Active Label Distribution Learning via Kernel Maximum Mean Discrepancy

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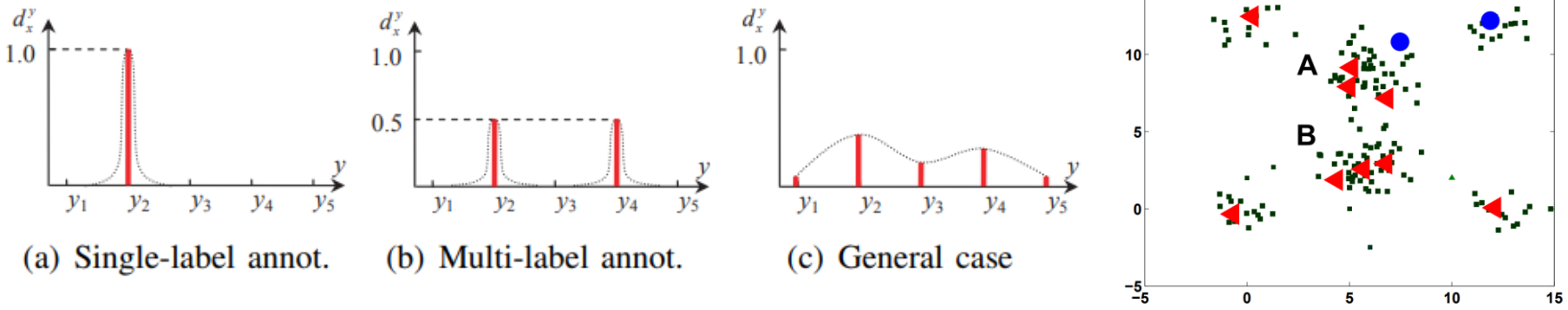
Problems & Ideas

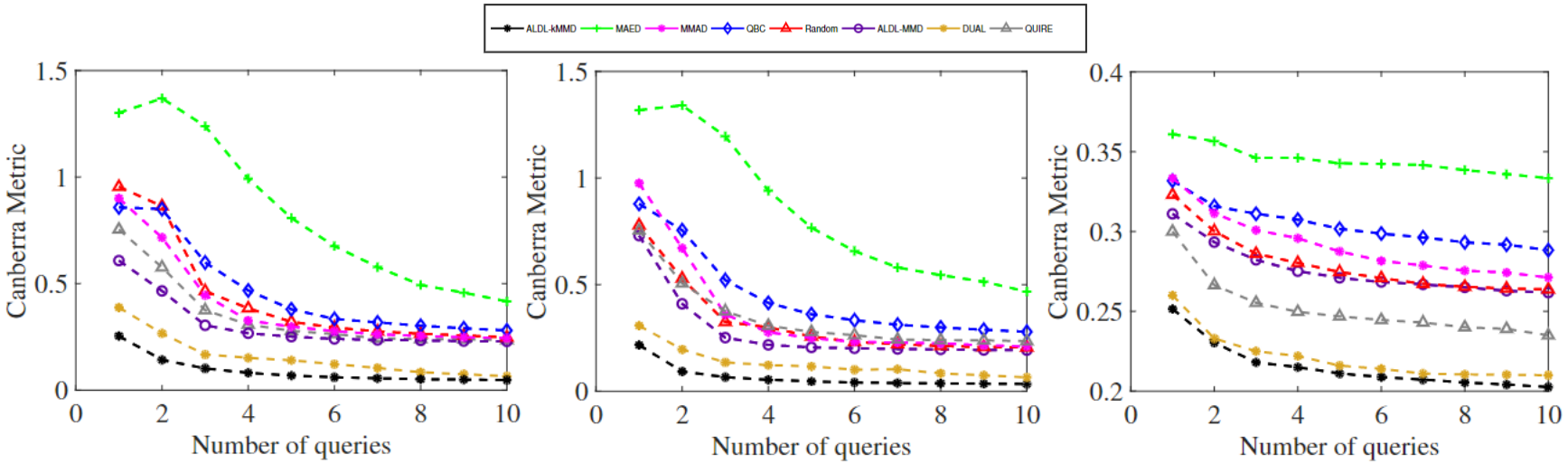
- Problems of high annotation of LDL:
  - LDL methods require sufficient labeled training instances and annotating them requires human annotators to recognize the relative importance of each label.
  - The performance of directly adopting existing AL algorithms in LDL scenario is not satisfactory.
- Ideas: ALDL-kMMD incorporates the nonlinear model and marginal probability distribution matching, exploiting the structural information of instances.



Left: Example label distributions for single-label annotation, multi-label annotation, and the general case. Right: Toy data set (dark green squares) and corresponding selected sets of query data points (red triangles) based on minimizing MMD. The two data points represented by blue circles are randomly selected initially available labeled data points (figures best viewed in color).

Main Contributions

- Contributions:
  - We study ALDL, which is a new and rarely studied learning scenario, to reduce the high annotation cost of LDL.
  - ALDL-kMMD is proposed to select representative instances by incorporating the nonlinear model and marginal probability distribution matching, capturing the structural information from the complex data.
  - We convert the original optimization problem with the implicit feature mapping into a dual problem by constructing auxiliary variables and develop a solution to address this problem.



Experimental Results with SA-BFGS, SA-IIS and LDL-LCLR Measured by Canberra Metric ↓, respectively