Generative or Discriminative? Getting the Best of Both Worlds

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Getting the Best of Generative and Discriminative

The problem

Predicting an unknown target $\mathbf{c}$ given input features $\mathbf{x}$.

Two Approaches:

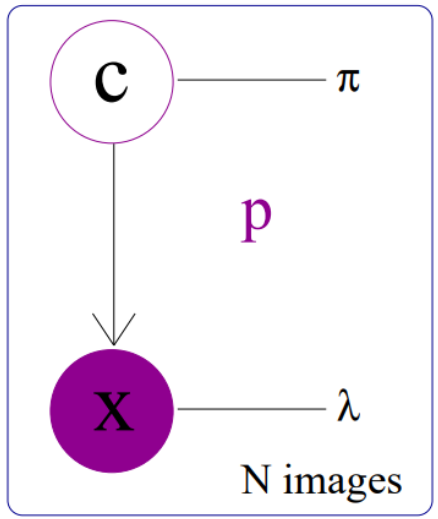
- **Discriminative Models:** Learn the conditional distribution $p(\mathbf{c}|\mathbf{x})$ directly. They model the boundary between classes or regression relationships.
- **Generative Models:** Learn the joint distribution $p(\mathbf{x}, \mathbf{c})$ and use Bayes' theorem to infer $p(\mathbf{c}|\mathbf{x})$. They can generate synthetic data and handle missing information.

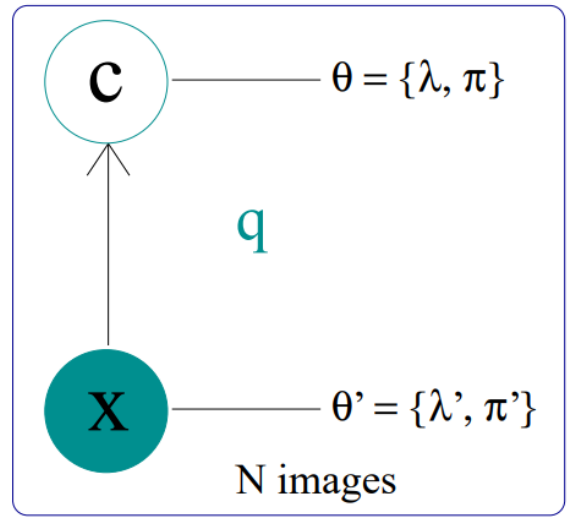
The solution

- A principled framework that combines generative and discriminative models.
- This framework improves generalization performance, particularly when labeled data is scarce.

Generative vs Discriminative Models

1) Left: Generative model $p(\mathbf{x}, \mathbf{c})$,
2) Right: Discriminative model $p(\mathbf{c}|\mathbf{x})$





This paper discusses how to use a Bayesian approach to find automatically the appropriate trade-off between the generative and discriminative extremes.