD PIPELINE

12-13 September, 2016 - University of Illinois at Urbana-Champaign

HOME REGISTRATION AGENDA CALL FOR SUBMISSIONS ORGANIZERS SPEAKERS



SMART & RESILIENT COMMUNITIES

- Kick-off planning meeting – Oct. 2017 in Omaha
 - identify existing projects from around the MBDH
- Who's Involved?
 - Academia, NGOs, National Labs, Industry
 - Data Resource Organizations;
 - Local governments
- Smart, Local Resilient Workshop: July 2018
 - Rural Health
 - Access to rural broadband
 - Data for decision-making in small & rural communities



HACKING SOCIO-TECHNICAL ISSUES WITH OPEN MUNICIPAL DATA



ILLINOIS go.illinois.edu/reversepitch

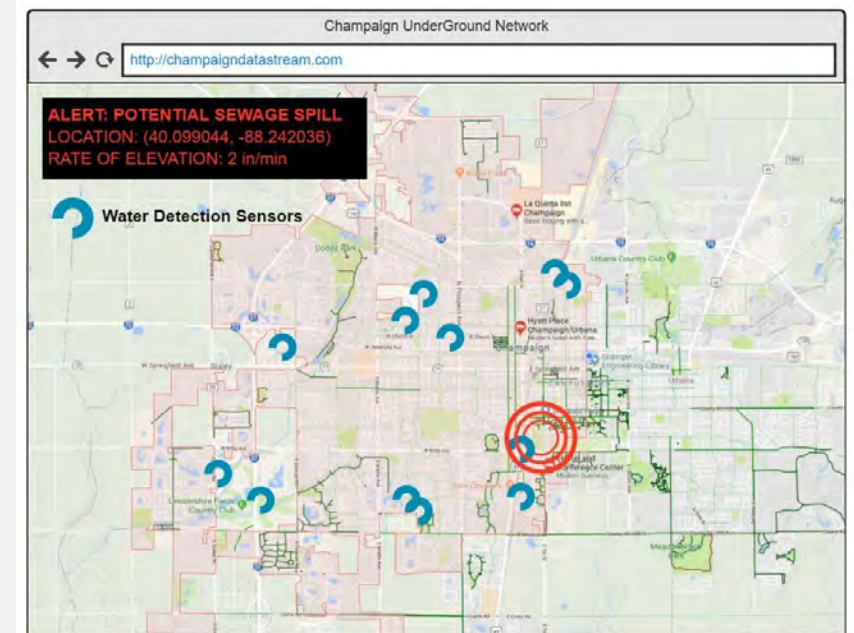
Champaign
Smart Gigabit Community @ **HACK ILLINOIS**
Reverse Pitch

**Hacking Socio-technical issues
with Open municipal data**

US Ignite Reverse Pitch challenge

Sponsored by
Technology Services Research IT,
the Center for Digital Inclusion, the School of Information Sciences, and...

