Environment Is a Nexus: Generalization Process for Domain Generalization

Meng CAO, Songcan CHEN

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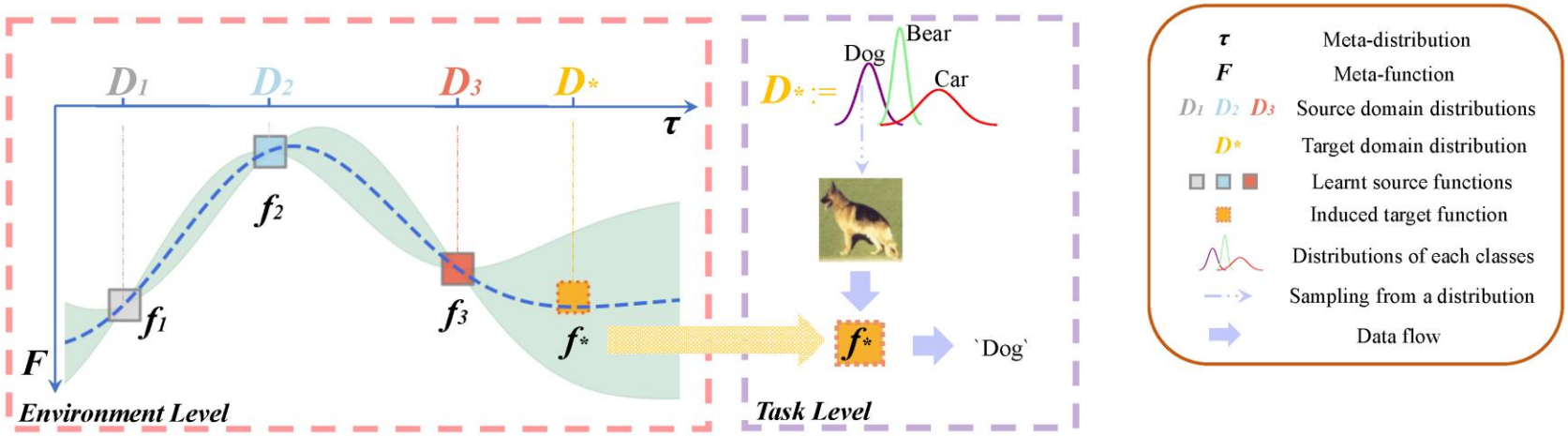
Problems & Ideas

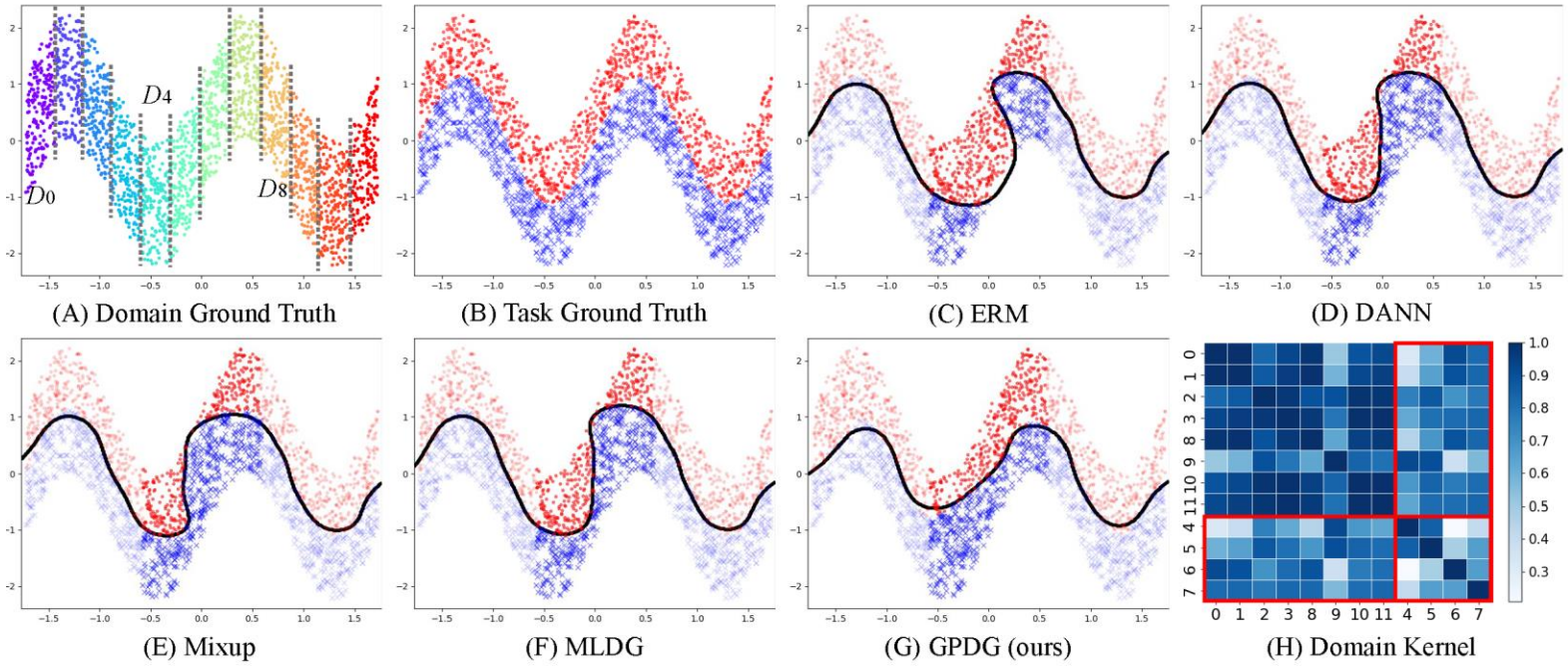
- Problems of domain generalization:
  - Domain invariant representation cannot maintain invariance across diverse unseen target domains.
  - Most current methods focus on learning a universal sample-to-label mapping (function) across domains, overlooking semantically intrinsic domain-specific information.
- Ideas:
  - A novel standpoint is adopted, that is, a domain can be regarded as a meta-sample sampling from a certain meta-distribution.
  - Functions learned from individual domains can be seen as a collective set of functional samples.



