Joint Legislative Committee on Emergency Management
Senate Committee on Governmental Organization
Assembly Committee on Emergency Management

Joint Informational Hearing

How California is Leveraging AI for Effective Emergency Preparedness and Response

Monday, August 5, 2024
1021 O Street, Room 1100
2:30pm or Upon Adjournment of the Assembly and Senate Floor Sessions

BACKGROUND

Introduction:

California faces complex and severe disaster conditions due to its unique geography and fluctuating weather patterns, exacerbated by climate change. With recent dramatic advances in the capabilities of artificial intelligence (AI) systems, today's hearing will focus on the extent to which AI can improve California's disaster planning, response, and mitigation activities enabling more effective and efficient decision-making to save lives and property. As a global leader in AI - boasting 35 of the world's top 50 AI companies - California is in a unique position to leverage that advantage to better prepare for and respond to emergencies. Much of the discussion will center around the capacity for public agencies in the emergency management sector to leverage AI or adopt AI-based technologies to further their missions while helping first responders and communities anticipate, efficiently respond to, and quickly recover from disasters.

AI Overview:

AI is the mimicking of human intelligence by artificial systems such as computers. AI uses algorithms – sets of rules – to transform inputs into outputs. Inputs and outputs can be anything a computer can process: numbers, text, audio, video, or movement. AI is not fundamentally different from other computer functions; however, its novelty lies in its application. Unlike normal computer functions, AI is able to accomplish tasks that are normally performed by humans. AI can encompass a range of technologies, methodologies, and applications, such as machine learning, natural language processing, facial recognition, and robotics.

AI that are trained on small, specific datasets in order to make recommendations and predictions are sometimes referred to as 'predictive AI.' This differs from generative AI (GenAI), which are trained on massive datasets in order to produce detailed text and images. For example, when Netflix suggests a TV show to a viewer, the recommendation is produced by predictive AI that has been trained on the viewing habits of Netflix users. When ChatGPT generates text in clear, concise paragraphs, it uses GenAI that has been trained on the written contents of the internet.

GenAI refers to machine learning (ML) models developed through training on large volumes of data in order to generate novel content. The underlying models for GenAI tools can be adapted to perform a broad range of tasks, such as text analysis, image generation, and speech recognition. These advancements, and the wide variety of applications for AI technologies, have renewed debates over appropriate uses and guardrails, including in the areas of health care, education, and national security.

The Legislature is currently considering a number of bills related to AI, which define it as "an engineered or machine-based system that varies in its level of autonomy and that can, for explicit or implicit objectives, infer from the input it receives how to generate outputs that can influence physical or virtual environments."

AI technologies, including GenAI tools, have many potential benefits, such as accelerating and providing insights into data processing, augmenting human decision making, and optimizing performance for complex systems and tasks. However, AI systems may also perpetuate or amplify biases in the datasets on which they are trained; may not yet be able to fully explain their decision making; and often depend on such vast amounts of data and other resources that they are not widely accessible for research, development, and commercialization beyond a handful of technology companies.

Federal Laws and Pending Legislation:

Numerous federal laws on AI have been enacted over the past few Congresses, either as standalone legislation or AI-specific provisions in broader acts. These include the expansive National Artificial Intelligence Initiative Act of 2020 (Division E of P.L. 116-283), which included the establishment of an American AI Initiative and direction for AI research, development, and evaluation activities at federal science agencies.

Additional acts have directed certain agencies to undertake activities to guide AI programs and policies across the federal government (e.g., the AI in Government Act of 2020, P.L. 116-260; and the Advancing American AI Act, Subtitle B of P.L. 117-263). In the 117th Congress, at least 75 bills were introduced that either focused on AI and ML or had AI/ML-focused provisions. Six of those were enacted.

In the 118th Congress, over 40 bills have been introduced that either focus on AI/ML or contain AI/ML-focused provisions, and none have been enacted. Collectively, bills in the 118th Congress address a range of topics, including federal government oversight of AI; training for federal employees; disclosure of AI use; export controls; use specific prohibitions; and support for the use of AI in particular sectors, such as cybersecurity, weather modeling, wildfire detection, precision agriculture, and airport safety.

