



Three Challenges in Utilizing Machine Learning to Predict Human Behavior from Observational Data

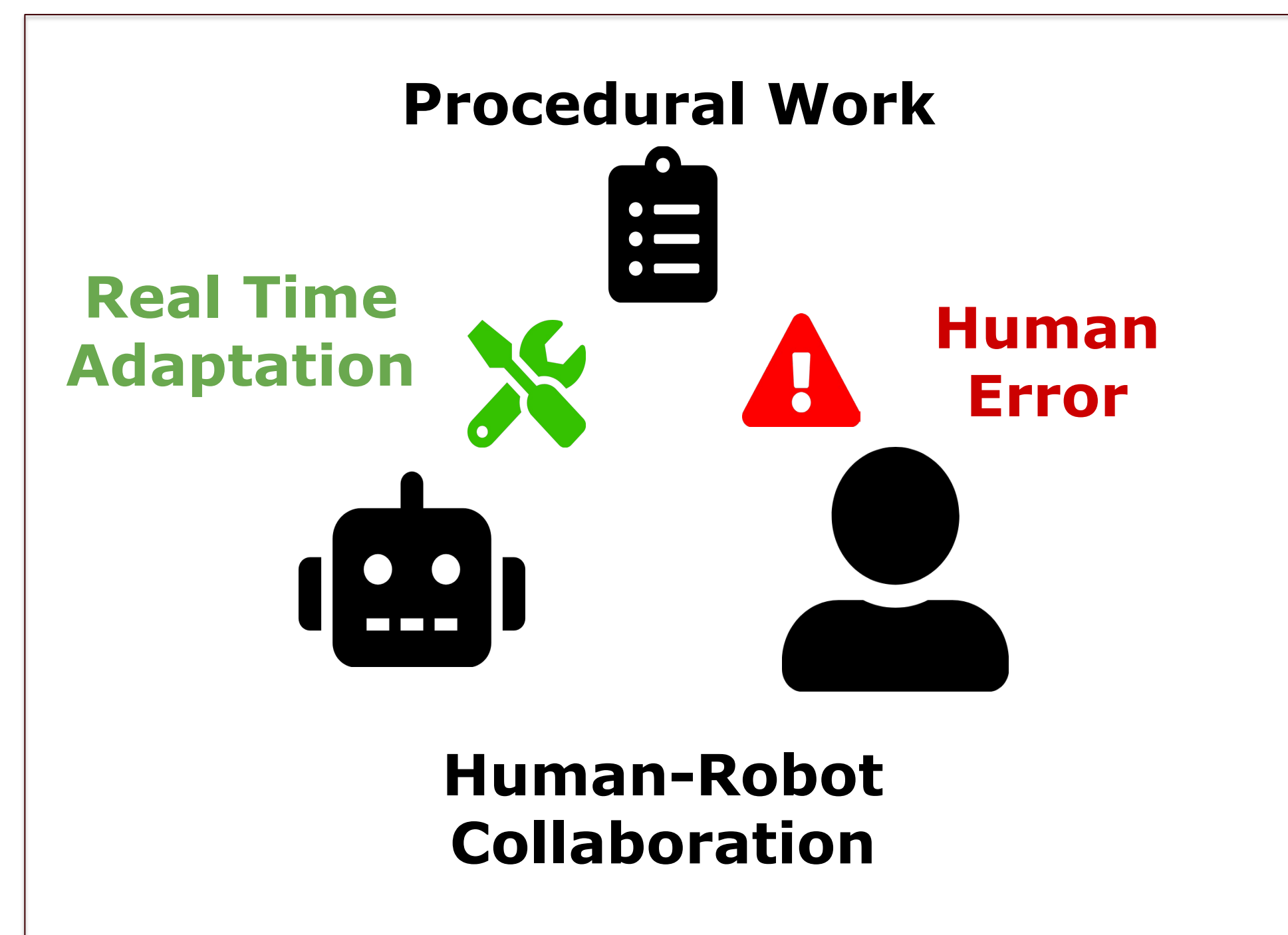
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Introduction

In Human-Robot Collaborative Tasks ...

