

AURORA

AI-driven University Research for
Orbital Resilience and Autonomy



What should AI in Space become?

Student Introduction • September 17, 2026

USC Viterbi



Before we define the program...

WHAT IS AI?

A chatbot? • A model? • A decision system? • Autonomy? • A robot that learns?

“Give me one sentence. No definitions from Google.”

There is no single simple definition — and that is exactly why this field is interesting.

NASA already uses AI. The question is how far it should go.

NASA's working definition

Systems that can perform complex tasks normally associated with human reasoning, decision-making, learning, perception, planning or physical action.



AI in space is not science fiction.

MARS AUTONOMY

88%

Perseverance driving
reported autonomous

NASA / 2026

EDGE AI

ON ORBIT

Prithvi geospatial
foundation model

NASA / 2026

MISSION AUTONOMY

REAL TIME

event-driven
Autonomous
spacecraft operations

NASA / 2026

DISTRIBUTED SYSTEMS

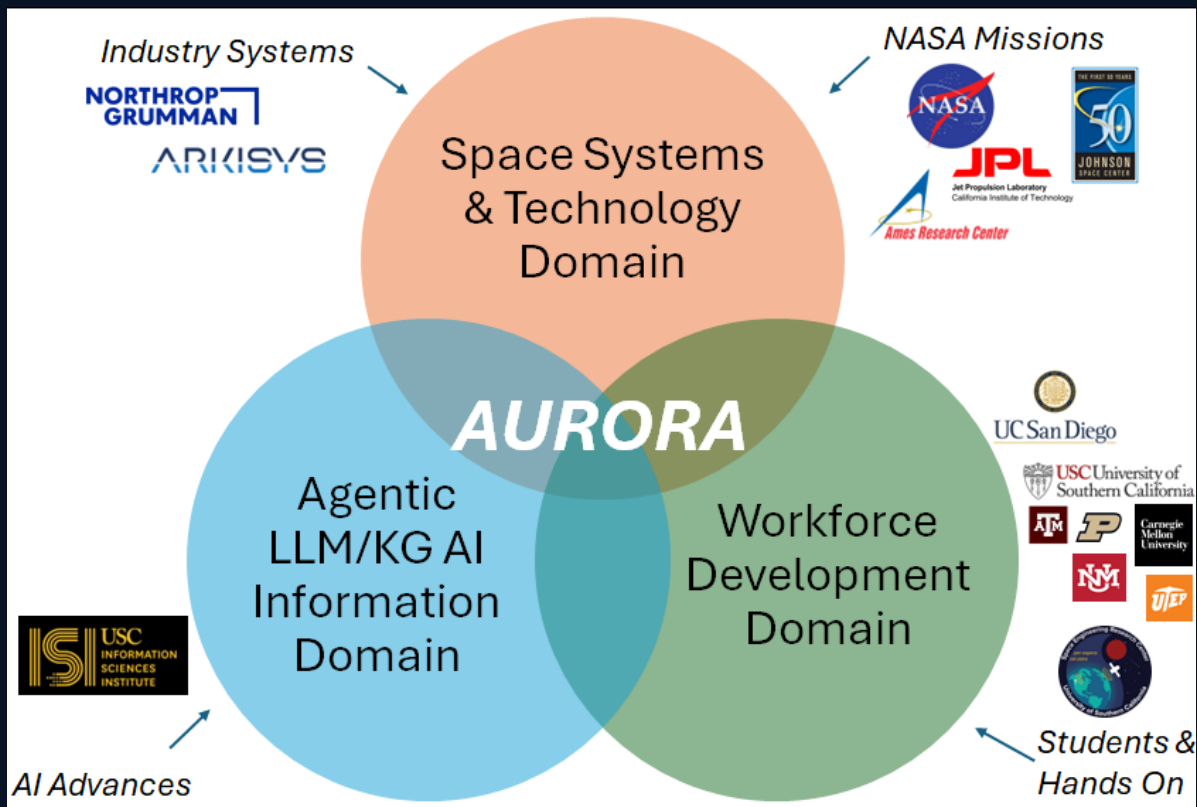
SWARMS

Starling
GPS-independent
navigation demo

NASA / 2026

The technology is moving from analysis → assistance → onboard decisions.

AURORA exists at the intersection of three moving targets.



1 SPACE SYSTEMS

More autonomy. More complexity. Less time to call home...oh my!

2 AI / AGENTIC SYSTEMS

LLMs, knowledge graphs, simulation, RL/ML, edge compute, do we trust agents?

3 WORKFORCE

Engineers must understand both AI and aerospace constraints.