President Biden's Executive Order 14110: Safe, Secure, and Trustworthy Development and Use of AI:

Executive Order 14110 tasks the Department of Homeland Security (DHS) with the following critical responsibilities:

- Manage AI in critical infrastructure and cyberspace;
- Promote the adoption of AI safety standards globally;
- Reduce the potential risk of AI's use to facilitate weapons of mass destruction attacks;
- Combat AI-related intellectual property theft; and,
- Ensure the United States attracts talent to develop responsible AI nationally.

Governor Newsom's Executive Order N-12-23:

Last year, Governor Newsom signed Executive Order (EO) N-12-23, addressing the potential benefits and harms faced by the government as it pertains to GenAI. Item 2 of the order addresses emergency management specifically:

"No later than March 2024, the California Cybersecurity Integration Center and the California State Threat Assessment Center, both established within the Governor's Office of Emergency Services, and inclusive of the California Department of Technology, the California Military Department, and the California Highway Patrol, shall perform a joint risk analysis of potential threats to and vulnerabilities of California's critical energy infrastructure by the use of GenAI, including those which could lead to mass casualty events and environmental emergencies, and develop, in consultation with external experts as appropriate from civil society, academia, and industry, a strategy to assess similar potential threats to other critical infrastructure. Once this analysis is completed, these agencies shall provide a classified briefing to the Governor and, where appropriate and without divulging classified information, make public recommendations for further administrative actions and/or collaboration with the Legislature to guard against these potential threats and vulnerabilities. These recommendations shall address how to ensure systems are regularly tested and monitored to detect and avoid unintended behavior, and how to ensure they remain under effective human control. At a cadence deemed appropriate by the Governor's Office of Emergency Services, the analysis and public recommendations should be updated to reflect changes to the technology, its applications, and risk management processes and learnings."

According to Cal OES, the report has been drafted and is currently undergoing internal review prior to public release.

The full text of the EO can be found here: https://www.gov.ca.gov/2023/09/06/governor-newsom-signs-executive-order-to-prepare-california-for-the-progress-of-artificial-intelligence/

State/Local Uses of AI in Emergency Management:

The ALERTCalifornia System:

A collaboration between CAL FIRE and UC San Diego, the ALERTCalifornia program provides state-of-the-art technology that supports data-driven decisions to prepare for, respond to, and recover from natural disasters.

One purpose of ALERTCalifornia is to improve wildfire detection. To achieve this, the program utilizes 1,807 high-resolution cameras equipped with AI to provide continuous, 360 degree monitoring, which is then used to alert emergency services of potential fires, sometimes before 911 calls are made. Data from these camera installations help mitigate the impact of wildfires on people and property and bolster research into how to best prepare and respond to wildfire threats, both before, during and after serious burn events.

The project also provides the public real-time footage of active incidents on the fire.ca.gov/Incidents page. In addition to cameras, the program utilizes tools like Light Detection and Ranging (LiDAR) for detailed data gathering to aid in both immediate firefighting efforts and longer-term environmental research.

ALERTCalifornia was recently recognized by Time Magazine as one of the "Best Inventions of 2023." Early detection is the most valuable benefit of this AI tool, but the resulting data is also helpful to decision-makers at all stages of fire response.

CAL FIRE's Office of Wildfire Technology Research and Development:

The Office of Wildfire Technology Research and Development within CAL FIRE serves as the central organizing hub for state government's identification of emerging wildfire technologies. The office's goal is to drive meaningful advancements and tap innovation from the public and private sectors. According to the office, AI improves wildfire suppression by detecting fires early, as discussed above, predicting their occurrence, guiding firefighting efforts, and aiding in post-fire analysis and restoration. AI can analyze satellite imagery, weather and environmental data, and provide real-time mapping and tracking of a fire's progress. Additionally, AI-powered drones can survey the area and offer information to firefighters on the ground.

State Threat Assessment Center:

The State Assessment Center (STAC) serves as California's information sharing clearinghouse of strategic threat analysis and situational awareness reporting to statewide leadership and the public safety community in support of efforts to prevent, prepare for, mitigate and response to all crimes and all hazards impacting California citizens and critical infrastructure, while preserving civil liberties, individual privacy, and constitutional rights.

