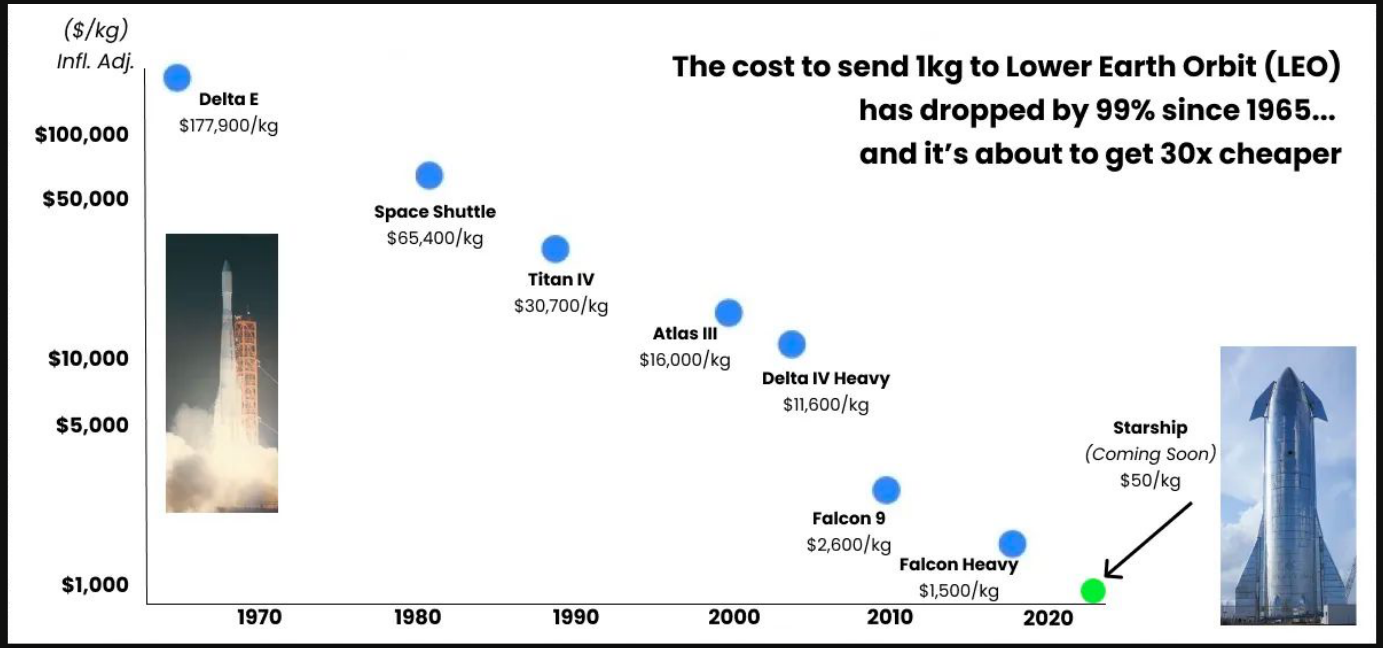
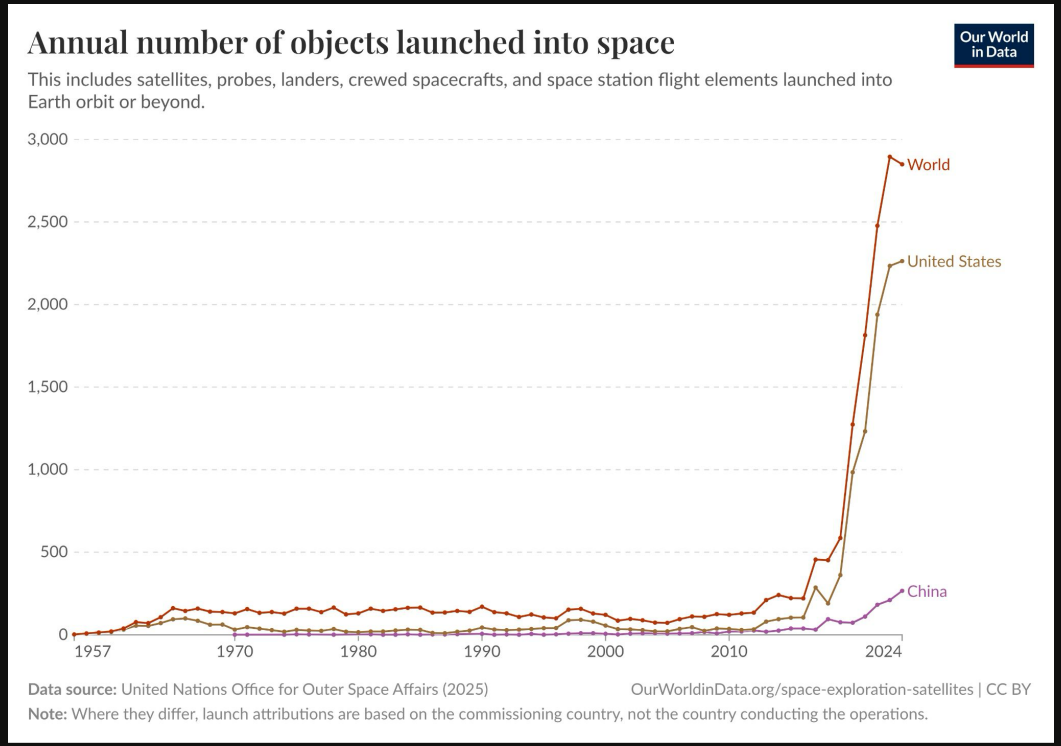
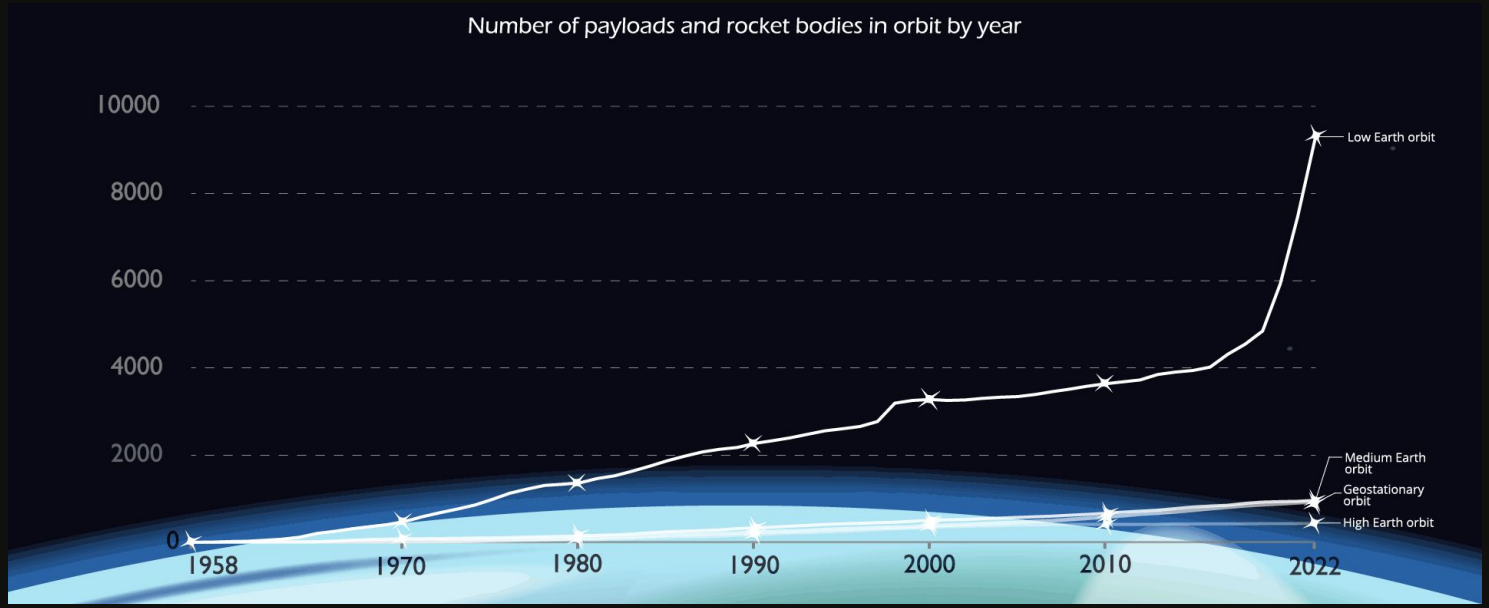

