

In-Context Meta Learning for Automatic Designing Pretext Tasks for Self-Supervised Image Analysis

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Abstract : Self-supervised learning (SSL) includes machine learning models that are trained on one aspect and/or one part of the input to learn other aspects and/or part of it. SSL models are divided into two different categories, including pre-text task-based models and contrastive learning ones. Pre-text tasks are some auxiliary tasks learning pseudo-labels, and the trained models are further fine-tuned for downstream tasks. However, one important disadvantage of SSL using pre-text task solving is defining an appropriate pre-text task for each image dataset with a variety of image modalities. Therefore, it is required to design an appropriate pretext task automatically for each dataset and each downstream task. To the best of our knowledge, the automatic designing of pretext tasks for image analysis has not been considered yet. In this paper, we present a framework based on In-context learning that describes each task based on its input and output data using a pre-trained image transformer. Our proposed method combines the input image and its learned description for optimizing the pre-text task design and its hyper-parameters using Meta-learning models. The representations learned from the pre-text tasks are fine-tuned for solving the downstream tasks. We demonstrate that our proposed framework outperforms the compared ones on unseen tasks and image modalities in addition to its superior performance for previously known tasks and datasets.

Keywords : in-context learning (ICL), meta learning, self-supervised learning (SSL), vision-language domain, transformers

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