

Problem

Foreground Distance



Pixel-wise Comparison



Binary Segmentation

Background Distance



Interactive Segmentation by Distance Transform

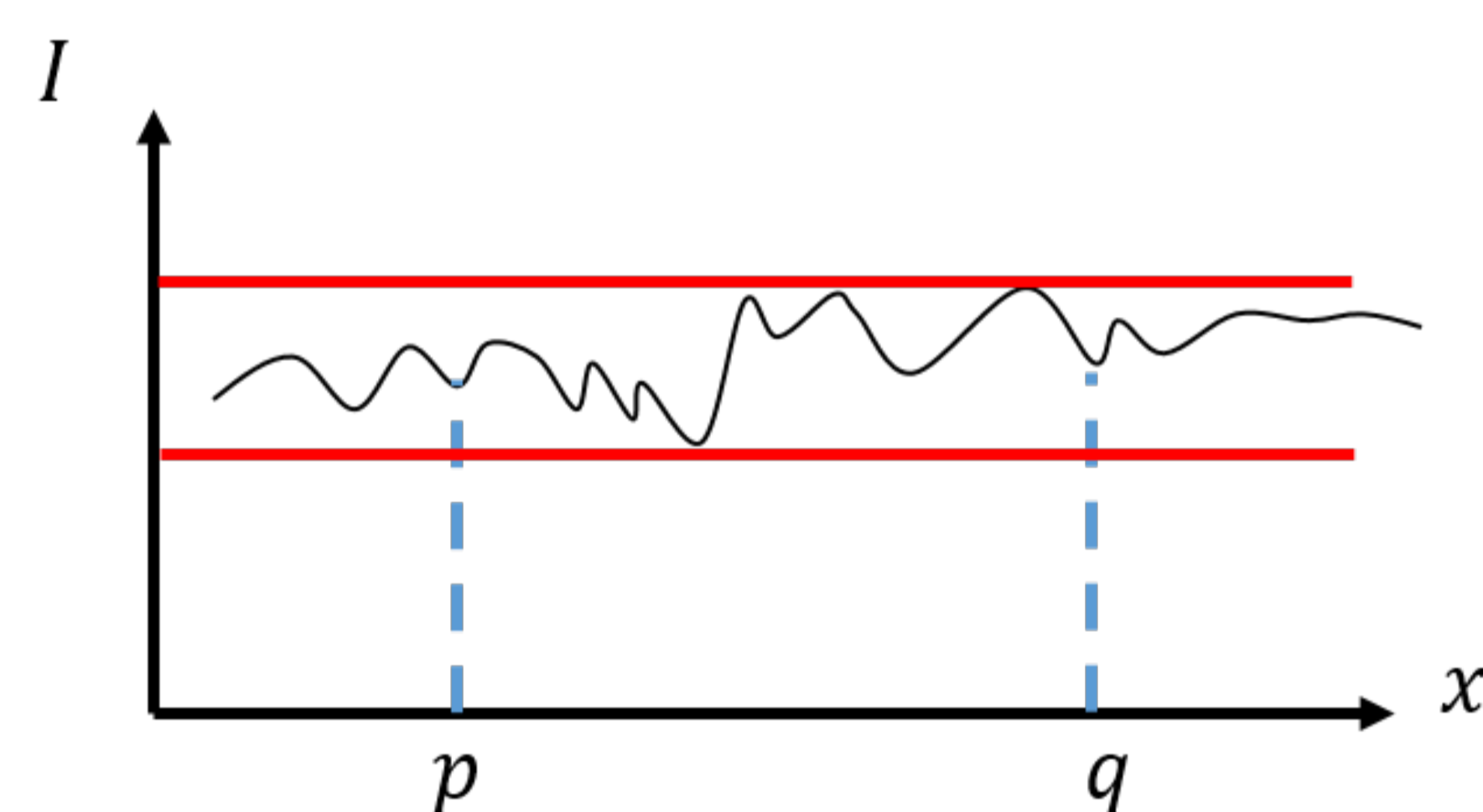
