

Delegating decision making to the computer in Science

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Changes in the night sky

A vibrant, multi-colored nebula or supernova remnant is positioned on the left side of the image, radiating outwards from a central bright point. The colors transition from deep reds and purples to bright yellows and blues. The background is a dark, star-filled space, with numerous small, glowing blue and white stars of varying sizes scattered across the dark void.

Stellar Explosion

S



5 Units

Hawaii (x2), Chile, South Africa, Canaries



1 Billion
visible sources



10 Million
Differences per night

Legacy Survey of Space and Time

Data
x100

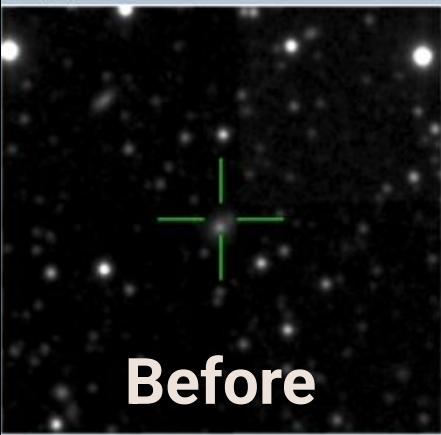


Why we delegate

1. **Data Volume** (inc. dimensionality)
2. **Time Pressure**
- ...
3. **Both!**

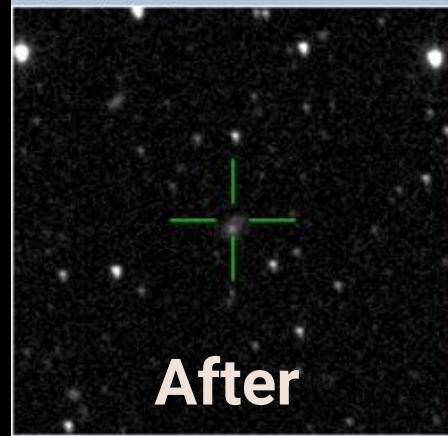
How we delegate...

ref (o) mjd: 60548.20795



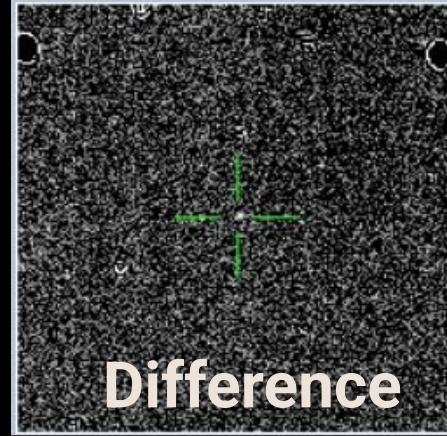
Before

target (o) mjd: 60548.20795



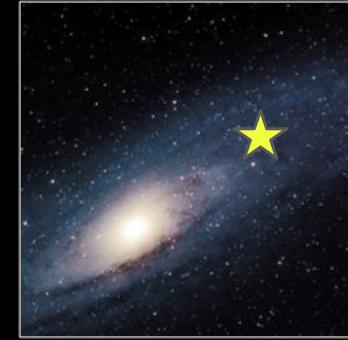
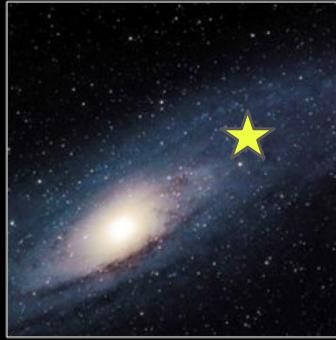
After

