

# Harnessing Responsible AI for Science: Taming Open Data

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Presidential Professor, Kahlert School of Computing



**Multicore World 2026**

Christchurch, New Zealand, 02/16/2026

ONE-U RESPONSIBLE AI INITIATIVE *at the*  
SCIENTIFIC COMPUTING & IMAGING INSTITUTE



# The SCI Institute

www.sci.utah.edu

**Mission:** Transform science and society through *translational research and innovation*

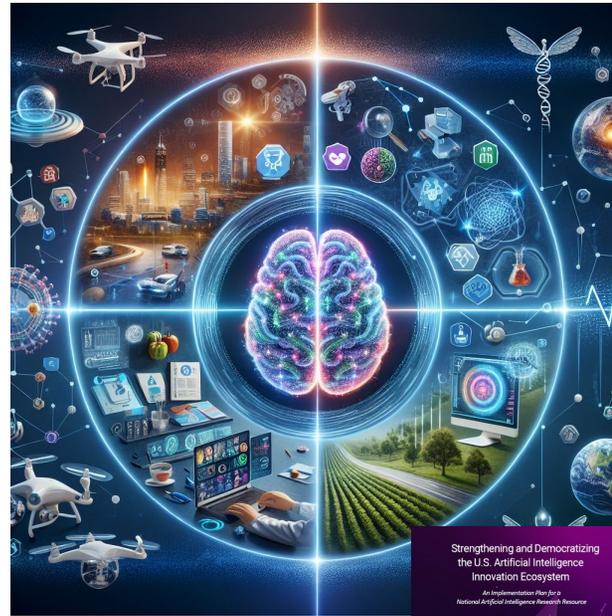
- Inter/transdisciplinary, collaborative, convergent
- Core strengths in: Visualization & imaging; Scalable analytics; Advanced computing & data
- Software/system development and distribution are integral to our research processes



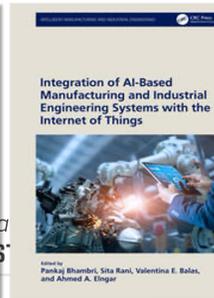
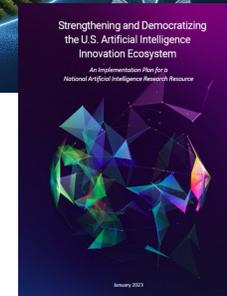
**One-U Responsible AI Initiative:** Responsibly advance *translational AI* for societal good

# Transcendence of AI:

- AI has become an essential engine of innovation, scientific discovery, and economic growth.
  - Impacts span routine daily tasks to societal-level challenges.



Images generated with Microsoft Copilot.



ONE-U RESPONSE  
SCIENTIFIC COMPUTING

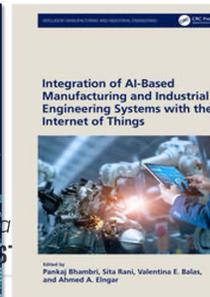
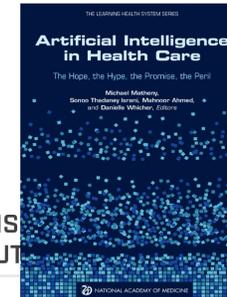
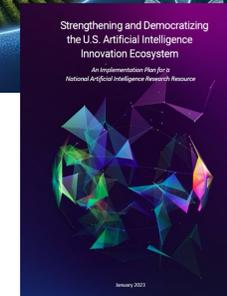


# Transcendence of AI

- AI has become an essential engine of innovation, scientific discovery, and economic growth.
  - Impacts span routine daily tasks to societal-level challenges.
- AI has potential negative social, environmental, and economic consequences.
- It is imperative that we responsibly advance and use AI.



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Ack: ChatGPT

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## Gartner AI Hype Cycle: A Focus on Data



<https://www.bigdatawire.com/wp-content/uploads/2025/08/AI-hype-cycle.png>



David Baker, shared the 2024 Nobel Prize in Chemistry, “for computational protein design.”

David Baker on the importance of the Protein Data Bank for his AI-driven breakthroughs: ***“It’s not just the methods, it’s the data. And there aren’t so many places where we have that kind of data.”***

- Analysis of 41 M papers (2 M researchers) finds that AI expands individual impact and benefits career trajectories (Science 01/26, 10.1126/science.zc518iv)
  - Scientists adopting AI published 3.02 times as many papers and received 4.84 times as many citations
  - Junior scientists using AI less likely to drop out of academia and more likely to become established research leaders (1.5 years earlier than peers who hadn’t)
- But using AI wasn’t good for science overall – it narrows collective scientific exploration
  - AI papers covered 4.6% less territory than conventional scientific studies
- A feedback loop: *Popular problems motivate the creation of massive data sets, which make the use of AI tools appealing, and advances made using AI tools attract more scientists to the same problems*
- To realize the promise of AI for, we need to make data more *abundant, usable, useful and used!*

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# Why is data so challenging to use?

