Combat Data Shift in Few-shot Learning with Knowledge Graph

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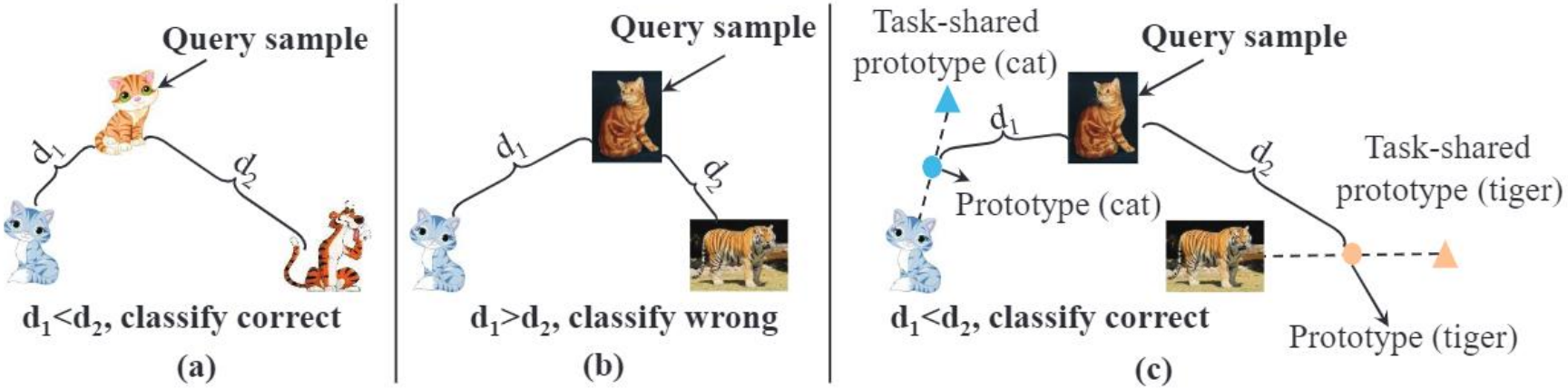
Problems & Ideas

- Problems of Data Shift in Few-shot Learning:
  - Intra-task data shift.
  - Inter-task data shift。
- Ideas: We propose Graph Prototypical Networks (GPN), which utilizes knowledge graph via a Graph Convolutional Network (GCN) to extract task-shared representations, and uses a CNN to extract task-specific representations from each task.



A 2-way 1-shot task is used as an example. (a) The ideal scene of few-shot: all samples are drawn from the same distribution (cartoon). The query sample is a cartoon cat, and the support samples are a cartoon cat and a cartoon tiger. The query sample is closer to the support cartoon cat, and thus is classified correctly. (b) The real-world scene of few-shot: the samples in the same task sometimes are drawn from different distributions. The query sample is a real-world cat, and the support samples are a cartoon cat and a real-world tiger. The query sample is closer to the real-world tiger, which leads to wrong classification. (c) Our proposed solution: adjusting the task-specific prototypes by combing them with the task-shared prototype for each category, which is learned from a given knowledge graph. Classification decisions can be correctly made based on the new prototypes (shown as circles).

Main Contributions

- Contributions:
  - In this paper, we address few-shot learning under data shift, while existing models focus on few-shot learning without the consideration of data shift;
  - We propose an effective way to utilize knowledge graph to guide the learning of task-shared representations, which are combined with task-specific representations to generate appropriate class prototypes in few-shot learning;
  - The evaluation results demonstrate the superior performance of the proposed GPN model.