

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

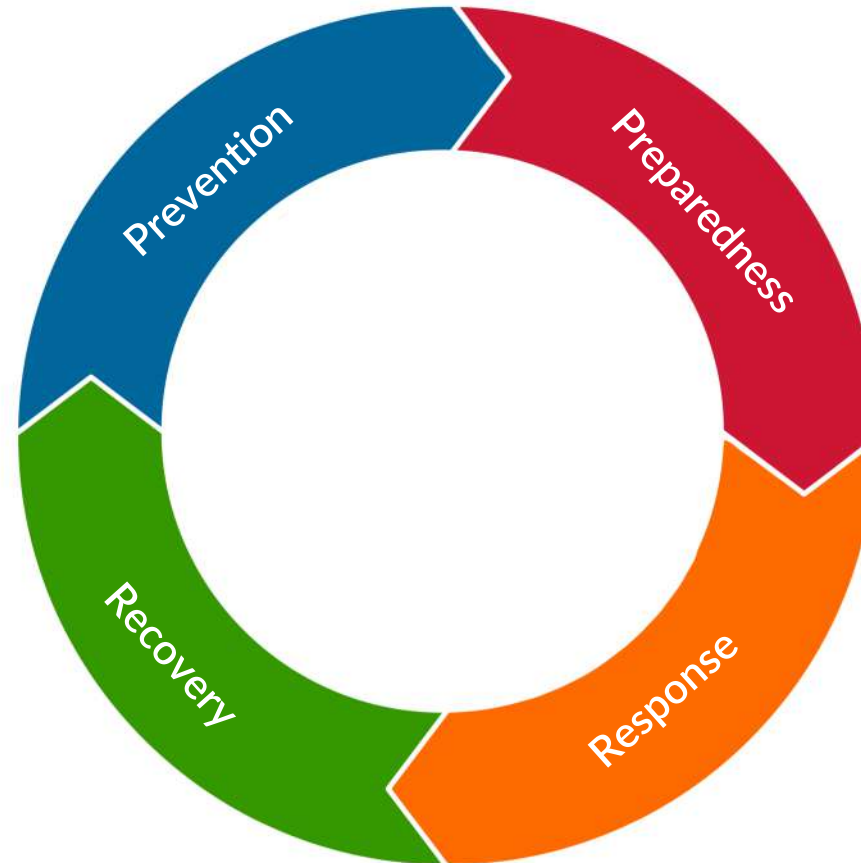
- processing of **large amounts of data** requires increasing levels of automation;
- lack of large-scale datasets with curated data that is relevant for wildfire science and wildfire operations, which limits performance and practical relevance of machine learning (ML) solutions;

