

Real-time Discovery of Near-Earth Objects via Accelerated Image Analysis with AI Methods

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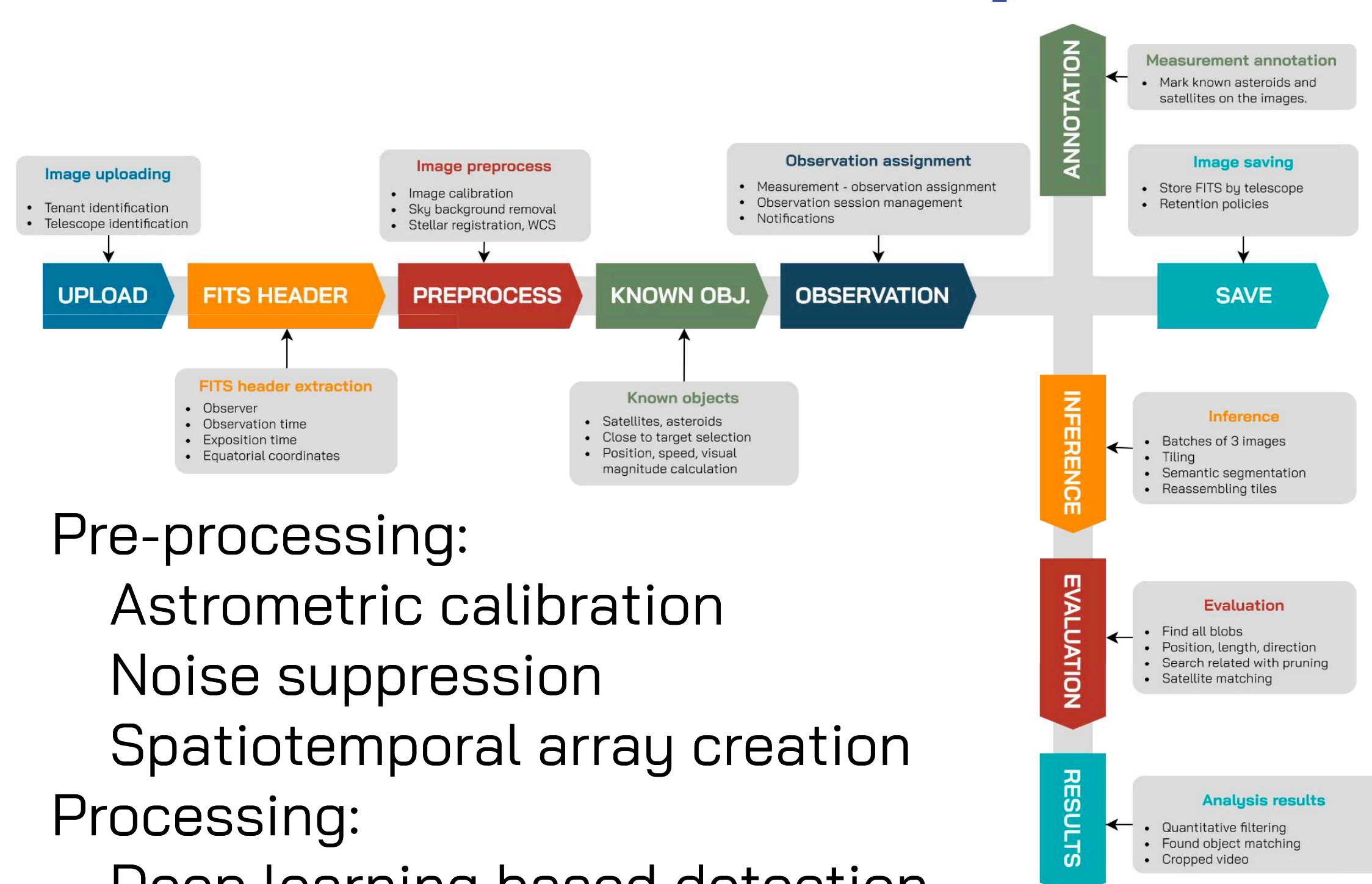
The Challenge

Enhance the detection capabilities of very faint streaks of NEOs - including both natural objects and artificial ones (satellites, rocket bodies, space debris) - within a real-time detection framework.

