Empirical study of the topology and geometry of deep networks (Supplementary material)

1. Paths

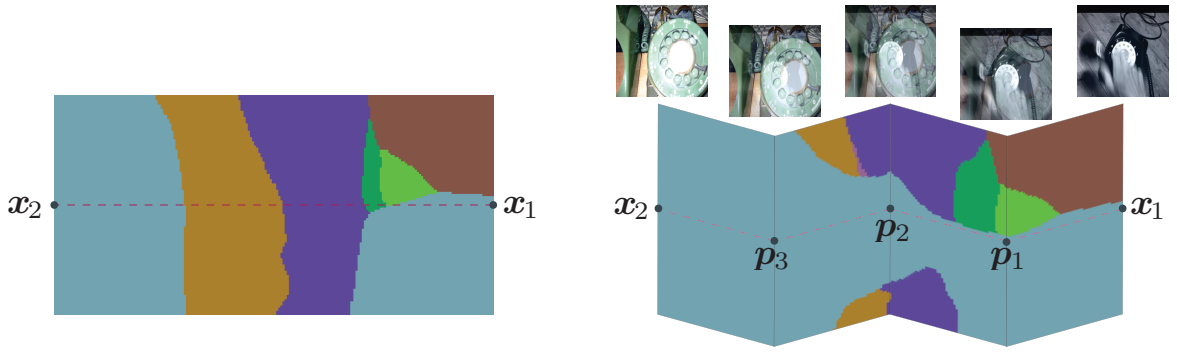

Figure 1: **Scenario 1.** Classification regions (shown with different colors), and illustration of different paths between images $\boldsymbol{x}_1, \boldsymbol{x}_2$. **Left:** The convex path between two datapoints might not be entirely included in the classification region (note that the linear path traverses 4 other regions). **Right:** Illustration of a nonconvex path that remains in the classification region. The image is obtained by stitching normal cross-sections spanned by $\boldsymbol{r}(\boldsymbol{x}_1)$ (adversarial perturbation of $\boldsymbol{x}_1$) and $\boldsymbol{p}_i - \boldsymbol{p}_{i+1}$ (two consecutive anchor points in the path $\mathcal{P}$).

