Visualization of the relationship between ChIP-seq peak and attention weights.

For each genomic region, the figure on the left represents the attention weights and the figure on the right represents the enrichment of fold changes in ChIP-seq BigWig file in the same region. Since the lengths of attention weights are reduced by the convolution and pooling layers, their lengths are less than the fold change values. Thus, the plots are aligned on the X-axis to represent the relative position of fold change and averaged attention weights.

The attention scores are extracted from both single and pairwise models. For single module, the dimension of attention scores is $L \times d_{model}$, and the channel that contains the highest attention weight is used. Similarly, for pairwise module, the dimension of attention scores is $L \times L$, and the row sum of these weights are always 1. As a result, we use the row that contains the highest attention weight.
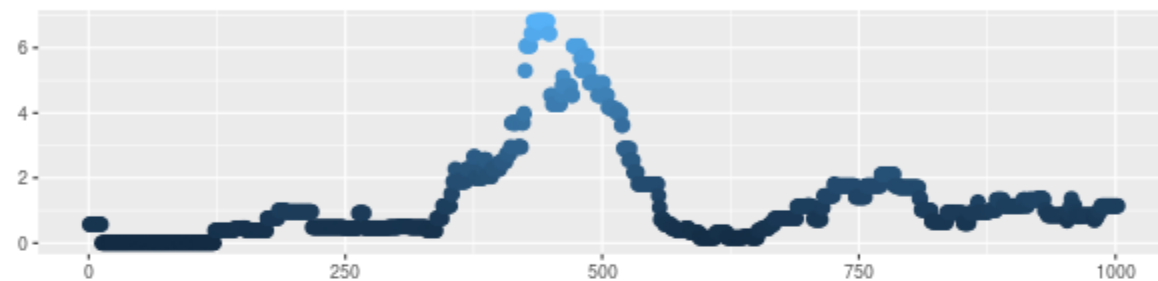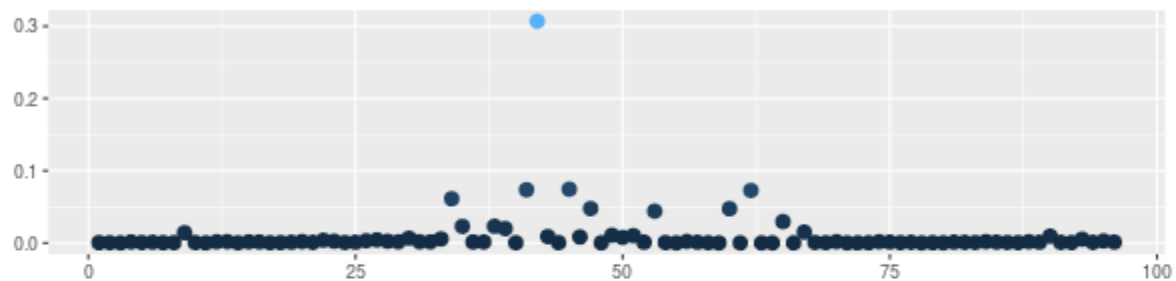
Single attention module
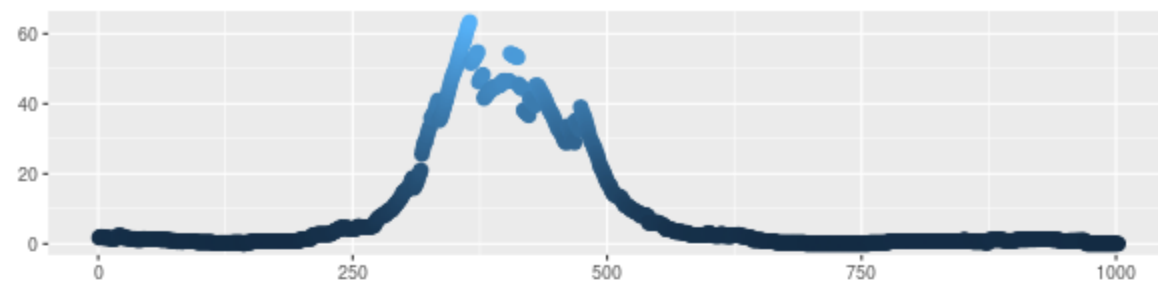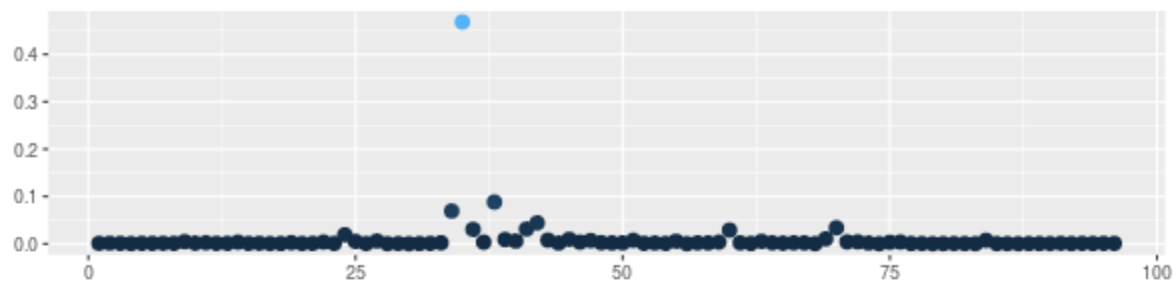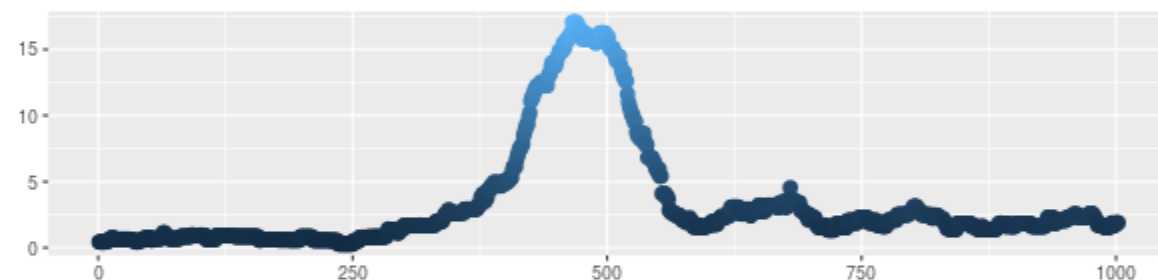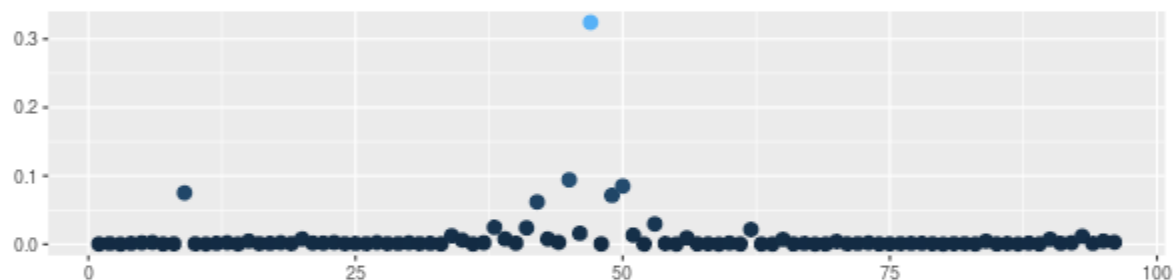
CTCF/induced pluripotent stem cell
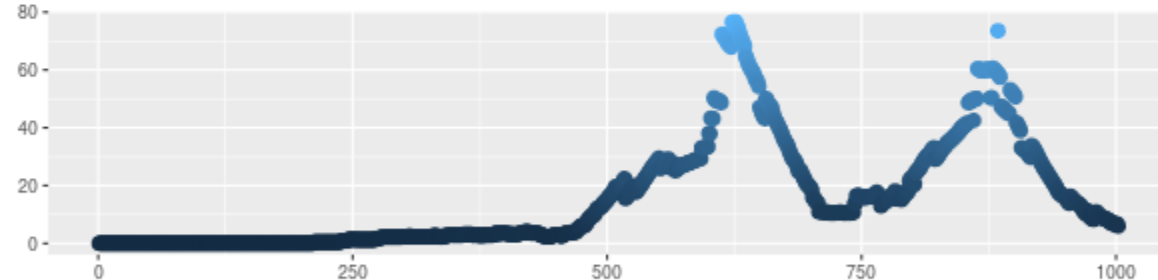