AURORA is a workforce program disguised as a set of hard engineering problems.

The program is designed to move from ideas → hardware → flight.

01

ASK

Can AI predict an event before it happens?

02

MODEL

Turn requirements + data into knowledge.

03

TEST

Use simulation and real hardware.

04

FLY

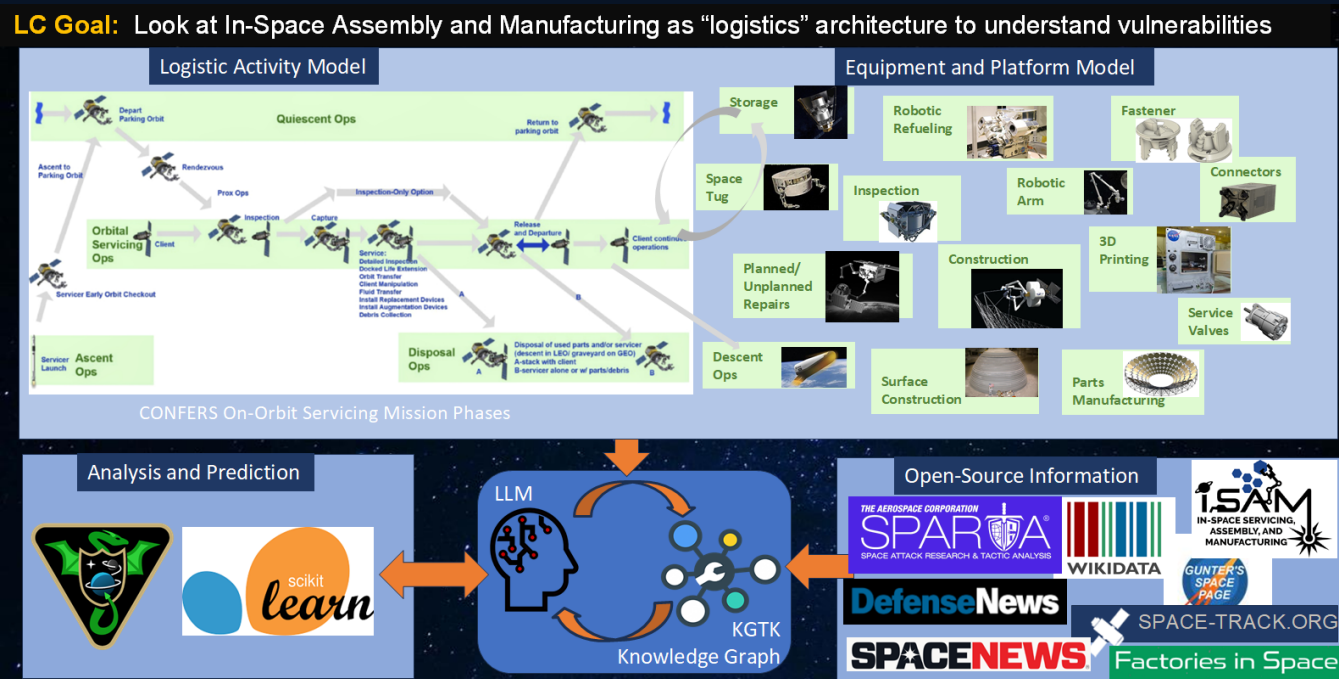
Push selected ideas toward a Flight!

You do not need to arrive as an AI expert.

You need curiosity, engineering discipline, and a willingness to build.

Can AI "read" the engineering record before something goes wrong?

