# Expert-in-the-loop Systems Towards Safety-critical Machine Learning Technology in Wildfire Intelligence

*Proposal Track*


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**NeurIPS 2020 Workshop**:
Tackling Climate Change with Machine Learning

# Problem Definition

## motivation

- with the advent of climate change, wildfires are becoming more frequent and severe across several regions worldwide and we need to prevent and mitigate its devastating effects;

## challenges

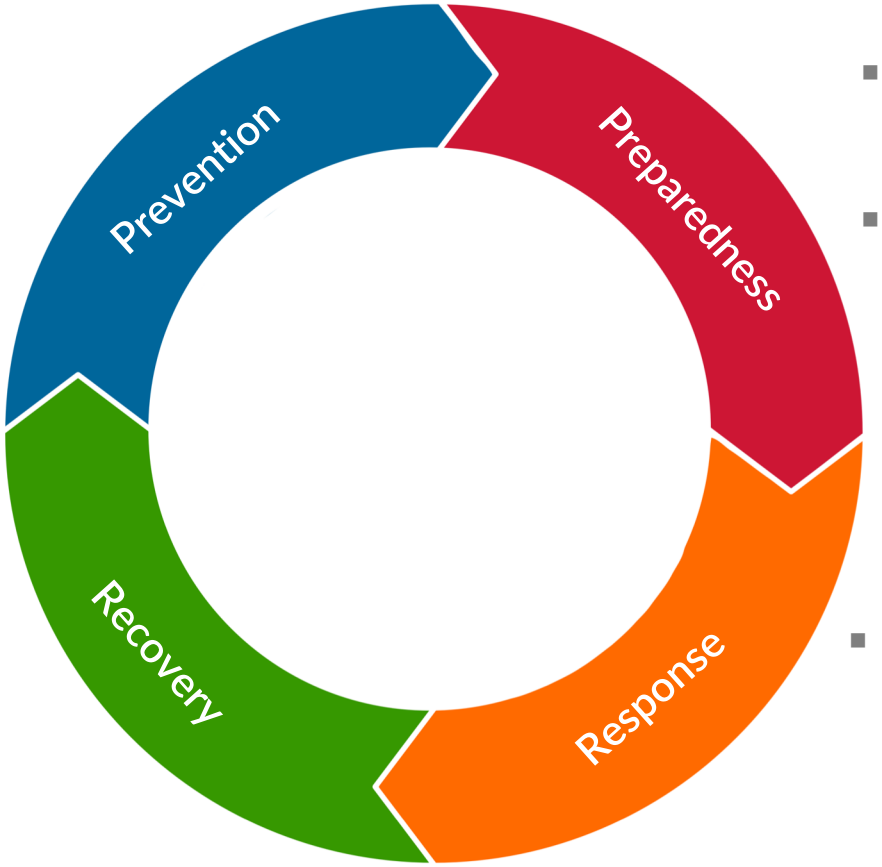
- processing of **large amounts of data** requires increasing levels of automation;
- lack of large-scale datasets with curated data that is relevant for wildfire science and wildfire operations, which limits performance and practical relevance of machine learning (ML) solutions;

## question

- how to address **wildfire management needs** with **ML**?

# Image-based Wildfire Management Tasks

- vegetation management to reduce fire severity such as: fuel mapping, or tracking of vegetation fuel moisture content.




- risk assessment concerning environmental conditions;
- risk mapping based on land-use and social patterns;

