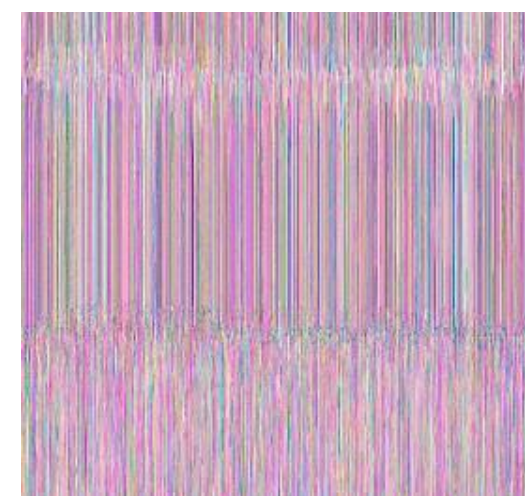
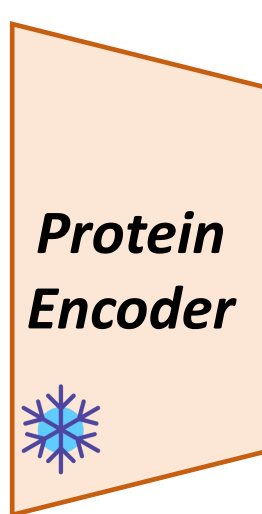


(A)

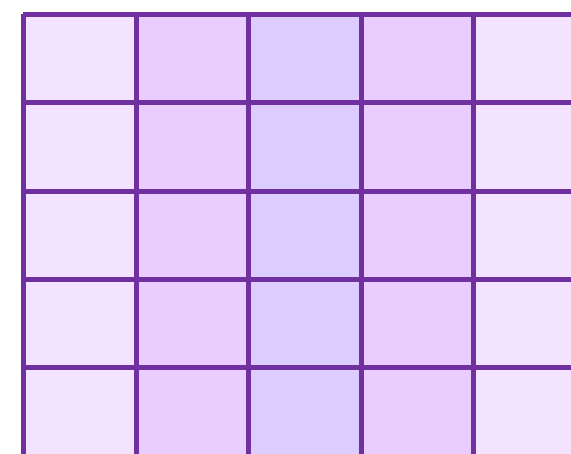
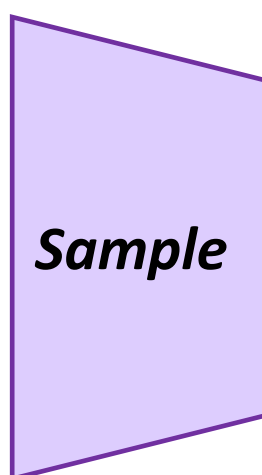
Target Protein Sequence



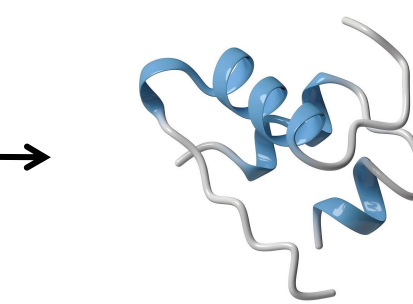
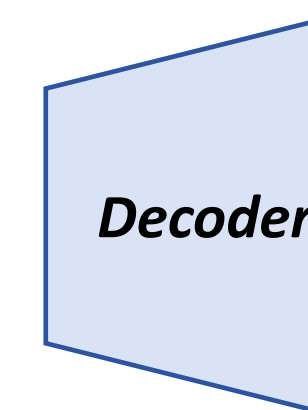
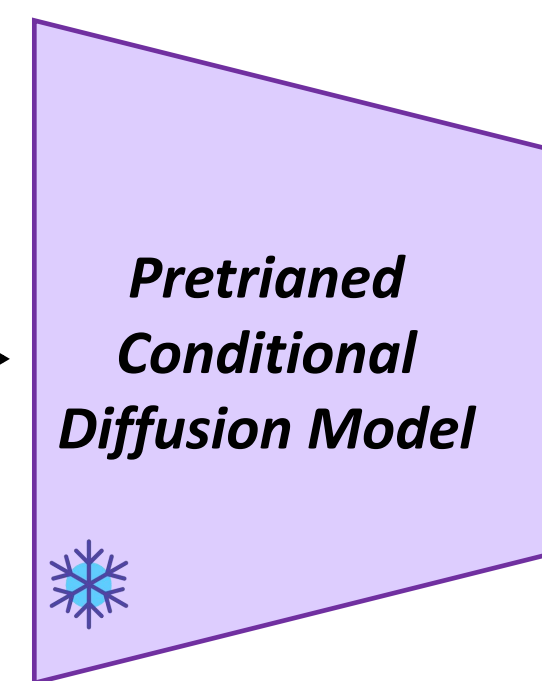
Gaussian Noise