## Infrastructure Challenges

- **Siloed data ecosystems:** Diversity of data sources/repositories that are not interoperable or composable
- **Inconsistent data services:** Disparate, specialized data pipelines built for application domains
- **Difficult to deploy and use:** Data platforms and services require specialized skills to deploy and use
- **Access to computing:** Data source disconnected from computing; access to computing requires funding, training, and local infrastructure

## User/Usage Challenges

- **Awareness:** Why is data important? What data is relevant to me? Where do I find the data I need? What do I need to know about it?
- **Ability:** How can I get the skills needed to use data? Where do I go for help?
- **Access:** Where do I get the resources to access, contribute to, and/or use data?
- **Fit for use:** How do I determine what data is appropriate for me to use? How do I build trust in data?
- **Association:** How do I find out who else is using the data and how? How do I become part of a community?

Move beyond Open => Useful, Usable, Used

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THE UNIVERSITY OF UTAH

# National Data Platform (NDP)



A screenshot of the National Data Platform website. The header includes the NDP logo, navigation links (Catalog, About, Events and Press, User Stories), and buttons for 'Get Started with NDP' and 'Log in/Register'. The main content area features the heading 'Open Data, Available Access and AI Services' and a sub-heading 'Building the nation's federated data ecosystem. Explore data. Run analyses. Transform AI education.' Below this is a button 'Explore our catalog of datasets'. A map of the United States is shown with a grid of blue and yellow squares. Logos for partner institutions are displayed: San Diego Supercomputer Center, SCR (www.sci.utah.edu), EarthScope Consortium, UC San Diego, The University of Utah, and University of Colorado Boulder. At the bottom, three statistics are presented: 4656 data collections and livestreams, 5 data and AI services, and 606 registered users.

A **broad, federated** and **extensible** data ecosystem to promote collaboration, innovation, and customizable use of data on top of existing national infrastructure capabilities.

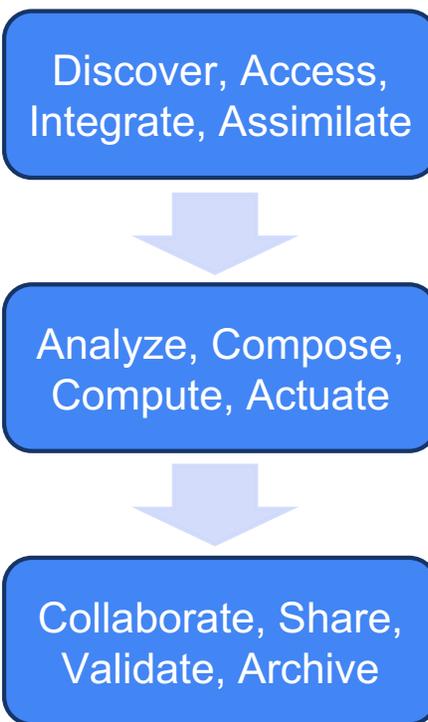
<https://www.nationaldatapatform.org/>

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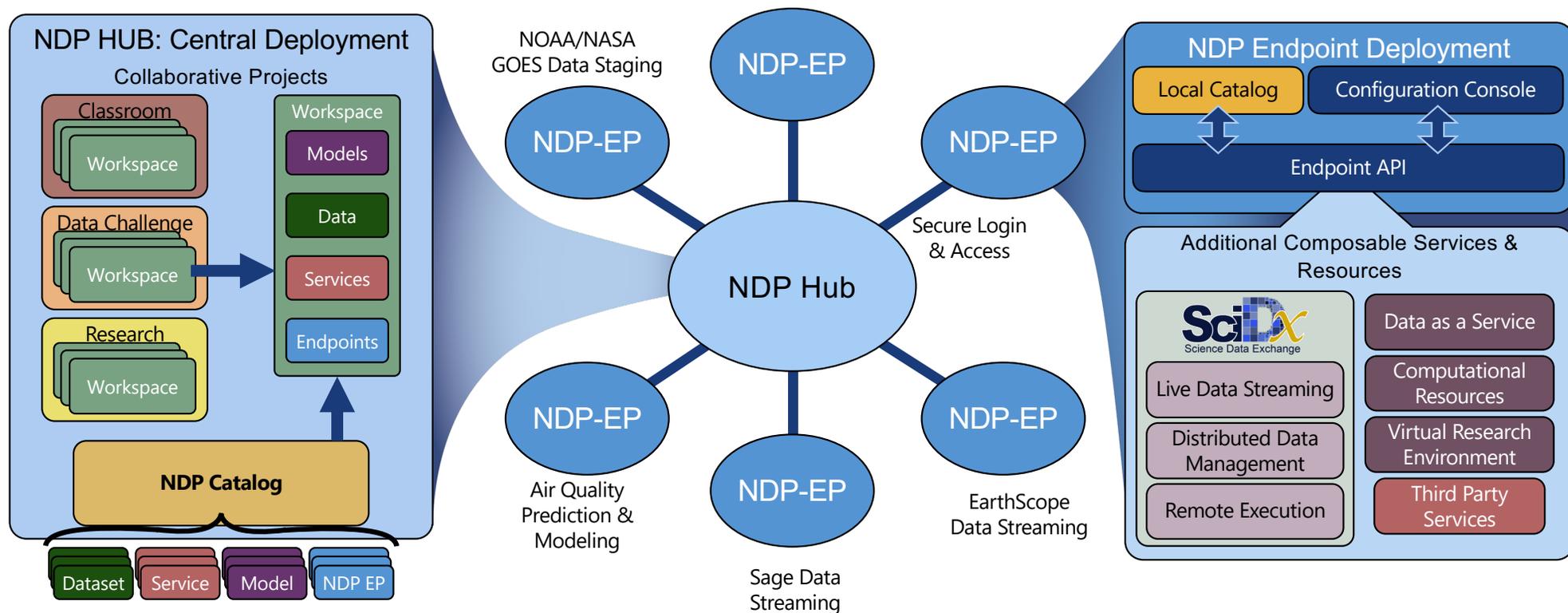


