Universities Space Research Association

RIACS

Winning the AI Space Race

Past, Present and Future

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Co-Founder of the GenAI Lab for Science & Engineering

Co-Founder of the Quantum AI Lab

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1983 President Ronald Reagan's Vision for the AI Race

"Industry is making rapid advances in supercomputer technology, human computer interfaces, and artificial intelligence."

Transmitted from President Reagan to the U.S. Congress in 1983

1983 President Ronald Reagan's Vision for the AI Race

"In recognition of the significance to space programs …

A major commitment is the establishment of an independent Research Institute for Advanced Computer Science (RIACS), to be operated at Ames Research Center by the Universities Space Research Association"

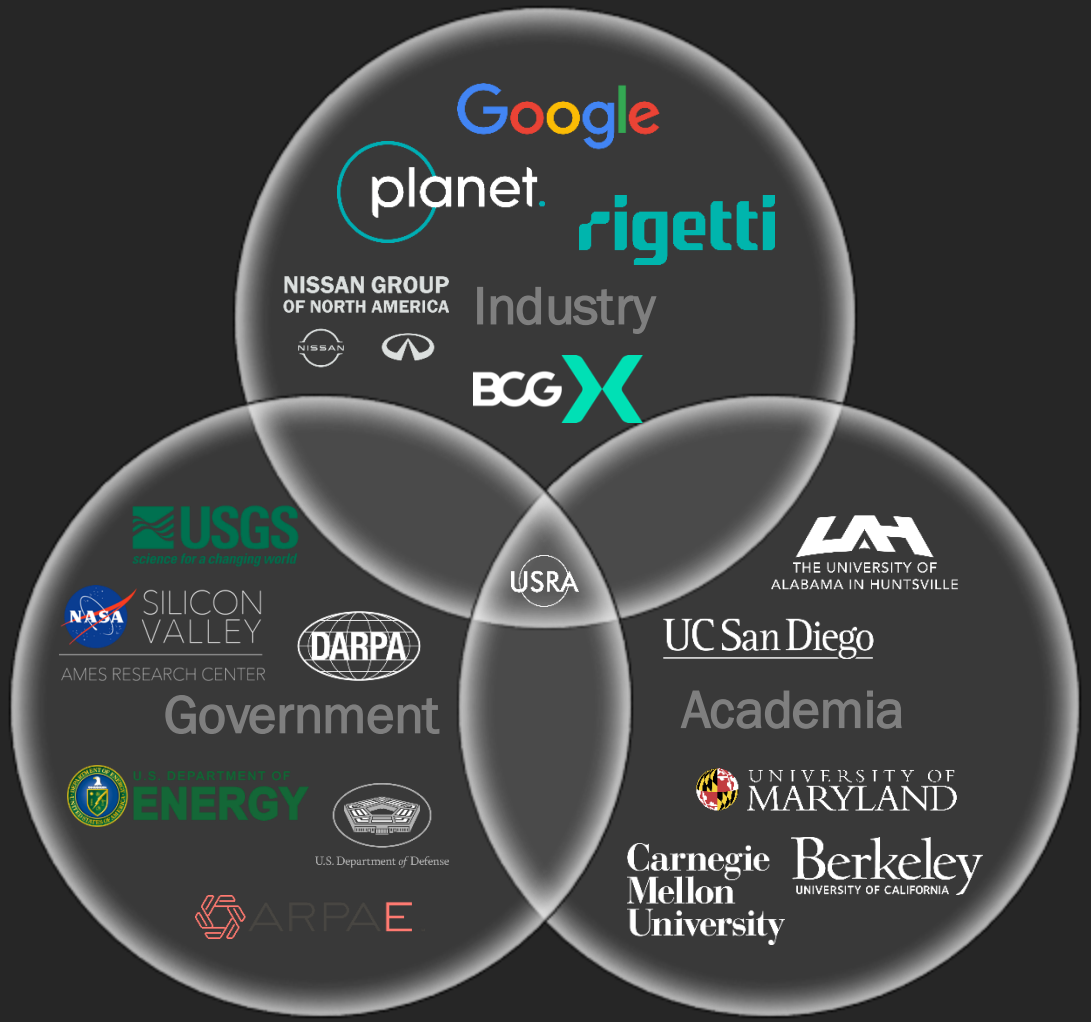
Transmitted from President Reagan to the U.S. Congress in 1983