WELCOME TO THE
2nd space robotics workshop.
IEEE SMC-IT/SCC 2025
28-29 JULY
CALIFORNIA SCIENCE CENTER
LOS ANGELES, CA
IEEE COMPUTER SOCIETY

Launch costs: 99% decline



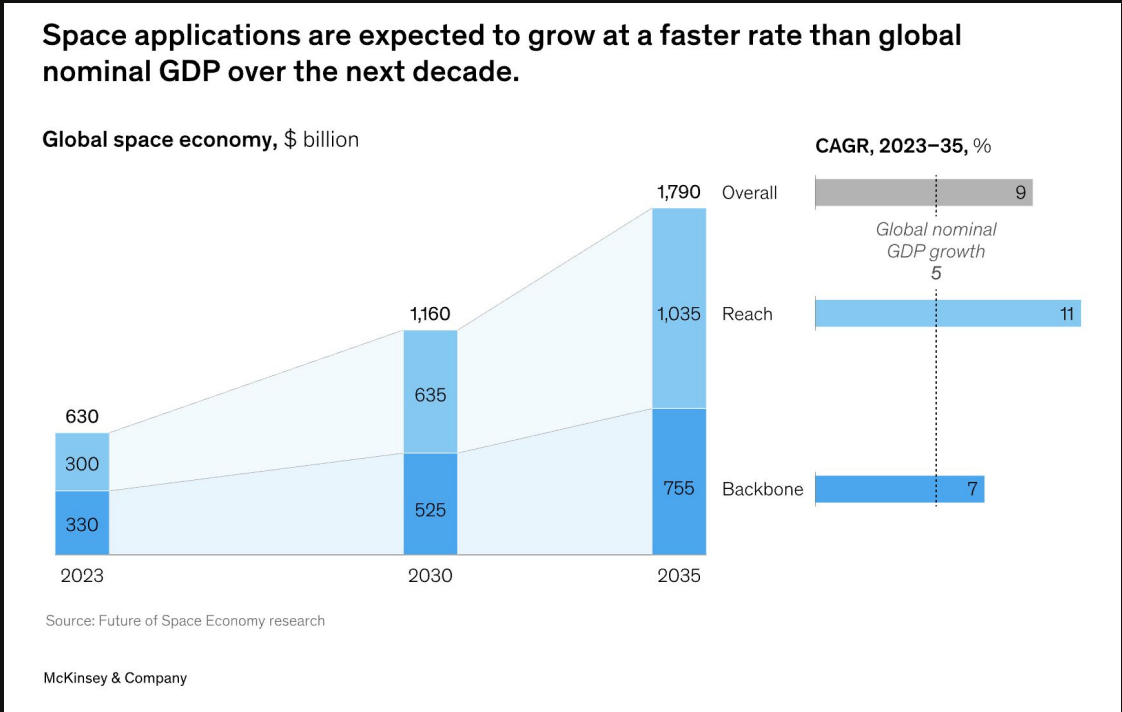

Annual number of objects launched into space
Our World in Data
This includes satellites, probes, landers, crewed spacecrafts, and space station flight elements launched into Earth orbit or beyond.
3,000
2,500
2,000
1,500
1,000
500
0
1957
1970
1980
1990
2000
2010
2024
World
United States
China
Data source: United Nations Office for Outer Space Affairs (2025)
OurWorldinData.org/space-exploration-satellites | CC BY
Note: Where they differ, launch attributions are based on the commissioning country, not the country conducting the operations.

