100 DATA INNOVATIONS

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Businesses, government agencies, and non-profits in countries around the world are transforming virtually every facet of the economy and society through innovative uses of data. These changes, brought about by new technologies and techniques for collecting, storing, analyzing, disseminating, and visualizing data, are improving the quality of life for billions of individuals around the world, opening up new economic opportunities, and creating more efficient and effective governments. Policymakers can help support these efforts by fostering the development of human capital, encouraging the advancement of innovative technology, and promoting the availability of data itself for use and reuse.

This list provides a sampling, in no particular order, of some of the most interesting and important contributions data-driven innovations have made in the past year.

Transportation	The City of Dublin, Ireland combines real-time data streaming with traffic information collected from a number of sources to map city bus locations and combat traffic jams.
Environment	The European Space Agency deploys satellites equipped with remote sensing technologies to track and analyze changes in the global environment and help forecast weather events, such as hurricanes and droughts.
Public safety	New York City's Fire Department prioritizes inspections based on risk assessments derived from building data, resulting in the lowest number of annual fire deaths since recordkeeping began in 1916.
E-commerce	Amazon uses purchase data and user reviews to improve product suggestions for online shoppers.
Government	The U.S. Securities and Exchange Commission analyzes reporting data from publicly traded companies to identify suspicious filings and inform fraud investigations.
Health	A hospital in Texas uses RFID tags on patients and healthcare workers to track who comes into contact with infectious diseases and should be screened for potential infection.
Energy	Wind energy companies use complex weather models to determine the optimal locations for their turbines.
Manufacturing	Intel conducts predictive modeling with data from its chip-manufacturing plants to anticipate failures, prioritize inspections and cut monitoring costs.
Paleontology	The University of Manchester uses computer simulation and machine learning algorithms to discover how the musculoskeletal systems of dinosaurs worked.
Crime	The Fort Lauderdale Police Department analyzes public records to predict and prevent specific types of crime related to certain events in the city.

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Solar energy

Researchers at the University of Southern California use computer simulations to efficiently detect which organic compounds are most suited for next-generation photovoltaic cells.

Crime

Police in Washington, DC pinpoint the location of gunshots using remote rooftop sensors and acoustic data analysis software.

Mining

New York City's Fire Department prioritizes inspections based on risk assessments derived from building data, resulting in the lowest number of annual fire deaths since recordkeeping began in 1916.

Logistics

The United Parcel Service (UPS) optimizes delivery routes using mathematical models that combine customer, driver, and vehicle data

Food

IBM researchers use natural language processing to detect relationships between ingredients and cooking methods in existing recipes, computer simulations to generate new recipes, and then data analytics to predict the tastiest and most exotic recipes.

Agriculture

Princeton University researchers use a low-cost, low-energy device to collect environmental data in Burkina Faso and Zambia that can help with crop-yield monitoring and modeling.

Cyber security

Google Ideas and Arbor Networks have created Digital Attack Map, a data visualization tool that depicts the impact, scale, and scope of distributed denial-of-service attacks.

Sports

Formula One racing teams collect data from sensors in their racecars to rapidly analyze car and driver performance data and improve performance.

Retail

The lingerie company True&Co gathers and analyzes opinions on garments to design the most fitting, comfortable bras.

Utilities

The Dutch Ministry of Water analyzes peta-bytes of sensor data from its water management systems to predict floods and droughts and reduce the cost of managing water resources.

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Health

Researchers at Washington University in St. Louis built the Drug Gene Interaction database to help scientists developing personalized medicine find data on drug-gene interactions.

Human Rights

Human rights workers use data analysis of satellite imagery to identify trends, patterns, and timing of human rights violations, such as the destruction of villages, in remote areas.

Legal

Law firms analyze their past billing data to better understand total project costs and offer more competitive pricing options to their clients.

Government

Chicago and New York City use vehicle tracking technology allowing citizens and city leaders to track real-time efforts to clear snow off of roads after snowstorms.

Business

DHL creates detailed pricing models from its shipping-cost data to maximize the efficiency of its global distribution network.