The Solution

Our pipeline is purposefully optimized to deliver high performance in both cloud-based environments and edge architectures, enabling onboard processing directly on satellites or spaceborne platforms without the dependency on ground based data transmission, thereby supporting autonomous decision-making in orbital environments.

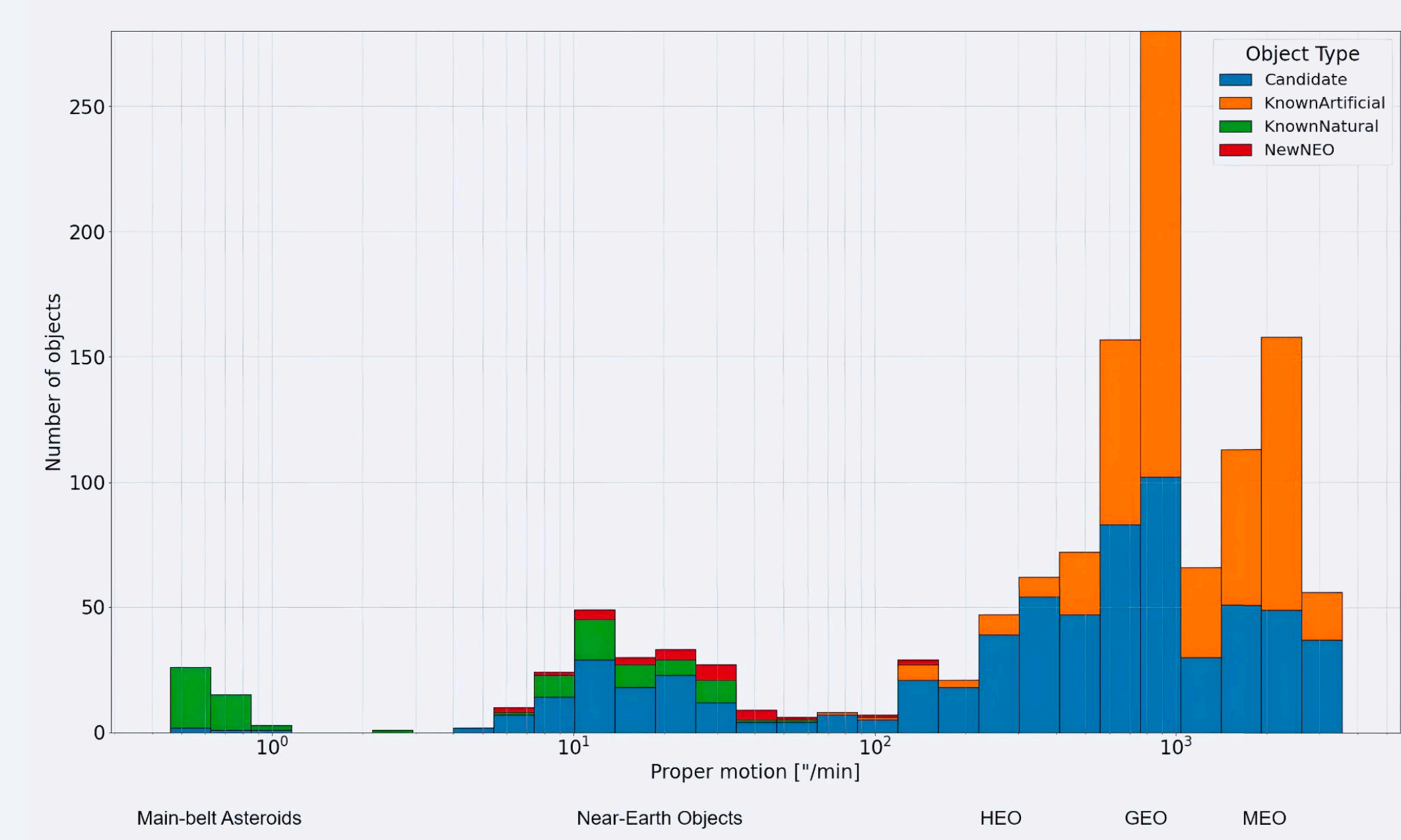
