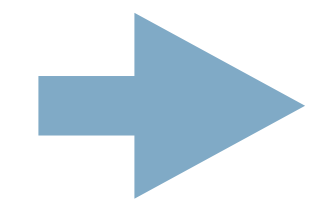


# ACTC: Active Threshold Calibration for Cold-Start Knowledge Graph Completion

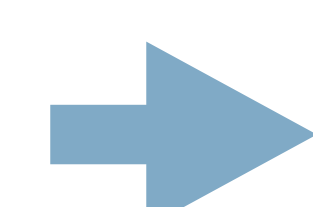
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**Knowledge Graph (KG) Completion: adding new triples (entity, relation, entity) to a KG**

The usual way: scoring of triples with KG Embedding models & **ranking** of triples



The way we want it: **classification** of new triples into valid and invalid ones



We need to estimate decision **thresholds**; usually based on human annotation

**What if we have only a very limited annotation budget?**

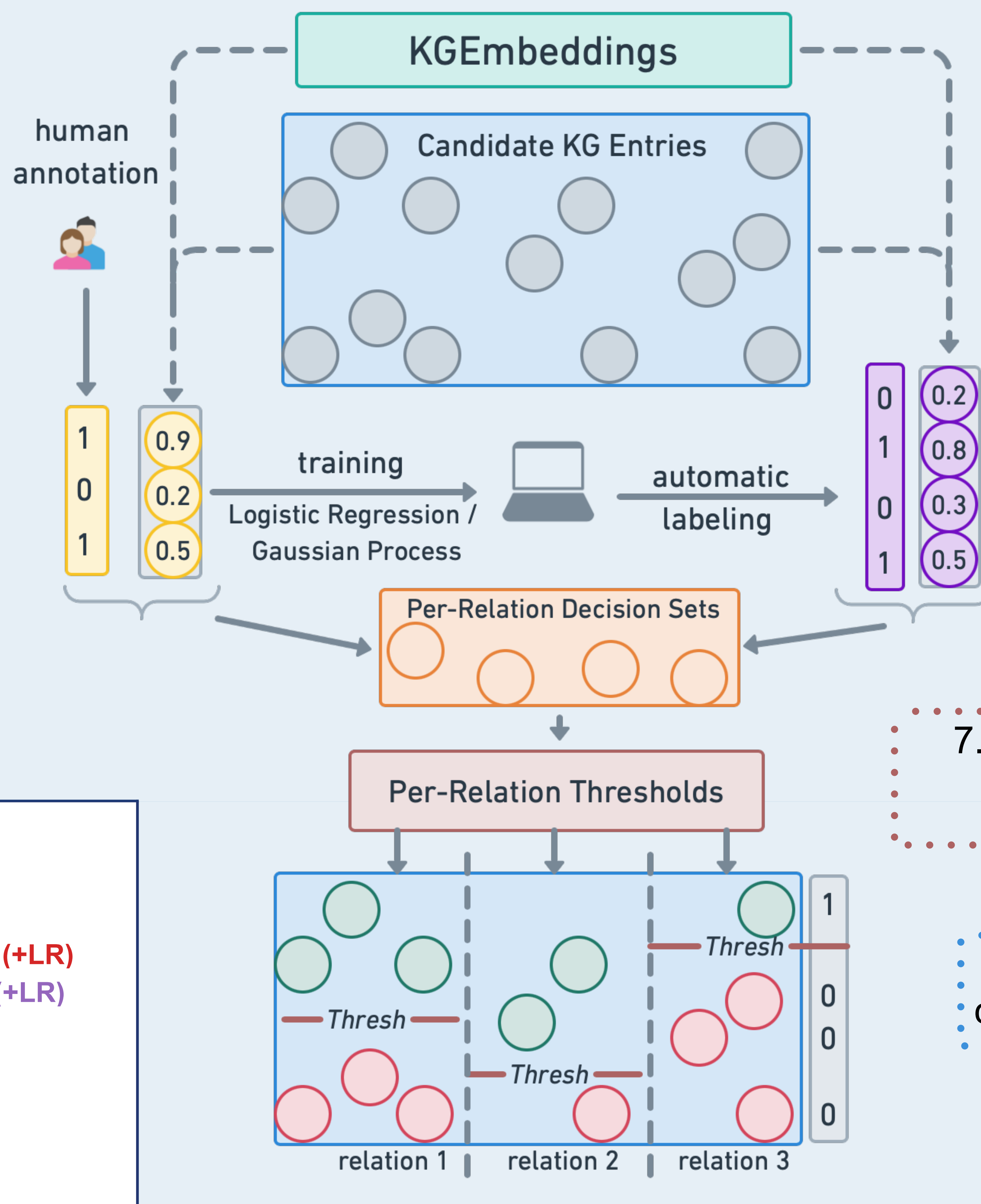
**ACTC:**  
**Active Threshold Calibration**

