Societal Computing:

Designing AI-Ready Ecosystems for a More Resilient Future

İlkay ALTINTAŞ and Melissa FLOCA, University of California San Diego

Multicore World 2026, February 18, 2026 – Christchurch, New Zealand

Presenter: İlkay ALTINTAŞ, Ph.D.

University of California, San Diego

Chief Data Science Officer, **San Diego Supercomputer Center**
Founding Faculty Fellow, **Halıcıoğlu Data Science Institute**
Founding Director, **Societal Computing and Innovation Lab**
Joint Faculty Appointee, **Los Alamos National Laboratory**

Societal Computing and Innovation Lab

SAN DIEGO SUPERCOMPUTER CENTER

UC San Diego

PART I — The AI-Readiness Problem

İlkay ALTINTAŞ, Ph.D. (ialtintas@ucsd.edu)

Why do we need to be AI-ready?

Lots of reasons…

- Because complexity of our problems has outpaced human-only systems
- Because AI changes the scale of discovery and decision-making
- Because then can build AI-integrated systems not just models
- Because we want to be prepared for its risks and impacts
- Because we want to do x, y, z, … improve a, b, c...
- …

But the reason should not be…

… because AI is inevitable.

İlkay ALTINTAŞ, Ph.D. (ialtintas@ucsd.edu)

Getting Ready for AI in 1961…

UC San Diego

The Thinking Machine
(Artificial Intelligence in the 1960s)
https://www.youtube.com/watch?v=aygSMgK3BEM

Spoiler Alert!

We're Still Getting Ready!

> *"… in 10-15 years, a robot will merge from the laboratory of science fiction fame …"*
>
> - Claude Shannon, 1961

İlkay ALTINTAŞ, Ph.D. (ialtintas@ucsd.edu)

So… are *we* AI-ready now?

Or do we need another 10–15 years?

My answer: Being ‘AI-ready’ will be a long journey for the society.

İlkay ALTINTAŞ, Ph.D. (ialtintas@ucsd.edu)

More positively…

To be ready for AI is to be ready to continuously innovate.

We need to train ourselves to be adaptive, data-driven, and human-centered.

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Continuous Innovation requires AI-Ready Ecosystems and Innovation Models

SOCIETAL COMPUTING

- Discoverable and usable data
- Connected workflows
- Responsible AI integration
- Collaborative solution and scale models
- Outcome driven community adoption

İlkay ALTINTAŞ, Ph.D. (ialtintas@ucsd.edu)

This is a part of my why for founding SCIL.

İlkay ALTINTAŞ, Ph.D. (ialtintas@ucsd.edu)

The other part of founding SCIL…

UC San Diego

SCIL Societal Computing and Innovation Lab

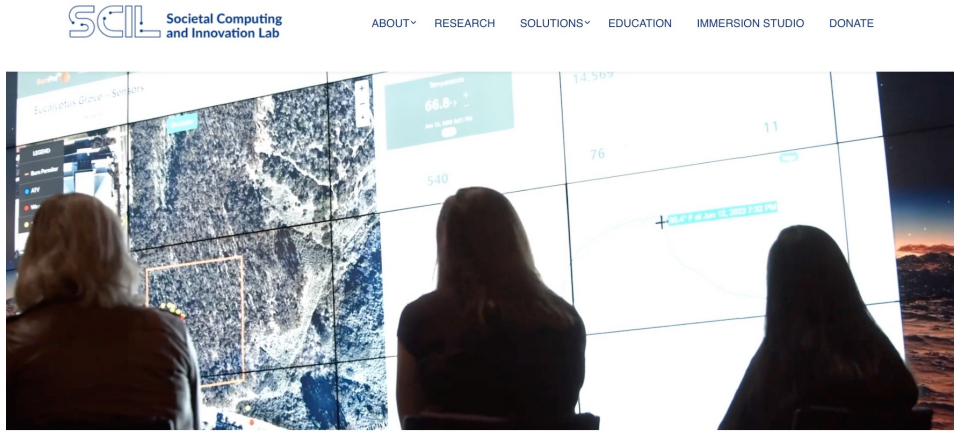
İlkay ALTINTAŞ, Ph.D. (ialtintas@ucsd.edu)

Societal Computing and Innovation Lab

SAN DIEGO SUPERCOMPUTER CENTER

UC San Diego

- Informed by cutting-edge scientific discoveries, SCIL pioneers innovation pathways to address complex societal challenges.
- At the heart of SCIL's approach, is a commitment to moving from use-inspired problems to scalable, real-world solutions.



Cutting-Edge Science for Scalable Solutions

Informed by the forefront of scientific discovery and technological advancement, SCIL offers scalable solutions to complex societal challenges

READ MORE

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PART II – The Societal Computing Model

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Societal Computing

UC San Diego

- Fusion of science, data, AI and computing to accelerate solutions in real-life challenges – agriculture and resilience to health and education
- Collaboration across sectors and disciplines – communities, researchers, institutions, agencies, industry
- Transformation of ideas to solve complex problems to scalable and sustainable solutions – open science, interoperability, composability and humanity-centered design

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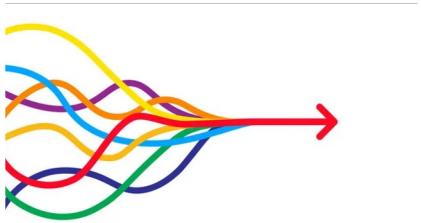
Making the Complex Simple



CONVERGENCE

Integrate domain, technical, and community expertise

Design

COMPOSABLE COMPUTING

Modular workflows, data services, and computing systems that adapt to new domains and challenges