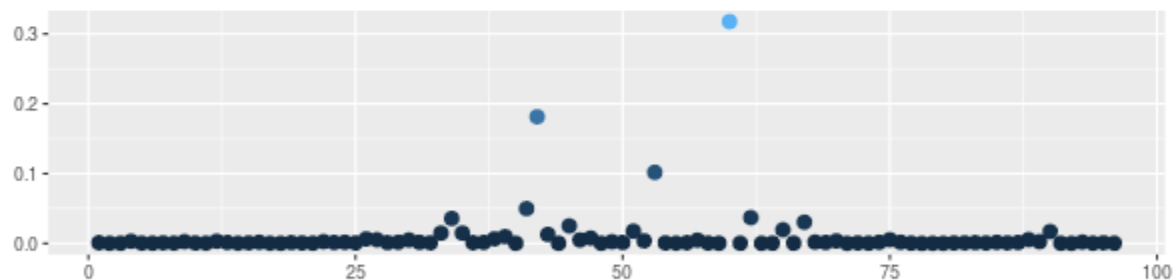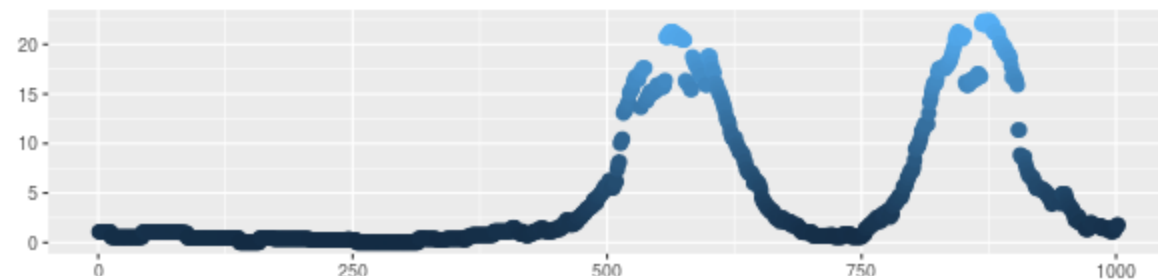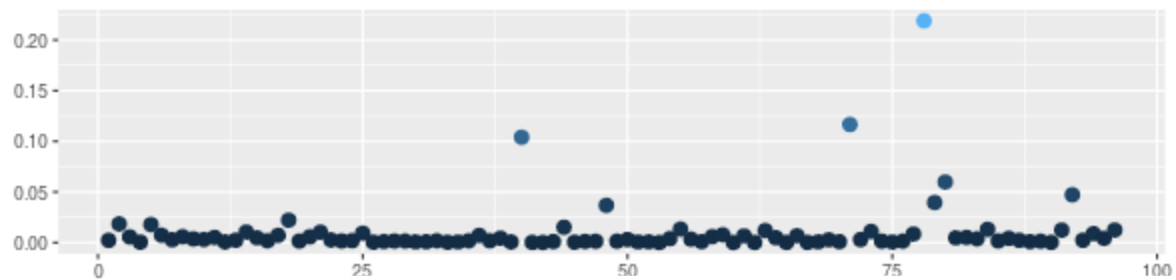
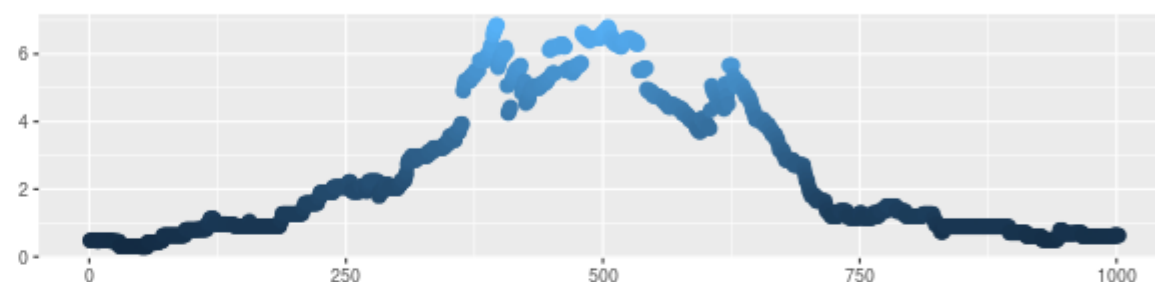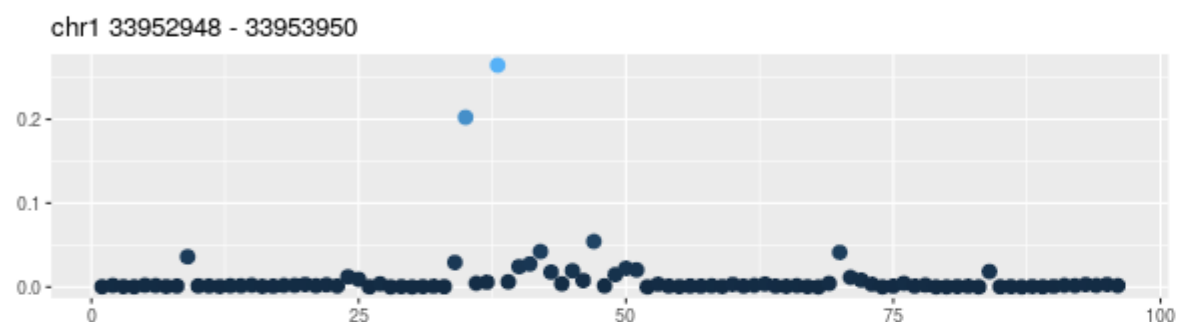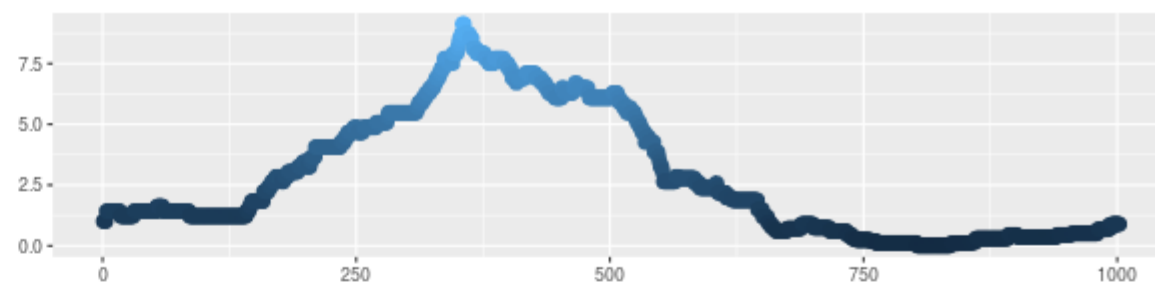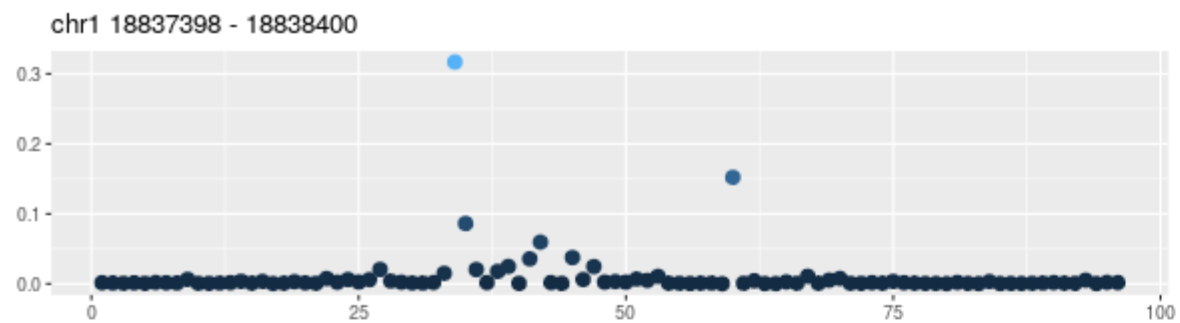Attention weights   ChIP-seq score