LEO Sats Fuelling the New Space Race

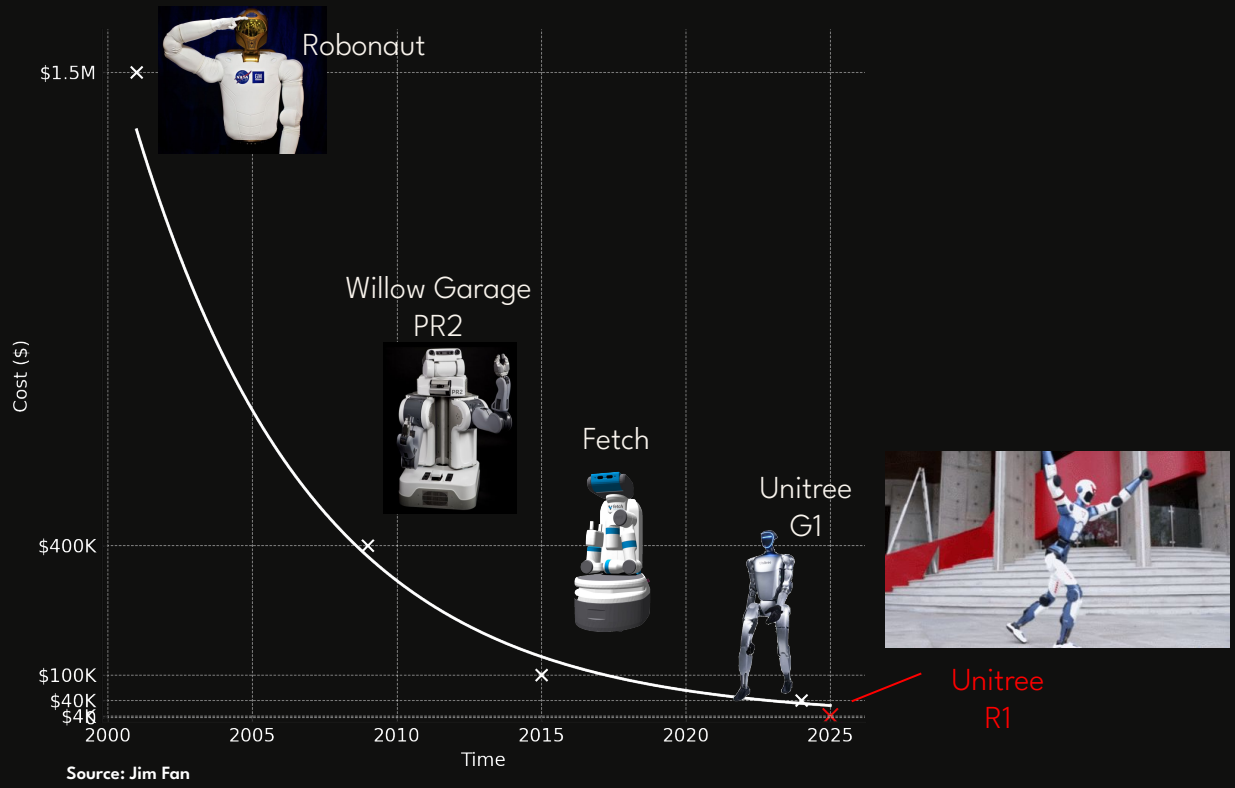


Source: techsight

Space Sector: $1.8 Trillion expected growth

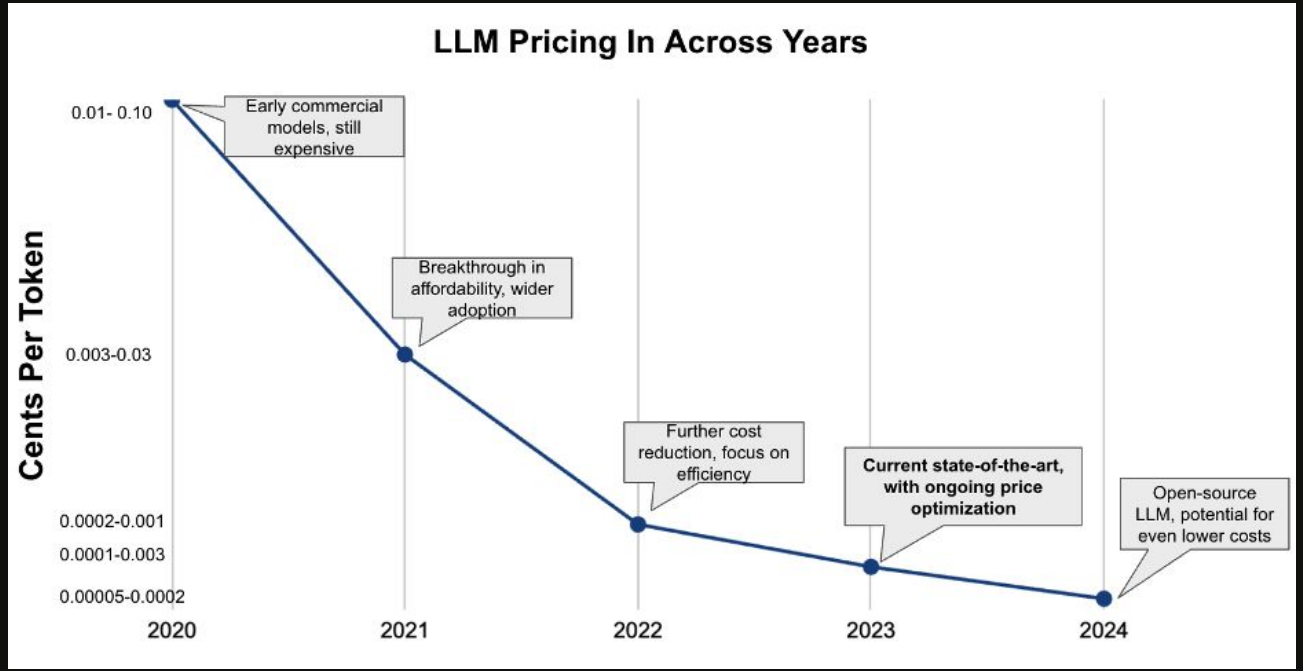


Cost of Hardware: ~~$40k~~ $6k

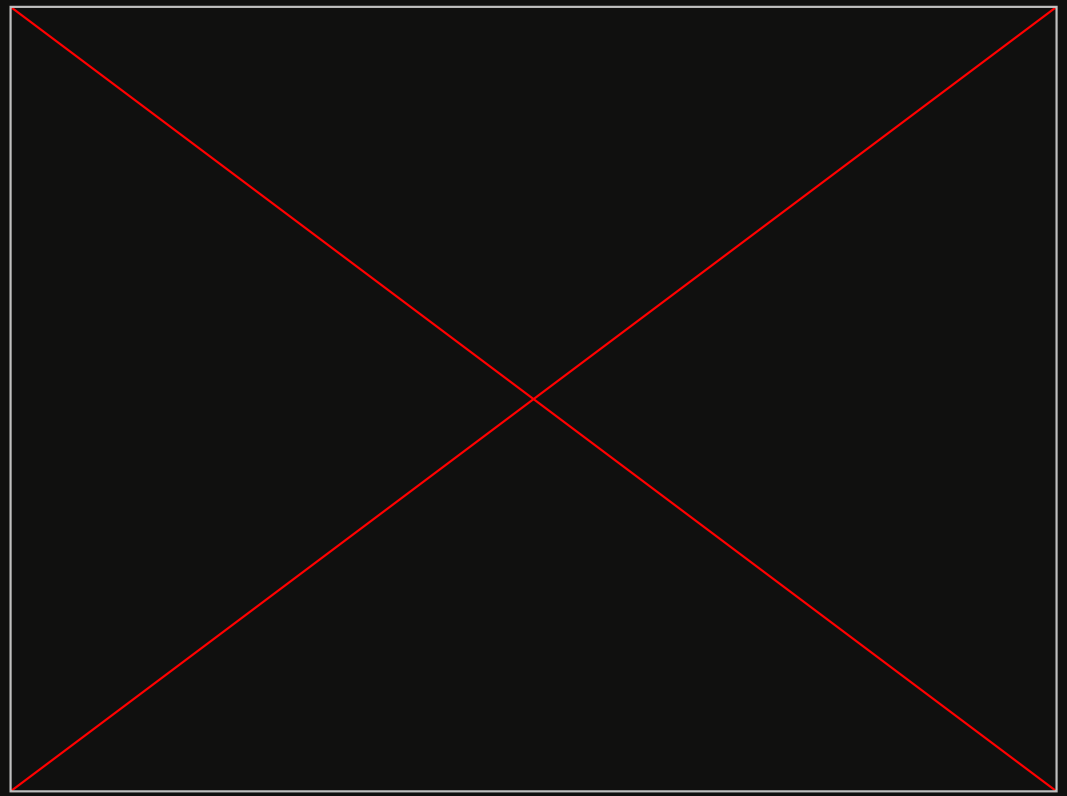


Source: Jim Fan