Integration

COMMUNITY

Co-design and co-production with multisector partners

Partnerships

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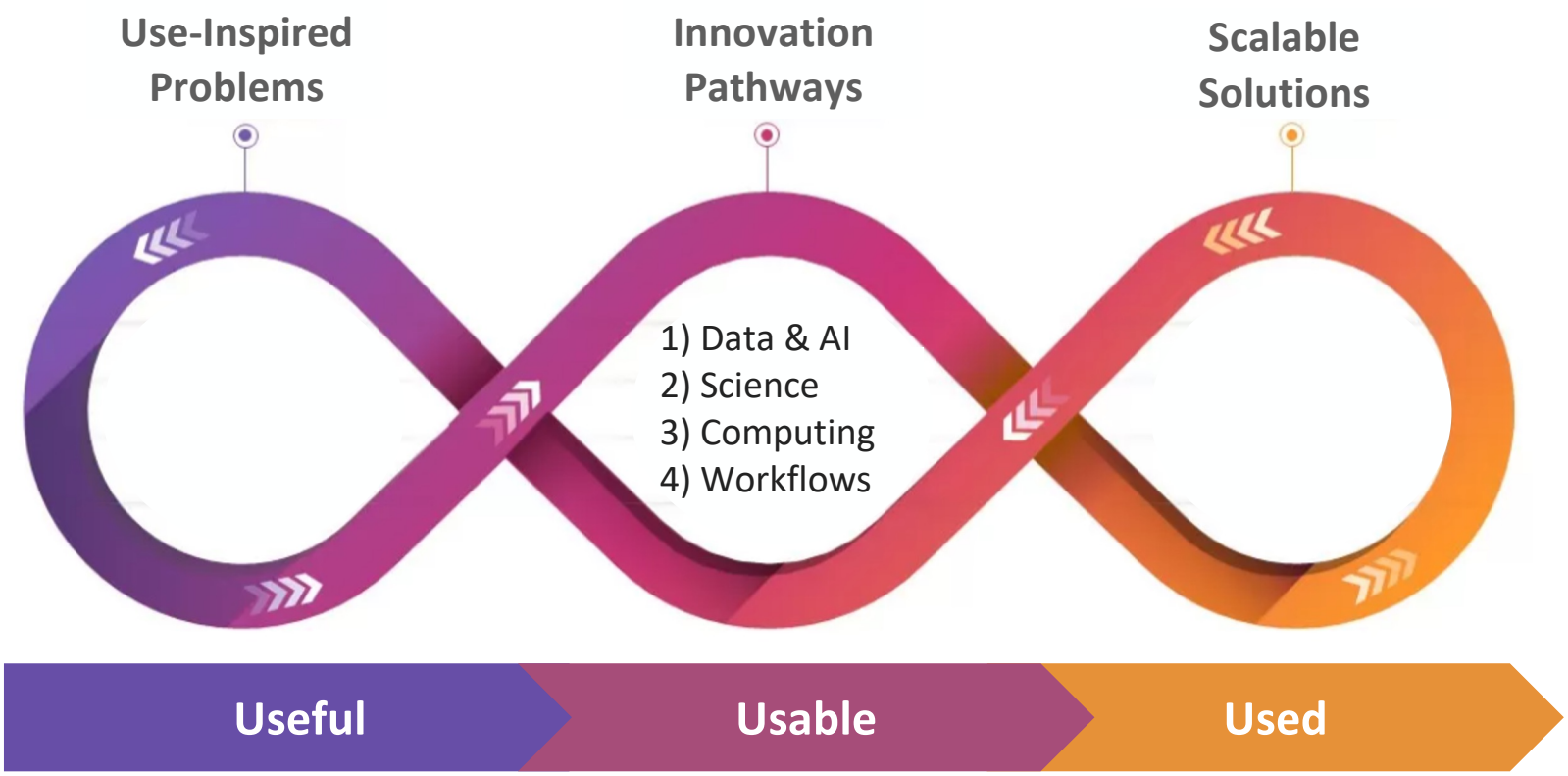
Innovation Approach



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SCIL Societal Computing and Innovation Lab

Harnessing Data and Workflows

UC San Diego

Our current research areas to focus on computing and AI for impact

- **Integrated Research Workflows**, enabling seamless connections between data, models, and compute to accelerate discovery;
- **Composable Systems Across the Digital Continuum,** linking edge, cloud, and high-performance computing resources into a unified innovation fabric;
- **Data and Knowledge Systems**, advancing FAIR, connected, and context-rich infrastructures that transform information into actionable insight;
- **Digital Twins for Complex Systems,** creating dynamic, data-driven representations of natural and human systems to enable simulation and prediction; and
- **AI-Enabled Science and Decision Support,** developing adaptive, agentic and collaborative AI methods that enhance reasoning and decision-making across disciplines.

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PART III – Enabling AI-Ready Platform

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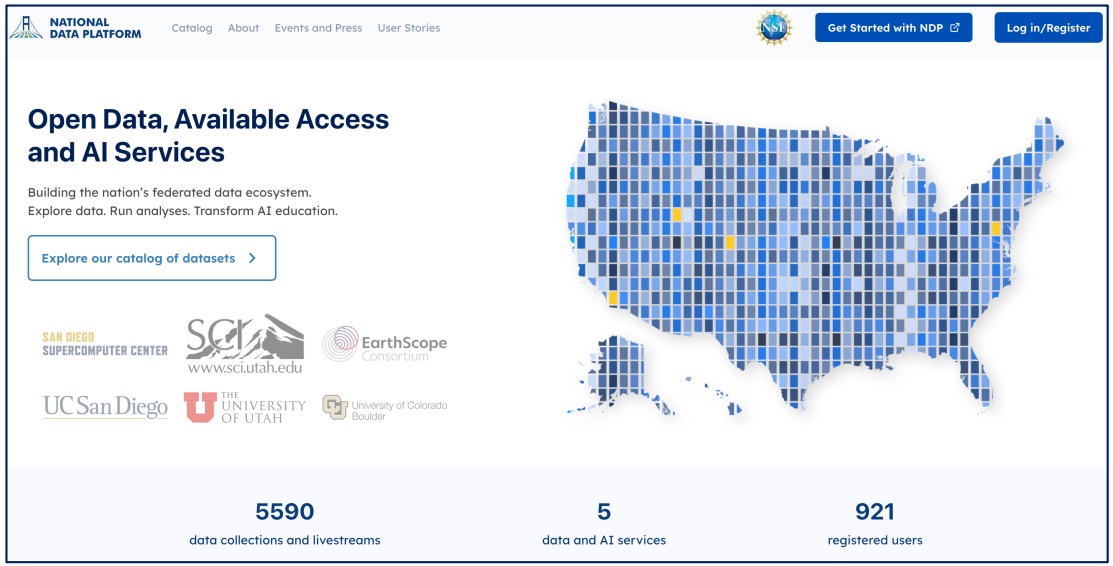
National Data Platform

UC San Diego

…. enabling interoperable data and AI integrated workflows.



NATIONAL DATA PLATFORM

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.nationaldataplatform.org/

UC San Diego
UTAH
University of Colorado Boulder
SDSC SAN DIEGO SUPERCOMPUTER CENTER
www.sci.utah.edu
EarthScope Consortium

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What does NDP solve for AI-readiness?