Knowledge graph + agentic reasoning + physics simulation



“Logos Celestia” CONOPS, courtesy SERC

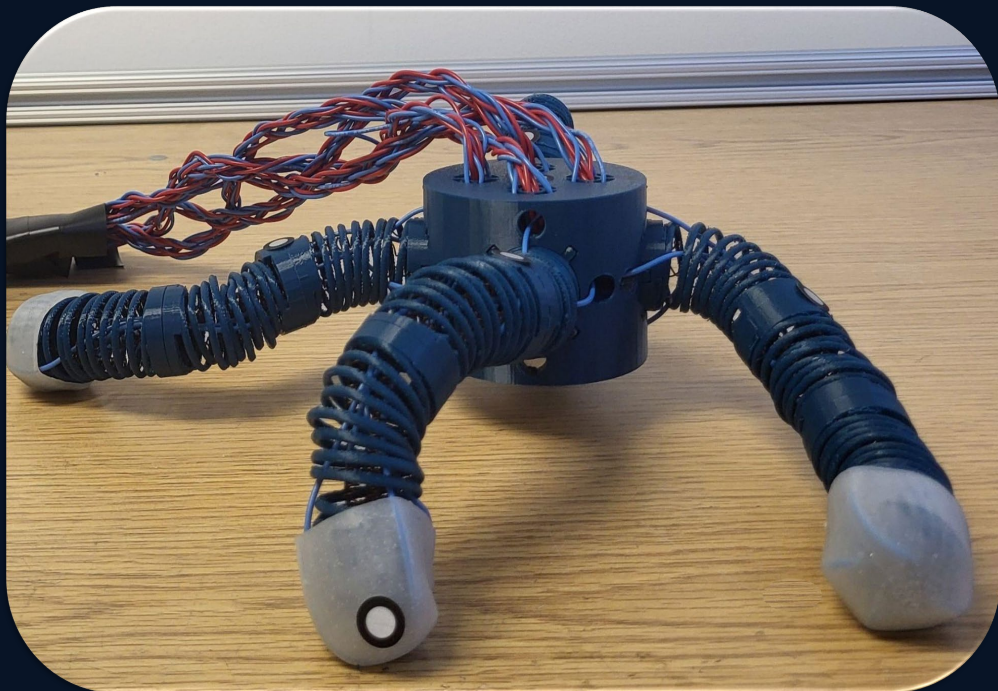
- Requirements and technical-document ingestion
- Design / integration / operational risk assessment
- Simulation-driven trade studies
- Engineer review remains in the loop

STUDENT QUESTION

How do you prove an AI-generated engineering conclusion is traceable?

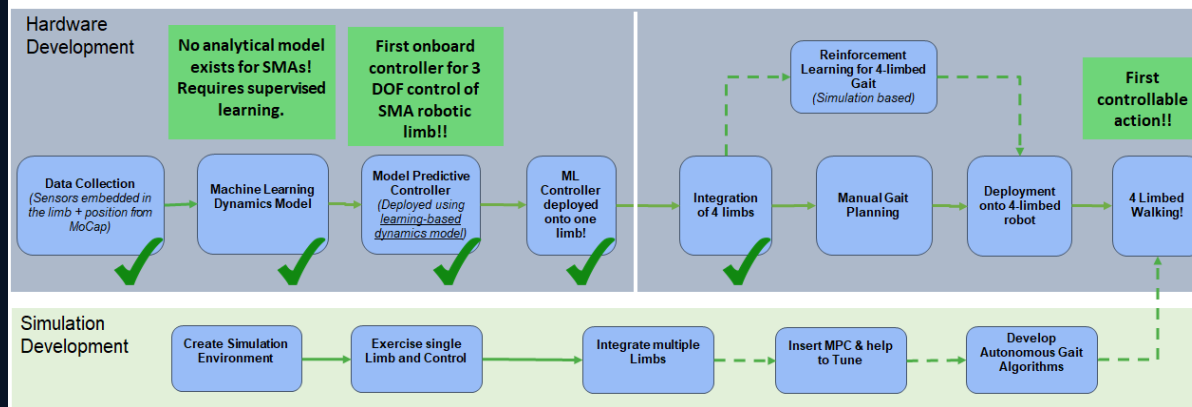
Can a robot learn how to move on a spacecraft it has never seen?

Cyber physical connectivity without saying “use reinforcement learning”?



“STARFISH” prototype robot, courtesy SERC

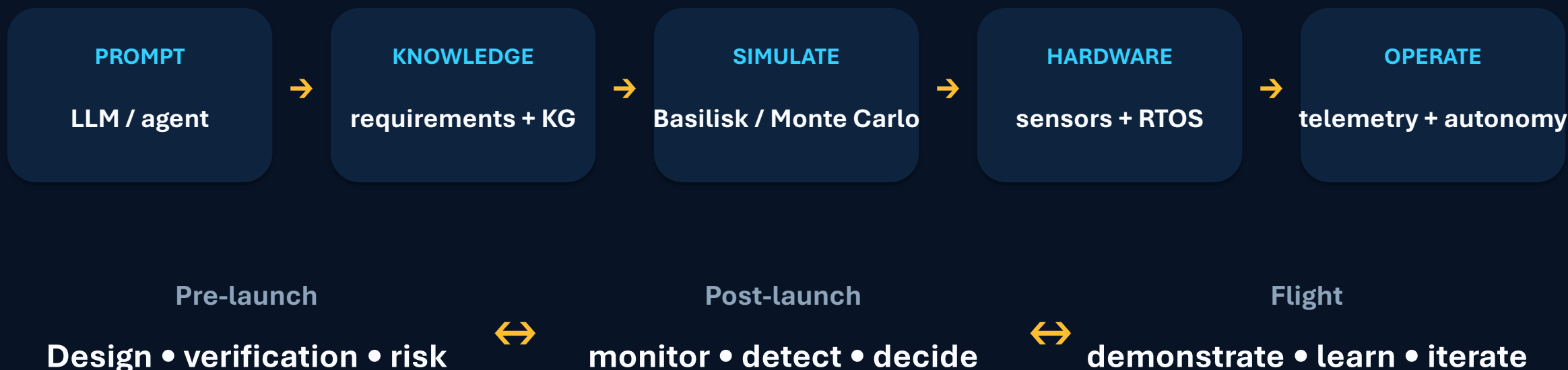
Controls Development Using RL to AI Algorithm



