

## Input

Sequence  
input (On-  
seq/off\_seq)

Preprocess  
sequences

## Feature Extraction

GC Content

Sequence Length

Nucleotide frequency

AT Content

Pam Detection

Hamming Distance

Self Complementry

Mismatch Distance

## Normalizaton

Min-Max Scaling

## Hybrid Encoding

XOR Encoding

K-mer Encoding

Numerical  
Features and  
PAM Encoding

CNN-XOR

CNN\_Kmer

MLP

## EHNN Model

Bidirectional  
LSTM

y\_pred  
(Output)

Sigmoid

Dropout 0.5

Dense  
256+ReLu

Final  
Concatenation

## Forward Pass

## Prediction