Existing Path-wise Distance Metrics

Geodesic distance

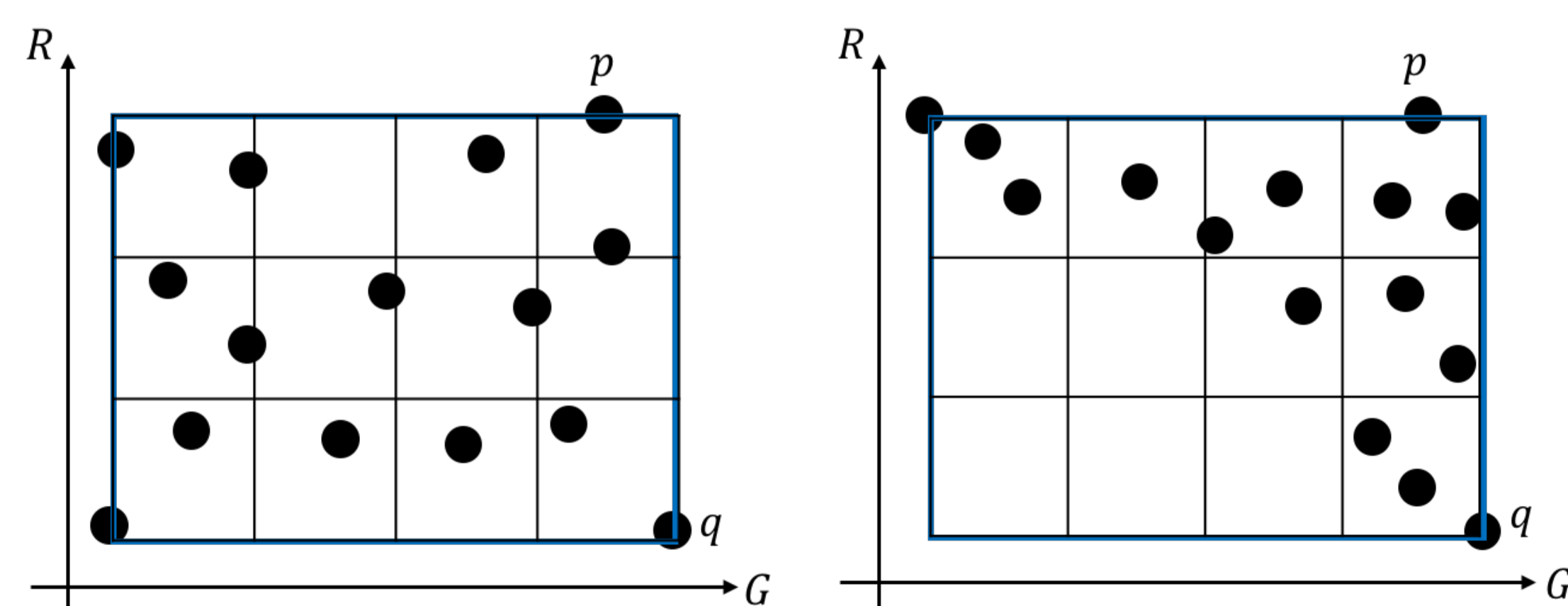
$$f_{Geo}(\pi) = \sum_{i=1}^{n-1} |I(\pi(i+1)) - I(\pi(i))|$$