- Humans make **mistakes**
- Robots must be able to **adapt in real-time**

Predicating such human behavior presents three main challenges

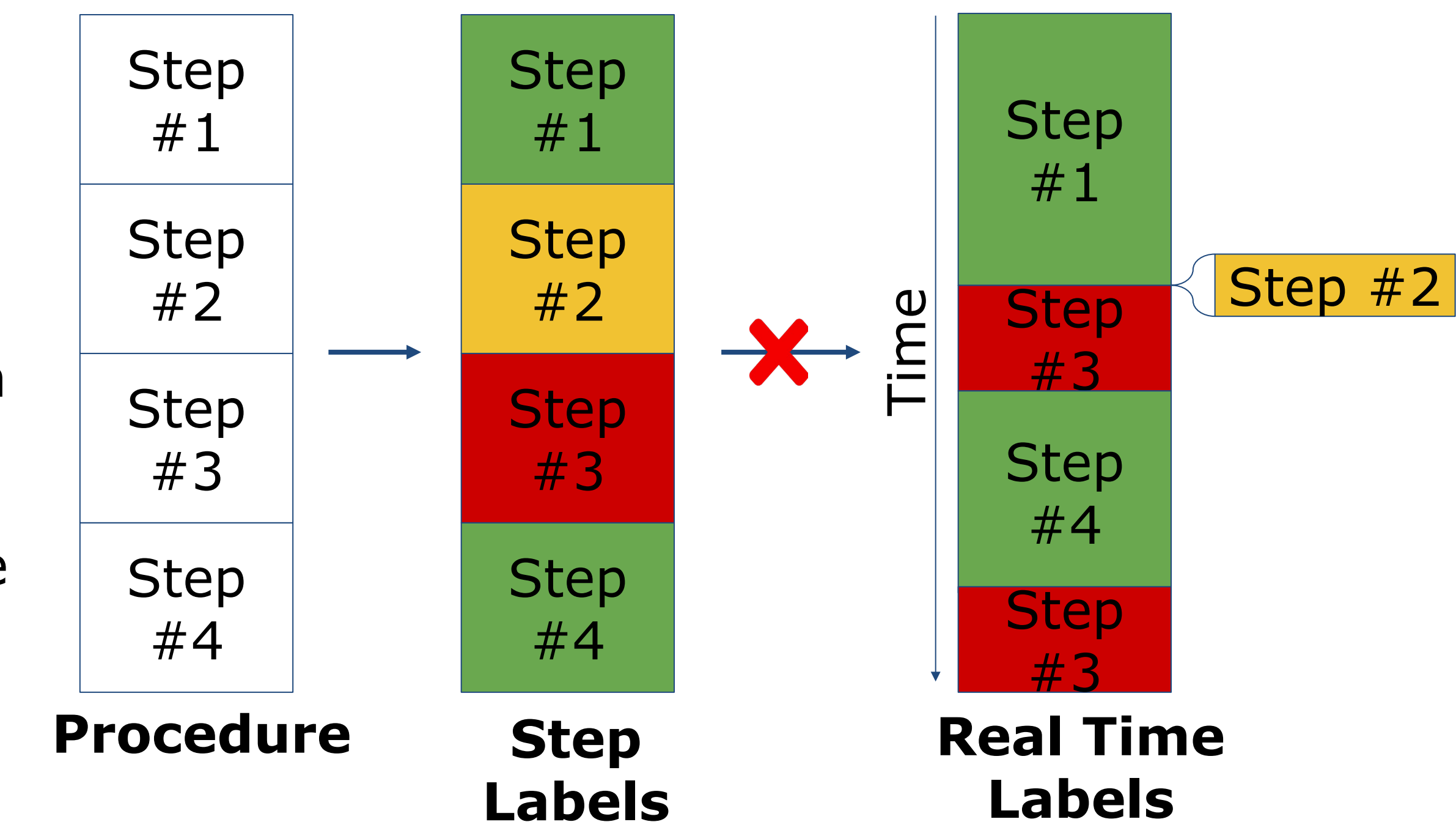


Challenge 1: Data Labels

In real time, humans do not tend to complete steps in order

It is impossible to know which step the human is executing

Therefore, step labels become difficult to use in real time predictions