Hardware to Sim to Hardware for Leg to System Gait

How to make learning coexist combining control stability, thermal limits, sensor fusion, navigation, real-time compute and flight safety?

AI has to survive (& thrive & learn) contact with physics.



AURORA's thesis: the workforce needs to understand the whole chain.

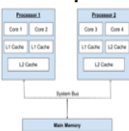
The goal is cyber-physical projects — not lecture-only program.

Application Area

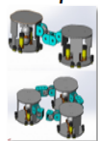
Research Focus Areas

- Spacecraft Engineering

Multi-Core processing



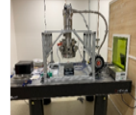
Modular Spacecraft



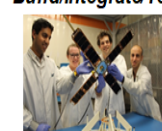
Spacecraft/Payload Design



Propellant-less Maneuver



Faster Build/Integrate/Test



- Ground and Flight Operations

Procedures & training



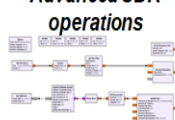
Crew/operator interaction



Tracking Command and Control

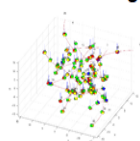


Advanced SDR operations

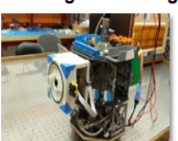


- In-Space Techniques and Activities

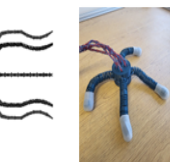
RPO/Sensing



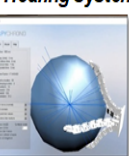
Docking/Connecting



Soft Robotics



Self-Healing systems



- Decision-Space

Design Optimization

Hazard Assessment

Autonomous Decision Processes

MICRO-PROJECTS

Small teams. 4–8 week problems. Real deliverables.

MENTORS

Faculty + researchers + NASA / industry input.

HARDWARE

Air-bearing, robotics, CubeSat, Astrobee pathways.

Possible outputs: code • test data • demos • papers • flight experiment

USC has some unique platforms to test AI in Space projects.



USC SERC Soft Robotics Lab



USC SERC Granite Table w/Astrobee



USC CLINGERS Flight Experiment on ISS

USC will work with UCSD & CA Space Grant Affiliates & Companies to expand Project Workspaces



Our Vision:
To Inspire and Educate the next generation of aerospace scientists, engineers, and managers.

Our Mission:
To Serve as a crosscutting and integration agent in California to bring NASA aerospace-related content and expertise to the educational community and general public.

CaSGC Affiliates & Partners

Lead Institution ●
UCSD-UC San Diego

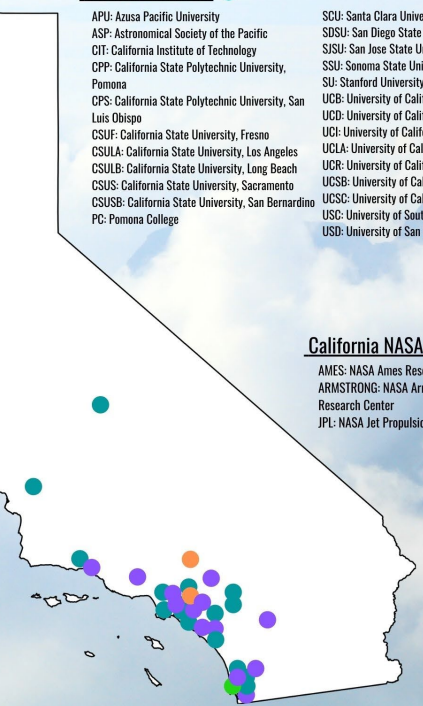
Affiliate Members ●

APU: Azusa Pacific University
 ASP: Astronomical Society of the Pacific
 CIT: California Institute of Technology
 CPP: California State Polytechnic University, Pomona
 CPS: California State Polytechnic University, San Luis Obispo
 CSUF: California State University, Fresno
 CSULA: California State University, Los Angeles
 CSULB: California State University, Long Beach
 CSUS: California State University, Sacramento
 CSUSB: California State University, San Bernardino
 PC: Pomona College