The STAC is California's primary fusion center, as designated by the Governor, and is operated by the California Highway Patrol (CHP), Cal OES, and the California Department of Justice (DOJ). The STAC was opened as a direct result of the events of 9/11 with the goal of helping to

fix issues with information sharing across the nation, and serves as the state-level partner to regional and urban fusion centers in Sacramento, San Francisco, Los Angeles, Orange County, and San Diego, all of which are locally organized and directed.

City of Los Angeles:

The City of Los Angeles is currently working with researchers at the University of Southern California Center for AI in Society to optimize the placement of seismic-resilient pipes so that, in the event of an earthquake, water can continue to be provided to critical customers, such as hospitals and evacuation centers, and always within reach of a fire hydrant for firefighting efforts. In addition, the researchers are looking at how cities can make strategic and targeted investments efficiently and effectively in order to maximize the disaster resiliency of key transportation infrastructure, such as roads, if flooding were to reduce connectivity and access. Their efforts seek to optimize resource allocation and network design while minimizing the number of potentially isolated people, reducing evacuation or response times, improving robustness and efficiency of path routing, and ensuring no region goes unserved.

San Diego Gas & Electric (SDG&E):

SDG&E is the first utility in the country to develop a dedicated Fire Science & Climate Adaptation Department. The Department generates weather predictions twice a day, a seven-day fire potential index product, and fuel data specific to the local environment. SDG&E collaborates with the San Diego Supercomputer Center's WIFIRE Lab at the University of California San Diego campus to enable open use of this data, with appropriate policy and access restrictions in place. As a part of this effort, students and AI researchers in the WIFIRE Lab work on case studies involving the use of data in utility wildfire mitigation, tree hazard analysis and prediction, weather/fuel/lightning-related risk modeling, and grid infrastructure failure modeling.

The program seeks to prepare a workforce trained to deal with the evolving needs associated with wildland fire management and power utilities. SDG&E provides the data to foster continued research and development in fire science & climate adaptation, evaluate the impacts of climate change and improve climate resiliency to protect critical infrastructure in wildfire-prone areas. The program also aims to utilize AI technology to fortify the power grid infrastructure against wildfire and other hazard events and to develop collaborative open data approaches that address climate-related weather events, mitigation strategies and communication between utilities and emergency management partners.

More information about this effort can be found here: https://wifire.ucsd.edu/collaboration.

Federal Uses of AI in Emergency Management:

DHS' AI Roadmap:

On March 18, 2024, DHS released its first AI Roadmap, which directs DHS's efforts to fully realize AI's potential to protect the American people and our homeland, while steadfastly protecting privacy, civil rights, and civil liberties.

As part of the roadmap, DHS announced three innovative pilot projects that will deploy AI in specific mission areas. Homeland Security Investigations (HSI) will test AI to enhance investigative processes focused on detecting fentanyl and increasing efficiency of investigations related to combating child sexual exploitation. The Federal Emergency Management Agency (FEMA) will deploy AI to help communities plan for and develop hazard mitigation plans to build resilience and minimize risks. Additionally, the U.S. Citizenship and Immigration Services (USCIS) will use AI to improve immigration officer training.

Other DHS Uses of AI:

- To keep fentanyl and other dangerous drugs out of the country. The U.S. Customs and Border Protection (CBP) uses a ML model to identify potentially suspicious patterns in vehicle-crossing histories.
- To aid law enforcement officers in investigating heinous crimes. In 2023, the U.S. Immigration and Customs Enforcement Homeland Security Investigations Operation Renewed Hope identified more than 300 previously unknown victims of sexual exploitation thanks in part to a ML model that enhanced older images to provide investigators with new leads.
- To allow FEMA to more efficiently assess damage to homes, buildings, and other properties after a disaster. This approach enables FEMA inspectors to look at impacted structure damage remotely instead of exclusively in-person, leading to swifter delivery of disaster assistance to survivors.
- To make travel safer and easier. By introducing customer-facing technologies such as Touchless Check-In at the airport, the Transportation Security Administration (TSA) provides travelers an optional way to navigate TSA security processes, check bags, and board their flights by taking just a photograph. These and other efforts are already saving time at security checkpoints and reducing physical touchpoints.