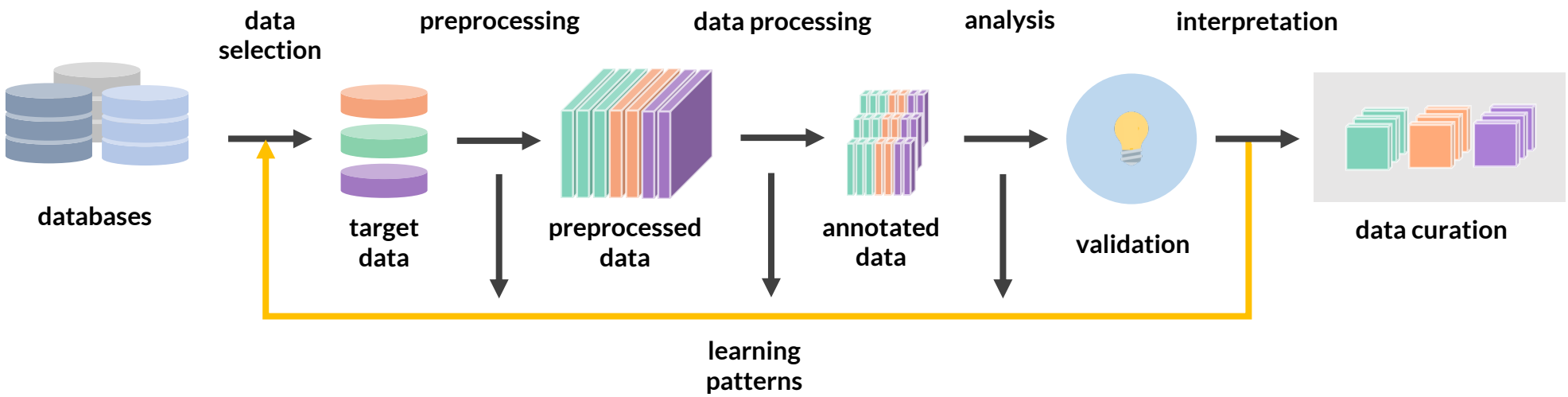
- post-event analyses, e.g. burned area mapping,
- evaluation of cascading effects, e.g. erosion risks and air-quality estimation;

- wildfire detection and monitoring, e.g., early identification of flames and smoke plume, mapping of the fire front(s), detection of spot fires and identification of hot spots;