diff (o) mjd: 60548.20795



Difference

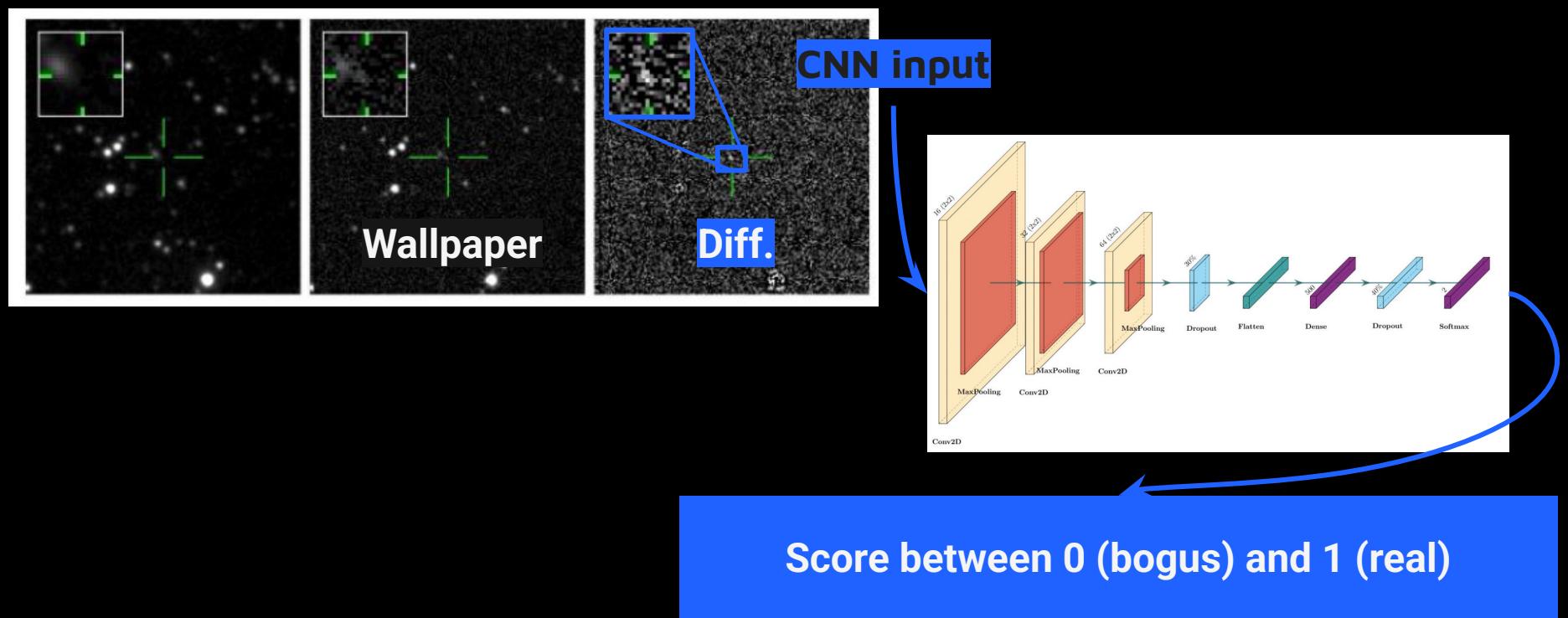
How we delegate:
1. DATA PROCESSING



AGN

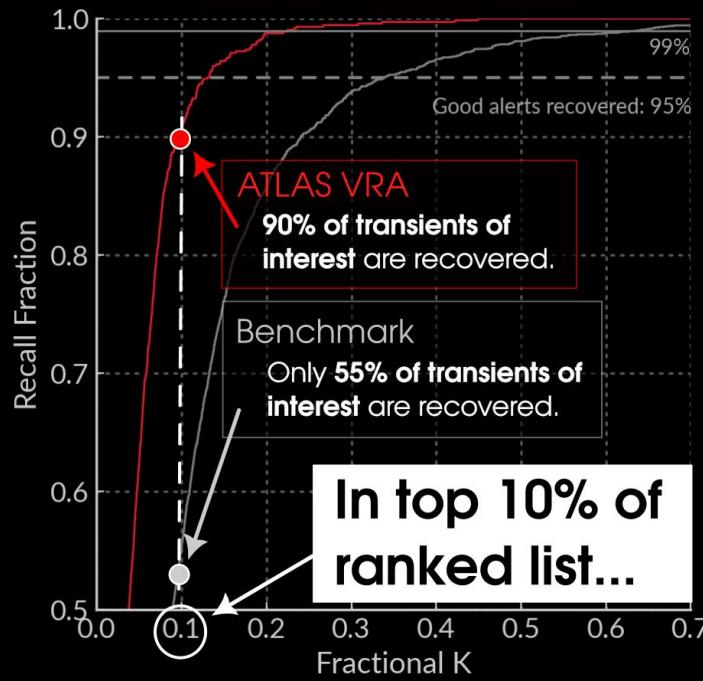
The transient is synonymous with [SDSS J054724.7+003734.9](#); a J=16.31 mag AGN found in the SDSS/GAIA/PS1/MASS catalogues. It's located 0.5" from the AGN core.