Cost of Digital Intelligence: 99% decline

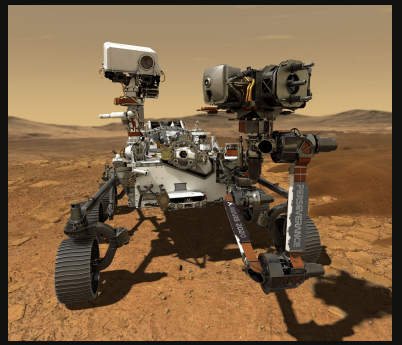


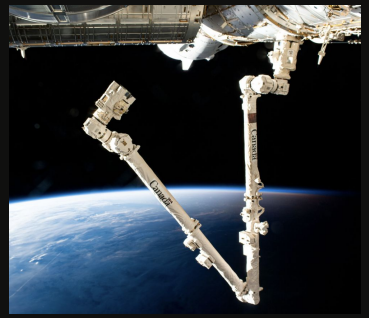
Physical Intelligence: Robots More Capable Than Ever

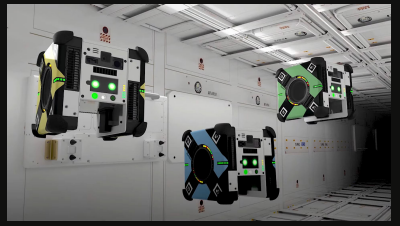


LLMs & VLAs
Reinforcement Learning
Imitation Learning
Distillation/Quantization
Sim-2-Real

