

## **Framing Brief:**

**Domain:** Life on Mars

**Main Research Question:** What types of evidence have been used to argue for past or present life on Mars, and how reliable are those indicators?

### **Sub-Questions:**

1. What geological features on Mars are cited as evidence for past habitability or life?
2. What organic molecules have been found on Mars, and what do scientists think they mean?
3. What evidence supports the past or present existence of liquid water on Mars, and how strong is that evidence?
4. What atmospheric measurements are used as potential biosignatures, and what alternative explanations exist?
5. What are the main sources of false positives or misinterpretations for proposed Martian biosignatures?
6. What evidence would be required to more conclusively demonstrate past or present life on Mars?

### **Tasks:**

1. Paper Triage: Contribution | Method | Data | Findings | Limitations
2. Claim–Evidence Extraction: Claim | Direct quote/snippet | Citation (source\_id)

### **Models:**

1. Model A: Gemini 3 Think
2. Model B: Copilot Smart (GPT-5.1)

### **In Scope:**

- Peer-reviewed research papers, mission reports, and reputable scientific reviews related to evidence for past or present life on Mars.
- Studies that evaluate the interpretation, reliability, or uncertainty of these indicators.
- Evidence drawn from Mars missions (e.g., rover, lander, orbiter instruments) and laboratory simulations relevant to Mars conditions.

### **Out of Scope:**

- Speculative science articles without primary data or peer review.
- Engineering details of spacecraft or rover hardware not directly tied to biological or habitability evidence.
- Studies focused primarily on human colonization or future mission design.
- Detection of life on other planets or moons.

### **Test Cases:**

- Paper Triage
  - Paper A: DesMarais2014\_HabitableMars: Survey/review of geological and mission evidence for past habitable environments on Mars.
  - Paper B: Rucker2021\_EridaniaLake: Modeling study of hydrothermal vent habitability in the Eridania basin.
- Claim–Evidence Extraction
  - Paper C: Lacy2006\_MethaneMars: Discussion of methane detections in the Martian atmosphere and associated uncertainties.
  - Paper D: Kite2025\_Carbonates: Modeling and rover-based evidence for carbonate formation and intermittent liquid water on Mars.