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

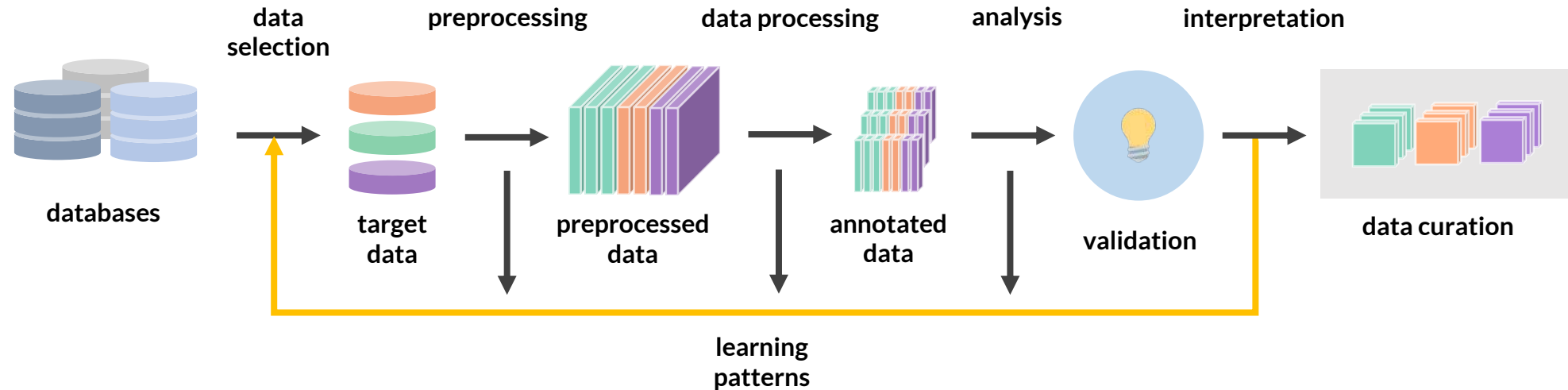


- risk assessment concerning **environmental conditions**;
- risk mapping based on **land-use** and **social patterns**;
- wildfire detection and monitoring, e.g., early identification of **flames** and **smoke plume**, **mapping of the fire front(s)**, detection of **spot fires** and identification of **hot spots**;

Addressing Wildfires with Machine Learning

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

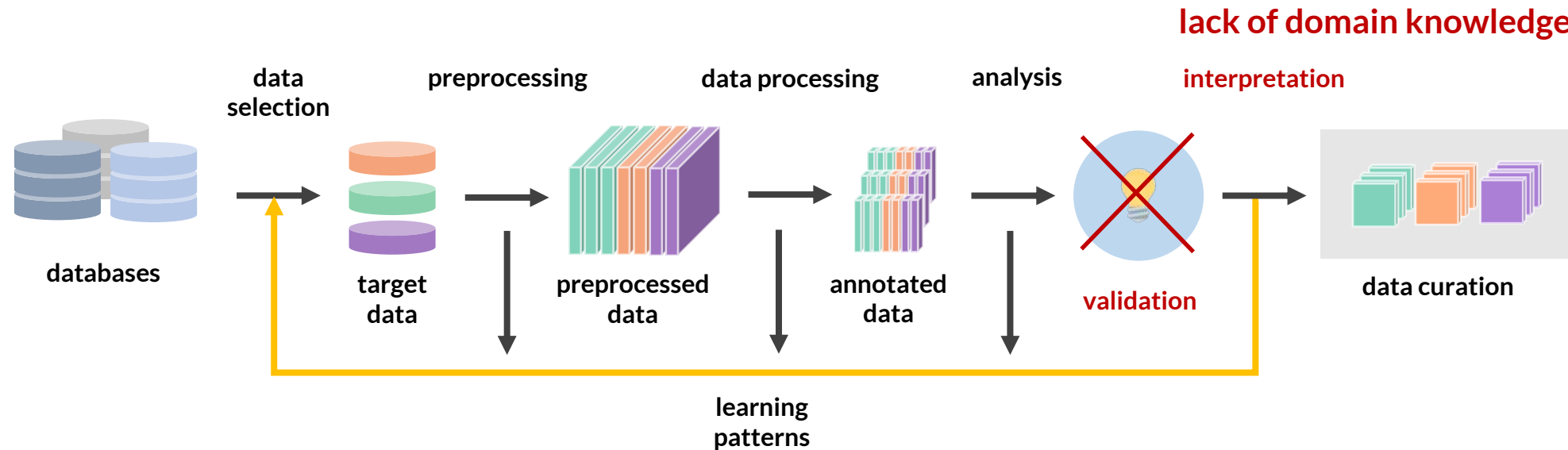
SOLUTION: we can **build pipelines** to (1) enable large-scale datasets, and (2) include relevant annotation