Protein Conditional Feature



Hidden States



Designed Peptide Sequences

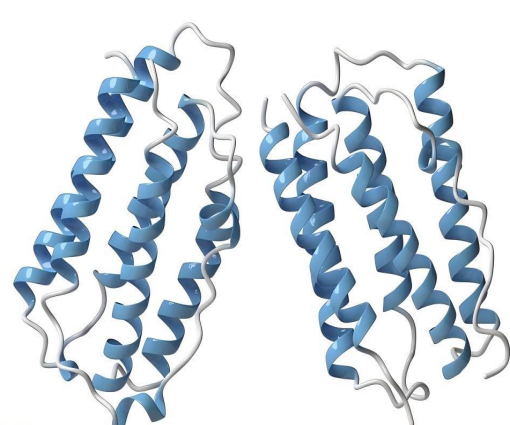
Trainable

Frozen

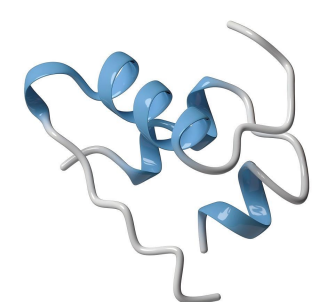
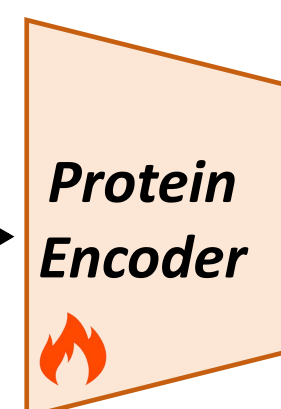
The overview of PepCCD framework

(B)

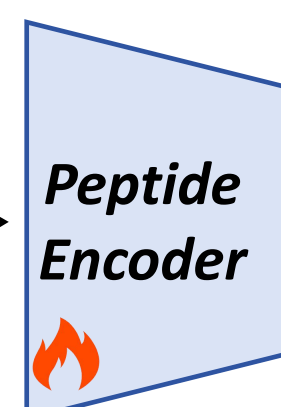
Stage1:Protein-Peptide Embedding Alignment