Winning the AI Race Together

RIACS

Research Institute for Advanced Computer Science

An Institute of USRA



40+ Years of Firsts for Space & Aeronautics

1983 — President Reagan transmits to U.S. Congress major commitment to establish RIACS to address rapid advances in artificial intelligence, supercomputing and human computer interaction.

1984 — RIACS founded as joint collaboration between USRA and NASA's Ames Research Center.

Working with Henry Lum, RIACS helps establish an Artificial Intelligence Plan for NASA's Ames Research Center.

1989 — AutoClass becomes first AI software to make a published astronomical discovery.

1998 — Remote Agent becomes first AI software to control a spacecraft in deep space and is 1999 NASA Software of the Year co-winner.

2002 — CART3D named NASA Software of the year.

2003 — EUROPA/ MAPGEN becomes first AI software to plan the work of robots on another planet during the MER mission.

2005 — Clarissa/ Regulus becomes first spoken dialogue system to be used in space.

2010 — NASA Common Bus used for modular spacecraft design in Robotic lunar mission (LADEE / GRAIL) launched in 2011.

2013 — Quantum Artificial Intelligence Lab founded with Google and NASA's Ames Research Center to solve complex optimization problems.

2016 — Feynman Quantum Academy Founded by USRA's RIACS.

2016—2021 Airspace Technology Demonstration-2 (ATD-2) demonstrates environmental benefits leading to FAA plans to integrate and deploy at 89 airports across the US.

2016 - 2021 UAS Traffic Management (UTM) concept developed through partnerships with FAA, industry, and academia.

2019 — Quantum Supremacy demonstrated by Google with NASA and USRA.

2021 — ExoMiner deep neural network adds 301 exoplanets to Kepler space telescope's total count.

2022 — 2022—2024 Machine learning algorithms used to optimize flight routes for airlines in the National Airspace System.

2024 — The Generative Artificial Intelligence (GenAI) Lab for Science and Engineering in Silicon Valley is founded in a collaboration with the Boston Consulting Group (BCG) and NASA's Ames Research Center.

1980s AI Firsts: Astronomical Discoveries

Infrared Astronomical Satellite (IRAS)

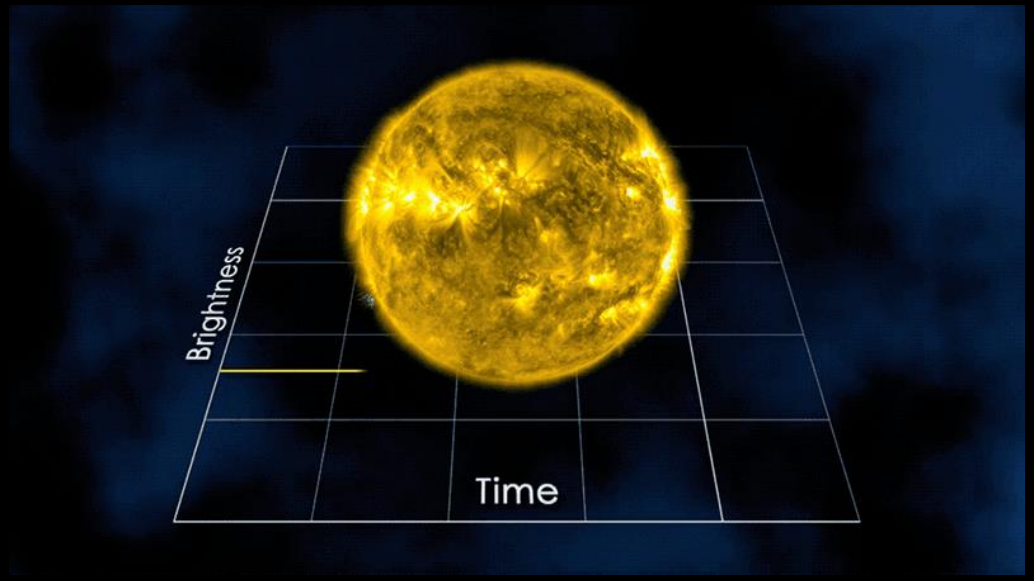
1st space telescope to survey the entire night sky at infrared wavelengths