Education

The U.S. Institute of Educational Sciences conducts randomized trials, inspired by clinical research, to collect data and measure the impact of certain educational variables, such as choice of instructional materials.

Literature

Researchers in England used data analytics to quantify and visualize the origins and evolution of the modern-day fairy tale *Little Red Riding Hood*.

Economic development

The non-profit company Ushahidi creates software to collect and visualize important information, such as the availability of critical drugs in Southeast Africa, for those providing humanitarian aid in developing countries.

Environment

Researchers in Madrid's Remote Sensing and Infrared Image Laboratory use remote sensing technology to automatically detect which vehicles emit the most pollutants and how environmental interventions and city planning projects impact air pollution.

Health

Companies like Mimo, Sproutling, and Owlet offer wearable baby monitoring devices to track an infant's sleep patterns and vital signs to help combat Sudden Infant Death Syndrome (SIDS).

Aviation

The Federal Aviation Administration collects, analyzes, and shares a wide range of aviation safety data to identify potential safety risks and prevent accidents.

Education

An online tool, hosted by The Guardian, allows parents to compare secondary schools in England based on how students have performed on standardized exams and how much schools have helped students improve.

Construction

The company Buildzoom has created an online database that combines state licensing information, business complaints, and client reviews to help U.S. homeowners find reliable, licensed contractors.

Auto insurance

The car insurance company Progressive makes a device called "Snapshot" that collects data on its customers' driving behavior in return for rates tied more closely to their unique driving profiles.

Urban development

The City of Buffalo analyzes emergency and non-emergency calls, unemployment data, and other poverty indicators to identify which neighborhoods could benefit most from efforts to fight urban blight.

Management

The U.S. Department of Health and Human Services mines data from its internal social network to gain insight into employee satisfaction and improve workplace management.

Manufacturing

General Motors tracks vehicle components at each point of assembly so that if a defect is later found, it has to recall only those vehicles affected.

Video Games

The company Playnomics uses data on video game markets and player behavior to give developers better insights into the potential success of their games.

Elections

Developers in Kenya and Zimbabwe have created a mobile-friendly online tool to help citizens find their polling places on Election Day

Soccer

The English Premier League tries to identify undervalued talent by analyzing detailed data about players competing in matches around the world.

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Economic development

The company DigitalGlobe uses geospatial analysis of satellite imagery to detect humanitarian crises and criminal activity in African countries, such as elephant poaching or oil theft.

Crime

Experts at the Massachusetts Institute of Technology and the Cambridge Police Department used a machine learning algorithm to identify which burglaries likely were committed by the same offender, thus narrowing the suspect pool for police investigators.

Football

The Philadelphia Eagles analyze data from advanced sensor technologies used to detect their players' physical and mental capabilities to better plan training regimens and reduce injuries.

Auto racing

NASCAR's Fan and Media Engagement Center collects and analyzes social media data in real time to determine if fans are confused about something during a race, thereby allowing broadcasters to better explain what is occurring.

Psychology

The UK firm FeatureSpace uses machine learning algorithms to detect early signs of gambling addiction among online players.

Public safety

The New York City Fire Department uses data from different city agencies to create risk-assessment models that help it prioritize building inspections based on fire risk.

Water management

Water utilities in Portugal use data from sensors and meters to detect leaks and other problems in the water supply network, thereby reducing water waste.

Research

Multiple pharmaceutical companies have created a joint data sharing platform that allows outside researchers to access their clinical trial data, encouraging secondary research and promoting independent reviews of findings.

Mental health

The Durkheim Project, funded by the U.S. Department of Defense, analyzes social media behavior to detect early signs of suicidal thoughts among veterans

Anti-fraud

The U.S. Securities and Exchange Commission uses data mining techniques on financial data to detect investor fraud and misconduct and identify abusive trading.

Space exploration

In its first year NASA's Curiosity Rover sent back over 190 gigabits of data on the environmental conditions of Mars, providing scientists a detailed look at whether the planet can support microbial life and its potential habitability for future human missions to the Red Planet.