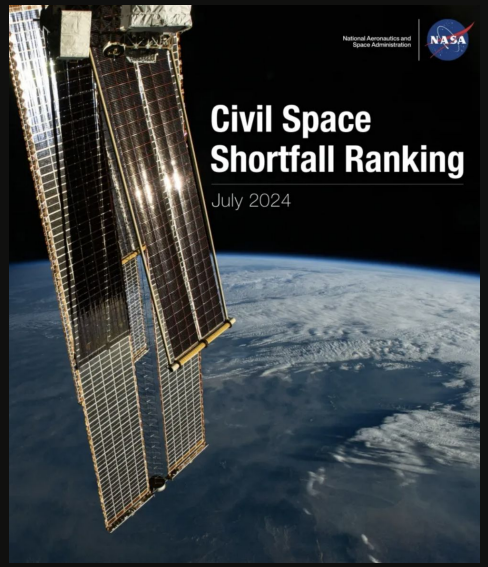
In-Space Robots: <30





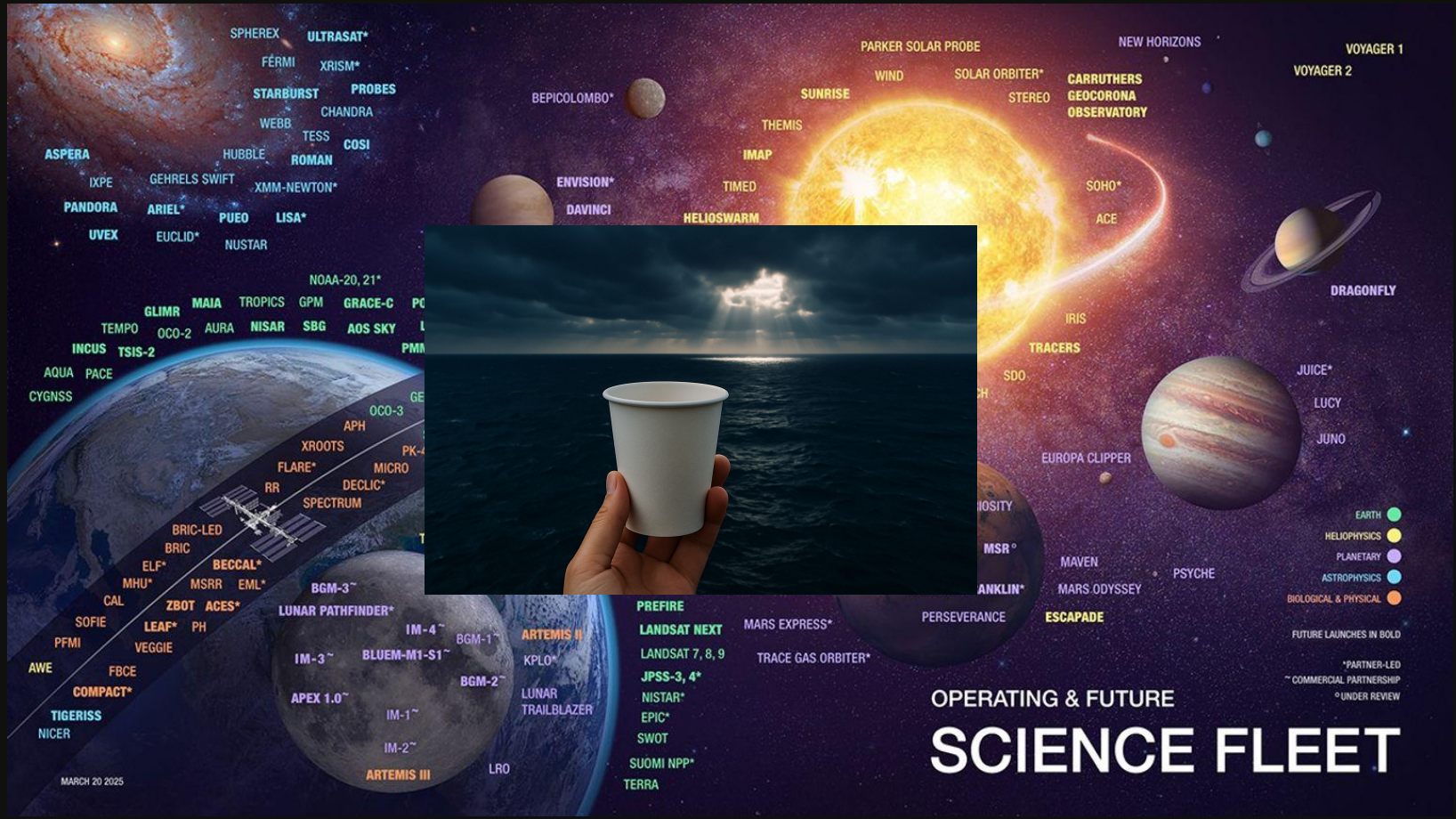


In-Space Robot Autonomy: A Key Mission Enabler



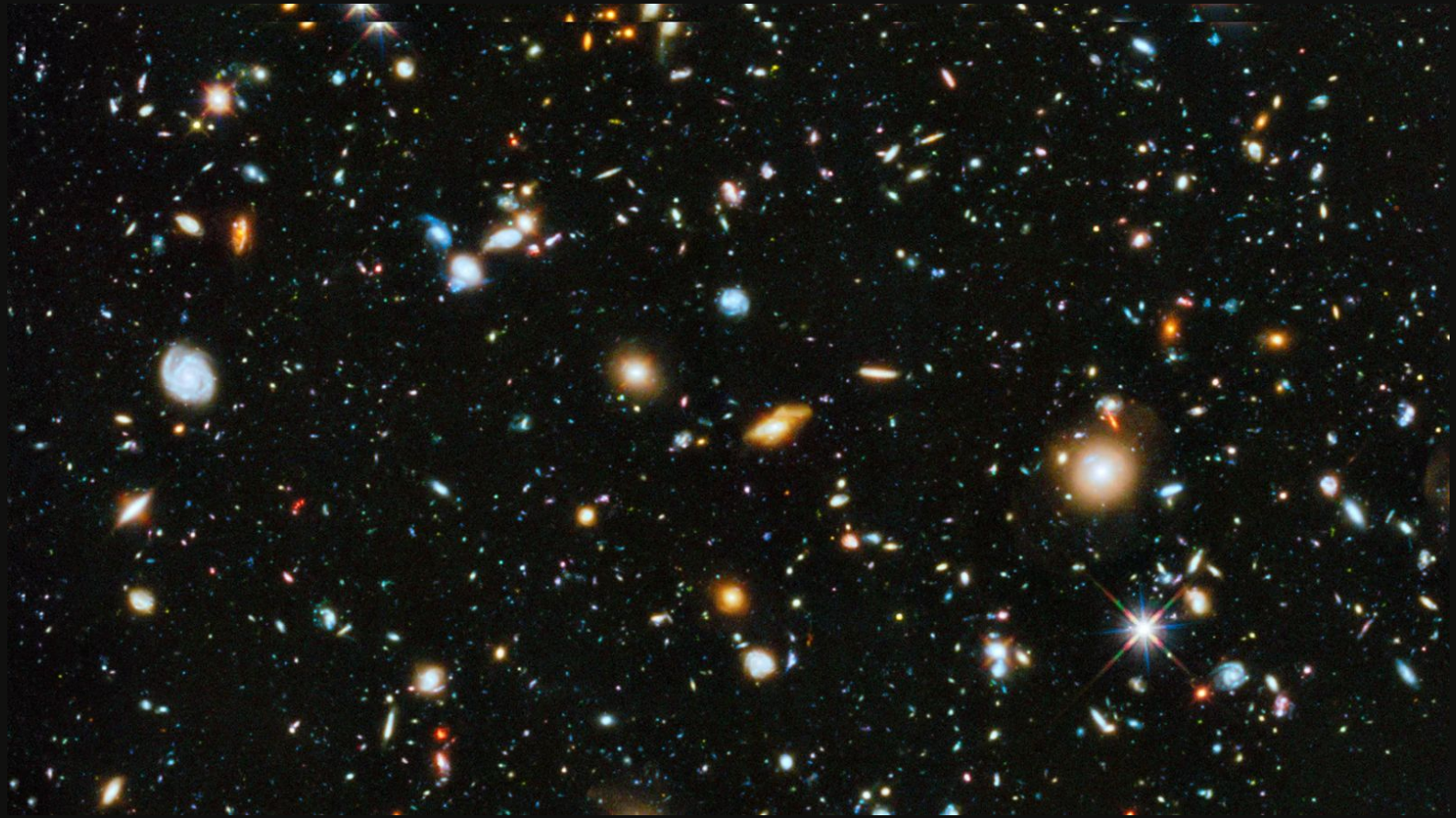
Critical Needs:

- Logistics
- Maintenance & Outfitting
- Servicing & Assembly
- Sample Collection & Handling
- In-Space Inspection & Servicing
- In-Space Manufacturing


SPHEREX
ULTRASAT*
FERMI
XRISM*
STARBURST
PROBES
CHANDRA
WEBB
TESS
COSI
ASPERA
HUBBLE
ROMAN
IXPE
GEHRELS SWIFT
XMM-NEWTON*
PANDORA
ARIEL*
PUEO
LISA*
UVEX
EUCLID*
NUSTAR
NOAA-20, 21*
GLIMR
MAIA
TROPICS
GPM
GRACE-C
TEMPO
OCO-2
AURA
NISAR
SBG
AOS SKY
INCUS
TSIS-2
AQUA
PACE
CYGNSS
OCO-3
APH
XROOTS
FLARE*
MICRO
RR
DECLIC*
SPECTRUM
BRIC-LED
BRIC
ELF*
BECCAL*
MHU*
MSRR
EML*
CAL
ZBOT
ACES*
SOFIE
LEAF*
PH
PFMI
VEGGIE
AWE
FBCE
COMPACT*
TIGERISS
NICER
MARCH 20 2025
BGM-3~
LUNAR PATHFINDER*
IM-4~
BGM-1~
ARTEMIS II
IM-3~