Minimum Barrier Distance

$$f_{MBD}(\pi) = \max_{i=1}^n I(\pi(i)) - \min_{i=1}^n I(\pi(i))$$

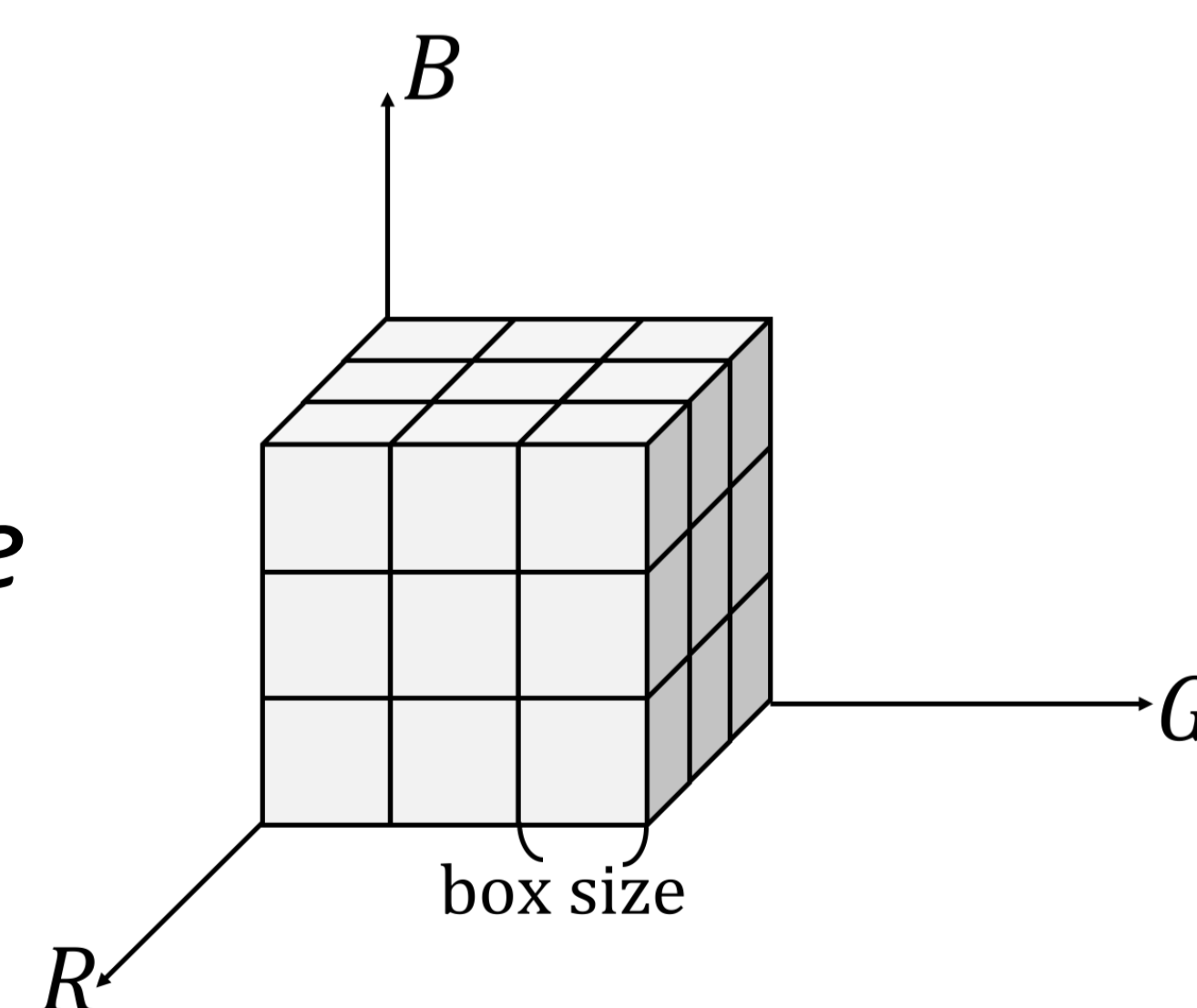


Our Main Idea: Minimum Spanning Distance



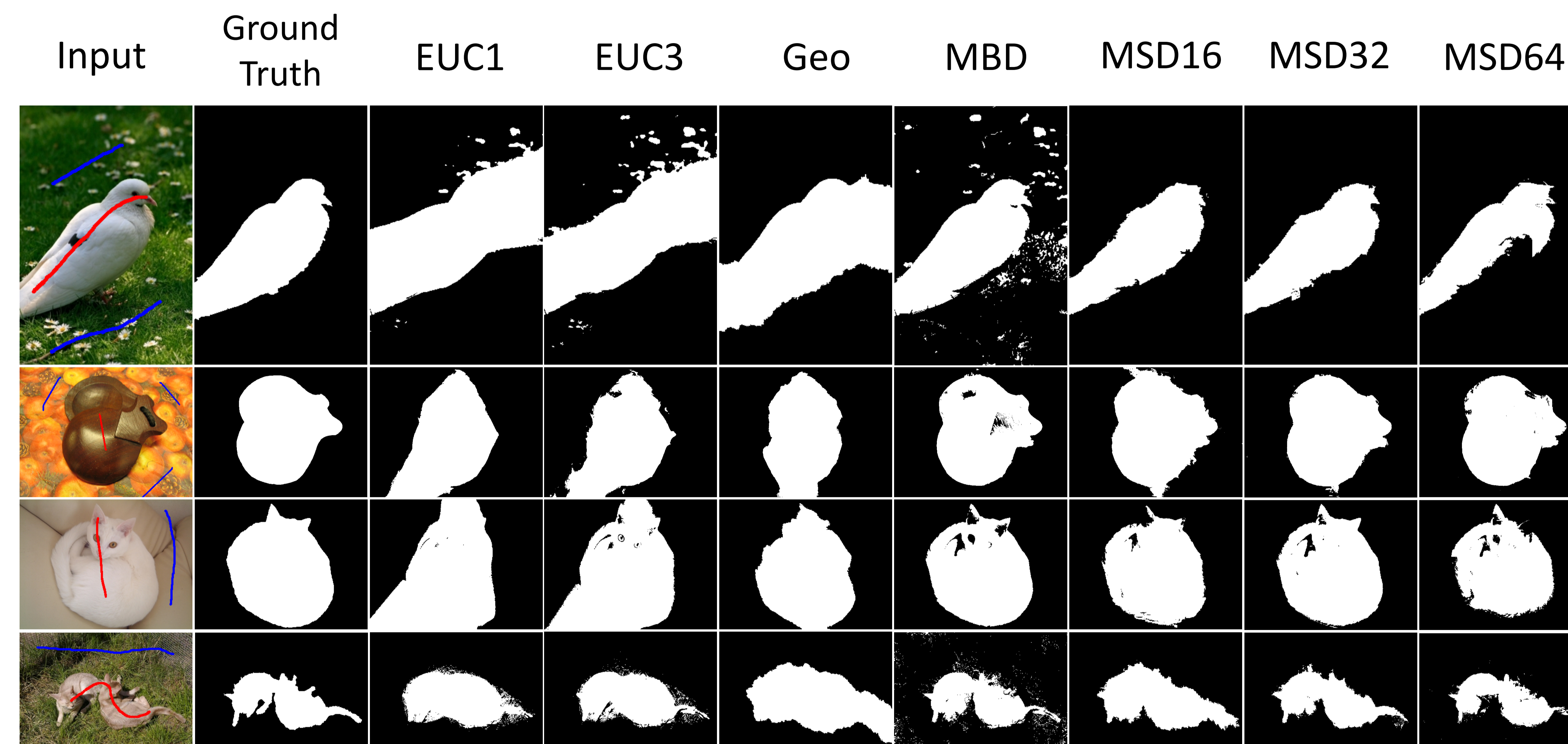
A toy example in 2D space

Illustration in 3D space



$$f_{MSD}(\pi) = \# \text{ of colors on the path } \pi$$

Visual Comparison



Numerical Evaluation on the Gulshan Dataset

Distance Metrics	EUC1	EUC3	Geo	MBD	MSD16	MSD32	MSD64
Cross-Entropy	29.27	28.64	31.34	33.93	27.31	26.21	32.81
Weighted- F_β	0.6631	0.6706	0.6469	0.6166	0.6821	0.6807	0.5812