The NEODetect Pipeline



- Pre-processing:
 - Astrometric calibration
 - Noise suppression
 - Spatiotemporal array creation
- Processing:
 - Deep learning based detection
- Post-processing:
 - False positive suppression
 - Candidate validation

Key Results & Impact

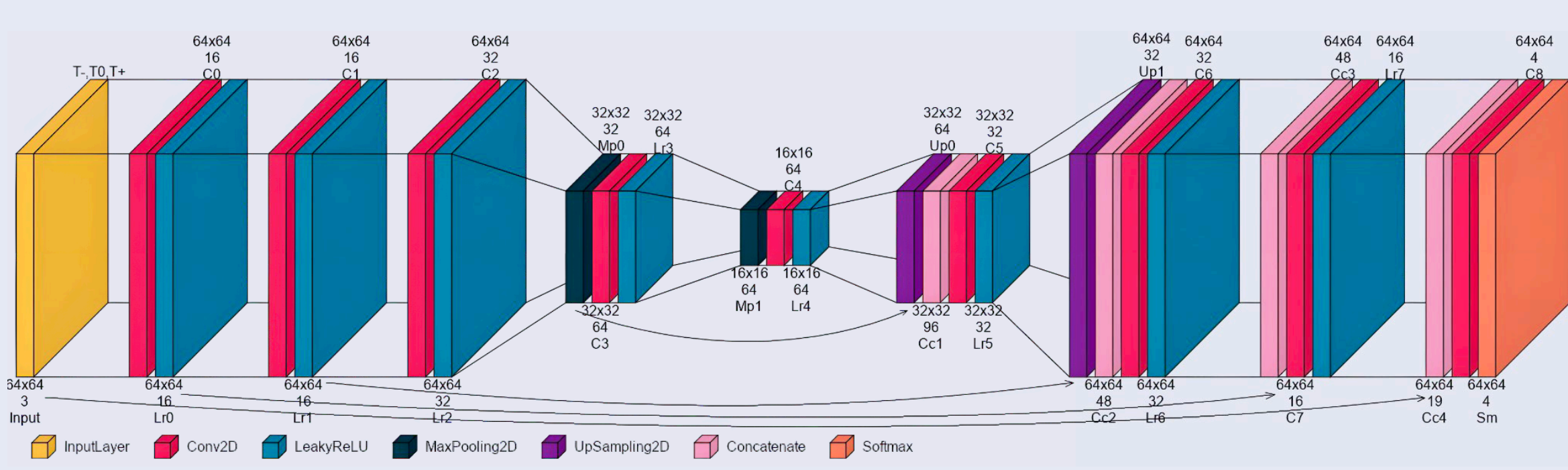
Real-time system allows for rapid alerting, crucial for planetary defense