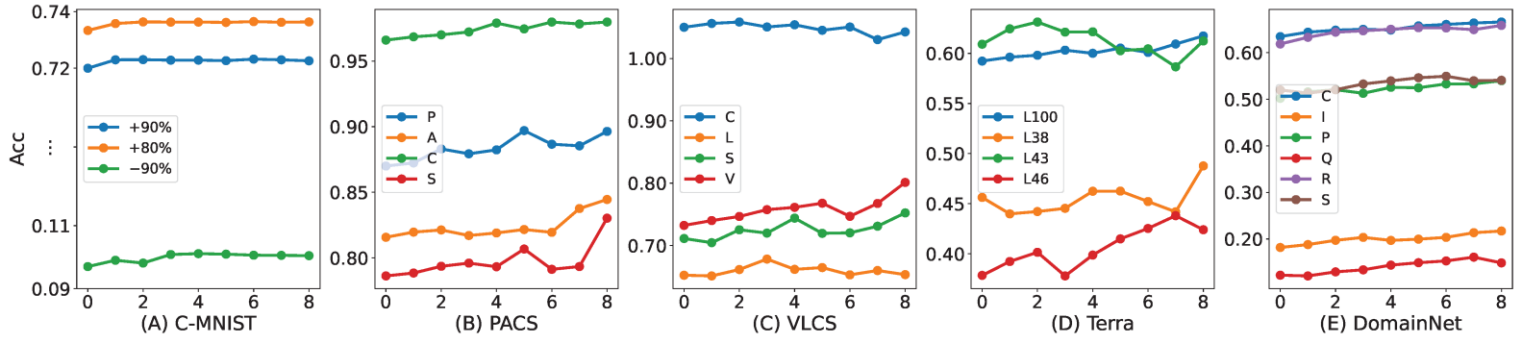
An illustration of the inference procedure in the Generalization Process, consisting of environment-level and task-level inference. The blue dashed line denotes the mean function prediction on observed domains, while the lightgreen area denotes the confidence interval. At the environment level, when a domain $D_{(\cdot)}$ is determined, i.e., a sample drawn from the true (meta-)distribution τ, the corresponding task function $f_{(\cdot)}$ can be determined.

Main Contributions

- Visualization results of our method and representative baselines on the Sine dataset. Subfigure (H) illustrates the functional correlations across domains.



- Parameter sensitivity to the number of test samples



The ticks on the x-axis are the logarithmic values, e.g., 0=$\log_2 1$