NATIONAL DATA PLATFORM

https://www.nationaldataplatform.org/

- Fragmented access to data, models and services
- Complexity of formats, interoperability and context
- Disconnect between producing & sharing data
- Lack of user experiences enabling collaboration
- Hard to customized service deployment practices
- Need for scalable or specialized compute readiness
- Disconnect between research & education capacity

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Underlying our AI-ready ecosystem approach is composable services and systems at the computing continuum to support it.

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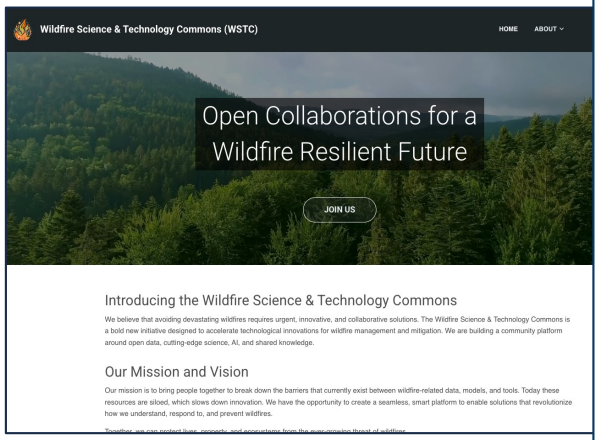
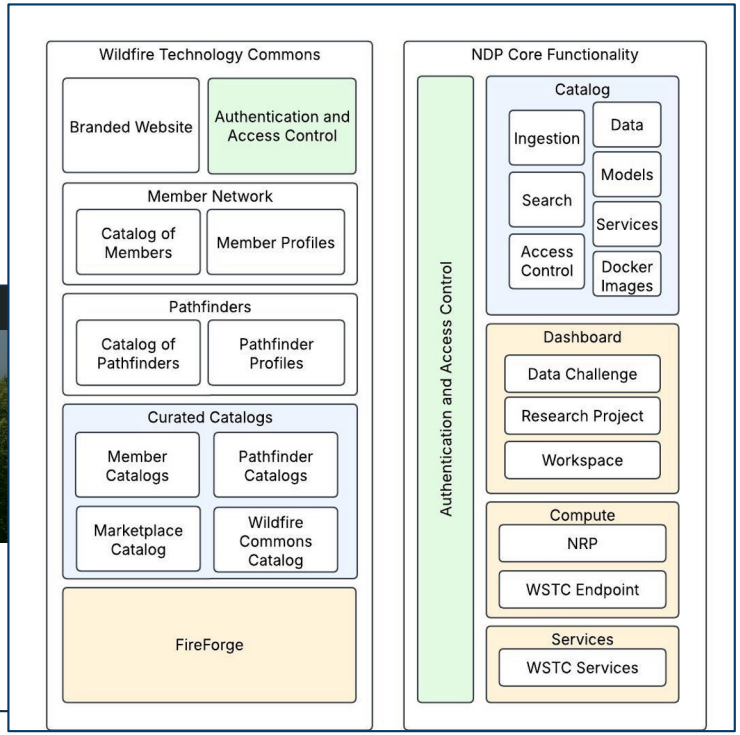
NDP is built to power many platform through its platform stack.

WILDFIRE SCIENCE & TECHNOLOGY COMMONS

https://www.wildfirecommons.org/





Powered by the NATIONAL DATA PLATFORM

- **NDP Catalog** is extended with catalogs for members, marketplace and pathfinders to serve a large network of wildfire experts
- FireForge platform is built on top of an **NDP** using **core NDP services and**
  - Authentication, Catalogs, Project Spaces, Workspaces
- A customized look-n-feel expanding NDP endpoint backend with a specialized user experience
- Platform launched July 1st, 2025

NIST UC San Diego SCIL Societal Computing and Innovation Lab PROWESS Proactive Wildfire & Environmental Sustainability Solutions

Contact: Claire Stirm, UC San Diego (PI: Altintas)

PART IV – Applying Societal Computing Innovation Model

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Example: Wildland Fire

https://scil.ucsd.edu/wifire-program

WIFIRE

Since 2010

Actionable Fire Science through AI-Ready Ecosystems

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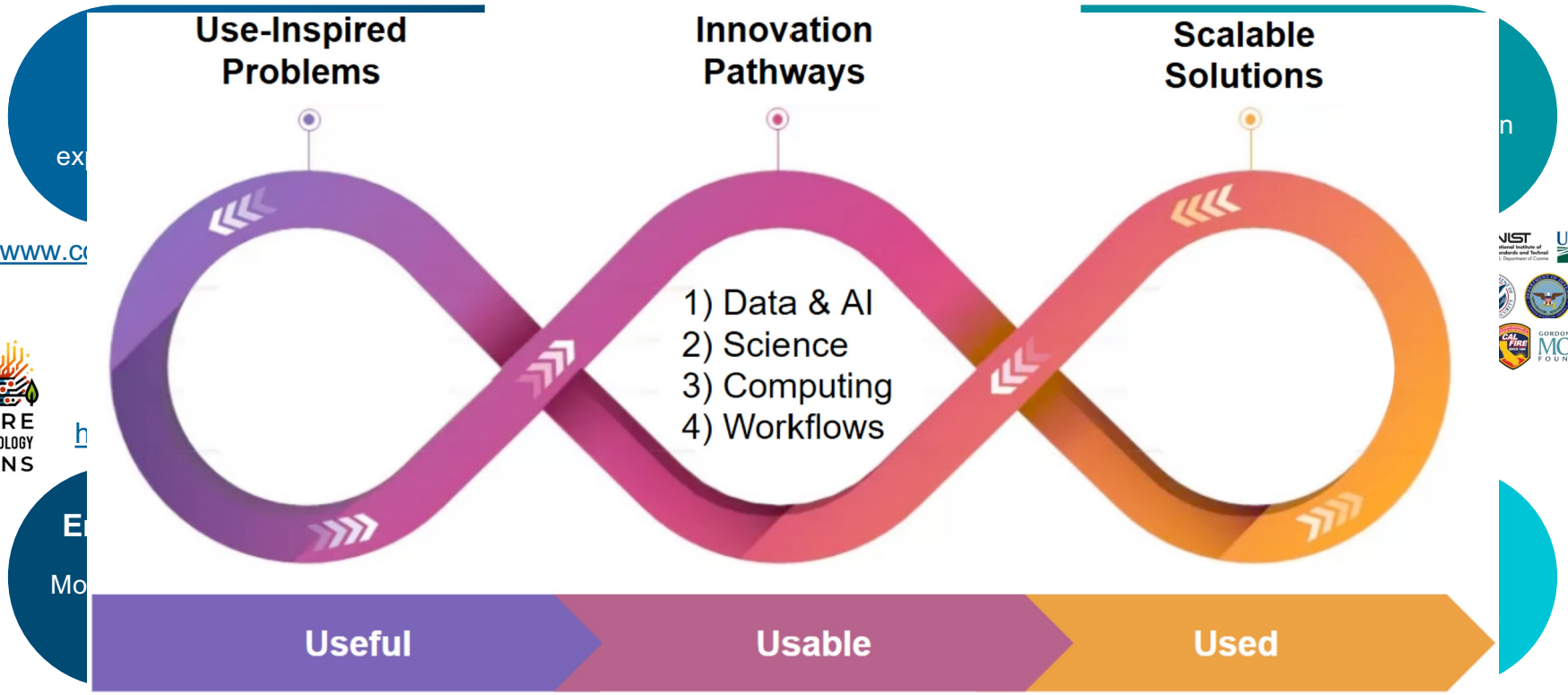