# What can NDP help with?

- Facilitates data cataloging to make data ***FAIR and used at scale***.
- Provides collaborative workspaces and customizable (near-data) services for ***data utilization***.
- Connects users to ***national cyberinfrastructure and Cloud resources***.
- Enables the development and deployment ***of AI-integrated workflows***.
- Offers tools to create classroom and ***data challenge learning experiences***.



# NDP Architecture: A Federated Data Ecosystem



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# Science Data Exchanges (SciDx) Services

*A customizable Data-Pop software stack for in-situ data access & processing*



## SciDx Staging Services

- Transient resources for in-situ (close to the data) data processing and access
  - High-performance in-memory processing
  - Server-side data transformations (e.g., sub-setting, reduction, user-defined analysis, etc.)
  - Caching/sharing of data, results, and data-products
  - Registration of data-triggers
- Efficient management of data in-motion
  - Streamline workflows; minimize data transfers
  - Perform ETL operations at data source



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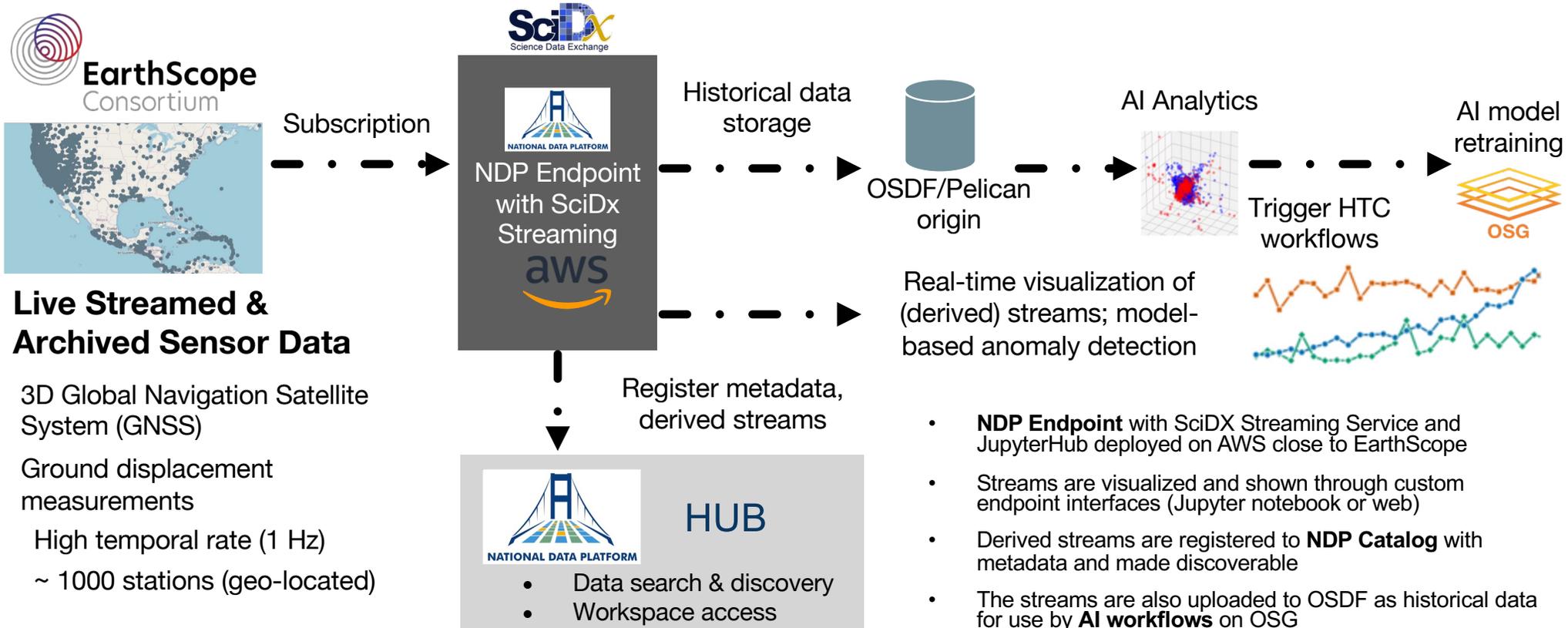
## SciDx Streaming Service