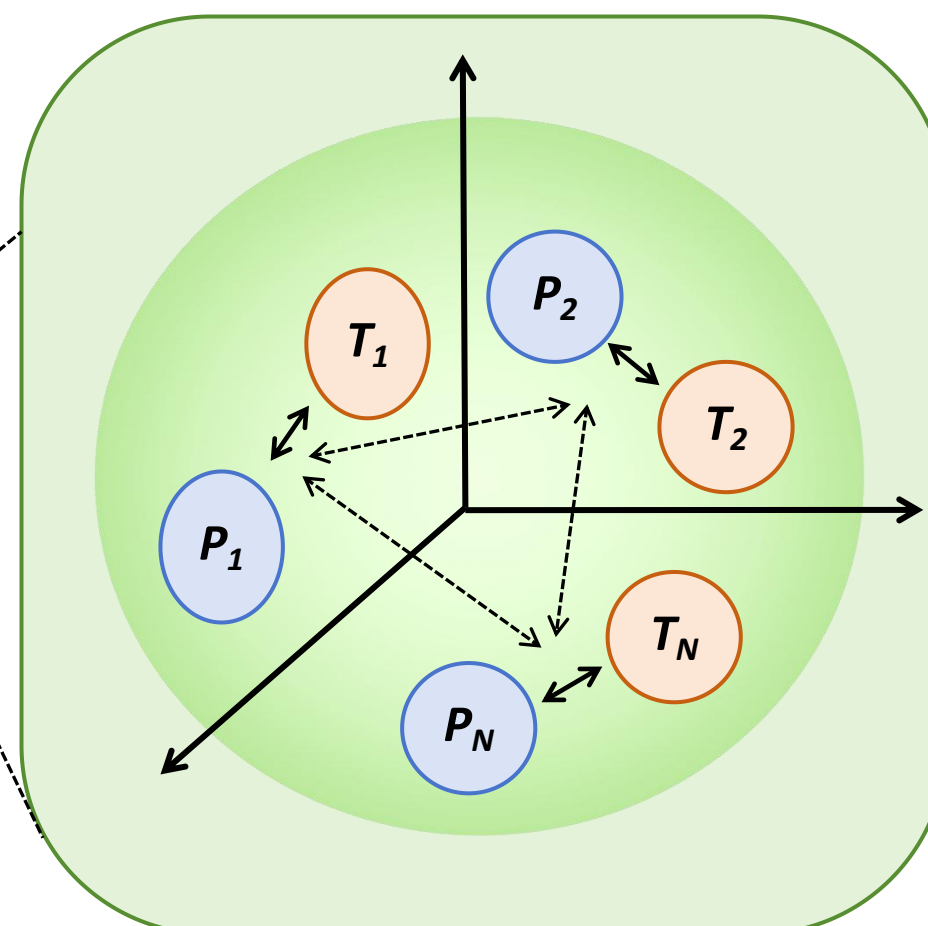
Protein Sequences



Peptide Sequences

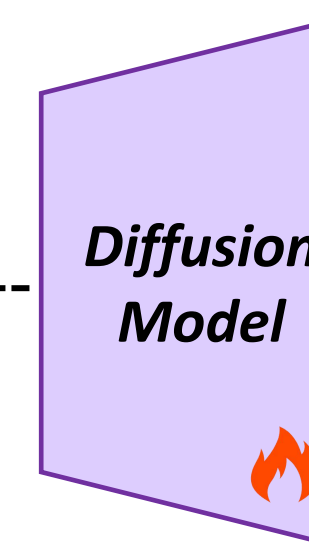


Contrastive Learning Module

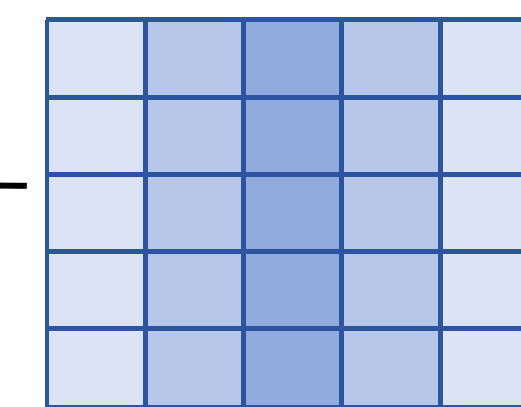


(C)