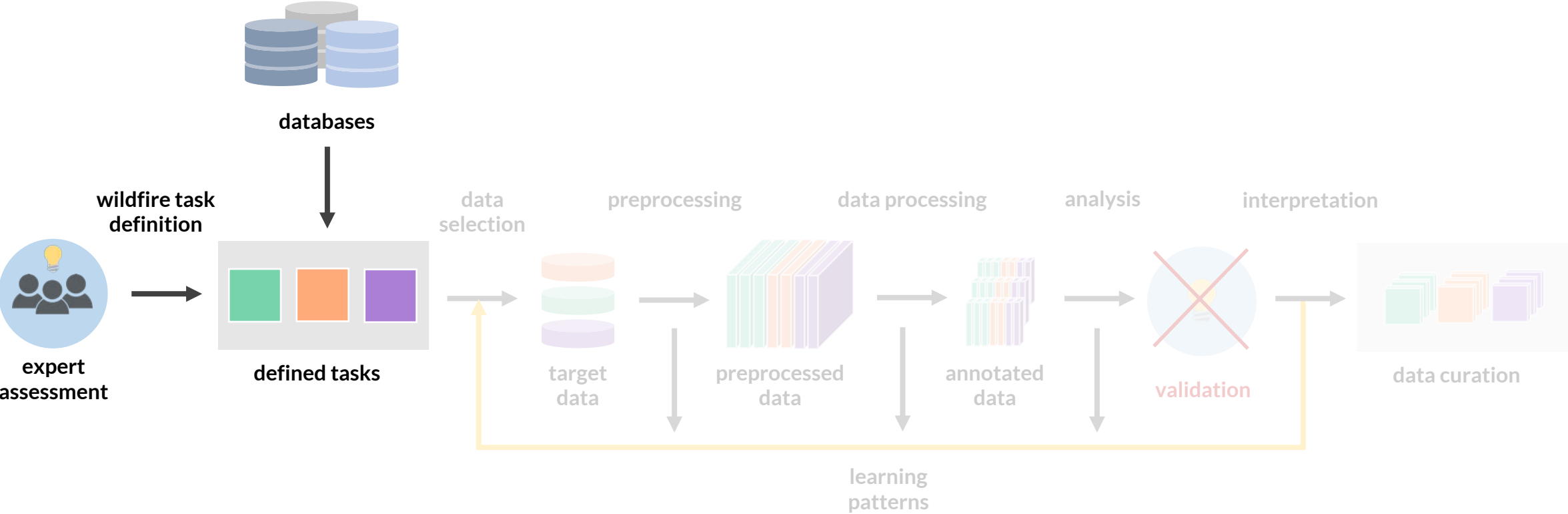
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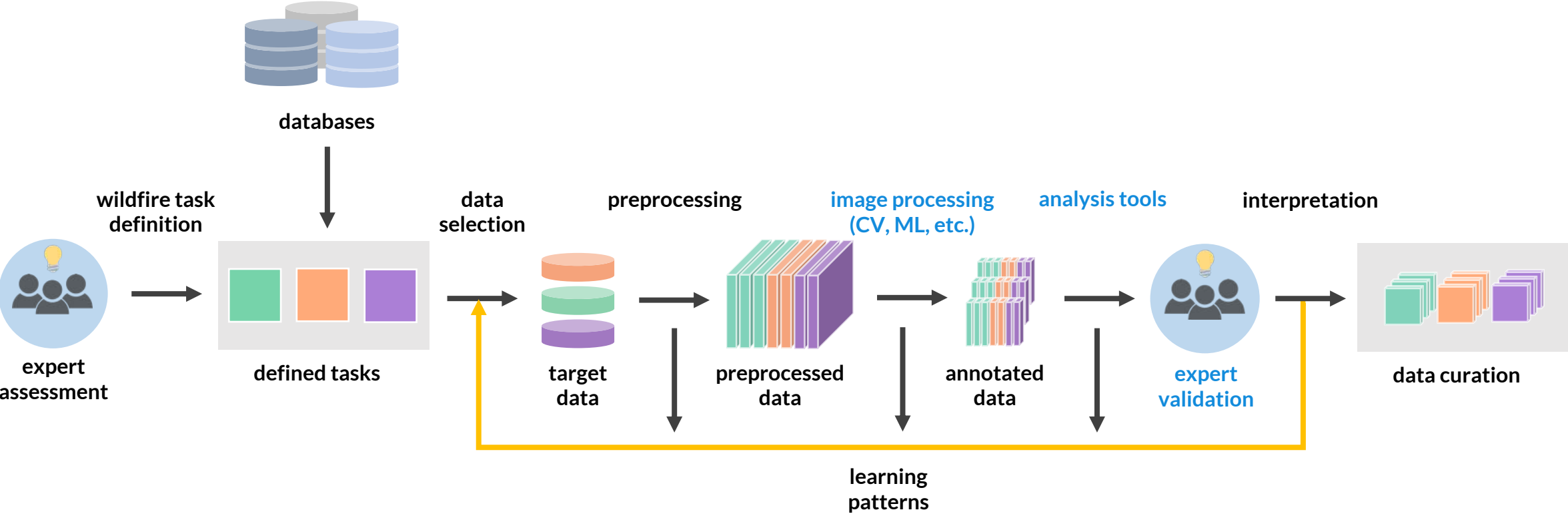
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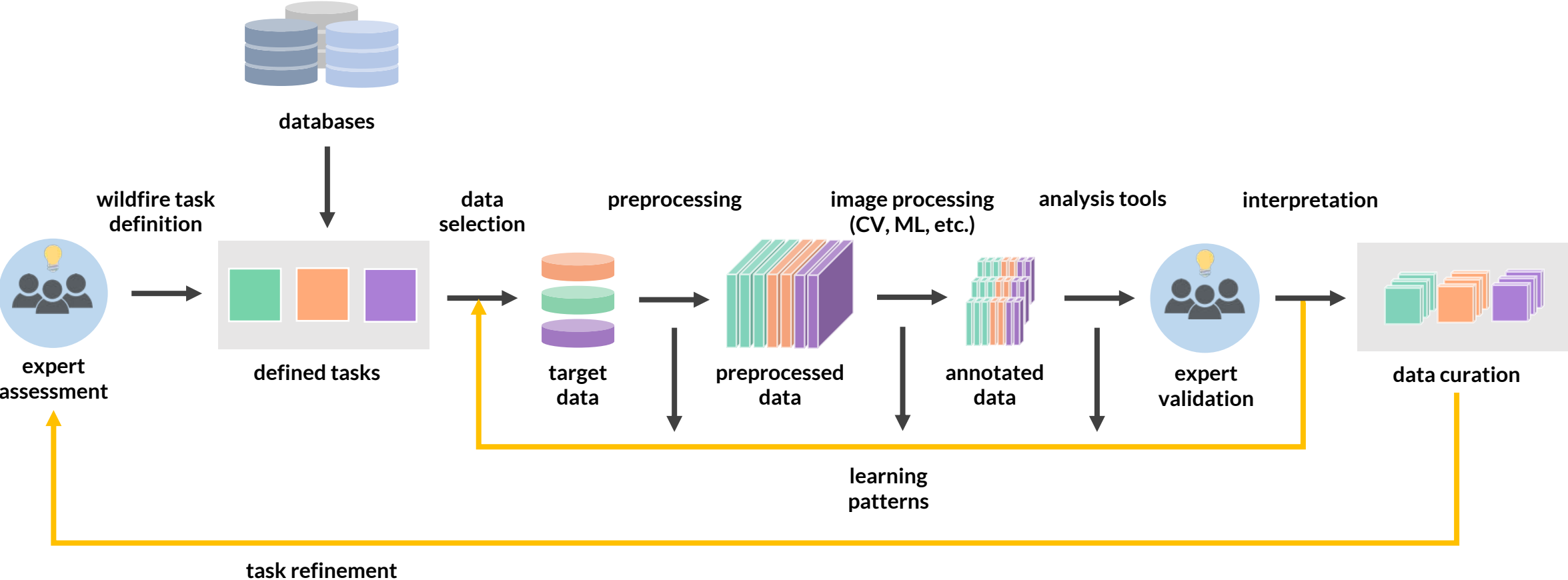
Bridging the gap between ML and fire domain experts



Expert-in-the-loop systems for data curation



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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.