- Streams registration, curation/archival for discovery and access
- User-defined operations/filters on streaming; containerized execution
- Combine streaming data with archived/playback data
- Mechanism for online data product generation (i.e., new data streams)



# EarthScope Early Earthquake Detection Workflow

Contact: Charles Meertens, University of Colorado and Dave Mencin, EarthScope Consortium

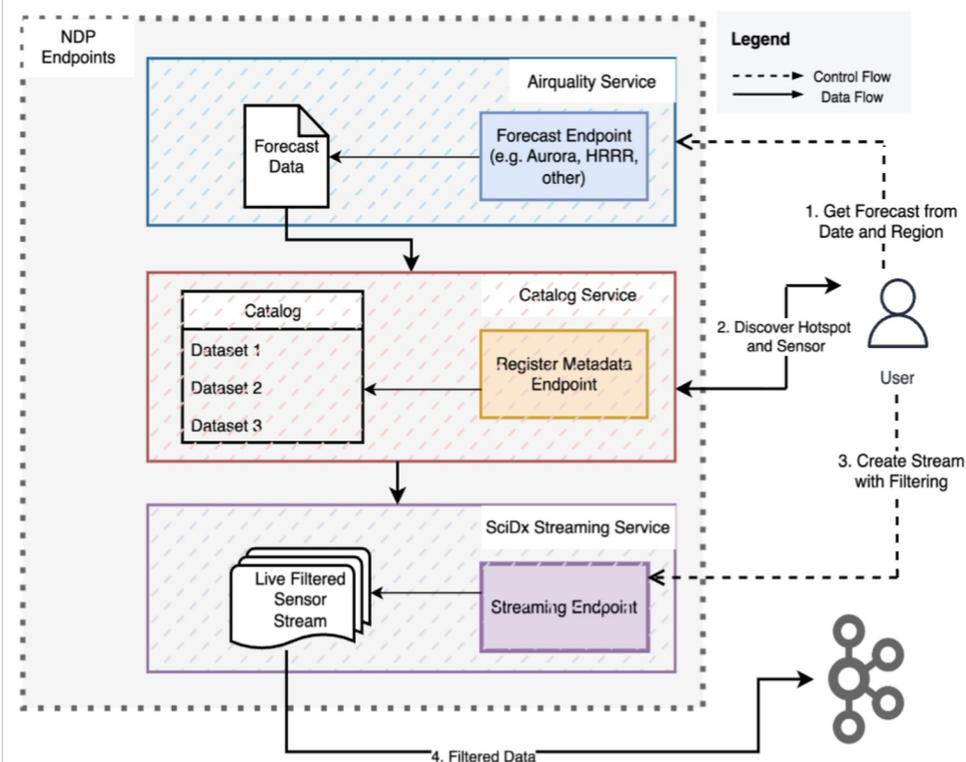


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# Adaptive Air Quality Sensing

- **Forecast ingestion:** Run Aurora on forecast inputs and catalog the forecast output in NDP.
- **Hotspot detection:** Find PM2.5 hotspots and turn them into persistent trigger events.
- **Adaptive ingestion:** Use triggers and NDP metadata to select nearby sensors and create streams only from those sensors.
- **Dissemination:** Publish activated streams via SciDx Streaming to downstream consumers (alerts/analytics/storage).

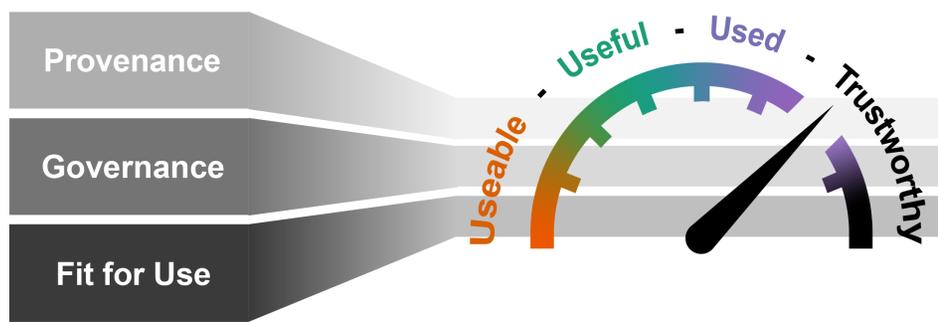


# In this talk ...

- Towards trustworthy data – accessing fit for purpose
- Leveraging agents for data discovery



# Towards Trustworthy Data: Dimensions of Trust



- **Usable**: Accessibility through governance, documentation, openness, and infrastructure.
- **Useful**: Context-dependent alignment with intended use cases; determination of *fit-for-use*.
- **Used**: Verification of usage and impact; user feedback.

## Determining *Fit-for-Use*

- Who is using the data and for what research?
- What is the impact of research using the data?
- What data sets are used together, how are they used, and for what research?
- What tools/codes are used for the data?
- ...



# NDP Contextual Insights

## Data Registration

- Leverage LLMs to characterize the dataset using keywords.
- Approve dataset keywords.