AI Impact - Scientific Discovery

AutoClass

1st AI (unsupervised ML)
to make a published astronomical discovery
1989

2020s AI Firsts: Planet Hunting



Kepler / K2

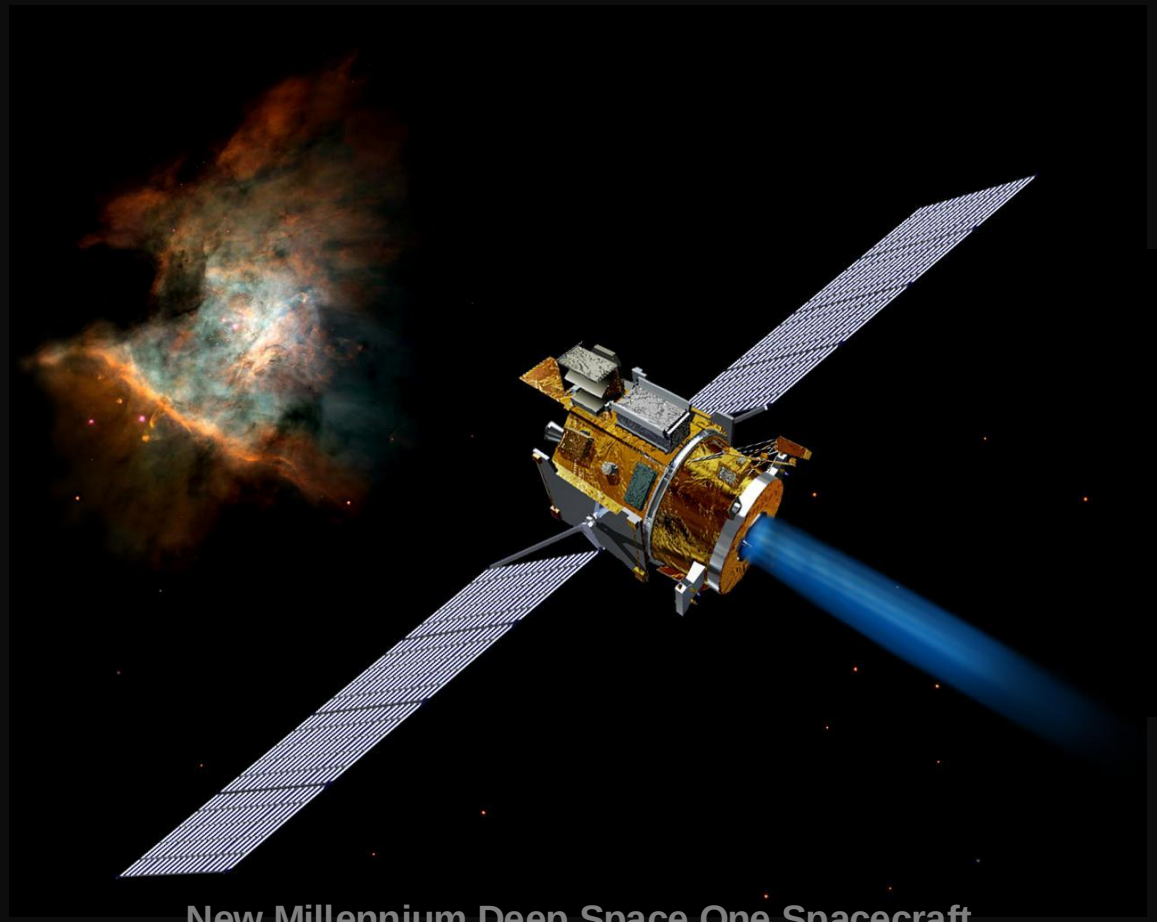
1st planet-hunting mission of NASA

AI Impact - Scientific Discovery

ExoMiner

Deep & explainable neural network
validates 301 new exoplanets in 2021
and another 69 exoplanets in 2023

1990s: AI for Spacecraft Control