When making real-time predictions, data should be labeled on a timestamp-level

Challenge 2: Annotation Process

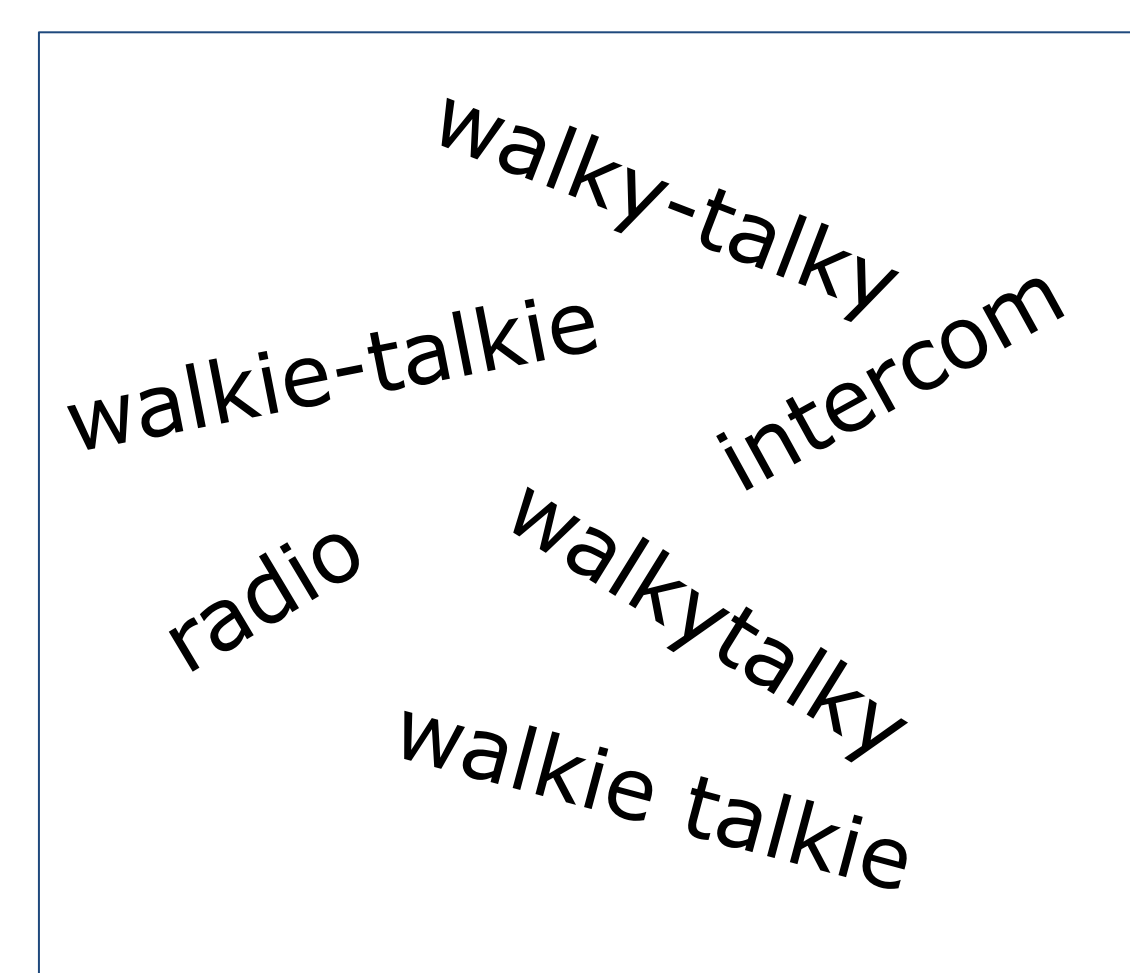
Annotations *lacked uniformity* due to no guardrails to reduce ...

- Incorrect annotations
- Incomplete/missing annotations
- Varying shorthands for data entries
- Inconsistent formatting

To address this use ...