## Metadata Collection

- Leverage publication corpora (e.g., OpenAlex, Dimensions) to generate context metadata knowledge graph about who, what, and how data have been used.
- Validate generated metadata for accuracy.

## Data Discovery

- Search query returns context metadata for matching datasets, which is summarized for the user.
- The user has the option to launch the portal for a more in-depth exploration.

## Data Use

- The user provides feedback on datasets/context metadata and fit for use.
- Context metadata is periodically updated.

Powered by:



2015 - 2025 - MIDRC

### MIDRC Data Commons

The MIDRC Data Commons is a repository of medical imaging and associated metadata, curated to support research in artificial intelligence (AI) and machine learning (ML). Created by the Medical Imaging and Data Resource Center (MIDRC), it is funded by the National Institute of Biomedical Imaging and Bioengineering (NIBIB) and the Advanced Research Projects Agency for Health (ARPA-H). The dataset includes standardized, vetted medical images, clinical data, and metadata, organized under a common data model to ensure interoperability. It serves as an AI-ready resource for developing and validating diagnostic tools, with use cases spanning radiology, pathology, and multi-modal data analysis. Key features include access via the Gen3 Data Ecosystem, secure query infrastructure, and integration with external data sources. MIDRC collects data through portals at RSNA and ACR, harmonizing datasets to address duplication and ensure quality. Researchers can query and access data through a unified portal, leveraging unique identifiers to retrieve files from distributed repositories. The commons emphasizes privacy compliance, scalability, and collaboration, enabling large-scale, interoperable research while adhering to ethical standards. Its design supports advancing medical AI while addressing challenges in data diversity and accessibility.

[artificial intelligence](#)
[medical images](#)
[deep learning](#)
[chest X-ray images](#)
[deep learning models](#)
[machine learning](#)
[convolutional neural network](#)
[out-of-distribution](#)
[federated learning](#)
[medical image analysis](#)

<b>Researchers using this</b> <b>1.47K</b> <a href="#">→ View details</a>	<b>Publications using this</b> <b>402</b> <a href="#">→ View details</a>	<b>Citations</b> <b>6.26K</b> <a href="#">→ View details</a>	<b>Institutions using this</b> <b>475</b> <a href="#">→ View details</a>
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Dataset details

From Year: All years  
To Year: All years

### Health and Nutrition Examination Survey

National Health Interview Survey

US adults social determinants of health risk factors physical activity hazard ratio mental health older adults cancer survivors quality of life body mass index health care diet quality depressive symptoms health outcomes

Publications Over Time

When datasets are being used

Authors & Institutions

Search authors...  
 Scott D. Solomon 72 publications  
 Khurram Noor 705 publications  
 Emily Chan 661 publications  
 Deepak L. Bhatt 602 publications

Publication Types

Search publication types...  
 Article 469.3K

Geographic Distribution

Where research is happening

ACTIVE at the  
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**Catalog Search** [Switch to Map Search](#)

- My Dashboard
- My NDP Hub
- Catalogs
- Education Hub
- NDP Endpoints

**Contextual Insights**  
Research Platform

2015 - 2025 - MIDRC

**MIDRC Data Commons**

**Contextual Insights**  
Research Platform

**Top experts & institutions**

- artificial intelligence 46 Publications, 321 Researchers
- medical images 26 Publications, 106 Researchers
- deep learning 11 Publications, 75 Researchers
- chest X-ray images 9 Publications, 50 Researchers
- deep learning models 9 Publications, 49 Researchers
- machine learning 9 Publications, 46 Researchers
- convolutional neural network 7 Publications, 24 Researchers

**Contextual Insights**  
Research Platform

**AI-Assisted Dataset Insights**

Signals derived from a multi-agent LLM review of publications that reference this dataset—helping researchers quickly see how others combine, extend, or operationalize the data.

**Contextual Insights**  
Research Platform

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**Contextual Insights**  
Research Platform

**Who uses the dataset?**

**Who uses the dataset?**

**Most active researchers**

Who publishes the most and who are the most cited researchers in this research area?

**Contextual Insights**  
Research Platform

**Usage by institutions**

Top 10 institutions using this dataset

Department of Psychology, Oreg...

University of Chicago

Emory University

Stanford University

Harvard University

United States Food and Drug A...

Massachusetts Institute of Tech...

Beth Israel Deaconess Medical ...

Massachusetts General Hospital

Indiana University - Purdue UN...