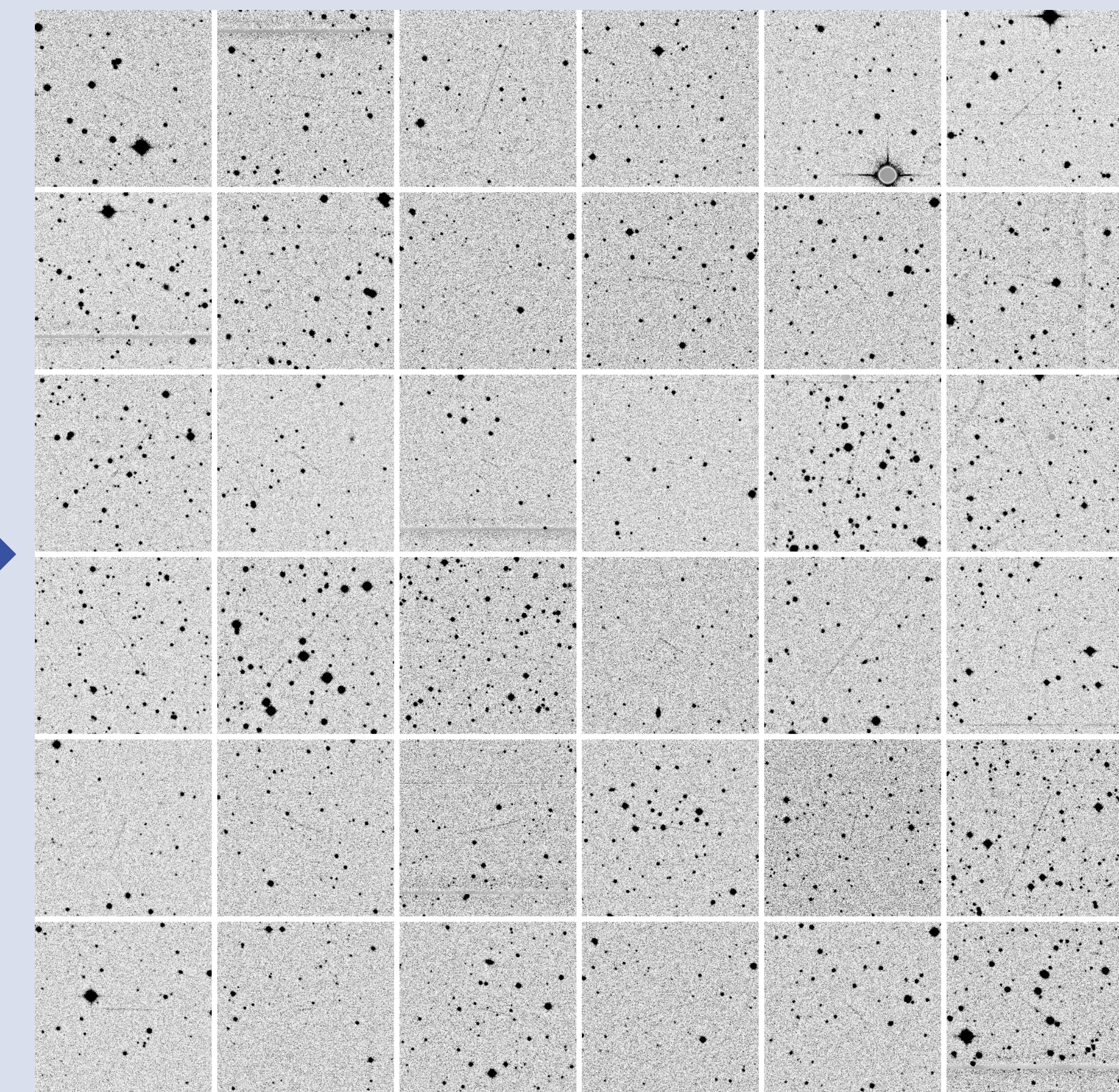
NEODetect identified thousands of objects during the evaluation period. These findings underscore its dual utility in both planetary defense and space domain awareness.

How NEODetect Works

AI model trained on real- and synthetic data enables robust detection of faint, fast-moving NEOs:
23,952 tiles
31,723,000 synthetic examples