Planning Assistance for Resilient Communities:

FEMA will launch a GenAI pilot to create efficiencies for the hazard mitigation planning process for local governments, including underserved communities. Hazard mitigation plans are not only a foundational step that communities can take to build their resilience but can be lengthy to produce and challenging for communities that lack resources to do so. The pilot will specifically support State, Local, Tribal, and Territorial governments' understanding of how to craft a plan that identifies risks and mitigation strategies as well as generate draft plan elements—from publicly-available, well-researched sources — that governments can customize to meet their needs. This could lead to more communities having the ability to submit grant applications for funding to become more resilient and reduce disaster risks.

National Geospatial-Intelligence Agency Products:

Produced by the National Geospatial-Intelligence Agency (NGA), GeoQ is an open source tool developed as a solution for collating disparate geo-data to support worldwide disaster relief and recovery efforts into one workflow. GeoQ allows anyone with a web browser and an understanding of geospatial tools like Google Earth and other mapping products to support a

project. GeoQ uses a crowd-sourcing model, allowing analysts to add information to the operational picture in real-time. Contributors can also see who else is working on the project within their web browser, increasing situational awareness and information sharing. GeoQ's built-in business analytics provide disaster managers like FEMA the self-service ability to track response timelines, gaps in coverage and manpower requirements. The tool also incorporates non-traditional sources like social media to develop a more robust and accurate operational picture.

Today, GeoQ appears to have been wrapped into a newer NGA product called GEOINT. More information can be found here:
https://www.nga.mil/news/GeoQ_team_creating_new_tracks_in_geospatial_suppor.html
https://www.nga.mil/news/Episode_29_(6_15_2018)_Civil_applications_of_intel.html

Private Sector Emergency Management Uses of AI:

Disaster management firms, such as One Concern, based in San Francisco, are also identifying ways to leverage AI to better fight emergencies. One Concern is a small firm dedicated to helping business clients identify their climate-risk and extreme weather vulnerabilities in order to make better operational decisions, such as precision mitigation. One Concern offers clients an array of resilience statistics and metrics to enhance curated datasets and provides AI products that empower users, such as those in the insurance and financial service sectors, to understand, plan, price, mitigate, or transfer business interruption and downtime risks for prospective and owned assets.

Google is also working to build more solutions, similar to their AI-based predictions and forecasting, to provide actionable information to help individuals stay safe and communities plan ahead. These tools and technologies are helping regions around the world address the effects of climate change.

Potential Pitfalls and Harms of AI in Emergency Management:

While AI has the potential to improve disaster preparedness and response systems, it also raises several complex issues that merit careful consideration, some of which are described below in a recent article by the non-profit, OpenMind:
https://www.bbvaopenmind.com/en/technology/artificial-intelligence/artificial-intelligence-and-natural-disasters/

Data Privacy and Security:

Gathering data from various sources, including personal devices and sensors, is essential for predictive AI models. However, this raises concerns about data privacy and security.

- *Privacy*: When collecting data from individuals, it is crucial to ensure that their privacy is protected. AI models must be designed to anonymize and aggregate data to prevent the identification of individuals. Transparent data usage policies and informed consent are critical.

- *Security*: With the increased reliance on data for disaster prediction, there is a heightened risk of cyberattacks. Protecting the data and systems from malicious actors is a vital concern, as an attack on these systems could result in false warnings or other misinformation that could be disastrous.

Bias in AI:

AI algorithms can inadvertently inherit biases from the data on which they are trained. In disaster prevention, bias could result in inaccurate predictions or unfair prioritization of resources. For example, if historical data is biased towards certain demographics or regions, the AI model might not provide equal protection to all.

Addressing bias in AI requires careful data selection and preprocessing, as well as ongoing monitoring and adjustment of the models. Ethical guidelines for AI development should include measures to identify and mitigate bias.

Accessibility and Equity:

It is crucial to ensure that AI-driven disaster prevention tools are accessible to all, regardless of socioeconomic status or geographic location. Historically disadvantaged communities may have limited access to technology and resources, making them more vulnerable to natural disasters.

Achieving equity involves not only providing access to AI tools but also addressing the underlying disparities in resources, infrastructure, and education that can exacerbate the impact of disasters on marginalized communities.

Accountability and Decision-Making:

As AI systems become more integrated into disaster prevention, it becomes essential to establish clear lines of accountability. An AI system should be transparent about how it arrives at predictions or recommendations.