**Contextual Insights**  
Research Platform

**Usage by geography**

Dataset usage distribution across geographic regions

United States

United Kingdom 28

China 27

Canada 27

Germany 13

Brazil 12

Netherlands 12

Spain 11

Australia 11

Italy 9

**Contextual Insights**  
Research Platform

**How datasets are combined and connected?**

Dataset connections

Which datasets are used or combined in publications

Health and Retirement ... 10

Current Population Sur... 1 2

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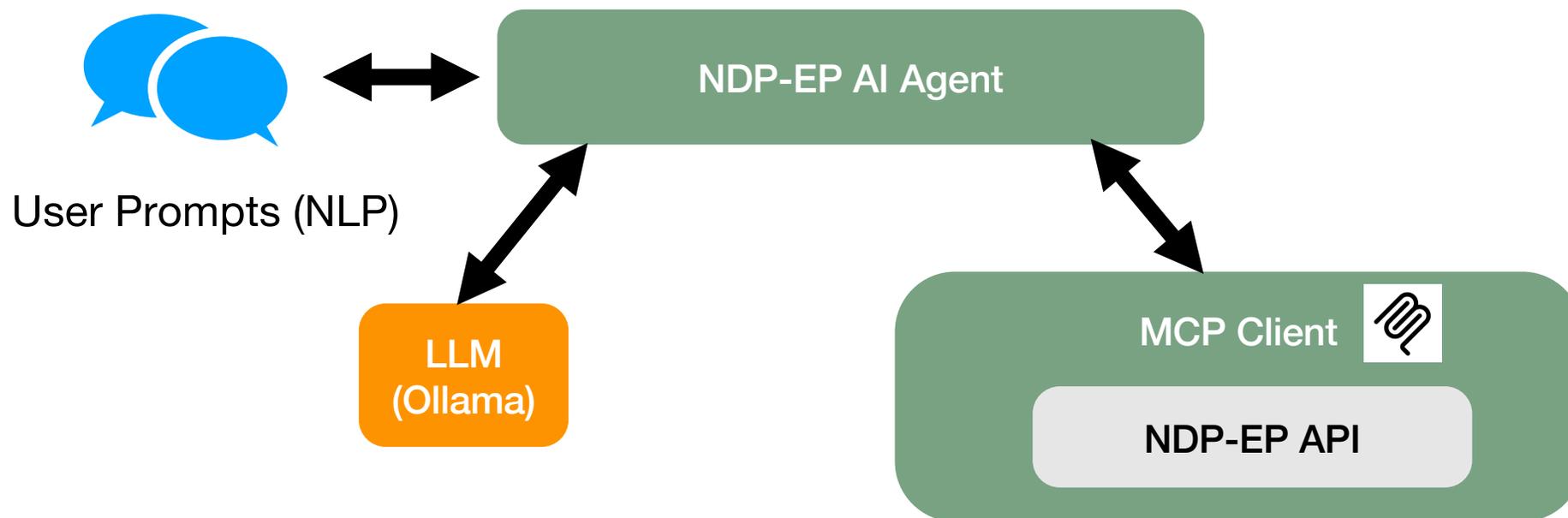
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**Contextual Insights**  
Research Platform

