



**Supplementary Fig. S8.** The Sequence logo of Tat/SPII generated with (A) known Tat/SPII sequences (represented by information content) and (B) predicted Tat/SPII sequence patterns via LoRA-tuned ESM2-3B (represented by attention weights). (C) Comparison between the gold-standard sequence logo and the predicted sequence pattern using Spearman's Rank Correlation between information content and attention weights. Each dot represents one position on the sequence.