BLUEM-M1-S1~
KPLO*
BGM-2~
APEX 1.0~
LUNAR TRAILBLAZER
IM-1~
IM-2~
ARTEMIS III
LRO
BEPICOLOMBO*
PARKER SOLAR PROBE
WIND
SOLAR ORBITER*
SUNRISE
STEREO
THEMIS
IMAP
ENVISION*
TIMED
DAVINCI
HELIOSWARM
SOHO*
ACE
NEW HORIZONS
VOYAGER 1
VOYAGER 2
CARRUTHERS GEOCORONA OBSERVATORY
DRAGONFLY
IRIS
TRACERS
SDO
JUICE*
LUCY
JUNO
EUROPA CLIPPER
PREFIRE
LANDSAT NEXT
LANDSAT 7, 9
JPSS-3, 4*
NISTAR*
EPIC*
SWOT
SUOMI NPP*
TERRA
MARS EXPRESS*
TRACE GAS ORBITER*
PERSEVERANCE
MSR°
MAVEN
MARS ODYSSEY
PSYCHE
ESCAPADE
EARTH
HELIOPHYSICS
PLANETARY
ASTROPHYSICS
BIOLOGICAL & PHYSICAL
FUTURE LAUNCHES IN BOLD
*PARTNER-LED
~ COMMERCIAL PARTNERSHIP
° UNDER REVIEW
OPERATING & FUTURE
SCIENCE FLEET

space robotics workshop.

IEEE COMPUTER SOCIETY



JULY 28-29, 2025 IEEE SMC-IT/SCC CALIFORNIA SCIENCE CENTER, LOS ANGELES

SPACE-ROBOTS.ORG

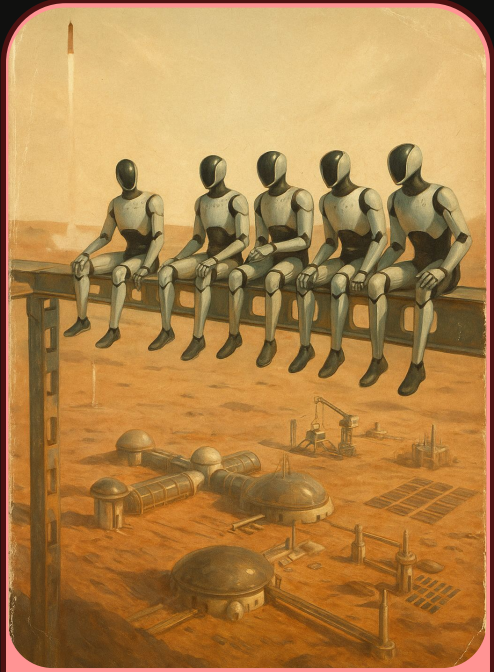
space robotics workshop.