Stage2:Uncondtional Peptide Pretraining

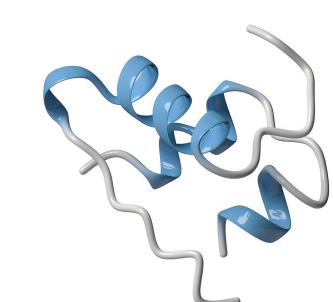


MSE Loss

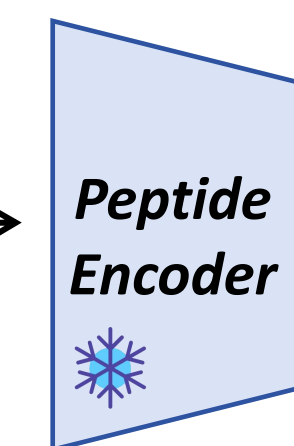


Noising Process

Denoising Process



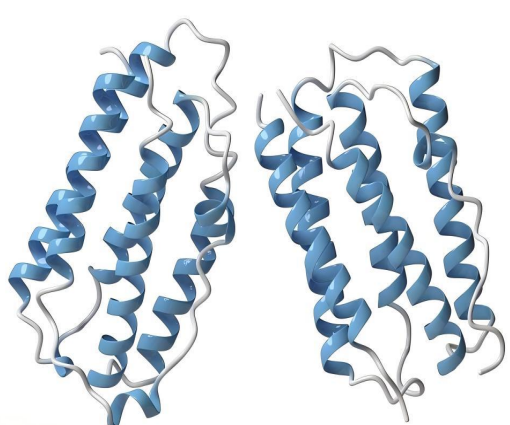
Pre-training Peptide Sequences



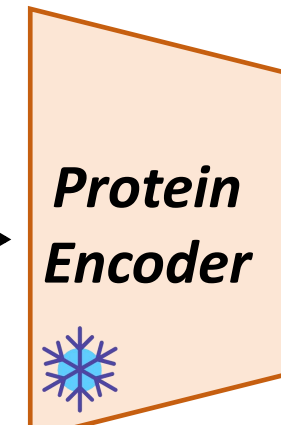
Embedding Matrix

(D)

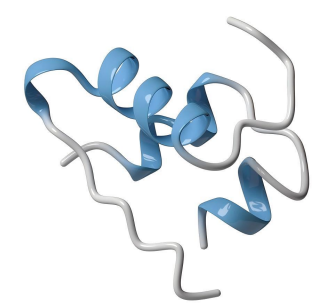
Stage3:Target-Guided Conditonal Fine-Tuning



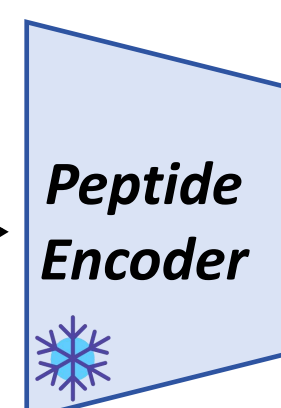
Protein Sequences



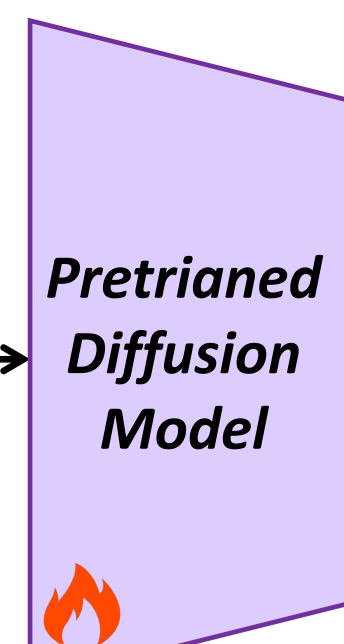
Protein Conditional Feature



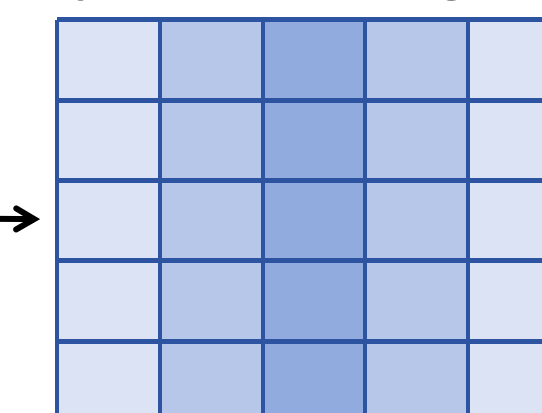
Peptide Sequences



Peptide Embedding Matrix



Output Embedding Matrix



MSE Loss

Decoded Tokens



Decoding

CrossEntropy Loss