Pregnancy

The start-up Ovuline collects health data from wearable technology, Internet-connected devices, and smartphone apps to help its female users predict their ovulation patterns, thereby helping parents plan when to start their families.

Legal

Law firms use text analytics to simplify organizing, prioritizing, and reviewing the thousands of documents produced during the discovery process.

Energy

China uses advanced weather forecasting technologies based on wind and temperature sensors and cloud-tracking cameras in order to maximize production of clean wind energy and avoid unnecessarily generating energy from other sources.

Crime

Researchers in Spain developed software that mimics the online speech of teenagers and automatically identifies potential child predators interacting with it on social media and in chat rooms based on a database of online conversations with known pedophiles.

Comedy

Comedian Aziz Ansari collects demographic data on his audiences to test the appeal of his jokes to different groups before delivering them to larger, more diverse audiences.

Engineering

Researchers at the University of Bristol have developed software allowing engineers and architects to analyze the structural integrity of their designs before they build physical prototypes.

Fashion

New York City-based startup Body Labs allows fashion designers to model their clothing virtually on realistic avatars based on data from 3D body scans, as well as offer analytics to companies making standardized clothing, equipment, and uniforms.

Health

Cincinnati Children's Hospital is using data analytics to identify health disparities in the community and treat the underlying causes of certain health conditions, such as asthma caused by poor housing conditions.

Retail

Retailers like CVS and AutoZone analyze their customers' shopping patterns to improve the layout of their stores and stock the products their customers want in a particular location.

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Trains

General Electric uses sensors to gather information about the turbines, locomotives, and jet engines it manufactures to ensure optimal performance.

Education

The online learning platform Coursera analyzes the results of different communication strategies to improve student grades and completion rates.

Weather

Weather Underground uses crowd-sourced weather data to deliver hyper-local weather forecasts to its users based on their precise location.

Biodiversity

Scientists use machine learning algorithms and networks of microphones in Costa Rica to analyze the vocal patterns of various fauna to study population trends at particular sites.

Tax collection

The government of India uses data analytics to identify people who have not paid their taxes.

Economic development

The non-profit Transparent Chennai collects, creates, and shares civic data and maps to empower citizens to have a greater role in city planning and governance.

Disaster relief

The UK government is developing software that analyzes real-time data from drones, security cameras, and social media to help first responders coordinate services during large-scale disasters.

Public safety

Researchers in Europe use chemical sensors in sewers to monitor public health and identify bomb-makers by detecting traces of illegal drugs and explosives.

Crime

Pinellas County, Florida's Juvenile Welfare Board uses data from the juvenile justice system, schools, and the Census to target interventions for populations of at-risk youth.

Environment

EOMAP, a German company, has create 3D maps of the Great Barrier Reef using satellite imagery and ocean-floor topography data that allow scientists to model the impact of climate change, pollution, and other changes to this important ecological system.

Health	Evena Medical, a U.S. company, produces "smart glasses" that use data from special digital cameras to identify and project vein locations on see-through glass screens thereby allowing nurses to more easily locate veins for IVs.
Emergency response	During Typhoon Haiyan in the Philippines, victims and first responders used tools from Google to locate health-relief centers and search for the missing.
Public safety	The Naval Meteorology and Oceanography Command applies computer models using data on shipping information, environmental factors, and pirate activity to predict the likelihood of pirate attacks.
Tennis	The U.S. Tennis Association analyzes social media data to predict public interest in particular matches and then automatically adjusts its computing resources so that its website can meet expected demand.
Economic development	UN Global Pulse analyzes data from online sources, physical sensors, the private sector, and citizens to study and predict global problems such as poverty and hunger.
Epidemiology	Epidemiologists at the Centers for Disease Control and Prevention use data from airline records, disease reports, and demographic data to map the risk of infectious diseases and prevent their spread.
Baseball	Major League Baseball uses computers to instantly capture, analyze, and rank more than 250 million data points each season about its games, including dozens of data points about every pitch, to help coaches, scouts and fans better understand team performance.
Markets	The U.S.-based company CSC combines data from NASA, NOAA, and other sources to predict how weather will influence crop yields, energy production, and energy demand.
Education	Marist College in Poughkeepsie, New York uses predictive modeling to identify college students who are at-risk of dropping out, allowing it to target additional support to those in need.
Restaurants	Los Angeles County Department of Public Health makes its restaurant inspection scores available in an open format so companies like Yelp can integrate them into restaurant review websites.