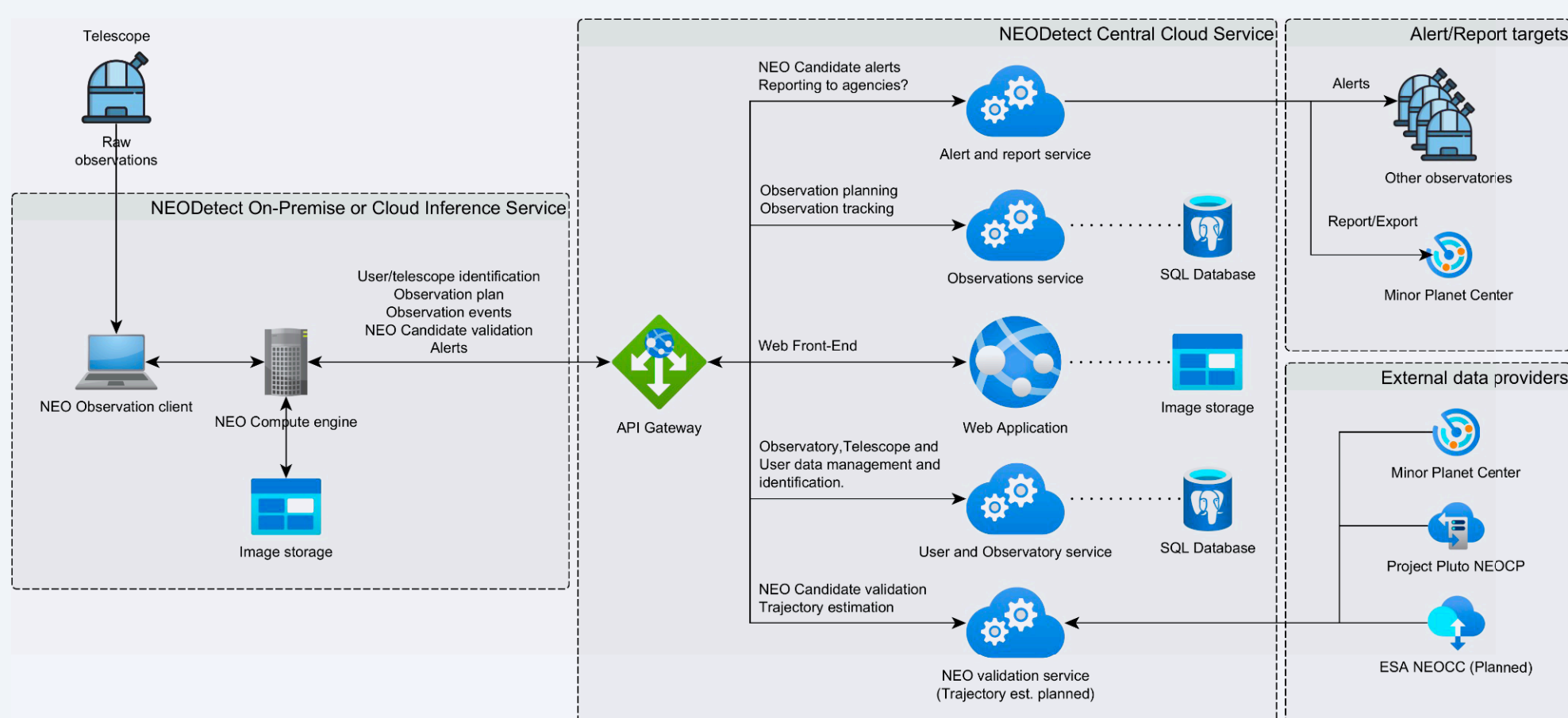


- Spatiotemporal detection
- Integrated noise reduction
- False positive suppression
- Candidate validation



System Overview

- On-premise observatory component
- Cloud-based central service
- Bridge to external systems
- Observation data storage
- Automatic processes