New Millennium Deep Space One Spacecraft

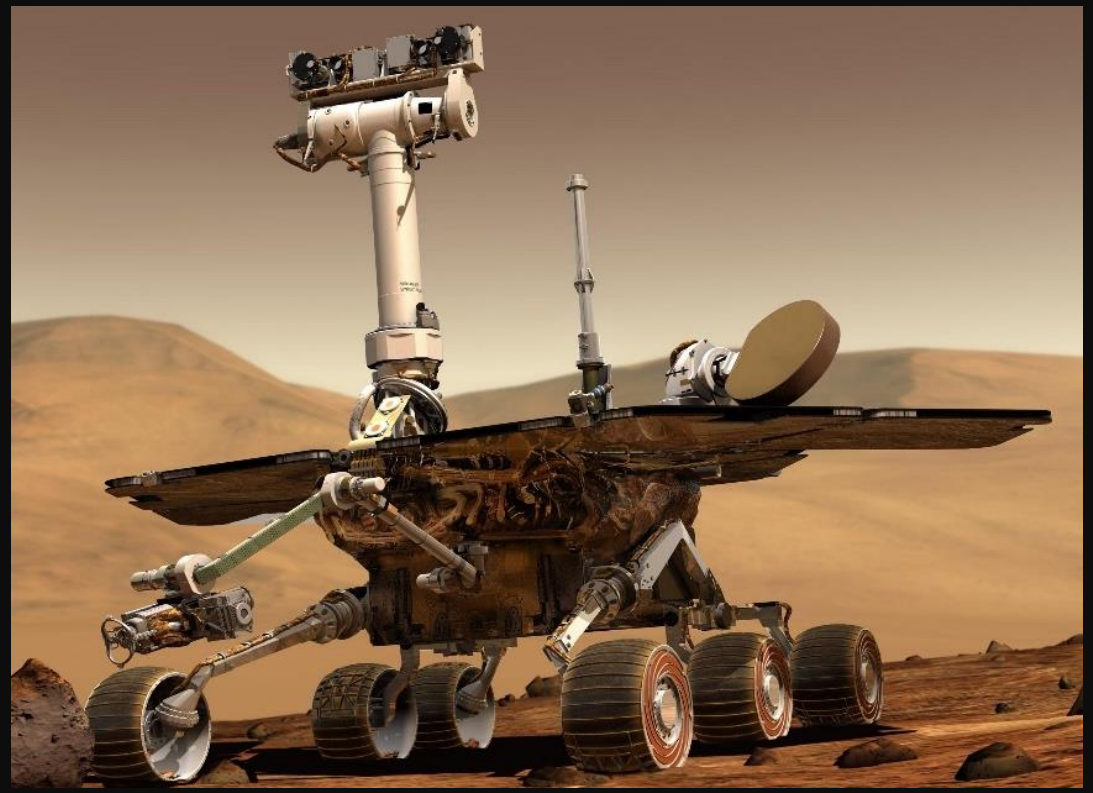
1st NASA spacecraft to use ion propulsion in deep space

AI Impact – Spacecraft Control

Remote Agent (with EUROPA)

1st AI to autonomously control a spacecraft in deep space in 1999

2000s AI Firsts: Robotic Exploration



Mars Exploration Rovers Spirit & Opportunity
1st space vehicle to traverse 10km on Mars

