OSCARS
Open Science Clusters' Action for Research & Society

Funded Project

The Astronomy Dark Matter Test Science Project

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Implemented by

The Open University

Funded by the European Union

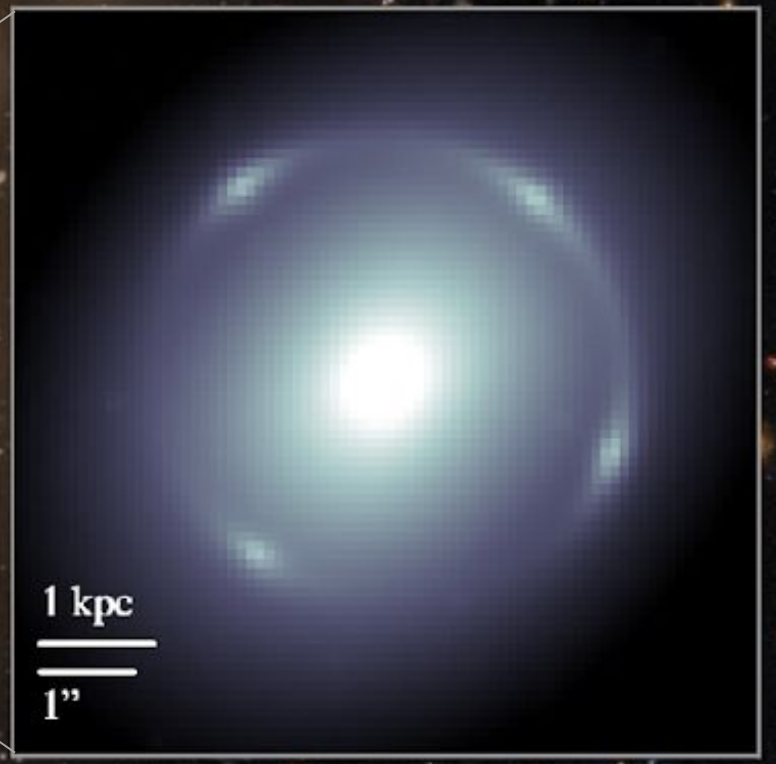
CHALLENGE ADDRESSED

What problem(s) are you going to solve?

Dark matter: perhaps the most pressing unknown in fundamental physics

All dark matter evidence is from astronomy

Lack of shared tools or services for astronomers to interpret high-energy and astroparticle dark matter detection experiments, & vice versa



O'Riordan+25 Astronomy & Astrophysics 694, A145

SOLUTION

Documentation: Astronomers' guide to DM direct detection

Advanced tools for gravitational lensing with Euclid and Vera C Rubin Observatory

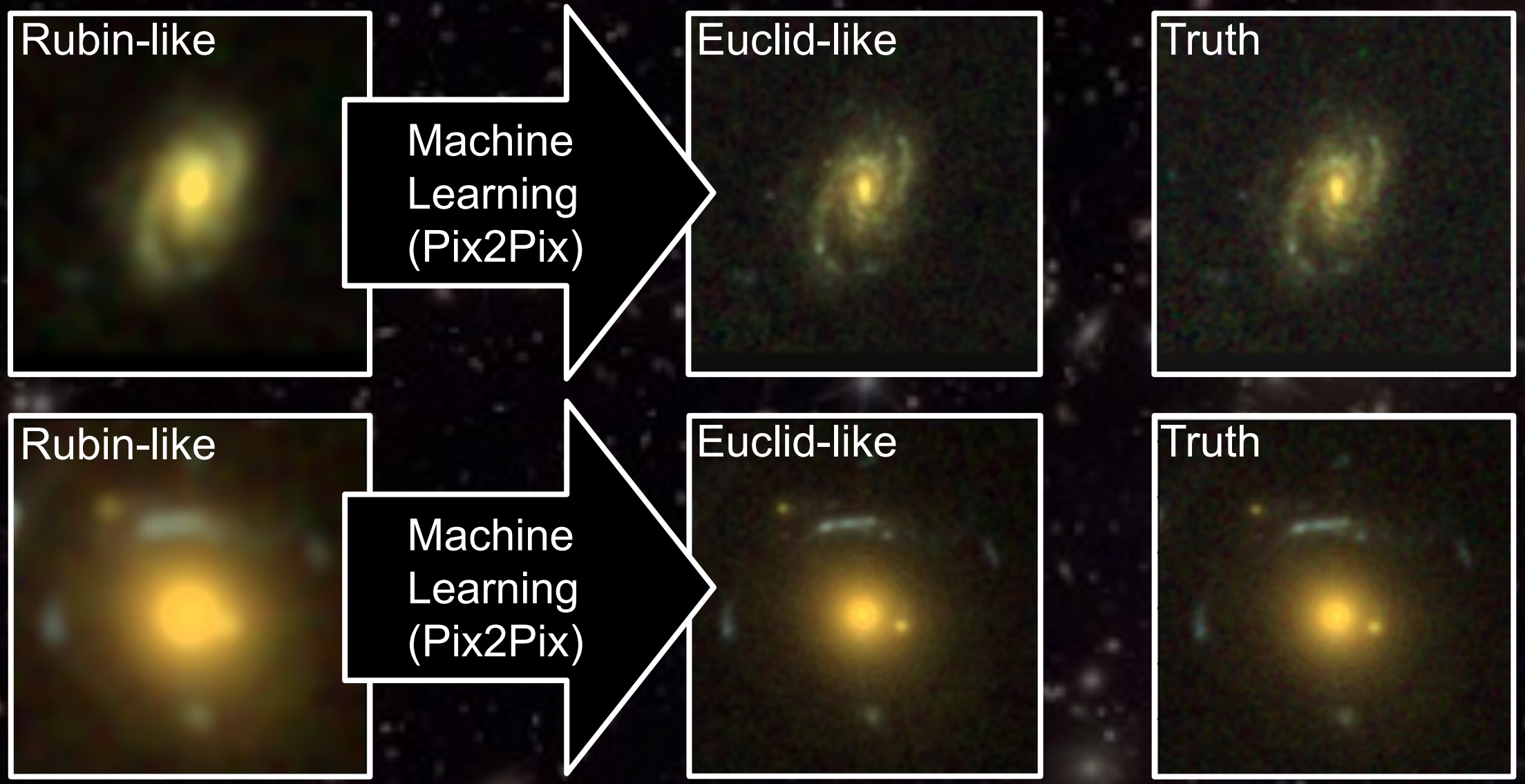
All underpinned by ESCAPE services ensuring FAIR principles

