

# Fighting Climate Change with Data from Space and AI

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Artificial intelligence (AI) has entered its Golden Age. However, AI is data-driven. Machine learning requires more data to provide compelling insights on how to optimize human activity. Landsat 9 will fill the gap and feed invaluable information into the most powerful AI recommender, predictive, and classifications systems ever. A new generation remote sensor satellite is the key that paves the road to climate change management.

## AI-driven remote sensor data

Remote sensors mounted on satellites detect emitted or reflected energy on Earth. The stored data provides the largest source of information on our planet from space in the history of humanity.

NASA provides the stored data from Landsat 8 to researchers around the world. AI researchers can then run machine learning models on the data and make predictions in numerous environmental areas.

Landsat 9's cutting-edge sensors will provide better image resolution and higher quality data. Artificial intelligence can then help make critical decisions and recommendations concerning coral reef degradation, climate change, glacier melting, water use, tropical deforestation, and many other areas.

Artificial intelligence has recently made giant leaps forward with better deep learning neural networks, such as the Transformer model. The deep learning Transformer model can learn billions of sequences of any data and make breathtaking predictions.

The convergence of Landsat's 9 launch and artificial intelligence's maturity brings hope to researchers, industries, farmers, and city managers worldwide. Remote sensors are here to stay.

# Disaster prevention with remote sensors and AI

California fires have been burning thousand-year-old sequoias and beautiful forests, and they threaten urban areas. Remote sensing can provide more accurate imagery data of the forests and can detect energy emissions. AI can take this information and merge it with weather forecasts based on ocean surface temperature, winds, and human activity. AI will use Landsat 9's more detailed data to make better forecasts. A potentially dangerous fire could be predicted a few days to a week earlier.

Signaling a probable disaster a few days in advance helps local authorities organize evacuations and find necessary resources to fight the disaster. Today, such forecasts already exist. But future forecasts will be more precise and will warn us of imminent disasters earlier. Lives will be saved.

AI-driven remote sensor data can also prevent flood disasters in urban areas. The remote sensors can use AI to study the land structure, river maps, and water levels and to make predictions to order evacuations days before a flood will occur.

An essential mission of Landsat 9 will be to gather data for classical algorithms and machine learning models to determine the difference between natural and human-made disasters. Scientific recommendations based on facts will be made to government and local authorities to implement environmental programs.

## Long-term predictions

Water management, for example, remains one of the main problems humanity has to solve. This year, 2021, the human-made water reservoirs, mostly lakes, in the western United States and in Mexico are shrinking to low levels never seen before. The situation could lead to water shortages in the western United States. If this happens, for the first time in US history, the federal government would have to make a water shortage declaration officially.

One of Landsat 9's critical missions will be to use state-of-art remote sensors to provide information on water levels, flow, and use. Artificial intelligence could merge data from human activity and make micro-decisions in real time. The competition for water between agricultural, industrial, and residential needs could tremendously benefit from AI.

Artificial intelligence can analyze digital imagery with convolutional neural networks. A deep learning algorithm will learn how to recognize water sources, levels, and flow.

The recent deep learning Transformer model can take multiple factors into account. A Transformer model can take a sequence of events into account and make a prediction. For example, water supplies in the western United States depend heavily on snowpack flows in the rivers. Arizona, California, Colorado, Nevada, New

Mexico, Utah, and Wyoming depend on Colorado River water. The Colorado River is thus literally a source of life for these states.

Remote sensors will provide tremendous amounts of new detailed data. AI can then dig into the information and make predictions that will help local authorities take preventive measures.

Implementing local smart AI hubs in the Western United States could help solve the problem of water use.

## Smart AI hubs

Let us fast-forward just a few years. Imagine Landsat 9 and artificial intelligence have converged to make short- and long-term environmental predictions. At that point, smart AI hubs of cross-disciplinary teams could solve many local problems.

A smart AI hub could optimize crop management for a farmer. An AI recommender could optimize seeding and watering with information pouring in from different sources merged with remote sensor data. The farmer would avoid watering just before a rainy day has been predicted by AI. The water saved could be used by industries or in residences.

AI-driven remote sensor data could warn a city council not to build a road in an area that seems fragile due to climate change and, with that warning, could avoid landslides. The city council could be advised that residential construction in a specific area would generate water consumption that would hurt nearby agricultural activities.

A machine learning recommender using Landsat 9 information could predict a water shortage for industrial activity.

Local farmers, industry managers, and residents could have a shared local AI hub. Local industries could then schedule their production, taking the water consumption predictions of nearby farmers and residents.

The sky is the limit for the productive use of smart sensors and AI!

## Conclusion

The environmental challenges facing us are daunting. However, technology can help us optimize our natural resources. Humanity's need for natural resources has increased exponentially over the past century. Humanity is depleting natural resources at a rate never seen.

However, the consumption of natural resources could benefit from rational AI-driven optimization. Remote sensors, such as Landsat 9, will provide the information AI needs to move to the next level.

Local smart AI hubs that gather information from satellites and ground sources could run efficient energy sharing, water-saving, and all forms of collaborative natural resource consumption.

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