# Integrating Agentic AI



# SciDx Data Streaming Pipeline

Discover data streams

Filter by location/channel

Subscribe to the derived stream

Stream analytics/event detection

Display results / derived data

Partial Python  
Implementation

```
# Discover streams
streaming.search_consumption_methods(
    terms = ["name"], types = ["*"], server = "local"
)

# Create a Derived Kafka stream with spatial/sensor filtering
stream = await streaming.create_kafka_stream(
    keywords=["sensor_data"], match_all=True, filter_semantics=filters,
    username="username", password="password"
)

# Retrieve the stream's topic name
topic = stream["data_stream_id"]

# Start consuming the filtered Kafka stream
consumer = streaming.consume_kafka_messages(topic)

# Retrieve the actual state of the real-time DataFrame
df = consumer.dataframe

# Apply temporal filtering
df["MA"] = df.rolling(window=5).mean()

# Plot/display data

# Pad all lists in each row to the same length
def pad_row(row):
    max_len = max(len(val) if isinstance(val, list) else 1 for val in row)
    return pd.Series({
        col: (val if isinstance(val, list) else [val]) + [np.nan] *
            (max_len - len(val) if isinstance(val, list) else max_len - 1)
        for col, val in row.items()
    })

# Apply padding and explode
df_exploded = df.apply(pad_row, axis=1).explode(df.columns.tolist()).reset_index(drop=True)
df = df_exploded

# Format dataframe for display
total_rows = len(df)
display_rows = min(max_rows, total_rows)

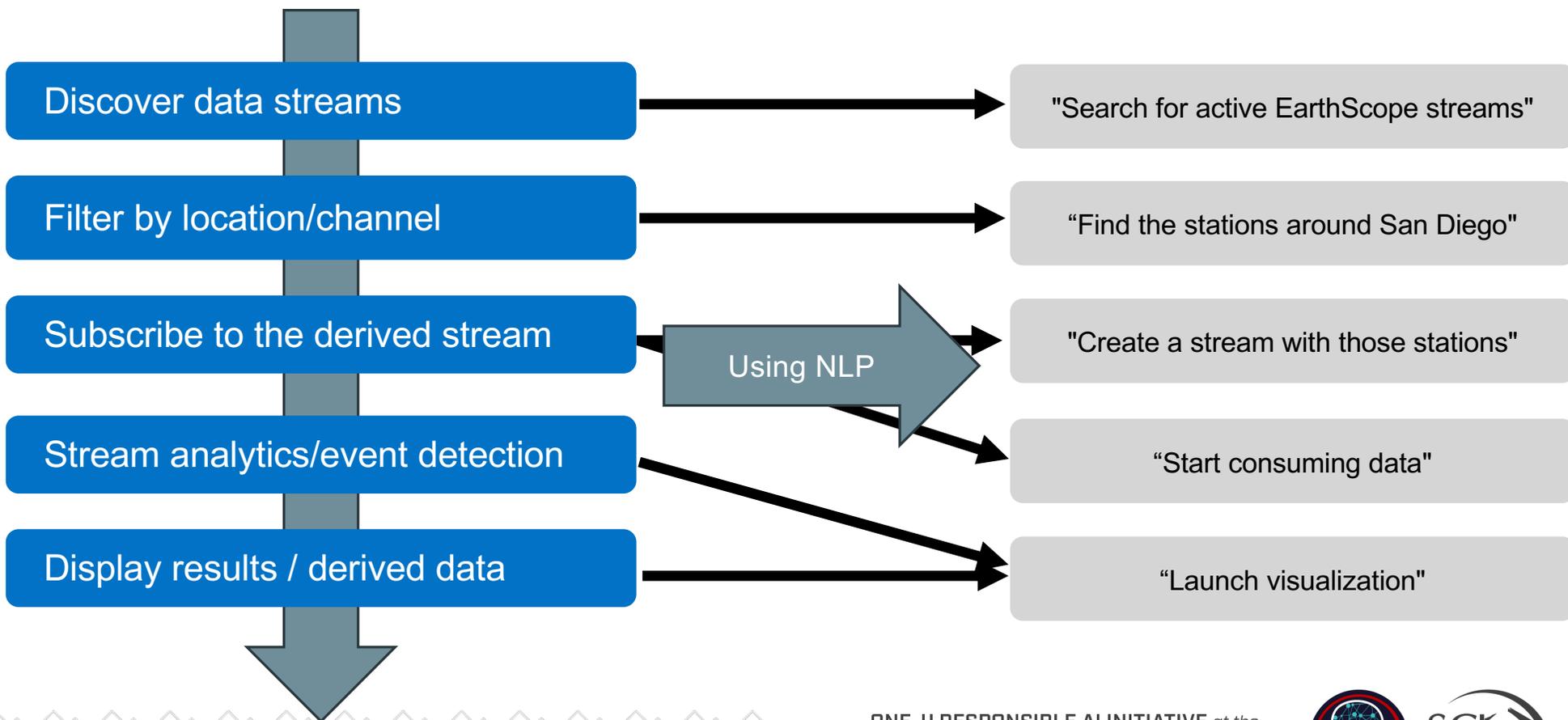
result = f"📄 Consumer Dataframe for topic: {topic}\n"
result += f"📄 Total rows: {total_rows}\n"
result += f"📄 Columns: {list(df.columns)}\n"
result += f"📄 Showing first {display_rows} rows:\n\n"

# Convert dataframe to string representation
result += df.head(max_rows).to_string(index=False)
```

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# SciDx Data Streaming Pipeline



# Demo: Using Agentic-AI for Data Discovery and Use

The screenshot shows a web browser window with the URL `nationaldataplatfom.org` and a "BeAI Chat Console" tab. The main content is the "My Dashboard" for user Andreu Fornos Bautista. The dashboard includes a sidebar with navigation options: My Dashboard, My NDP Hub, Catalogs, Education Hub, and NDP Endpoints. The main area features a "Recently Viewed" section for Workspaces, a message stating "You have no workspaces that match the given filters. Head over to My Hub to create a workspace now.", and a "1 Step-by-step: Create and Launch a Workspace" guide with four numbered steps. Below this is a "COMMUNITY" section with "Explore Public Workspaces" (noting no community workspaces are currently available) and "Explore Active Data Challenges" (showing 27047 days left for an "Example Data Challenge and Onboarding").