DAY 1

IEEE COMPUTER SOCIETY

Unlocking the Offworld Economy with Robotic Technologies

DAY 1 – 10:30 AM



Mars Settlement Starts with Autonomy and Robotics

DAY 1 – 1:00 PM

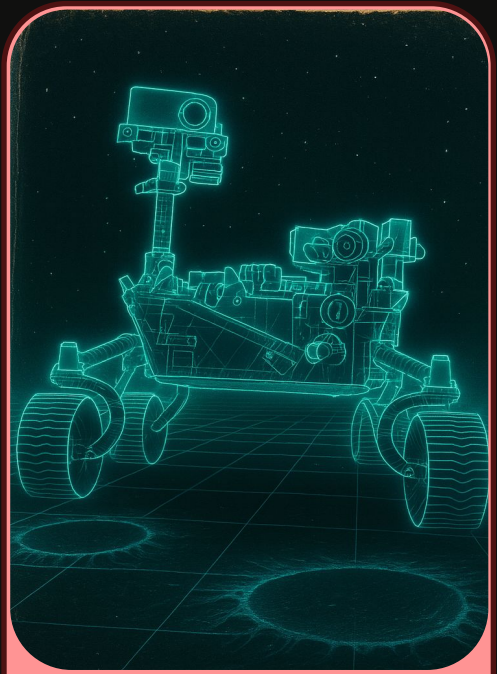
One-Shot Interplanetary Exploration with Software-Defined Systems

DAY 3 – 2:30 PM

space robotics workshop.

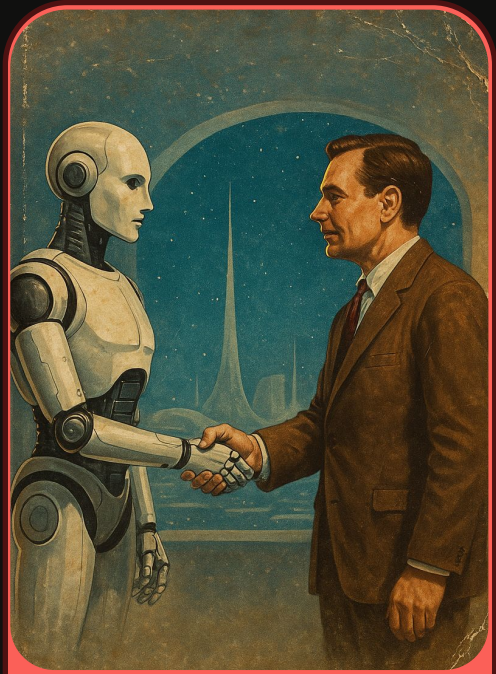
DAY 2

IEEE COMPUTER SOCIETY



High-Fidelity Simulation and Digital Twins for Space Robotics

DAY 2 – 10:30 AM



Special Session Earth and Beyond: The State of Robotics

DAY 2 – 1:00 PM

Spotlight Talks & Best Paper Award

DAY 2 – 2:00 PM

Spotlight Talks

BLOCK 1 – 2:00 PM

(1) **"Experimental Study of Magnetically-Actuated Satellite Swarm: Controllability Extension via Time-Integrated Control with Geometry Learning" –** Yuta Takahashi
(2) **"Validation and Verification of Safety-Critical Aspects of Autonomy in Orbital Robotics" –** Roberto Lampariello
(3) **"Learning Surface and Vertical Mobility for Enceladus Direct Ocean Access" –** Jack Naish
(4) **"Adaptive Science Operations in Deep Space Missions Using Offline Belief State Planning" –** Hailey Warner

Coffee Break (30min)

BLOCK 2 – 3:30 PM

(5) **"Drift-Free Visual Compass Leveraging Digital Twins for Cluttered Environments" –** Jungil Ham
(6) **"A Rigid-Soft Underactuated Tendon-Driven Gripper Prototype for Free-Flying Manipulation" –** Brian Coltin
(7) **"RA-SR: A 16–32-Channel Low-Power FPGA Multi-Protocol ESC Controller for Space Robotics" –** Mohamed El-Hadedy
(8) **"Free-Flying Intra-Vehicular Robots: A Review" –** Jordan Kam

Best Paper Award Announcement

Organizing Committee


Ignacio G. López-Francos
NASA Ames


Alex Sowell
NASA JSC


Brian Coltin
NASA Ames


Kuldeep Rambhai
Redwire


Maggie Wang
Stanford University


Marcel Kaufmann
NASA JPL


Ricard Marsal I Castan
University of Luxembourg


Rob Royce
NASA JPL


Roshan Kalghatgi
NASA Ames

Scientific Committee


Alison Lowndes
NVIDIA


Andy Hock
Cerebras


Animesh Garg
Georgia Tech, NVIDIA, Apptronik


Edward Balaban
NASA ARC


Giuseppe Cataldo
NASA GSFC


Hiro Ono
NASA JPL


Jean-Pierre de la Croix
NASA JPL

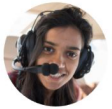

Jennifer Blank
Blue Marble Space Institute of Science


Jennifer Heldmann
NASA ARC


Jonathan Knowles
Former Autodesk, Apple, Adobe


Jonathan Stock
NASA ARC


Katherine Scott
Intrinsic, Open Robotics


Keerthana Gopalakrishnan
Google DeepMind


Kentaro Uno
Tohoku University


Luis Merino
Universidad Pablo de Olavide


Luis Sentis
University of Texas at Austin, Apptronik


Pyojin Kim
Gwangju Institute of Science and Technology (GIST)


Roberto Lampariello
DLR (German Aerospace Center)


Rodrigo Ventura
Instituto Superior Técnico (IST), University of Lisbon


Trey Smith
NASA ARC

softserve

space robotics workshop.