AI Impact – Planning & Scheduling

MAPGEN (with Europa)

1st AI Software to plan the work
of robots on another planet

2010s: Enabling Benefits for Leadership by the U.S. Automotive Industry

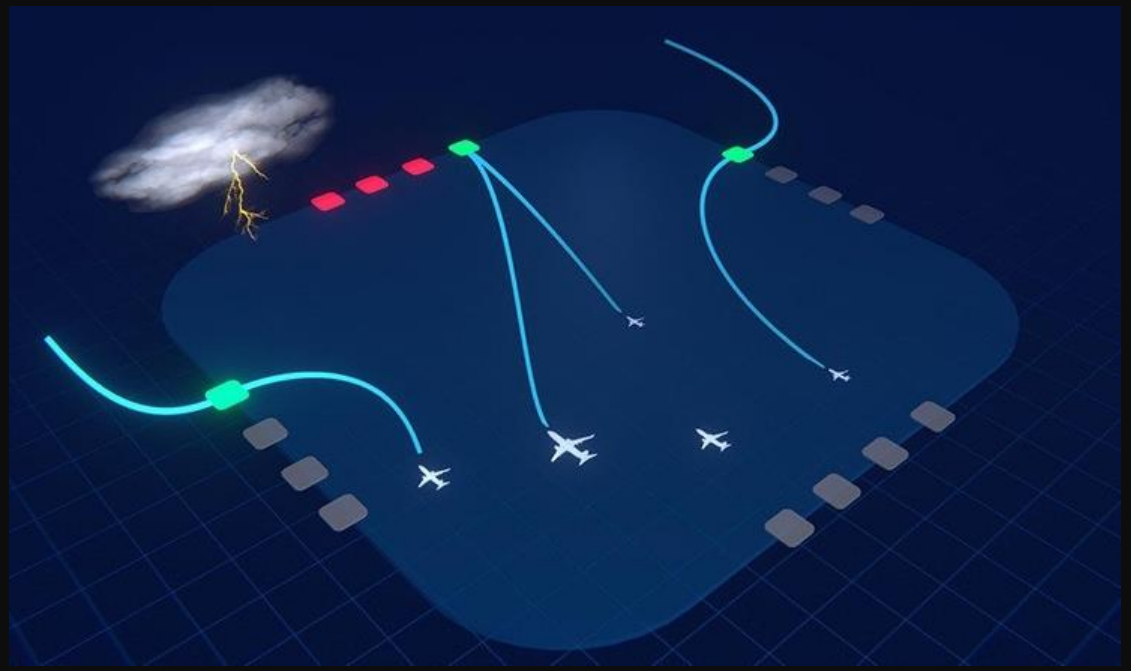
Tech Transfer to Automotive Industry

Mobility solution to manage fleets
of autonomous electric vehicles

NISSAN GROUP
OF NORTH AMERICA

NISSAN

2020s AI Firsts: AI for the U.S. Aviation Industry

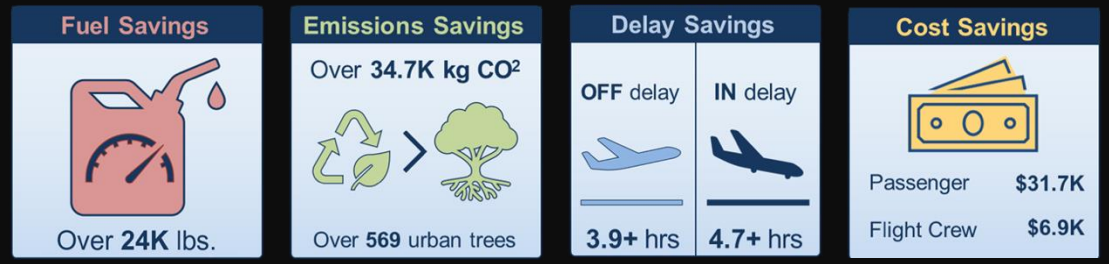


NASA Collaborative Digital Departure Rerouting System (CDDR)
1ST NASA AI routing field experiments with commercial airlines