https://www.c

WILDFIRE SCIENCE & TECHNOLOGY COMMONS

Operational Products

WIFIRE

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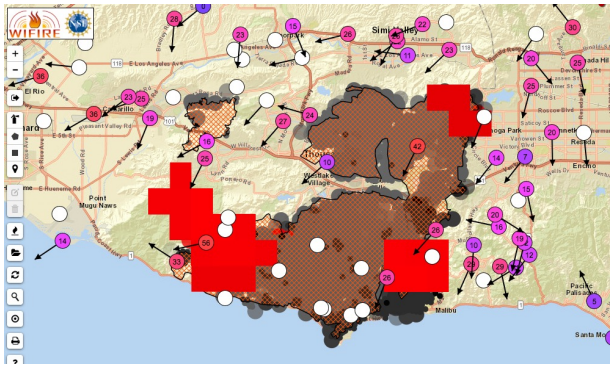
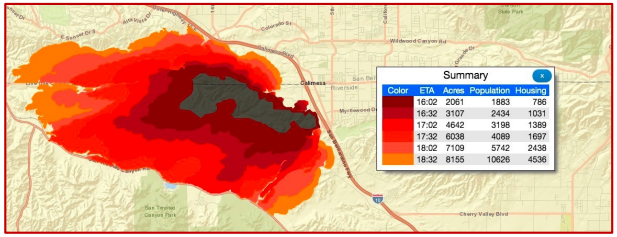
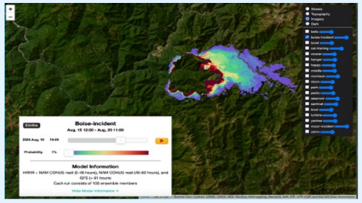
FIREMAP Since 2015

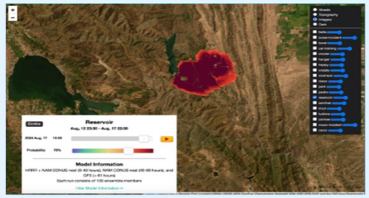
Firemap is currently being used by firefighters in Colorado, in collaboration with Intterra, and firefighters in California through the FIRIS program under the California Governor's Office of Emergency Services and CALFIRE. FIRIS uses Firemap to provide real-time information on weather conditions and fire ignitions and to monitor and predict direction and speed of fire spread, as well as communities at risk. It has revolutionized initial attack response for the most dangerous fires across California.

REACTIVE









Cal OES GOVERNOR'S OFFICE OF EMERGENCY SERVICES

NASA

U.S. DEPARTMENT OF HOMELAND SECURITY

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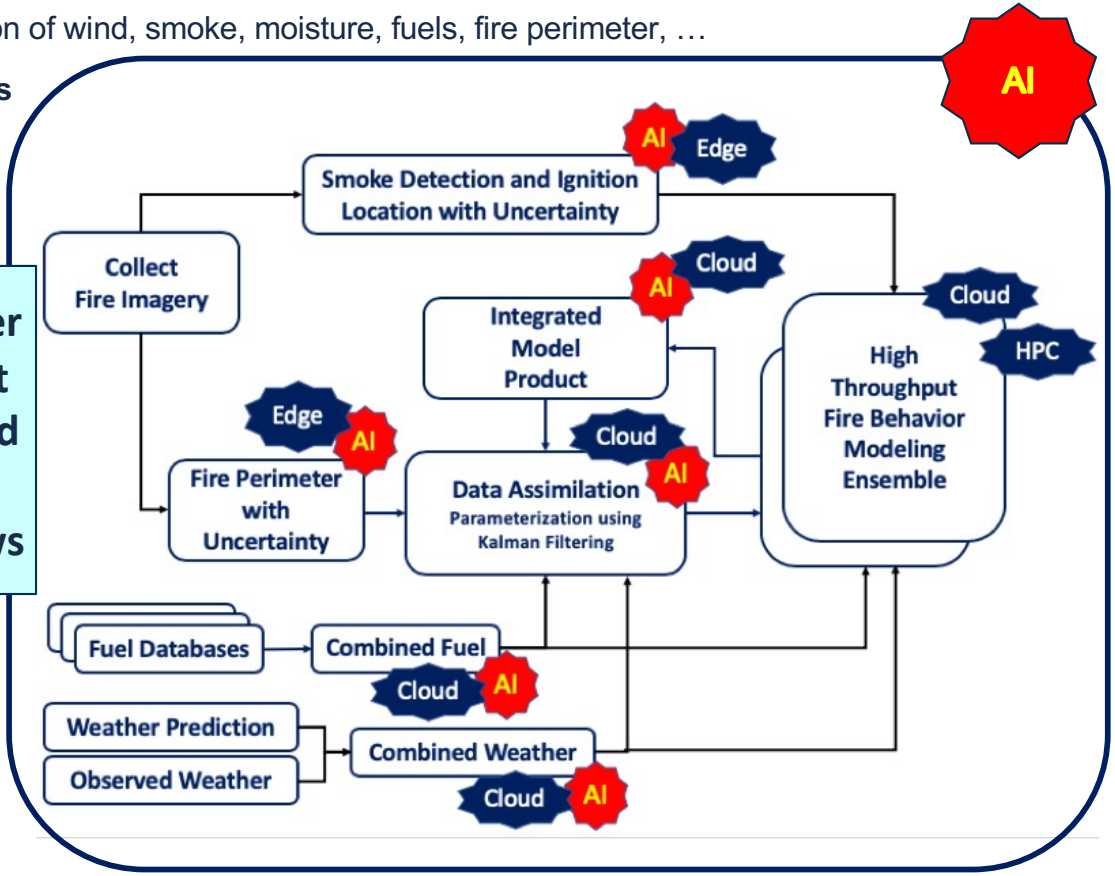
Digital Twins for the Fire Environment

- **Characterizing the dynamic fire environment :** Variation of wind, smoke, moisture, fuels, fire perimeter, …
- **Detection of fire ignitions and other related fire effects**
- **Monitoring of active fire and smoke**

FIREMAP

Sinc

AI at the outer shell is about the integrated application and workflows



Firemap provides real-time information on weather conditions and fire ignitions to monitor and predict speed of fire spread and communities at risk.