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LET'S BEGIN!

JULY 28-29, 2025 IEEE SMC-IT/SCC CALIFORNIA SCIENCE CENTER, LOS ANGELES

SPACE-ROBOTS.ORG

S01: Unlocking the Offworld Economy with Robotic Technologies

DAY 1 – 10:30 AM

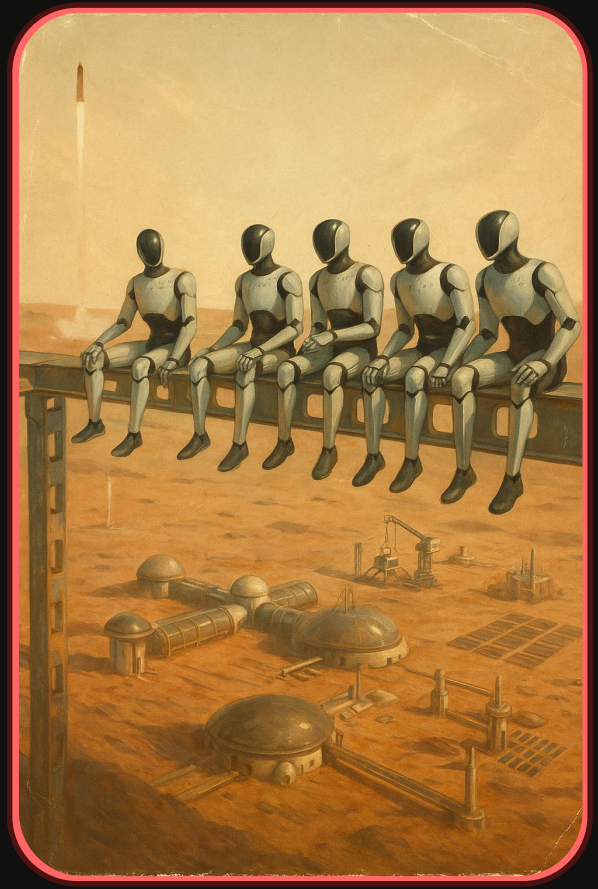
Maggie Wang
Stanford
(Session Chair)

Dennis Wingo
Skycorp

Brian Yamauchi
Starpath

Grace Gao
Stanford

Brice Howard
Sentric Solutions



S02: Mars Settlement Starts with Autonomy and Robotics

DAY 1 – 1 PM

Luis Sentis
U of Texas / Apptronik
(Session Chair)

Ignacio López-Francos
NASA

Pascal Lee
SETI Institute/ Mars Institute

Maruthi R. Akella
U of Texas

S03: One-Shot Interplanetary Exploration With Software-Defined Robotic Systems

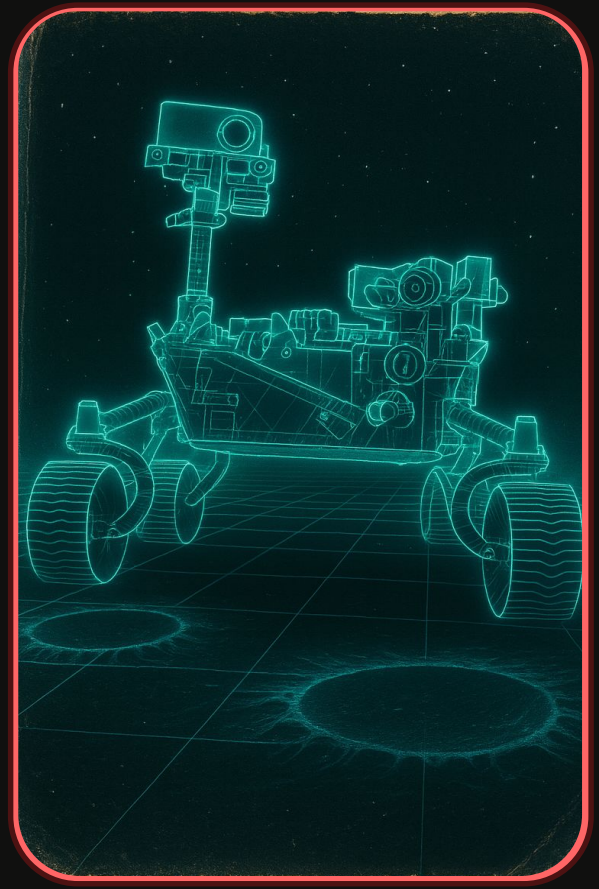
DAY 1 – 2:30 PM

Hiro Ono
JPL
(Session Chair)

Annika Rollock
Aurelia Institute

Lindy Elkins-Tanton
UC Berkeley

Dean Bergman
Honeybee Robotics



S04: High-Fidelity Simulation & Digital Twins for Space Robotics

DAY 2 – 10:30 AM

Lutz Ritz
SoftServe
(Session Chair)

Yue Wang
NVIDIA/ USC

Dan Negrut
Univ. Wisconsin - Madison

space robotics workshop.

IEEE COMPUTER SOCIETY

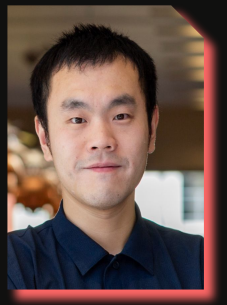
Special Session:
Earth and Beyond: The State of Robotics

DAY 2 – 1 PM

Ignacio López-Francos
NASA
(Session Chair)

Brice Howard
Sentric Solutions

Hiro Ono
JPL



Yue Wang
NVIDIA/ USC