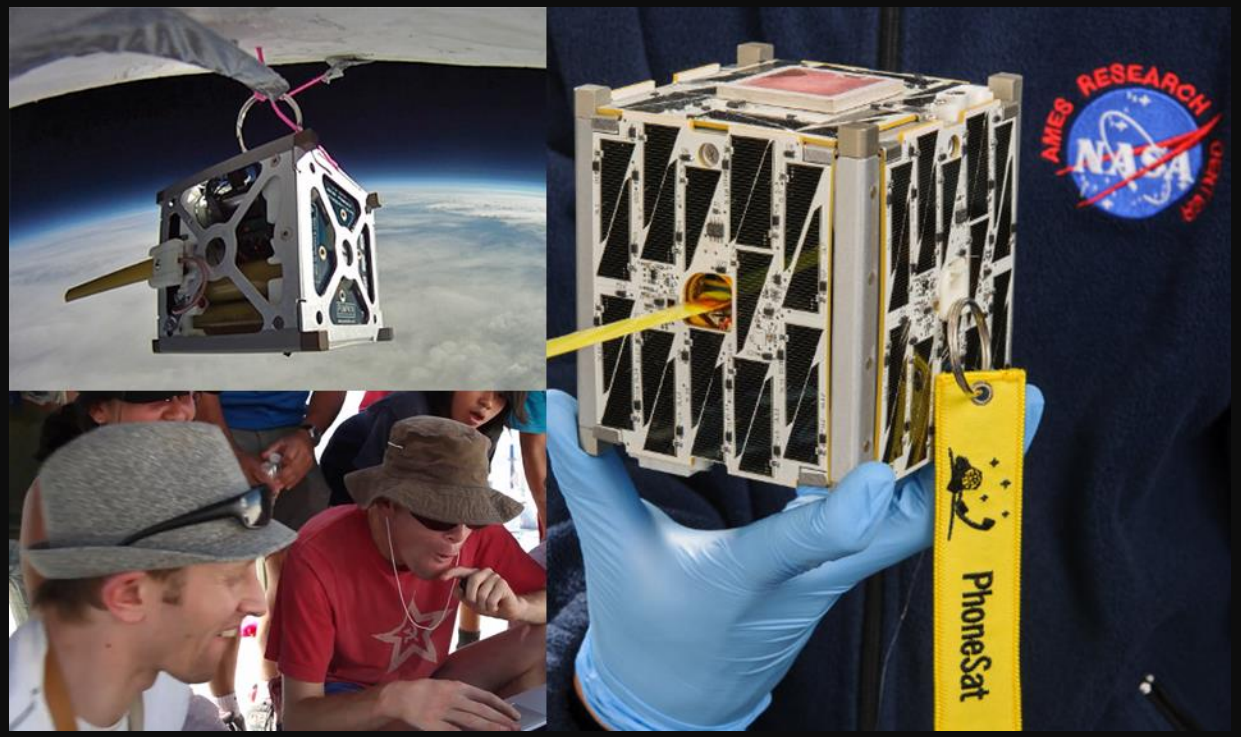
AI Impact – Rerouting Aircraft

CDDR
Collaborative Digital Departure Rerouting System

One of the first large-scale applications of AI for departure rerouting in 2022



2010s: Enabling U.S. Satellite Industry to Image the Earth Landmass Every Day



NASA PhoneSat

Building satellites using commercial smartphone technology

Industry Startup

Improving temporal & spatial resolution for Earth monitoring with nanosatellites

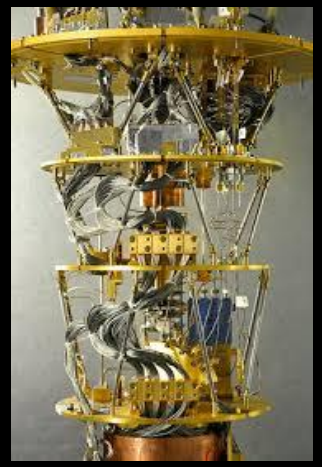
AI Firsts: Quantum AI Lab Founded in 2012