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From Reactive Firefighting to Proactive Fire Mitigation

REACTIVE

to

PROACTIVE

Fighting Severe Wildfires

Conducting Prescribed Burns

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Operational Products

WIFIRE

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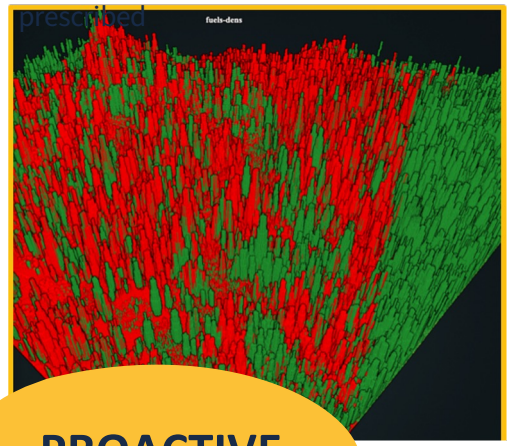
BurnPro3D

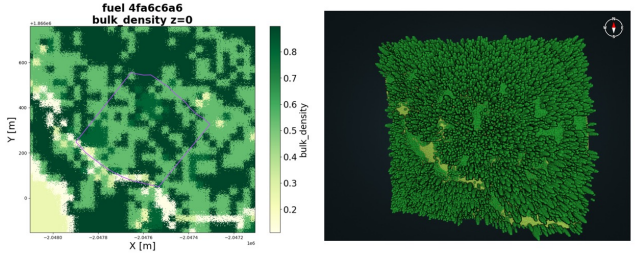
In alignment with the nation's goal to increase fuel treatments to reduce wildfire risk, BurnPro3D is designed to support the preparation of burn plans as well as the implementation of prescribed burns. The interface allows burn bosses to create and visualize high-resolution 3D fire simulations and compare fuel consumption and risk under different weather and ignition scenarios. It uses 3D FastFuels data developed by the US Forest Service and the QUIC-Fire coupled fire/atmosphere model developed at Los Alamos National Lab.

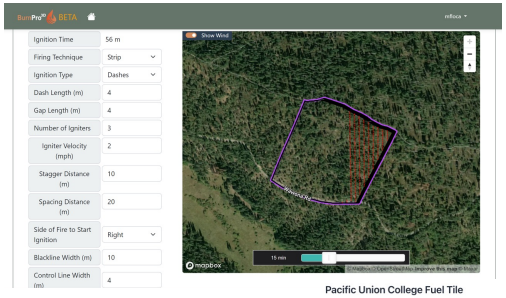


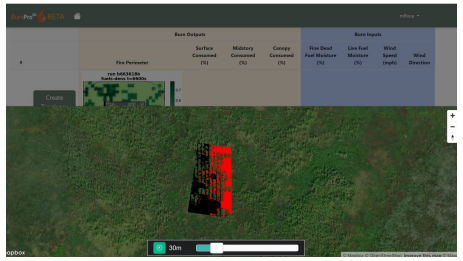
PROACTIVE

Los Alamos NATIONAL LABORATORY

3D Fuels: FastFuels Vegetation Model

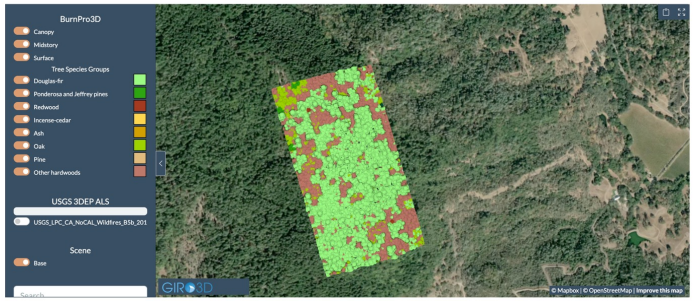






Pacific Union College Lidar Scans

Pacific Union College Fuel Tile



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From 2D to fast 3D… the scale challenge

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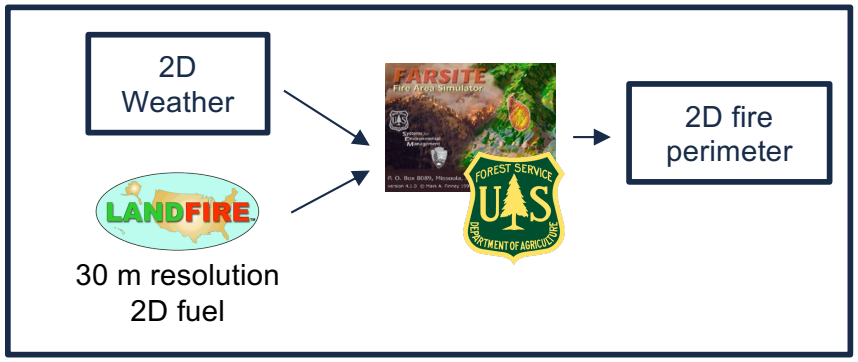
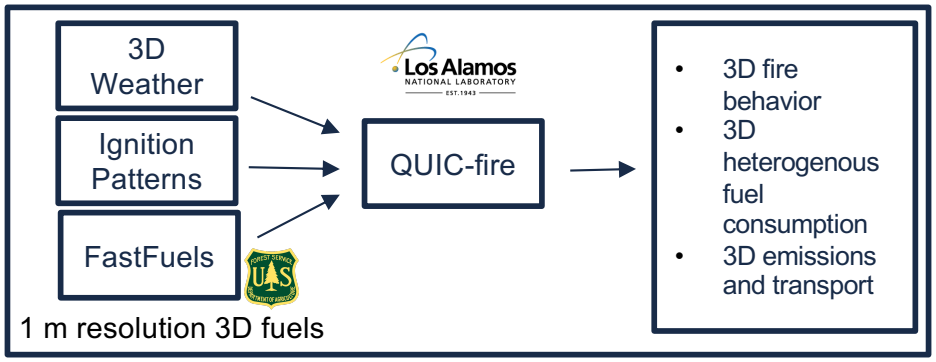
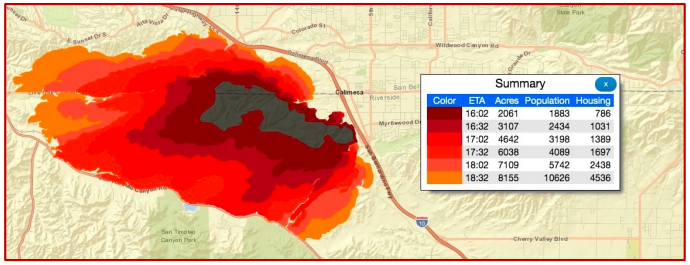
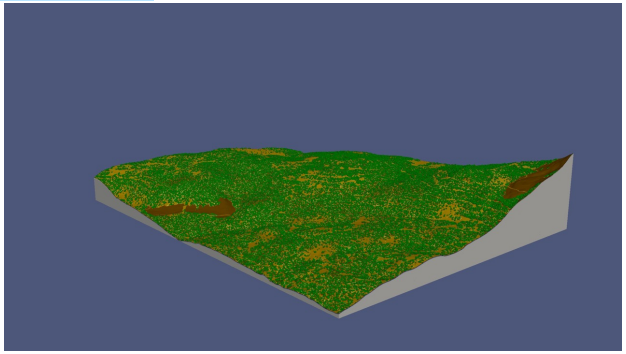