How we delegate: 2. BASIC STATS & CONDITIONS



How we delegate:
3. COMPUTER VISION

$<0.2 \rightarrow \text{Garbage}$



How we delegate: 4. RANKING ALGORITHM

Writing Code

ChatGPT 5.2 ▾

Correct solution: single source → generate the other

Step 1: Decide the source of truth

Pick one:

- ✓ `lvra_env.yml` (common in science)
- ✗ both (guaranteed pain)

Assume: `lvra_env.yml` is the source of truth.

Step 2: Auto-sync versions into `pyproject.toml`

Add a small script, e.g. `scripts/sync_versions.py`:

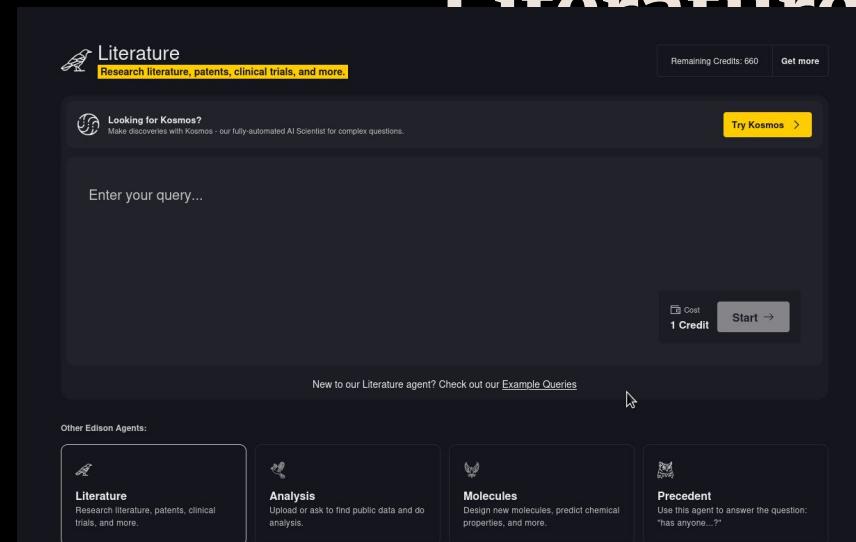
```
python                                ⌂ Copy code

from pathlib import Path
import re

env_file = Path("lvra_env.yml")
toml_file = Path("pyproject.toml")
```

How we delegate: 5. Large Language Models

Searching Literature



The screenshot shows the Edison AI platform's Literature agent interface. At the top, it says "Remaining Credits: 660" and "Get more". Below that is a "Try Kosmos" button. The main area has a "Literature" section with the sub-instruction "Research literature, patents, clinical trials, and more." It features a search bar with the placeholder "Enter your query...". Below the search bar are buttons for "Cost" (1 Credit) and "Start". A message at the bottom says "New to our Literature agent? Check out our Example Queries". At the bottom, there's a section for "Other Edison Agents" with four cards: "Literature" (Research literature, patents, clinical trials, and more.), "Analysis" (Upload or ask to find public data and do analysis.), "Molecules" (Design new molecules, predict chemical properties, and more.), and "Precedent" (Use this agent to answer the question: "Has anyone...?").

How we delegate

1. Data Processing
2. Basic Stats and Conditions
3. Computer Vision
4. Ranking Algorithm
5. Large Language Models

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1. Data Processing
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Increasing
Complexity

The Problems

Tech Debt

How hard will it be to maintain a tool/pipeline/method?

Intellectual Debt

How much skill and information do you forsake?

Sovereignty

How much data and skill is controlled by someone else?

Science is

Reproducible

Falsifiable

Aware of biases

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Aware of biases

Our shared responsibility

My research ethics

1. Software is only open if the data is open

Especially when training algorithms, data is everything, including the way that data has been cleaned and handled.