1. Calculate the scores for triples with one of the KG embedding models

2. Select some triples for human annotation (randomly/by density)

3. Manually annotate the selected triples:  
0 = an invalid triple  
1 = a valid triple

4. Train a model on the manually annotated triples (scores = features, annotations = classes)



5. Automatically label additional triples with the trained model

6. Make threshold decision sets out of manually and automatically labeled samples

7. Estimate the per-relation decision thresholds

8. Use the thresholds to classify the unknown triples

## Results

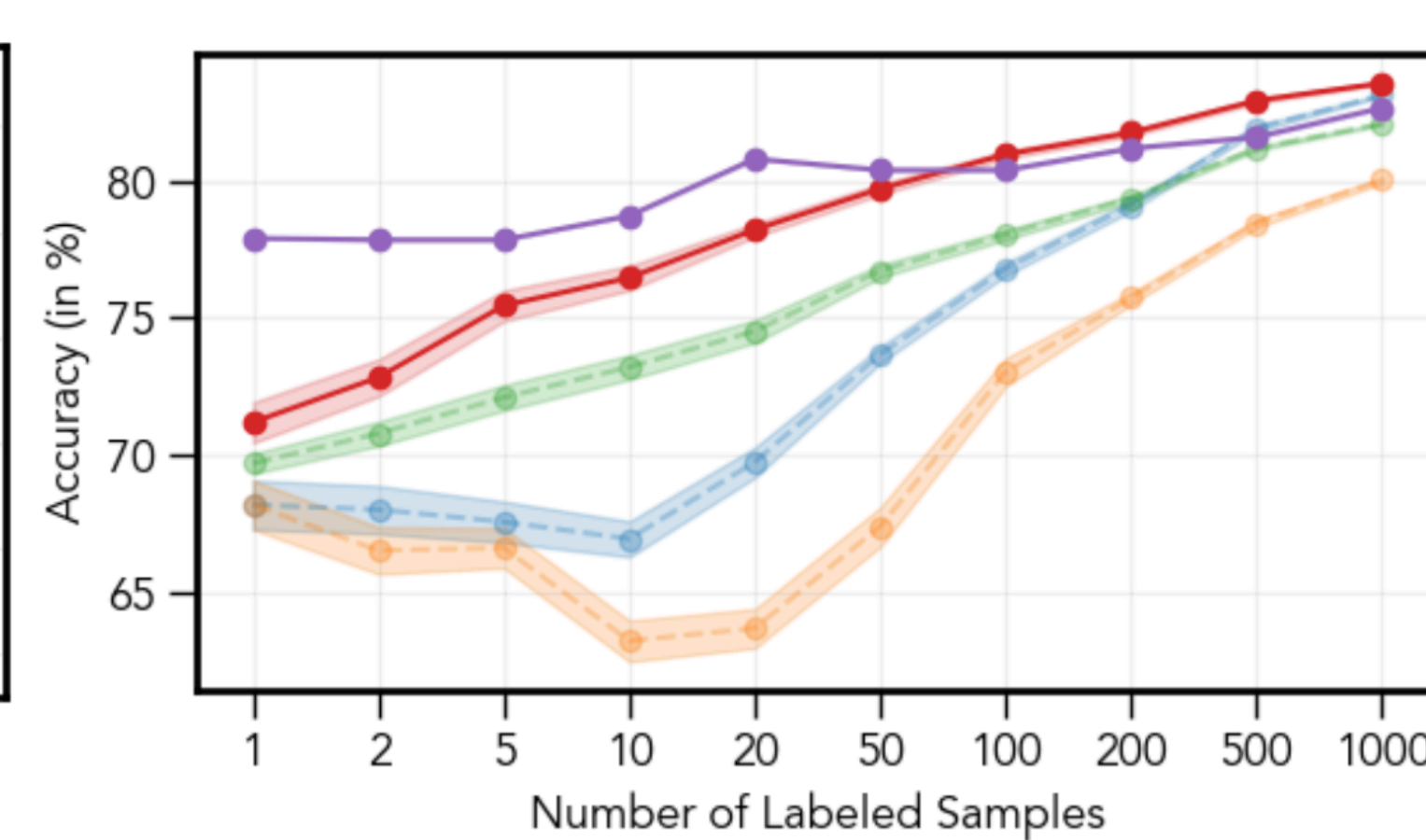
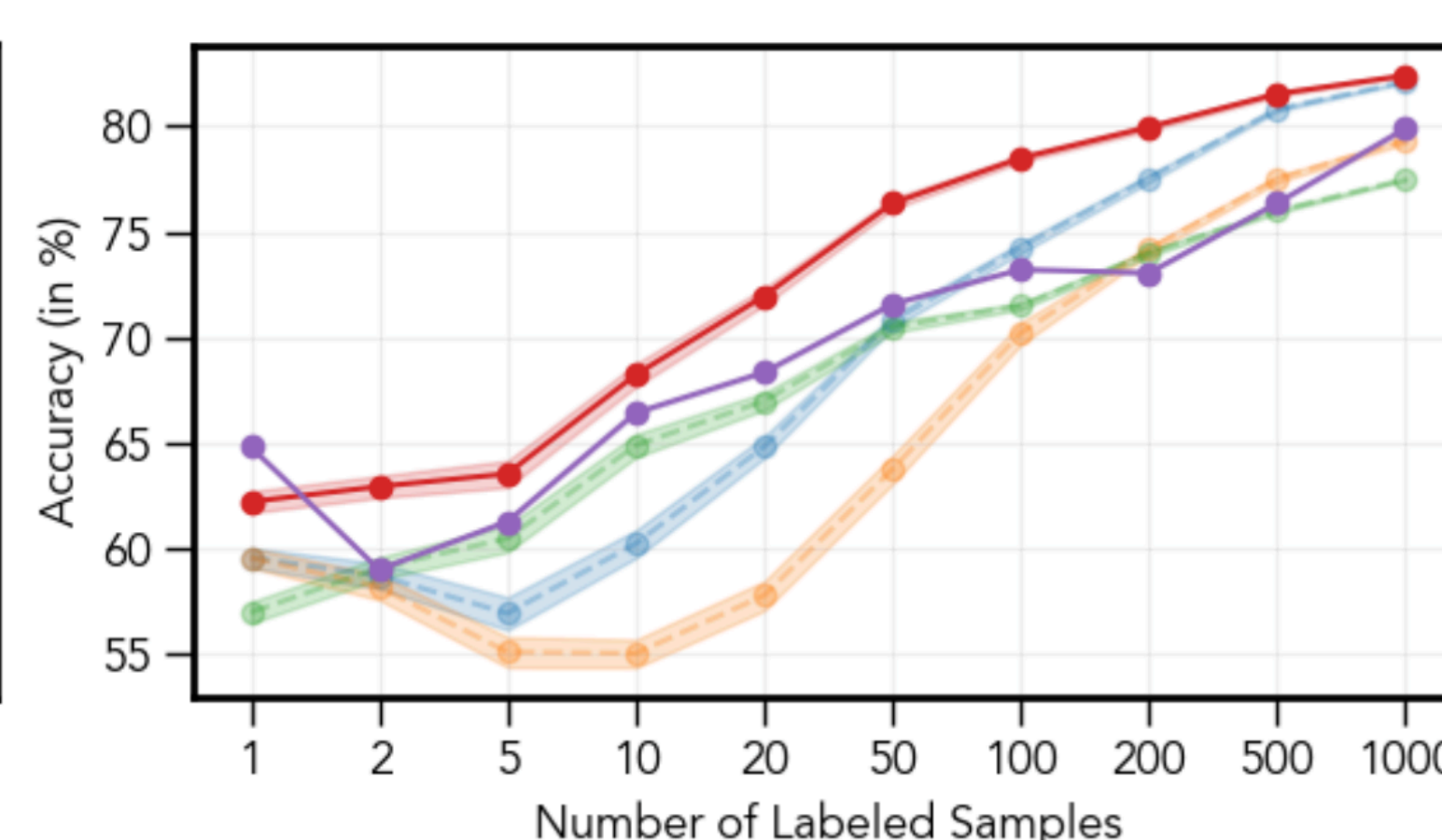
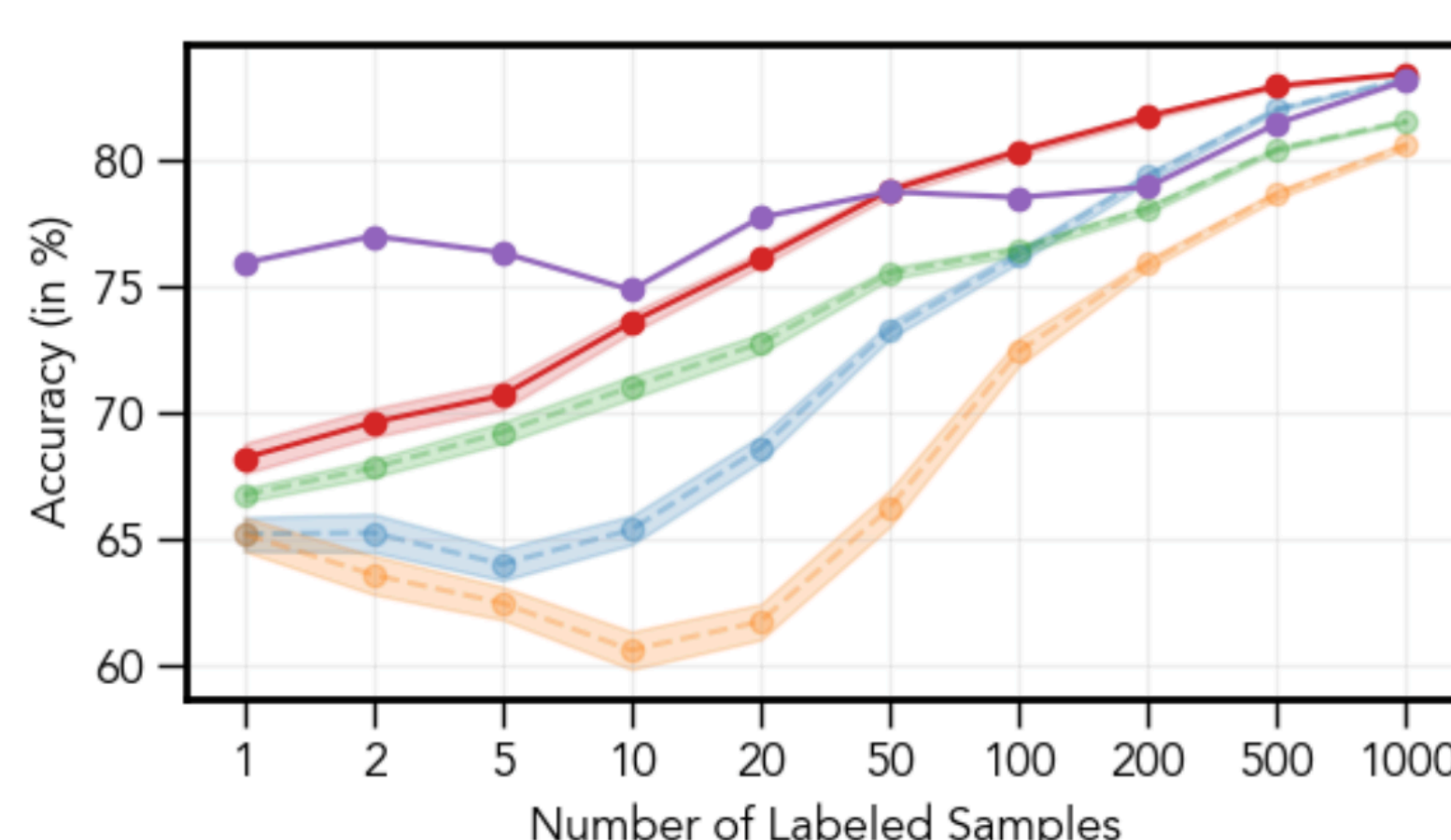
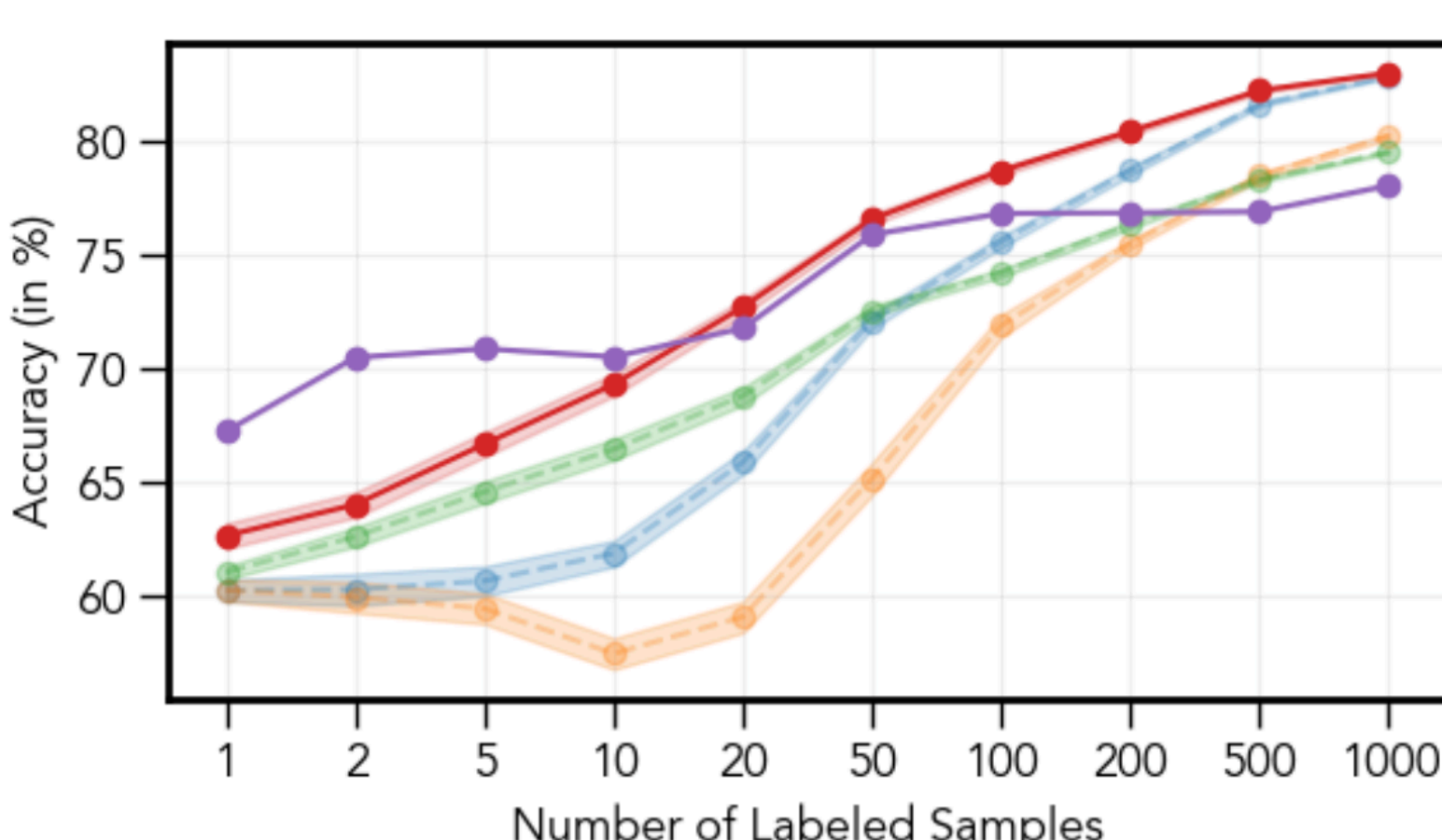
ACTC (ours):  
— Random-based ACTC (+LR)  
— Density-based ACTC (+LR)  
Baselines:  
— LocalOpt (Acc)  
— LocalOpt (F1)  
— GlobalOpt (F1)

Complex

ConvE

TransE

RESNAL



**ACTC helps to find reliable per-relation decision thresholds, even with only one available manual annotation**



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