Results: [20, 35] Crossings

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November 8, 2025

The CNN (88M params) and ViT (86M params) were fine-tuned on a new dataset $\mathcal{D}$ comprising unknot $\mathcal{U}$ and non-trivial knot $\mathcal{K}$ diagrams partitioned into three disjoint data splits $S = \{\mathcal{D}_{\text{train}}, \mathcal{D}_{\text{val}}, \mathcal{D}_{\text{test}}\}$, where:

$$\mathcal{D} = \biguplus_{s \in S} s$$

$$|\mathcal{D}| = 560{,}000 \text{ diagrams,}$$

$$|\mathcal{D}_{\text{train}}| = 0.8 \cdot |\mathcal{D}| = 448{,}000 \text{ diagrams,}$$

$$|\mathcal{D}_{\text{val}}| = |\mathcal{D}_{\text{test}}| = 0.1 \cdot |\mathcal{D}| = 56{,}000 \text{ diagrams,}$$

$$\text{where} \ \ \forall s \in S, \ \ s \in \mathcal{U} \cup \mathcal{K} \ \ \text{and} \ \ |\mathcal{U}| = |\mathcal{K}|.$$

Each split in S contained knots with $n \in N := \{20, 21, \ldots, 35\}$ crossings. For all distinct $a, b \in N$, each split contained an equal number of a-crossing and b-crossing unknot and non-trivial knot diagrams.
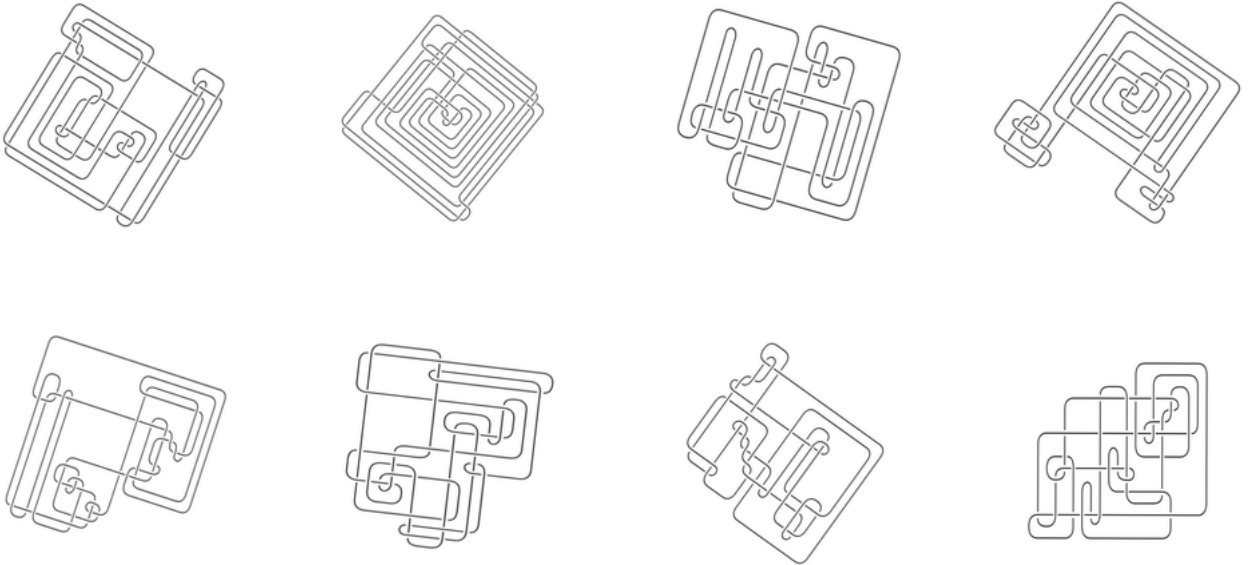
Learning Curves

Figure 1: TBC

CNN* Saliency Maps

Saliency maps for knot diagrams in $\mathcal{D}_{\text{test}}$ for the best-performing CNN (CNN*).

CNN* True Positives: True Unknots Predicted as Unknots

CNN* False Negatives: True Unknots Predicted as Knots

CNN* True Negatives: True Knots Predicted as Knots

CNN* False Positives: True Knots Predicted as Unknots

ViT* Saliency Maps

Saliency maps for knot diagrams in $\mathcal{D}_{\text{test}}$ for the best-performing ViT (ViT*).

ViT TP: True Unknots Predicted as Unknots

ViT FN: True Unknots Predicted as Knots

ViT TN: True Knots Predicted as Knots

ViT FP: True Knots Predicted as Unknots