SCU: Santa Clara University
 SDSU: San Diego State University
 SJSU: San Jose State University
 SSU: Sonoma State University
 SU: Stanford University
 UCB: University of California, Berkeley
 UCD: University of California, Davis
 UCI: University of California, Irvine
 UCLA: University of California, Los Angeles
 UCR: University of California, Riverside
 UCSB: University of California, Santa Barbara
 UCSC: University of California, Santa Cruz
 USD: University of San Diego

Community College Partners ●

ARC: American River College
 BC: Butte College
 CERC: Cerritos College
 CC: Citrus College
 CaC: Cabrillo College
 CCC: Contra Costa College
 CDC: College of the Canyons
 COD: College of the Desert
 COM: College of Marin
 CSM: College of San Mateo
 CYP: Cypress College
 EVC: Evergreen Valley College
 GC: Gavilan College
 HC: Hartnell College
 IVC: Irvine College College
 LACC: Los Angeles City College
 MC: Mendocino College
 MSAC: Mt. San Antonio College
 NVC: Napa Valley College
 NC: Norco College
 OCC: Orange Coast College
 PCC: Pasadena City College
 RHC: Rio Hondo College
 SBCC: Santa Barbara City College
 SBVC: San Bernardino Valley College
 SDC: San Diego City College
 SDMC: Miramar College
 SMCC: Santa Monica City College
 SWC: Southwestern College
 VVC: Victor Valley College



California NASA Centers ●

AMES: NASA Ames Research Center
 ARMSTRONG: NASA Armstrong Flight Research Center
 JPL: NASA Jet Propulsion Laboratory

NORTHROP GRUMMAN

AEROSPACE

ARIISYS

LOCKHEED MARTIN

PLANETARY SYSTEMS AI

GALILEO
SPACE IS HERE

NASA Jet Propulsion Laboratory
California Institute of Technology

Ames Research Center

ENGINEERING DIRECTORATE
PLANETARY SYSTEMS

JSC ENGINEERING NASA

Fall 2026: build the conversation before we build the course.

SEP 17 KICKOFF

What is AI in Space?

OCT 29 PROGRAMMING

NASA JPL Simulation

SEP 29 ROBOTICS

NASA JSC Software, Robotics and Simulation Division

NOV 12 INFORMATION USEAGE

NASA JSC Exploration Science, NODS

OCT 6 STRUCTURES

NASA Langley Autonomous Integrated Systems
Research Branch

DEC 03 STUDENTS

Lightning talks + Spring 2027 projects preview

All will be on ZOOM and in SGM 226, 5:30-6:20PM

Spring 2027: turn the seminar into a project-based course.

01

UNDERSTAND

AI/ML, agents,
knowledge graphs,
responsible AI

02

APPLY

NASA requirements,
safety, V&V,
mission operations

03

BUILD

simulation + hardware
micro-project

04

DEMONSTRATE

reviewable result with
engineering evidence

Senior + graduate elective • seminar/project format • NASA/industry guest lectures • team deliverables

Beware! The course should change as fast as the field is changing!

NASA's AI strategy makes the workforce part of the technology.

NASA AI Vision

Harness AI across missions, operations and the workforce — while scaling responsible adoption.

FY26–FY28 strategy themes

innovation • governance • public trust • workforce training

AURORA's role

- Make AI tangible for aerospace students
- Teach verification — not just prompting
- Connect software to hardware constraints
- Create pathways to NASA and industry

Question for the room:

What capability should a NASA engineer graduating in 2027 have that one graduating in 2024 did not?

Your Mission? Pick a question worth spending a semester on.

Can an AI explain why it is wrong?

Can autonomy be certified?

Should an LLM ever command hardware?

What data should stay onboard?

Can AI discover a failure before telemetry limits are crossed?

How do humans stay meaningfully in the loop?

Add yours. The best AURORA projects should start with questions we cannot answer today.

AURORA

**COME HELP DEFINE AI,
IN SPACE!**



Seminars • Micro-projects • Spring 2027 course • Hardware • Potential flight

TODAY'S ASK

Ask a question. Join a seminar. Formulate a micro-project. Develop a new skill.

What should AI in Space become?