**BeeAI Console**  
Chat orchestration

New chat

Just the names of the MCPs you have

Reset chat Close chat

CONVERSATIONS

Just the names of the MCPs you hav  
127.0.0.1:3000  
Gemini - 43s ago

**BeeAI Console**  
Chat orchestration

New chat

Just the names of the MCPs you have

Reset chat Close chat

CONVERSATIONS

Just the names of the MCPs you have  
127.0.0.1:3000  
Gemini - 52s ago

Station Preview  
Stations posted: 90 Generated at: 2025-10-23 18:15:39



**BeeAI Console**  
Chat orchestration

New chat

Just the names of the MCPs you have

Reset chat Close chat

CONVERSATIONS

Just the names of the MCPs you have  
127.0.0.1:3000  
Gemini - 1m ago

Andreu Forno  
andreu07@gmail.com  
Expires in 8 h

Log

**BeeAI Console**  
Chat orchestration

New chat

Just the names of the MCPs you have

Reset chat Close chat

CONVERSATIONS

Just the names of the MCPs you have  
127.0.0.1:3000  
Gemini - 2m ago

Andreu Fornos Bautista  
andreu07@gmail.com  
Expires in 8 h

Log out

**BeeAI Console**  
Chat orchestration

New chat

Just the names of the MCPs you have

Reset chat Close chat

CONVERSATIONS

Just the names of the MCPs you have  
127.0.0.1:3000  
Gemini - 3m ago

Andreu Fornos Bautista  
andreu07@gmail.com  
Expires in 8 h

Log out

Summary

- Status: suc
- Consumer
- Active mon

Details

- status: suc
- topic: data
- tracked\_co
- [1] data\_st
- context\_hi

MODEL

gemini

GeminiMCPClient

08:16 PM - 5s ago - 35

launch the visualization

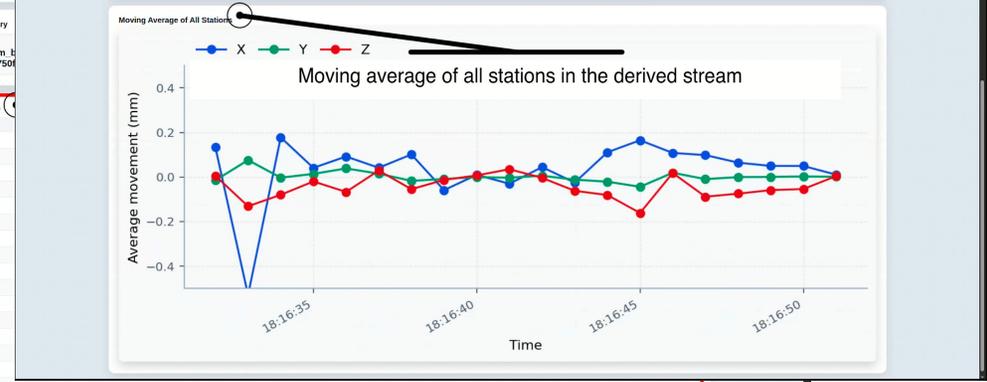
08:16 PM - 0s ago

Gemini is thinking...

Send a message...

Gemini - gemini - ready

STATION	TIME	X	Y	Z	LATITUDE	LONGITUDE
TBRN.PWLY_00	18:16:49	0.208	0.013	0.018	34.4803	-120.1326
POBS.CLLY_30	18:16:47	-0.074	0.161	0.195	33.8511	-116.8038
SLAC.PWLY_00	18:16:49	0.123	-0.022	-0.044	37.4165	-122.2943
CLMS.PWLY_00	18:16:49	0.267	-0.066	-0.279	34.3128	-117.4734
SLAC.PWLY_00	18:16:44	0.138	-0.029	-0.067	37.4165	-122.2943
KBRIC.CLLY_20	18:16:44	-0.027	0.007	0.026	34.3265	-119.9630
ANAL.CLLY_20	18:16:44	0.237	-0.041	-0.221	34.0350	-119.9630
PVHS.CLLY_20	18:16:43	-0.025	-0.017	-0.062	33.7725	-118.3722
OVIS.PWLY_00	18:16:42	0.166	0.000	0.026	34.3271	-119.1420
LRRN.CLLY_20	18:16:42	-0.011	0.008	-0.089	34.8075	-118.8677
SNOC.CLLY_30	18:16:42	-0.022	0.009	0.047	34.0282	-116.8078



Moving Average of All Stations

STATION	TIME	X	Y	Z	LATITUDE	LONGITUDE
CACTE.CLLY_40	18:16:39	-0.095	-0.000	-0.013	34.0351	-116.8262
HVYS.PWLY_00	18:16:38	0.187	-0.004	-0.139	34.4412	-119.1875
HPVS.PWLY_00	18:16:38	0.237	-0.062	-0.302	33.7090	-115.8303
TBRN.PWLY_00	18:16:37	0.195	0.000	0.012	34.4805	-120.1326
RTHS.CLLY_40	18:16:38	-0.100	0.004	0.077	34.0992	-117.3533

Station list

STATION	TIME	X	Y	Z	LATITUDE	LONGITUDE
CACTE.CLLY_40	18:16:39	-0.095	0.118	0.139	33.8551	-115.9900
SNOC.CLLY_30	18:16:40	0.009	0.047	0.064	34.0282	-116.8078
RTHS.CLLY_20	18:16:40	-0.099	0.009	0.064	34.0992	-117.3533
RHCL.CLLY_20	18:16:39	-0.099	-0.009	-0.013	34.0191	-118.0262
HVYS.PWLY_00	18:16:38	0.187	-0.004	-0.139	34.4412	-119.1875
HPVS.PWLY_00	18:16:38	0.237	-0.062	-0.302	33.7090	-115.8303
TBRN.PWLY_00	18:16:37	0.195	0.000	0.012	34.4805	-120.1326
RTHS.CLLY_20	18:16:38	-0.100	0.004	0.077	34.0992	-117.3533
SNOC.CLLY_30	18:16:37	-0.022	0.010	0.046	34.0282	-116.8078
LAPC.PWLY_00	18:16:36	0.178	-0.001	-0.083	34.1819	-118.9747
LAND.PWLY_00	18:16:36	0.006	0.018	-0.051	35.8598	-120.4733

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# Thank you!



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