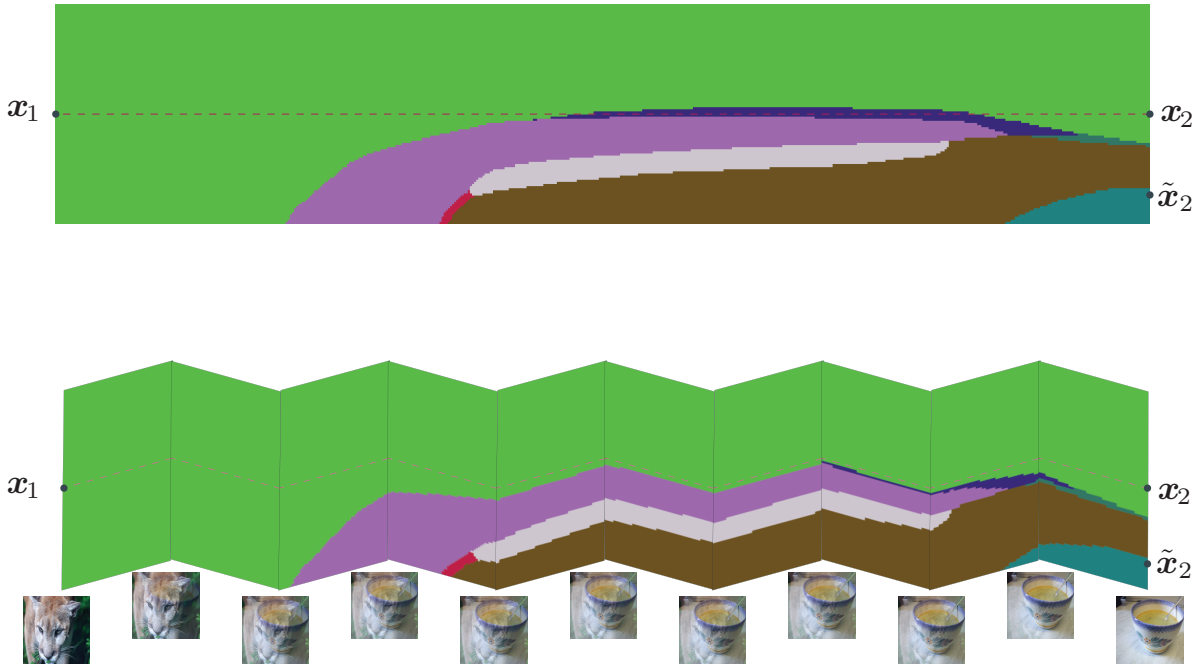

Figure 2: **Scenario 2.** Classification regions (shown with different colors), and illustration of different paths between images $\boldsymbol{x}_1$ and $\boldsymbol{x}_2 = \tilde{\boldsymbol{x}}_2 + \boldsymbol{r}$, where $\boldsymbol{r}$ is the targeted adversarial perturbation. **Top:** The convex path between two datapoints might not be entirely included in the classification region. **Bottom:** Illustration of a nonconvex path that remains in the classification region. The image is obtained by stitching normal cross-sections spanned by $\boldsymbol{r}$ and $\boldsymbol{p}_i - \boldsymbol{p}_{i+1}$ (two consecutive anchor points in the path $\mathcal{P}$).

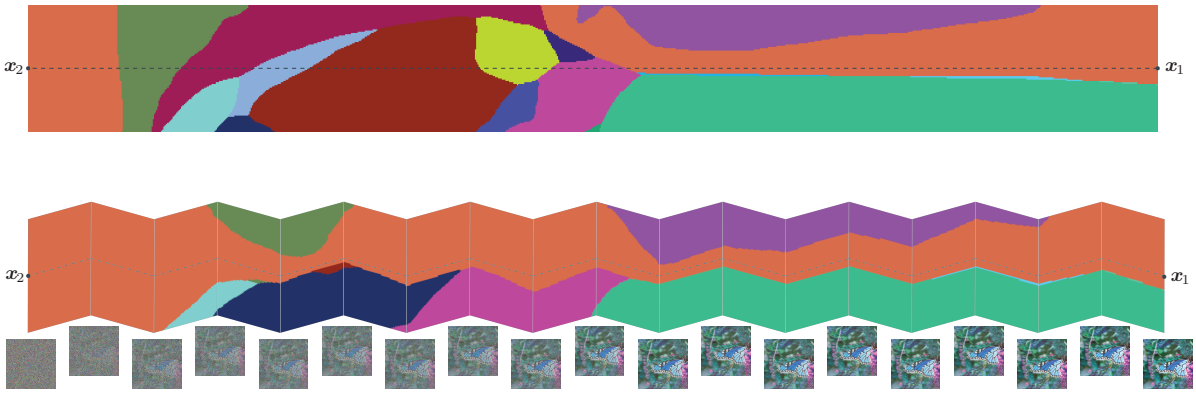

Figure 3: **Scenario 3.** Classification regions (shown with different colors), and illustration of different paths between images $\boldsymbol{x}_1$, $\boldsymbol{x}_2$. **Top:** The convex path between two datapoints might not be entirely included in the classification region. **Bottom:** Illustration of a nonconvex path that remains in the classification region. The image is obtained by stitching normal cross-sections spanned by $\boldsymbol{r}(\boldsymbol{x}_1)$ (adversarial perturbation of $\boldsymbol{x}_2$) and $\boldsymbol{p}_i - \boldsymbol{p}_{i+1}$ (two consecutive anchor points in the path $\mathcal{P}$).