My research ethics

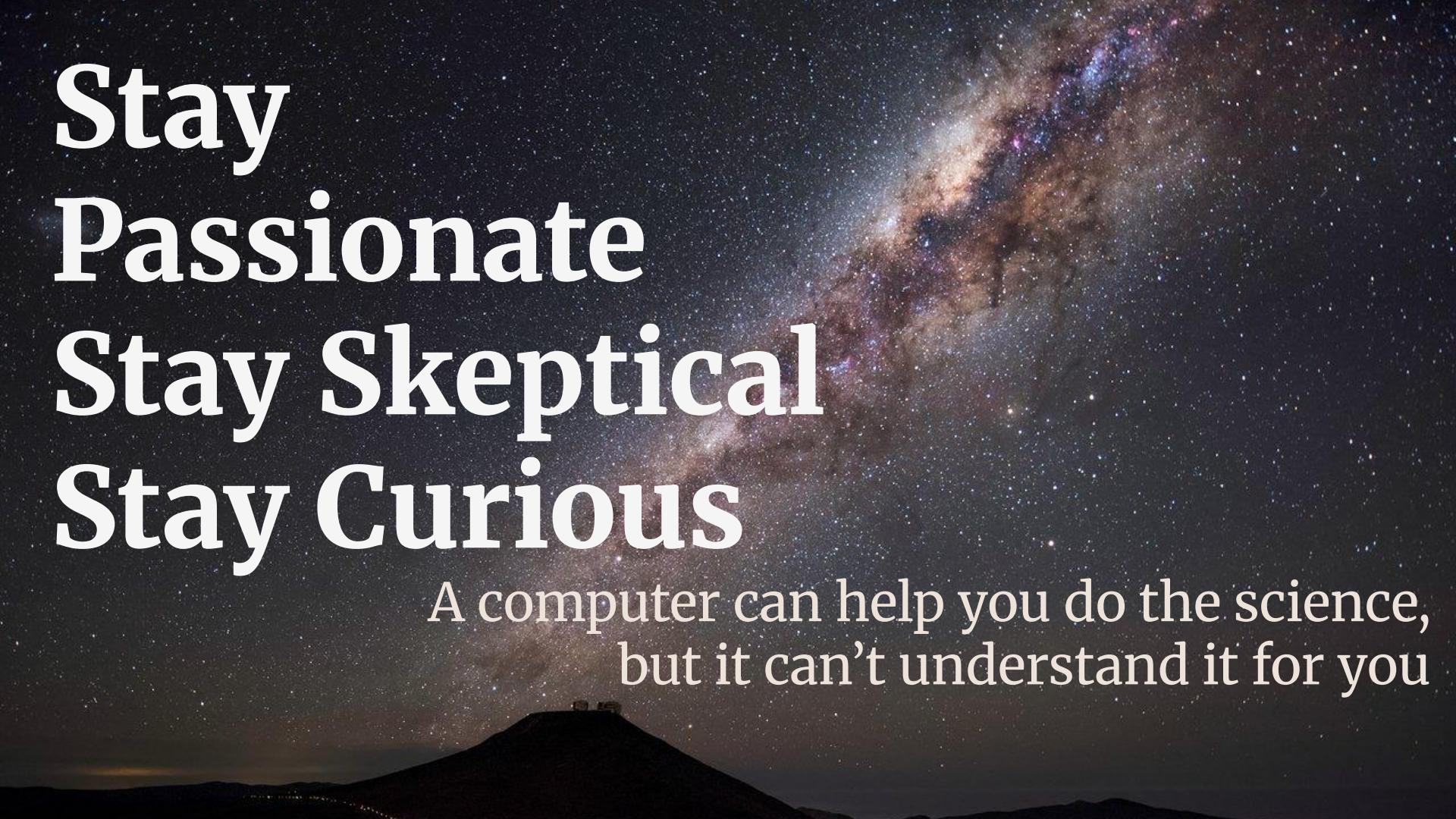
2. Use the simplest solution that works

Whenever we create a new tool and add it to our scientific process, that tool has to be maintained and updated (tech debt) but it also has to be understood so that the data that it generates or currates is understood with all its caveats (intellectual debt). The more complex the algorithms, the fewer people understand it, making it harder to ensure scientific rigour. To minimise this issue, I will always use the simplest tool/algorithm that produces sufficient performance for success.

My research ethics

3. If it works but I don't understand it, *it does not work*

Complex methods have a lower barrier to entry for non-specialists now because they are more user friendly and LLMs like Chat gpt or Claude can help get code that runs without it being understood. It can be tempting to apply a new complex algorithm especially if it looks like it works, but as scientists we have to test our tools thoroughly and we cannot do that if we do not understand them or their caveats.



Stay
Passionate
Stay Skeptical
Stay Curious

A computer can help you do the science,
but it can't understand it for you