FEATURE-LEVEL DOMAIN ADAPTATION

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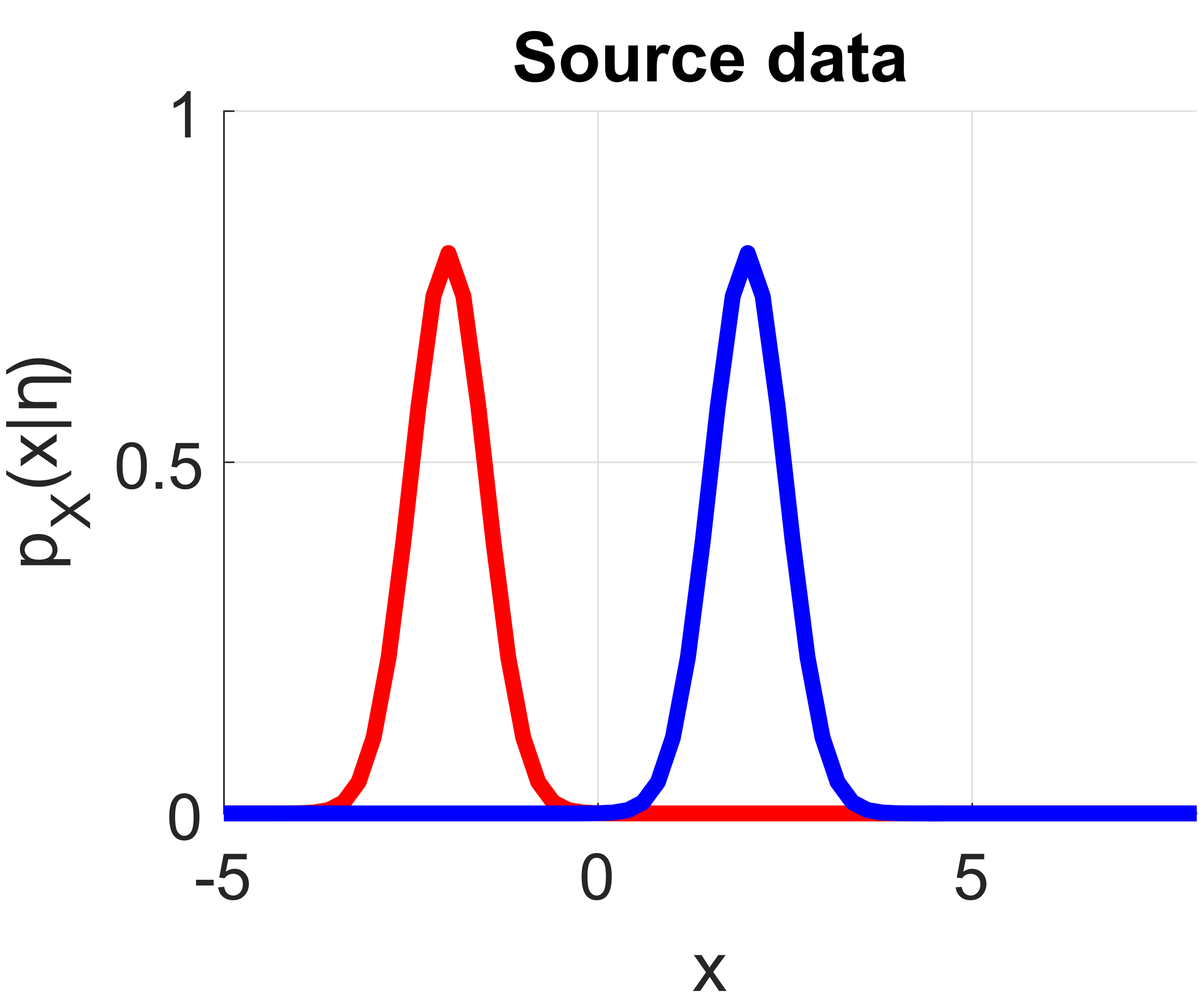
PROBLEM