- Verification layers (inter-annotator agreement, verification software, etc.)
- Ontology/Taxonomy (annotator to select from during data entry)

Annotators will label the same object differently

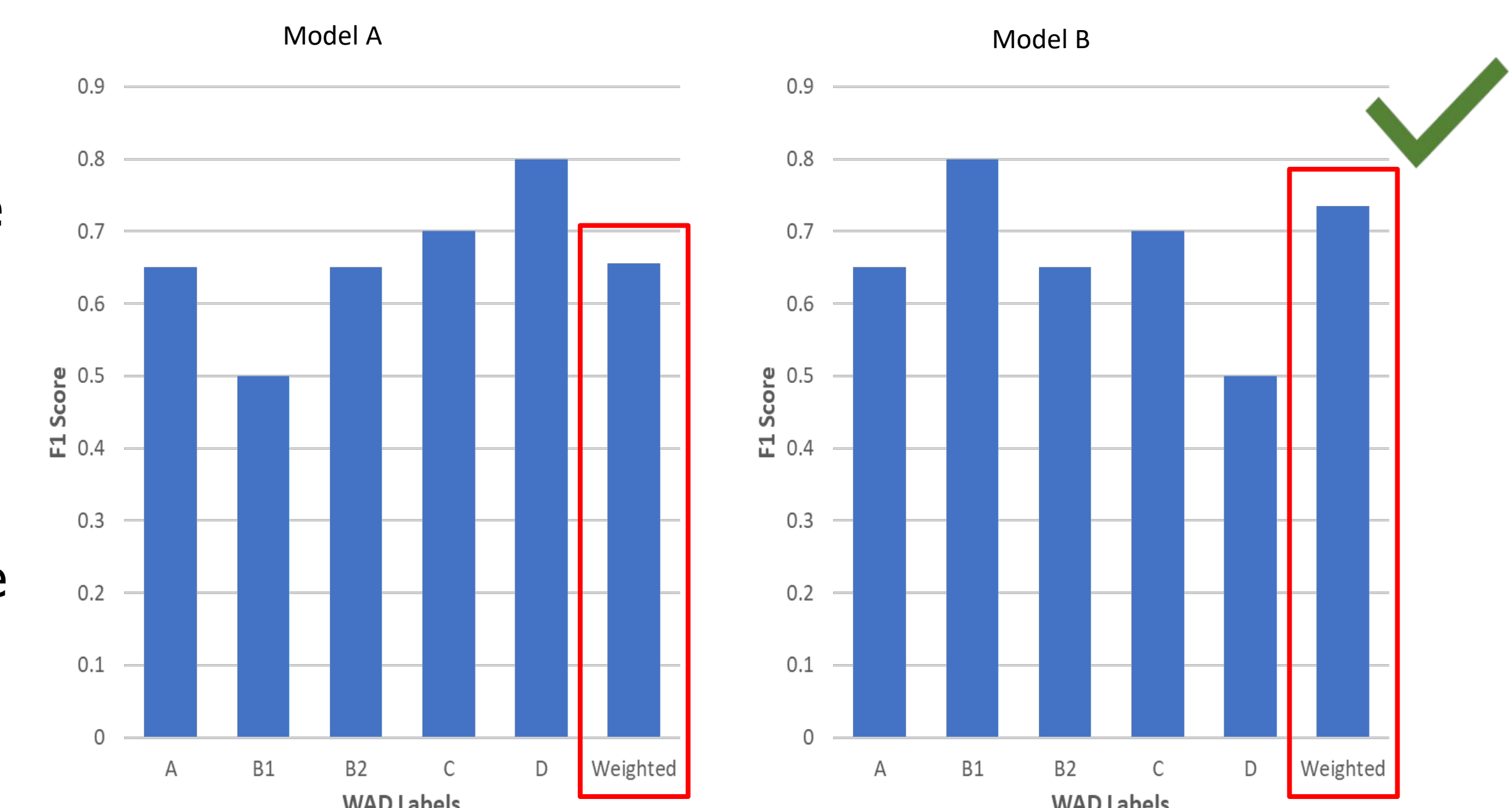


To reduce noise due to inconsistencies within an annotated dataset, develop an ontology/taxonomy for data entries and utilize additional verification layers

Challenge 3: Evaluation

Some labels may be more important than others

It can be **difficult to judge** the model's performance with multiple labels



To increase model comprehension, efforts should be made to converge on a single value to describe model performance