# Addressing Wildfires with Machine Learning

**PROBLEM:** how to address **wildfire management needs** that require processing of **large amounts of data**?

**SOLUTION:** we can **build pipelines** to (1) enable large-scale datasets, and (2) include relevant annotation



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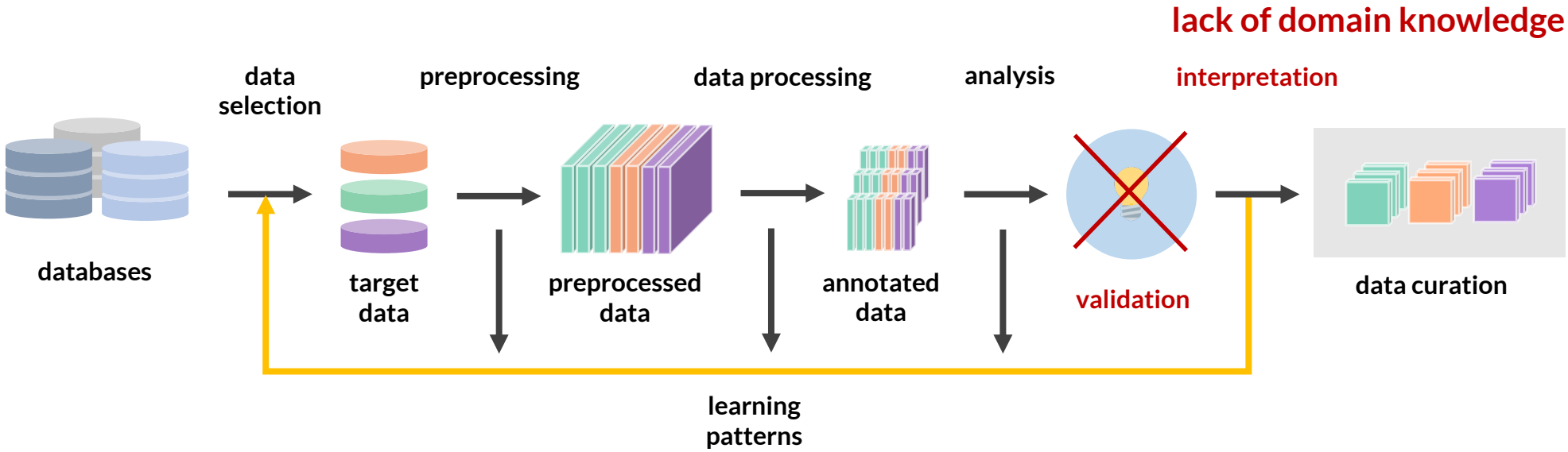
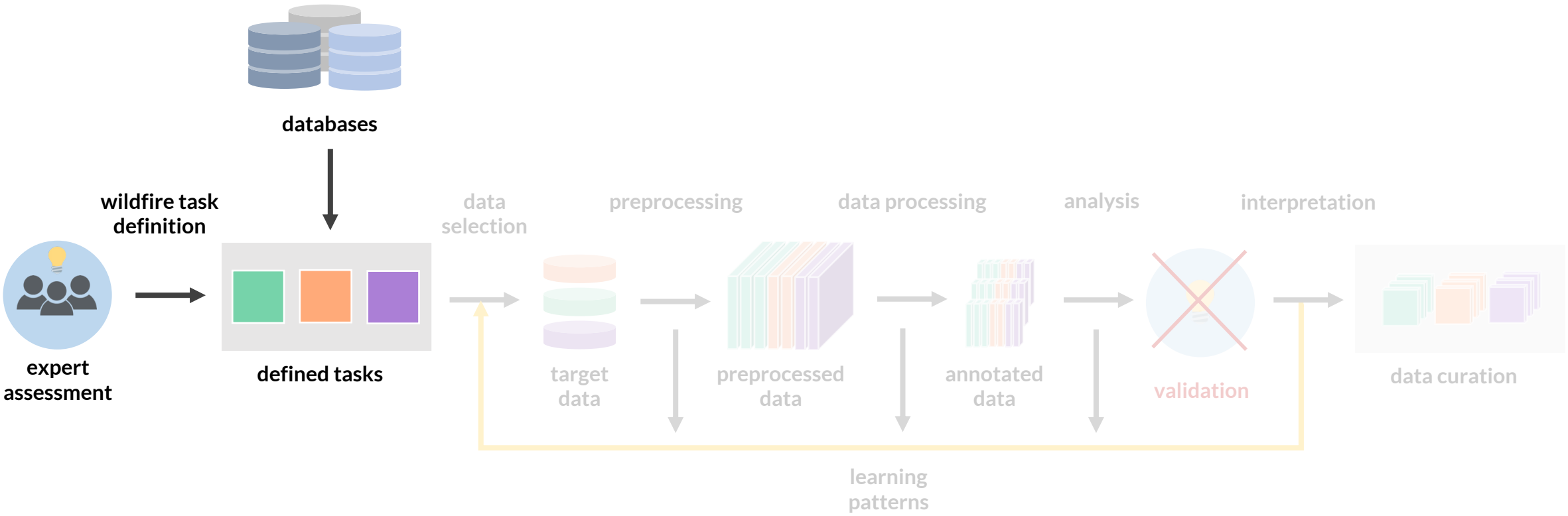
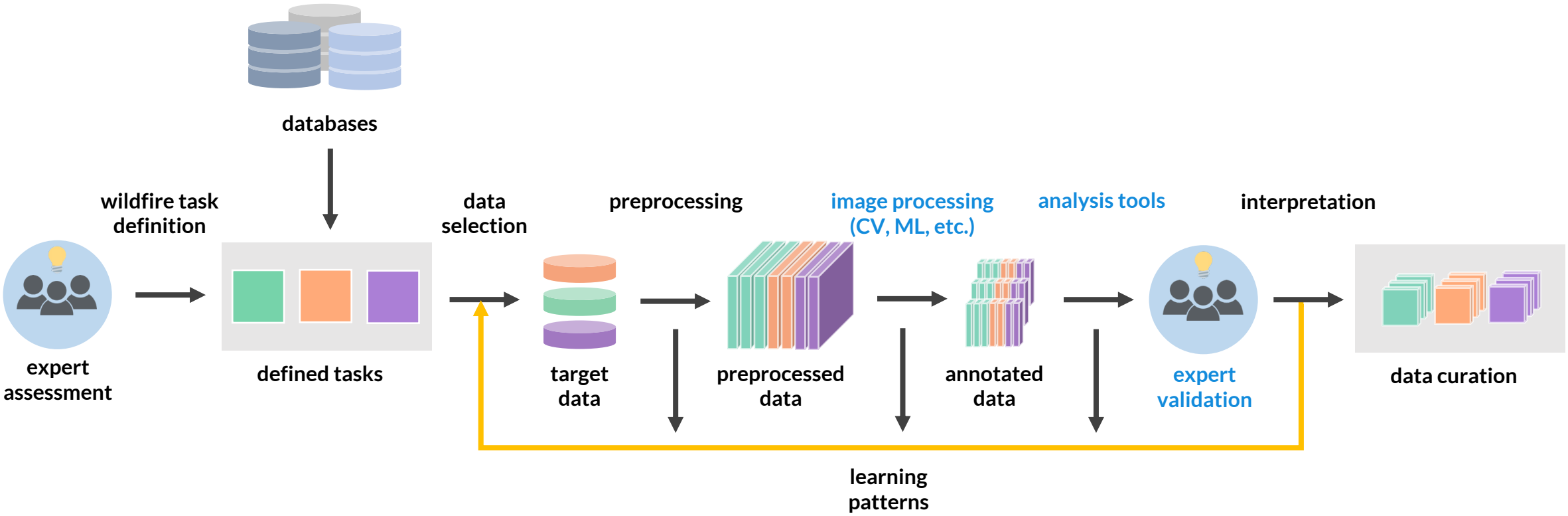