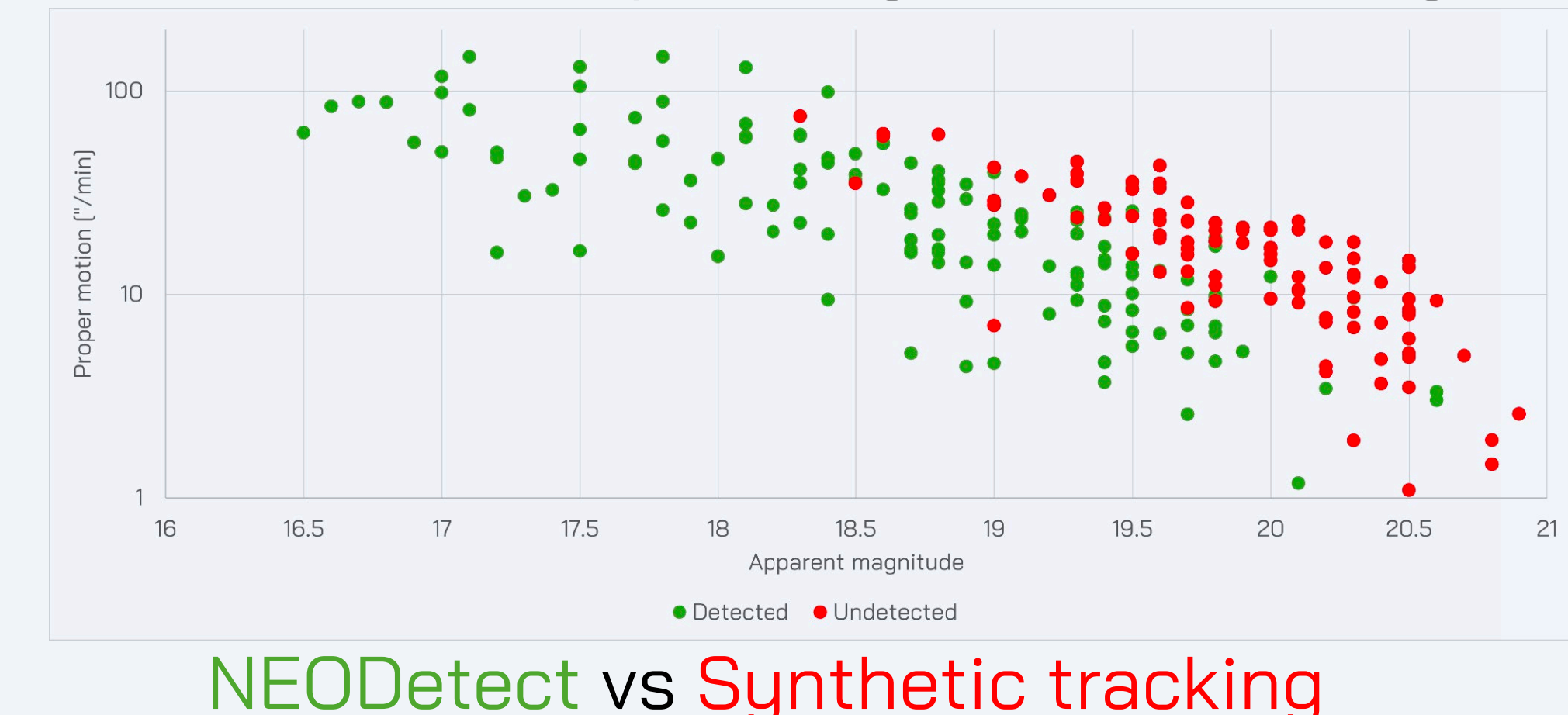
Why use NEODetect?

- Excellent detection performance
- Reduced false positives
- Automatic pipeline
- Available as a web service
- 50x less resource consumption
- 3x lower frame requirement
- Scanning 3x larger sky area per night



Comparison

NEODetect can integrate synthetic tracking
NEODetect can replace synthetic tracking



Our test period confirms that NEODetect's wide-field prioritization strategy increases short-term impact risk consequence mitigation compared to synthetic tracking-dominated surveys. This paradigm shift aligns with the time-critical nature of planetary defense, where rapid all-sky coverage outweighs the exhaustive depth-of-search optimizations.

Service & Access

Future Directions

- Internal orbit determination
- Integration with global NEO databases
- Expansion to new observatories
- Demonstrate operation on RH devices

Contact

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