Collaboration with Rod Linn (LANL), Kevin Hiers (TTRS) and Russ Parsons (USFS)



From 30m resolution in 2D … **To** 1m resolution in 3D



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AI Techniques to Condition Data and Improve Model Accuracy

UC San Diego

3D vs 2D

900x more detailed

Collaboration with Rod Linn (LANL), Kevin Hiers (TTRS) and Russ Parsons (USFS)

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AI Techniques to Improve Decision Making

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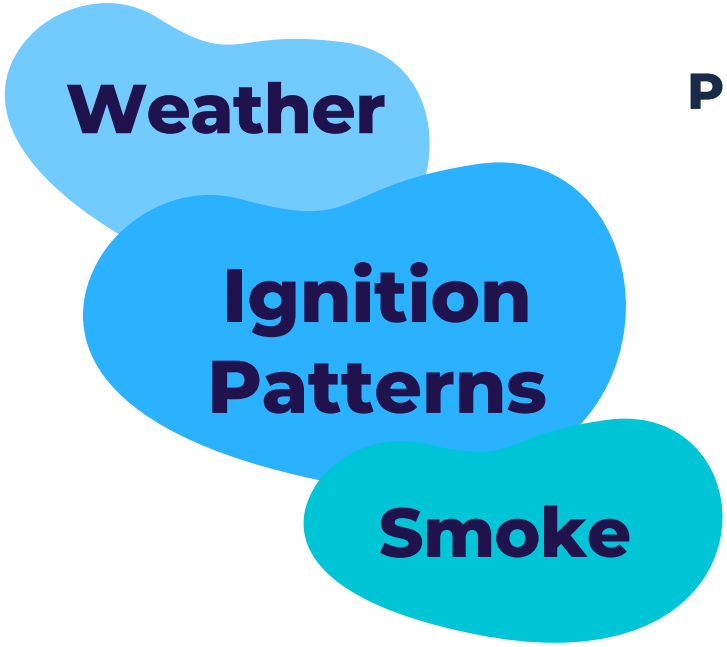

PHYSICS-GUIDED MACHINE LEARNING

To improve predictive fire behavior models

OPTIMIZATION

To address complex tradeoffs and prioritization

EXPLAINABLE AI

To increase scientific understanding and interpretability all along the decision-making chain

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Immersive Forest

Contact: Isaac Nealey, PhD Student, UC San Diego

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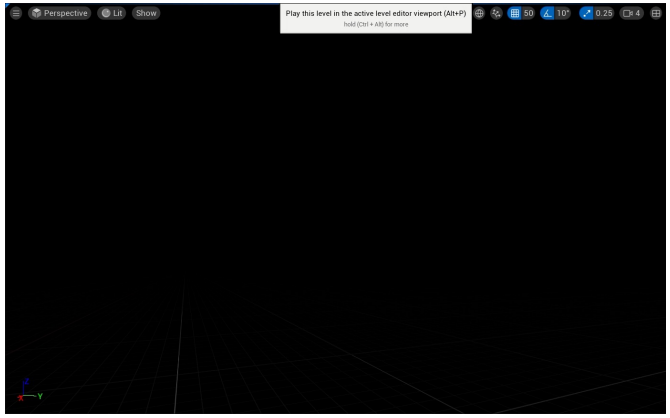

Data System

data model and underlying system for scientific data visualization

efficient query performance

high recall

empirically derived architecture

Contextualization Engine

projections & transformations

dimensionality reduction

derivative dataset generation

add semantics and AI-driven insights

Presentation Engine

interactive rendering

dynamic visual storytelling

data system insertion mechanism

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Many Scientific Data Types in Digital Twin