# Bridging the gap between ML and fire domain experts



# Expert-in-the-loop systems for data curation



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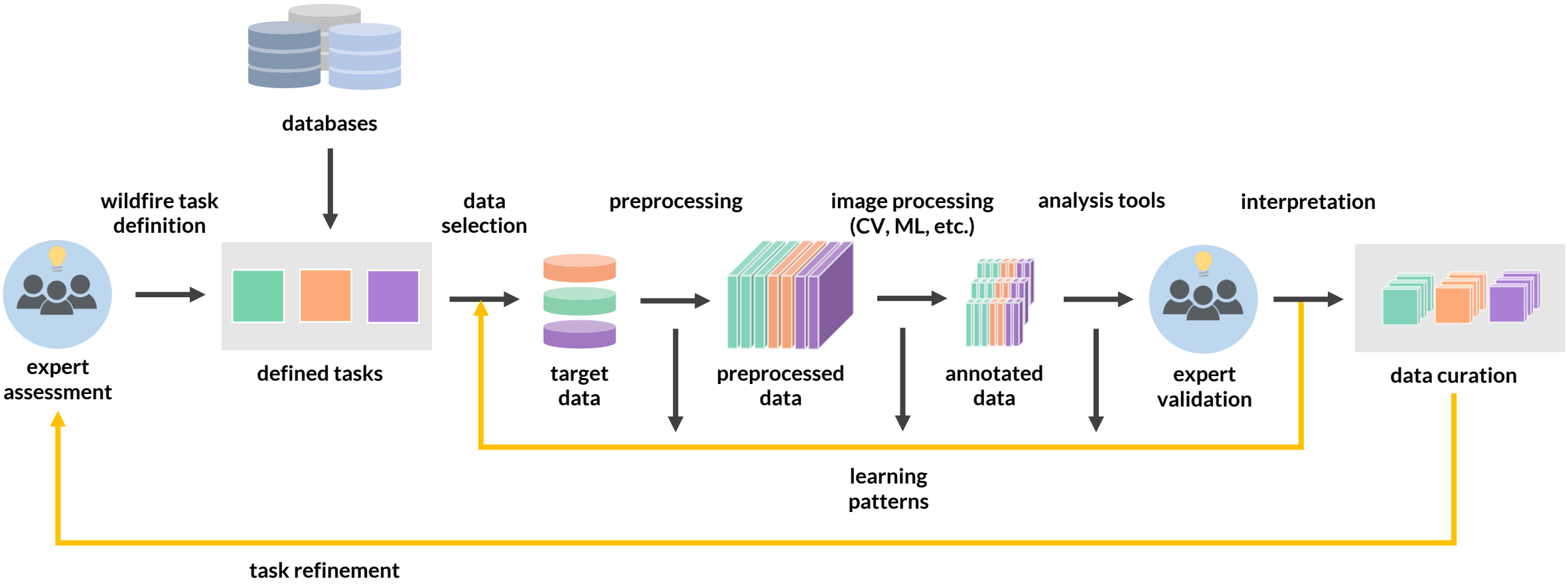

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**IDMEC – Center of Intelligent Systems** currently investigates innovative solutions for wildfire decision support systems, in the scopes of autonomous robotics and computational intelligence.

**ADAI – Forest Fire Research Center** is an international reference in wildland fire research with unique experimental structures that enable laboratory testing and field trials.