NASA SILICON VALLEY
AMES RESEARCH CENTER

USRA RIACS
Research Institute
for Advanced Computer Science

Google
Applied Science

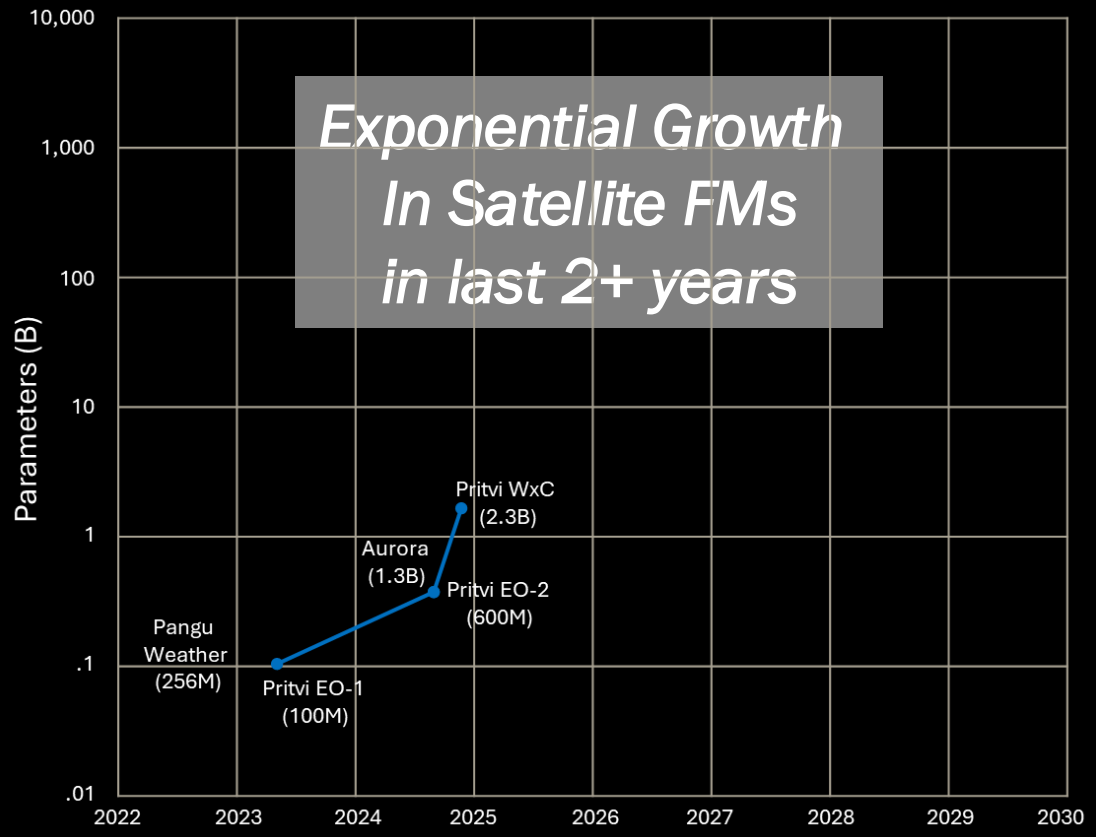
2012 Launch



Collaborative R&D

Industry Solutions

Future AI Race: Exponential Growth in Satellite AI Models



A Worldwide Competition with a happy few U.S. front runners

Google Microsoft NVIDIA

NASA USRA RIACS

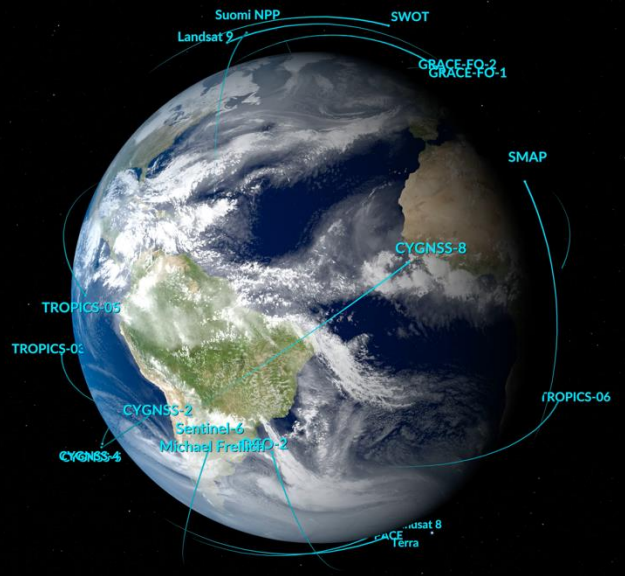
IBM BCG X

with universities

2024: GenAI Lab for Science & Engineering

Satellite AI Foundation Models

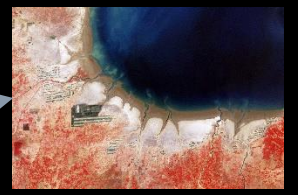