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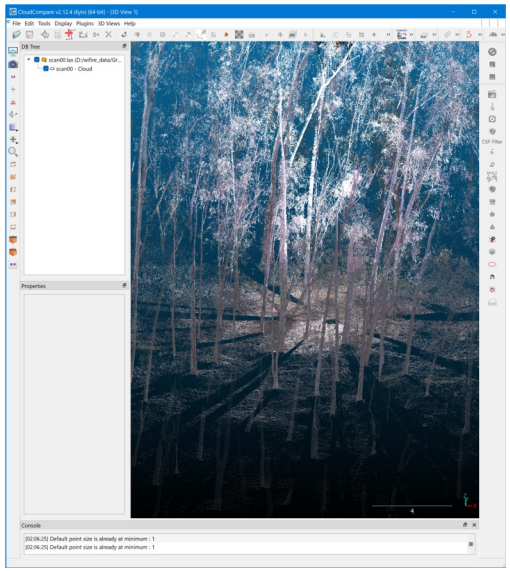
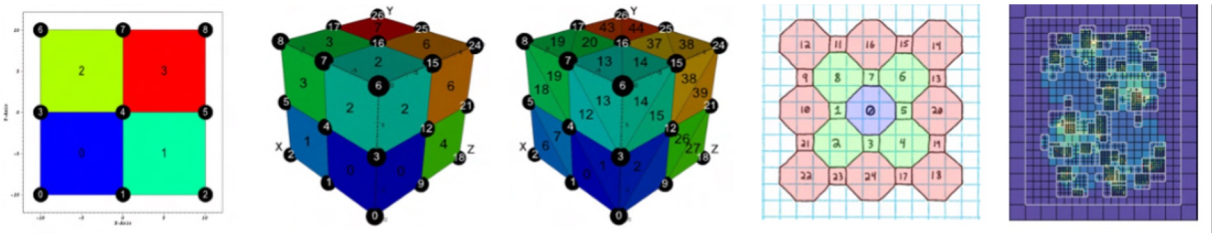
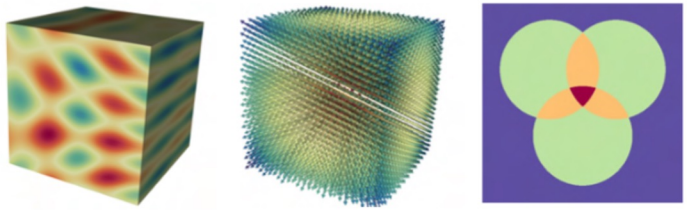
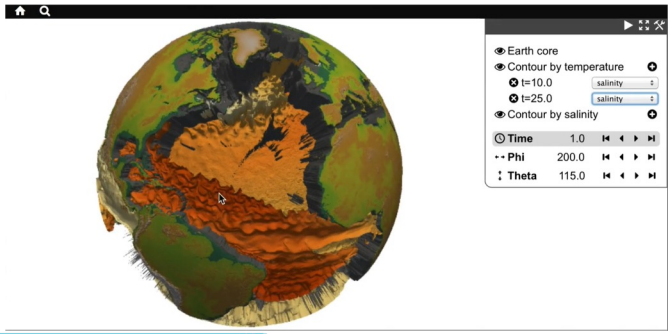


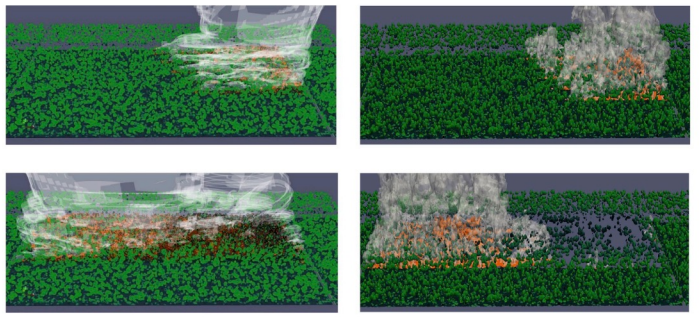


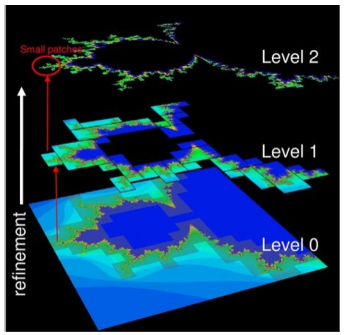
Topologies: 1D/2D/3D - Uniform, Rectilinear, Structured, Unstructured, Polygonal, Polyhedral, AMR



Fields: Scalar, Vector, Multi-material







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Knowledge Representation: Spatiotemporal Data Challenges

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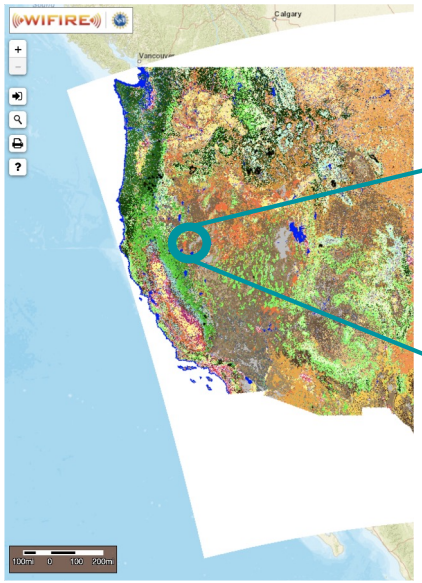
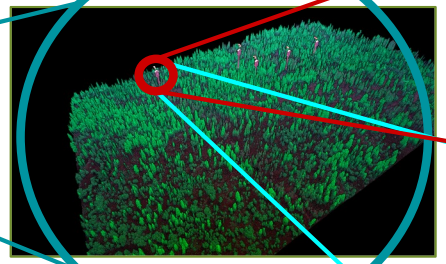
Multiscale Spatial Challenge



Satellite Imagery ~30m



Aerial LiDAR ~0.5m

pre-fire

post-fire

Terrestrial LiDAR ~1cm

Temporal Distribution Challenge

Modeling Remote Sensing Data Relationships with Spatiotemporal Knowledge Graphs
Isaac Nealey and Ilkay Altintas
IEEE eScience 2025

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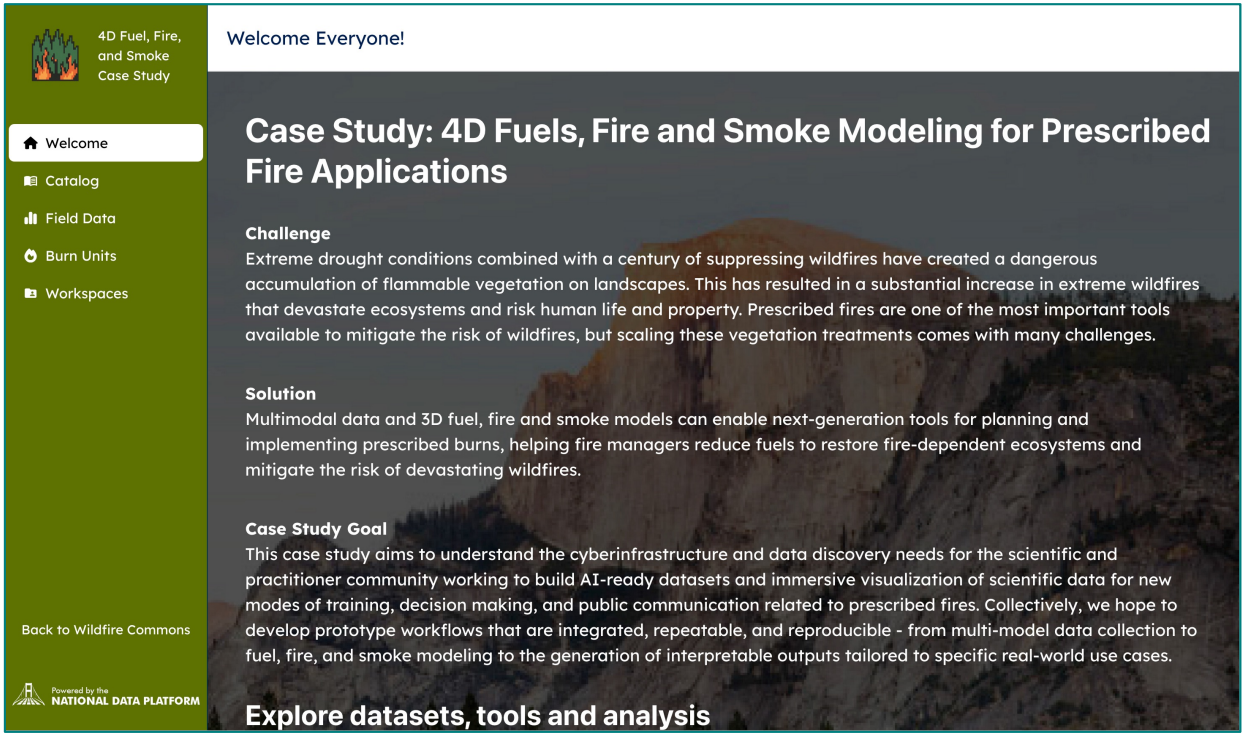
4D Fuels Data and Community in the Wildfire Commons