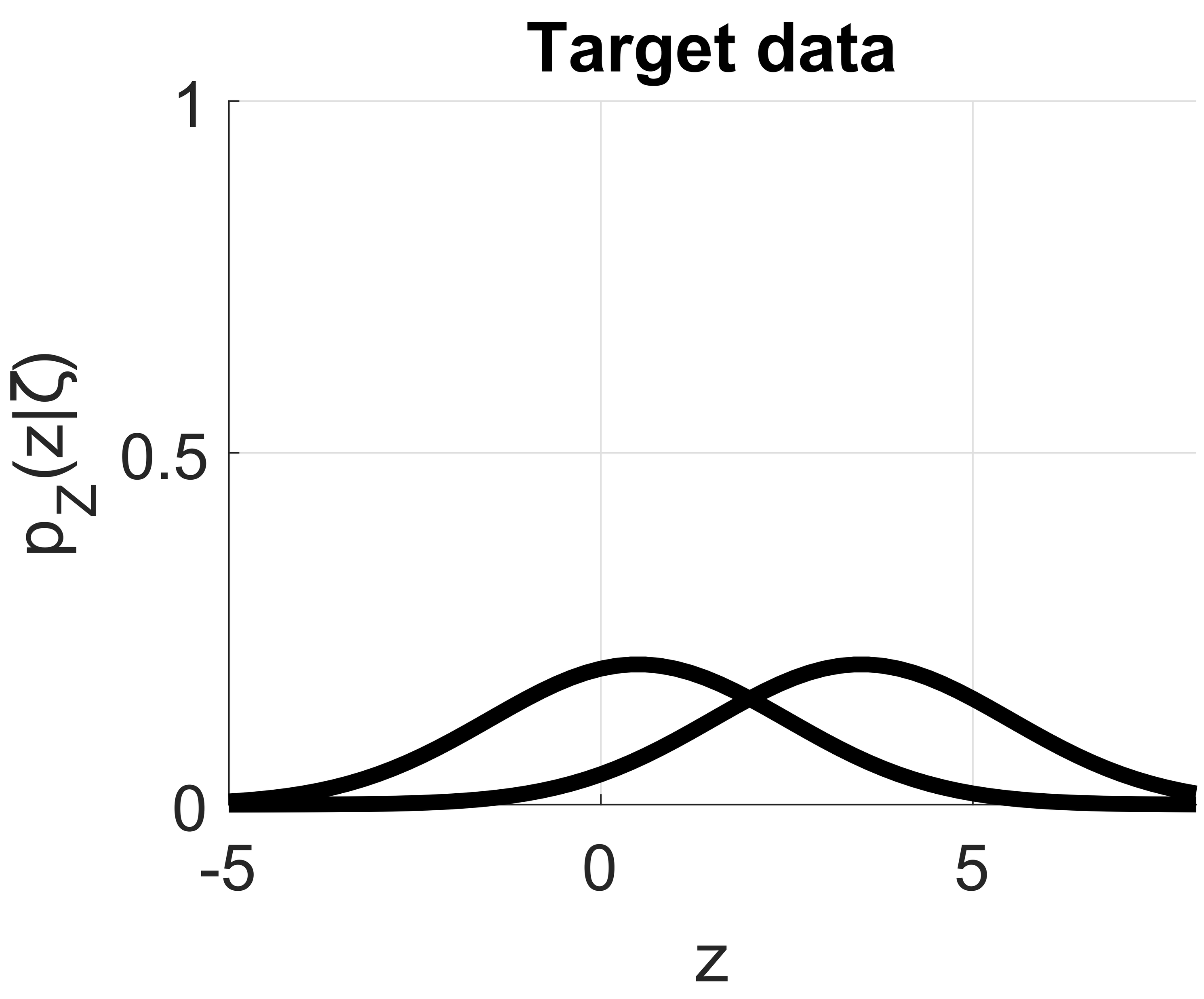
Pattern recognition algorithms learn from examples and classify new data. Domain adaptation is a specific problem setting where the new data stems from a different but similar distribution.

Given $X \sim p_X, Z \sim p_Z$, predict labels for $\{z_j\}_{j=1}^m$ using $\{(x_i, y_i)\}_{i=1}^n$

APPLICATION

- **Patients scanned by different MRI-scanners.**
- **Genomes sequenced under different laboratory conditions.**
- **Natural language text collected through different online media sources.**
- **Image data collected with different cameras.**





TRANSFER MODEL

Propose family of parametric distributions as models of the target data given source data:

$$p_{Z|X}(z \mid x; \theta)$$

Fit transfer model using maximum likelihood:

$$\hat{\theta} = \underset{\theta \in \Theta}{\arg\max} \ \frac{1}{m} \sum_{j=1}^{m} \int_X p_{Z|X}(z_j \mid x; \theta) \ p_X(x \mid \hat{\eta}) \ \mathrm{d}x$$

TARGET RISK

Assume conditional independence of labels and target data given source data:

$$Y \perp\!\!\!\perp Z \mid X$$

Then target risk function can be written as:

$$R_T(h) \approx \frac{1}{n} \sum_{i=1}^{n} \int_Z L(h(z), y_i) \ p_{Z|X}(z \mid x_i; \hat{\theta}, \hat{\eta}) \ \mathrm{d}z$$

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github.com/wmkouw/flda
arxiv.org/abs/1512.04829