Global models for multiple uses



Satellite Remote Sensing Data

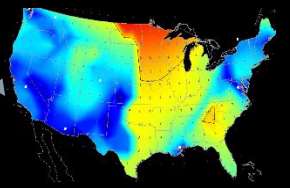
(+ Airborne Data & Sensor Networks)

Land



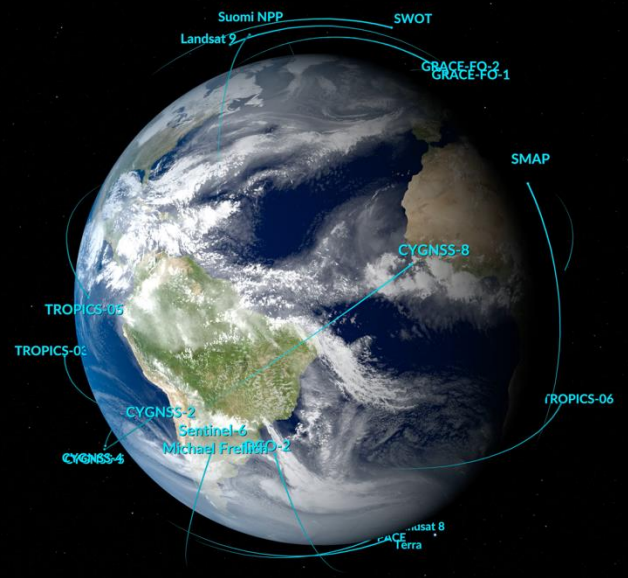
Water

Weather



Space Weather

2024: GenAI Lab for Science & Engineering



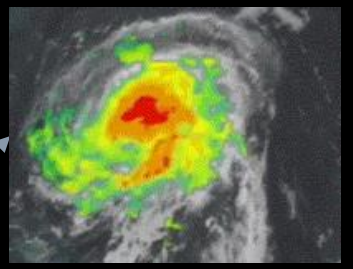
Satellite Data

(+ Airborne Data & Sensor Networks)

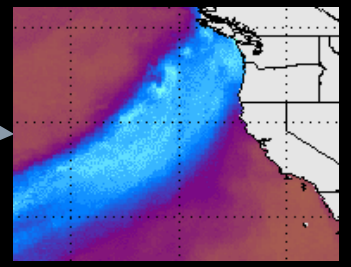
Satellite AI Foundation Models

Global models for multiple use

USRA BCG NASA



Tropical Cyclones



Atmospheric Rivers

Extreme Rain