Learn more

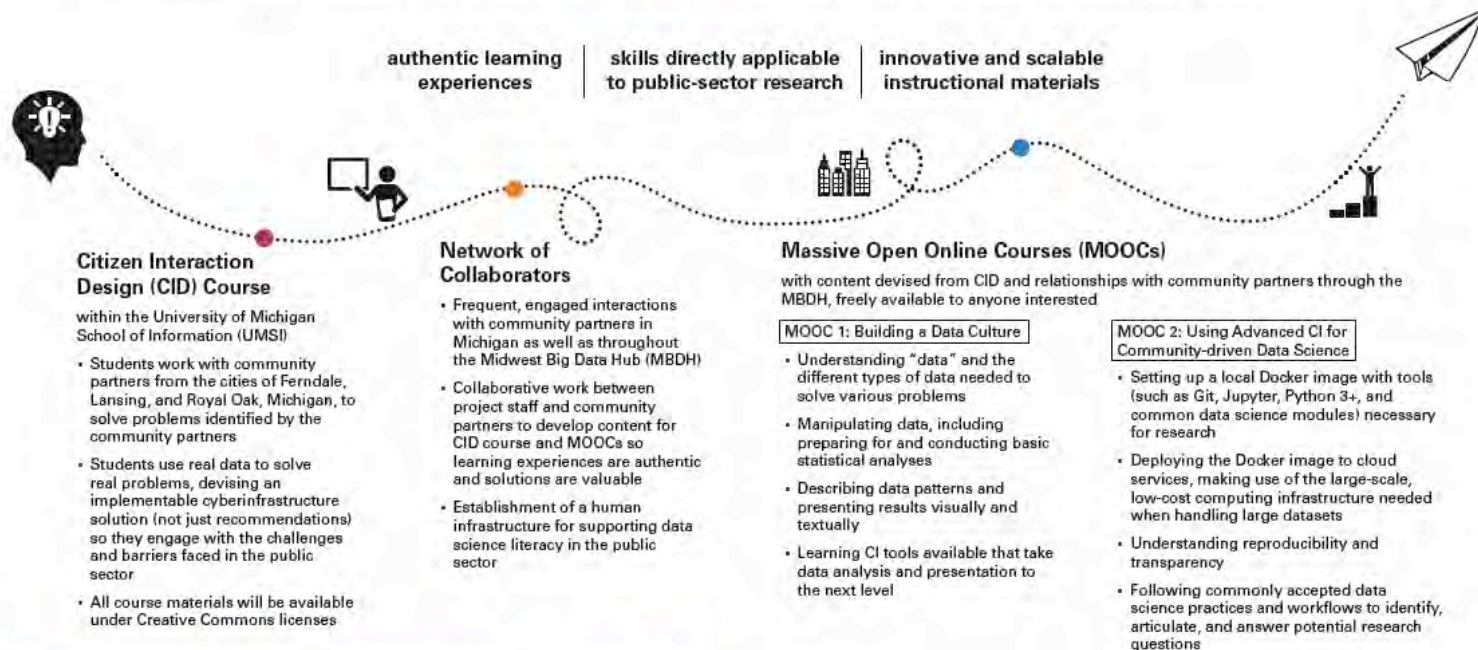


PROJECTS & PARTNERS AROUND SMART & RESILIENT

Preparing the Public-Sector Research Workforce to Impact Communities through Data Science

Libby Hemphill, Christopher Brooks, Lynette Hoelter, and Clifford A. Lampe; University of Michigan

Training **undergraduate students, graduate students, and community stakeholders** in collecting, extracting, cleaning, annotating, and analyzing data generated and used by government organizations to further enable **data-based decision making**. Working with the Midwest Big Data Hub (MBDH), we identify interested **community partners** who will guide the development of innovative and scalable instructional materials and suggest relevant data sources for in-person and online training offered by faculty at the University of Michigan. Direct community involvement ensures **authentic learning** experiences centered on skills directly applicable to public-sector research.



Other examples of projects we collaborate on:

- Community Driven Data Engineering for Opioid and Substance Abuse in the Rural Midwest (Spoke project)
- Developing an Informational Infrastructure for Building Smart Regional Foodsheds (RCN)
- Preparing the Public Sector Research Workforce to impact Communities through Data Science

OPPORTUNITIES TO ENGAGE & COLLABORATE

- Join the MBDH: Sign-up for our mail list and newsletter - **midwestbigdatahub.org**
- Learn about our events and utilize MBDH-related training events
- Help us generate and disseminate high-value information & announcements around
 - events, funding opportunities, training opportunities, data challenges and "civic tech"
 - e.g. Erie Hack, Feb. 7-June 20
 - Best Practices, lessons learned, case studies, and success stories
 - Reports and resources
- Participate in MBDH community and Partner activities
 - Join our priority and cross-cutting areas activities (calls; webinars; meetings; blog)
 - Join a project as a community participant (Pilot projects, etc.)

THANK YOU

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#bdhubs

[@MWBigDataHub](#)



IOWA STATE
UNIVERSITY



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