ESCAPE DIOS | Data Infrastructure for Open Science

ESCAPE ESAP | ESFRI Science Analysis Platform

Findable Accessible Interoperable Reusable

RESULTS



Astrophysics > Cosmology and Nongalactic Astrophysics

[Submitted on 26 Sep 2025 (v1), last revised 26 Feb 2026 (this version, v2)]

Overview of the ESCAPE Dark Matter Test Science Project for Astronomers

James Pearson, Hugh Dickinson, Sukanya Sinha, Stephen Serjeant

The search for dark matter has been ongoing for decades within both astrophysics and particle physics. Both fields have employed different approaches and conceived a variety of methods for constraining the properties of dark matter, but have done so in relative isolation of one another. From an astronomer's perspective, it can be challenging to interpret the results of dark matter particle physics experiments and how these results apply to astrophysical scales. Over the past few years, the ESCAPE Dark Matter Test Science Project has been developing tools to aid the particle physics community in constraining dark matter properties; however, ESCAPE itself also aims to foster collaborations between research disciplines. This is especially important in the search for dark matter, as while particle physics is concerned with detecting the particles themselves, all of the evidence for its existence lies solely within astrophysics and cosmology. Here, we present a short review of the progress made by the Dark Matter Test Science Project and their applications to existing experiments, with a view towards how this project can foster complementary with astrophysical observations.

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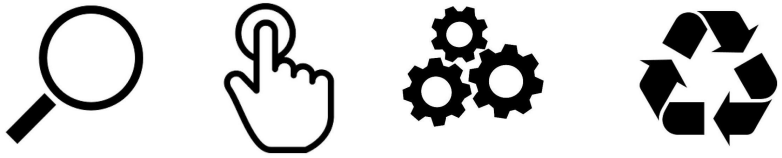
SUSTAINABILITY

- All data used and created will be FAIR-compliant, and all resulting digital objects (data, metadata and software) will be hosted ultimately in the EU EOSC Node, to allow both sustainable re-use and (where possible) reproducibility of the project results, benefitting all three of the astronomy / astroparticle / particle physics communities, and creating exemplars of widespread EOSC adoption
- Joint Euclid/Rubin Derived Data Products are the top joint priority of the facilities; filling this need for strong gravitational lenses will have an enormous science impact in lens discovery and dark matter characterisation

SUSTAINABILITY

OSCARS

Findable Accessible Interoperable Reusable



Data

Metadata

Software

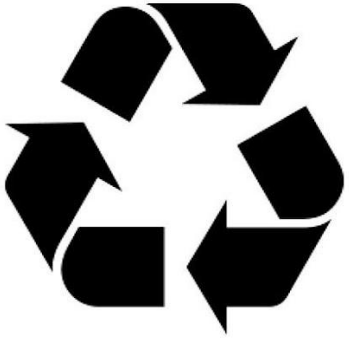
eosc

EOSC Node | European Commission

esa euclid

VERA C. RUBIN OBSERVATORY

TOP JOINT PRIORITY:
Euclid/Rubin Derived Data Products



Sustainable re-use

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