UC San Diego

Contact: Leticia Lee, UC San Diego (PI: Altintas)



https://4dfuels.wildfirecommons.org/

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Wildland fire is one of many societal areas being transformed by AI.

- Agriculture & Food Systems
- Medicine & Public Health
- Transportation & Infrastructure
- Energy & Climate
- Education & Workforce
- Urban & National Security

…and many more.

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PART IV – Toward a Societal AI Operating System

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AI will not transform society by itself.

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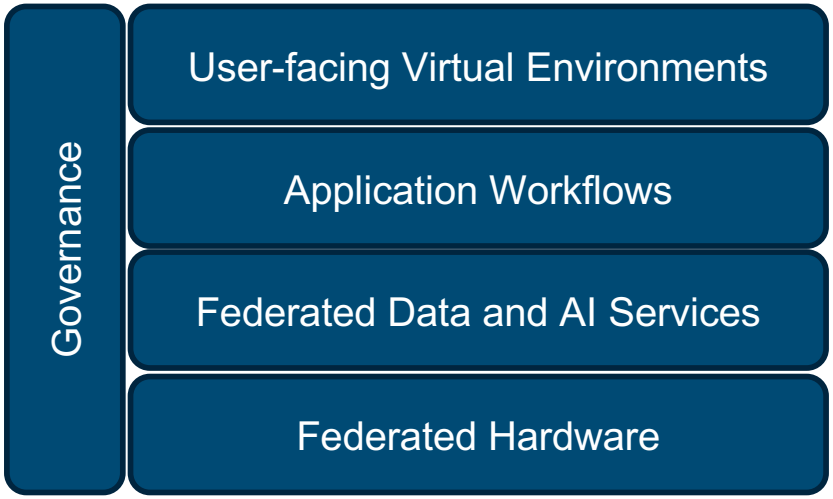
Societal innovation models coupled to platforms that organize data, computing, and collaboration around shared goals will.

NATIONAL DATA PLATFORM

WILDFIRE SCIENCE & TECHNOLOGY COMMONS



Data and AI aware service-oriented platforms like NDP and Wildfire Commons provide this kind of enabling operating system.

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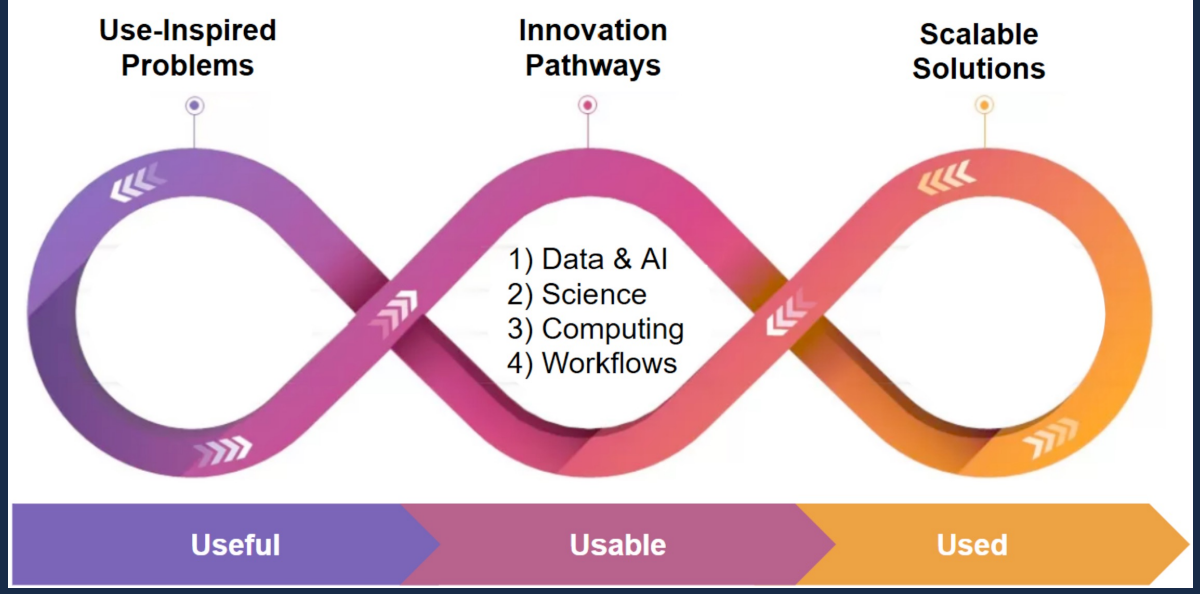
Our Innovation Approach



SCIL's **societal computing and innovation approach** is a connective framework to enable new innovation pathways and to imagine, design, build, and scale solutions to society's most pressing problems, where **data, science, and technology work in concert for the public good and resilience.**

Societal Computing and Innovation Lab

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Thank you!

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Architecting for Collective Data-Integrated Societal Impact

- Involve diverse users in architecting
- Identify access, use, expertise and education gaps
- Improve the experience of working with data
- Connect data to knowledge systems and services
- Create an ecosystem approach to capacity building
- Incubate use-inspired solutions to scale
- Explore new models of allocation
- Develop and teach models of sustainability and scale

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