Government
The City of Los Angeles has created a consolidated customer-relationship management system to monitor all requests for city services, let citizens track their requests, and make data about city performance available to city leaders and the public.

Health
The company Propeller Health makes a device that attaches to an inhaler and automatically senses when it is used. The data is collected on an online platform, allowing both patients and their doctors to better manage diseases like asthma and COPD.

International affairs
The U.S. State Department's Bureau of Conflict and Stabilization mines data from news reports to measure the effect of interventions to armed conflicts and run simulations based on historical data to predict potential outcomes.

Fire safety
Australian researchers and government planners use satellite imagery and climate data to map and predict the risk of bushfires.

Agriculture
The Sudanese company DAL uses electronic necklaces to store and track data about the health and readiness-to-breed of its cows as part of its high-tech approach to maximizing the efficiency of dairy farms.

Health
Mount Sinai Hospital in New York is piloting software that combines real-time data on the availability of hospital beds with electronic health records to match patients to beds based on their particular needs, such as health and gender.

Anti-fraud
JPMorgan Chase analyzes trading, email, and phone data on employees to detect potentially fraudulent behavior.

Banking
A California-based startup, LendUp, offers individuals loans based not only on their ability to pay back funds, but also on how strong they are tied to their community through social networks.

Human rights
U.S. Immigration and Customs Enforcement uses combined financial, location, and phone records to identify human trafficking victims and convict those perpetrating these crimes.

Mining
Dundee Precious Metals, a Bulgarian gold mine, collects data on mining activities, such as drill rates and ore production, along with worker location data to improve productivity and ensure safety.

International aid	RapidSMS, a project initially funded by UNICEF, allows workers in Africa to use text messaging services to collect data on the efficacy of aid programs, including neonatal health in Zambia, food distribution in Somalia, and mosquito net distribution in Nigeria.
Biodiversity	Brazilian and European researchers have developed ecological models that use environmental data to predict how a species will fare under different conditions in an effort to preserve biodiversity.
Energy	PowWow Energy uses data from smart meters attached to irrigation pumps to detect water leaks on farms in California.
Oil and gas	Oil and gas companies analyze a variety of data including images, video, and sounds to determine optimal locations to drill.
Prescriptions	The pharmacy benefits management company Express Scripts uses data from pharmaceutical companies, insurance claims, and clinical standards to recommend to doctors the medication most likely to be effective for particular patients given their medical histories..
Energy	The start-up company C3 automatically analyzes data from call centers, field crew reports, and internal systems to identify power outages and help utilities quickly make repairs that best help ensure customer satisfaction and safety.
Restaurants	The online food ordering company GrubHub collects and analyzes data on food orders to help restaurants predict product sales and better manage inventory.
Human rights	The Human Rights Data Analysis Group, a non-profit organization, uses data science to investigate human rights abuses; it helped secure a conviction against a Guatemalan general who committed genocide in the 1980s.
Agriculture	The U.S. Department of Agriculture collects and uses historical and current data from inspections to combat pests and disease in agricultural products.
Music	Shazam, which makes a popular app that recognizes songs based on the audio track, uses data from its users' searches to predict which musicians will be big successes.

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Have a suggestion for next year's list? Nominate an example of a data-driven innovation by sending an email to info@datainnovation.org.

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CENTER FOR DATA INNOVATION

The Center for Data Innovation conducts high-quality, independent research and educational activities on the impact of the increased use of data on the economy and society. In addition, the Center for Data Innovation formulates and promotes pragmatic public policies designed to enable data-driven innovation in the public and private sectors, create new economic opportunities, and improve quality of life. The Center for Data Innovation also sponsors the annual Data Innovation Day.

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