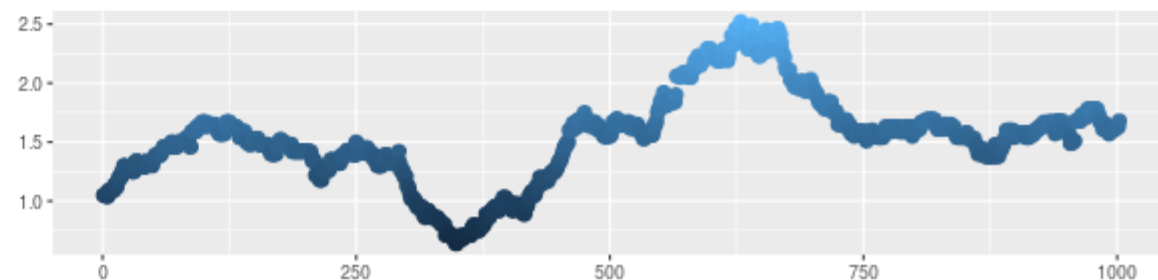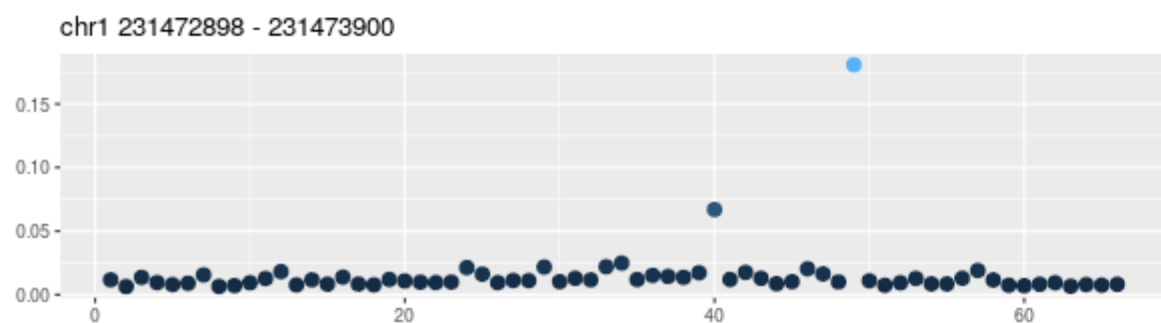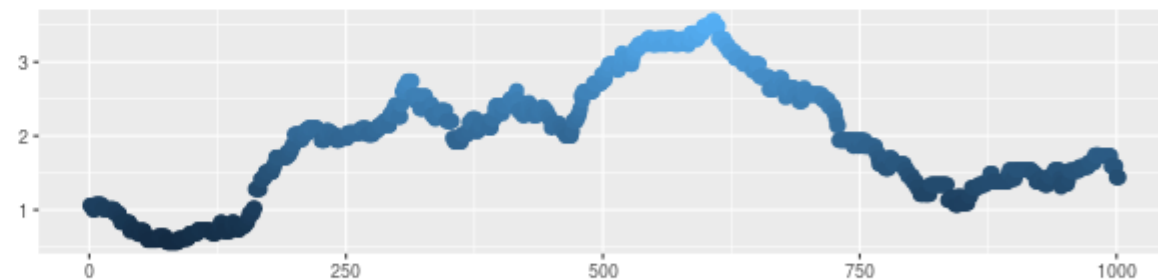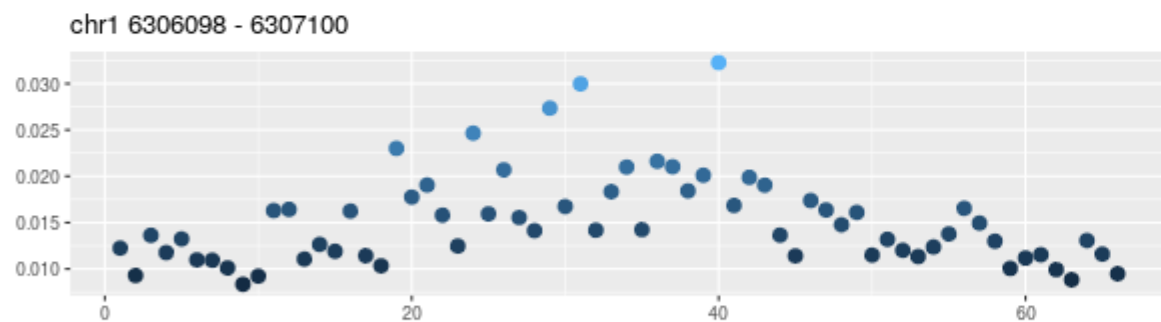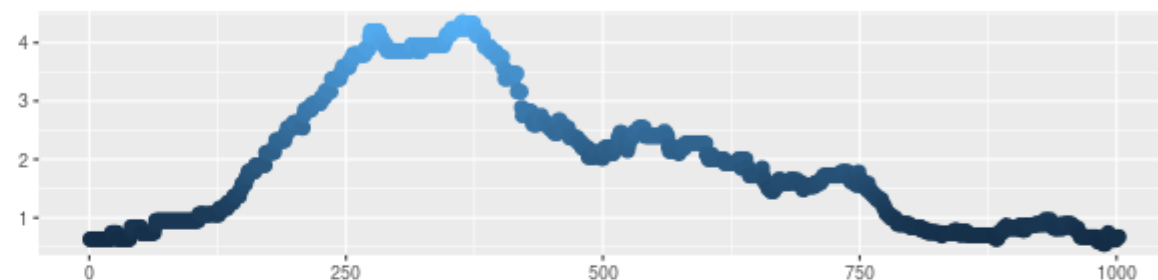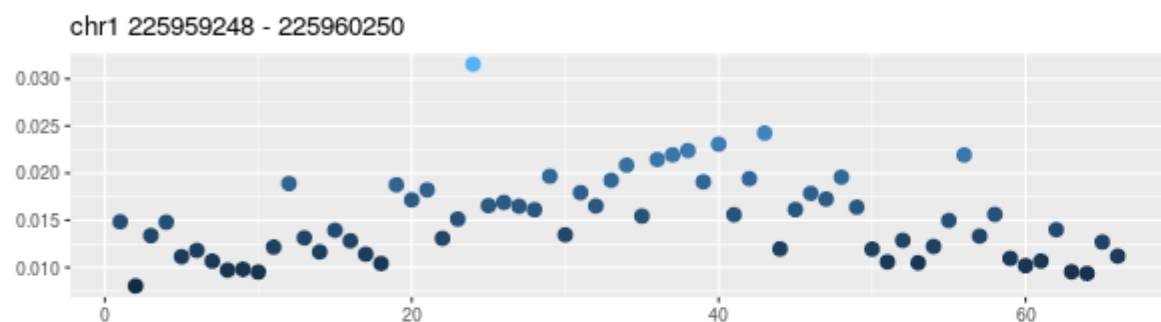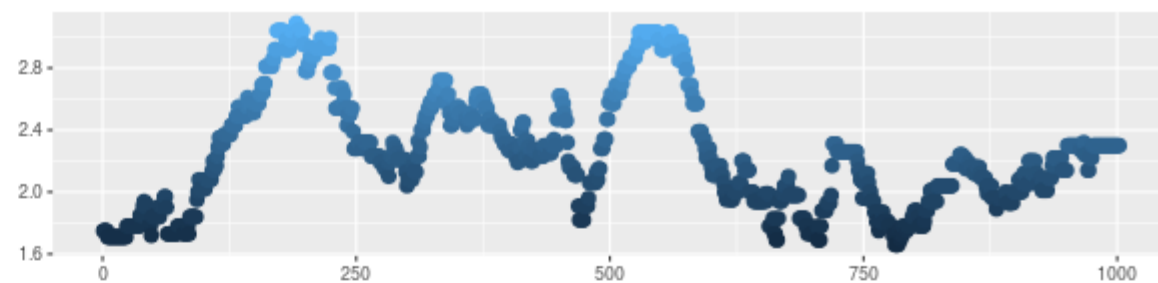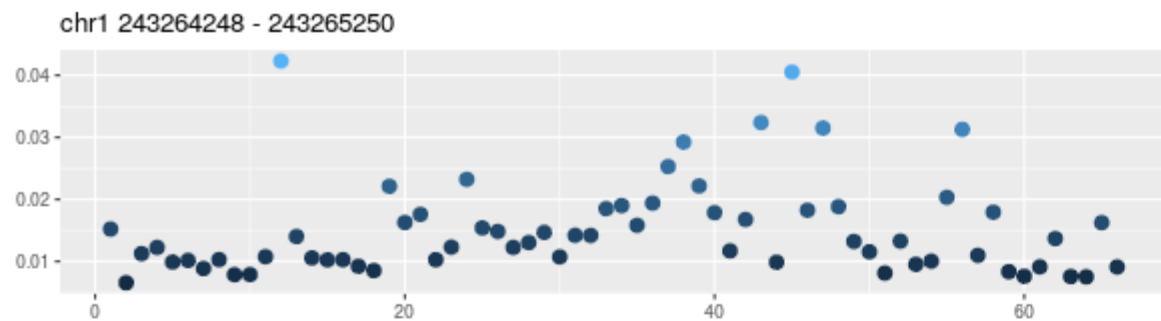
Single attention module

CTCF/PC-3
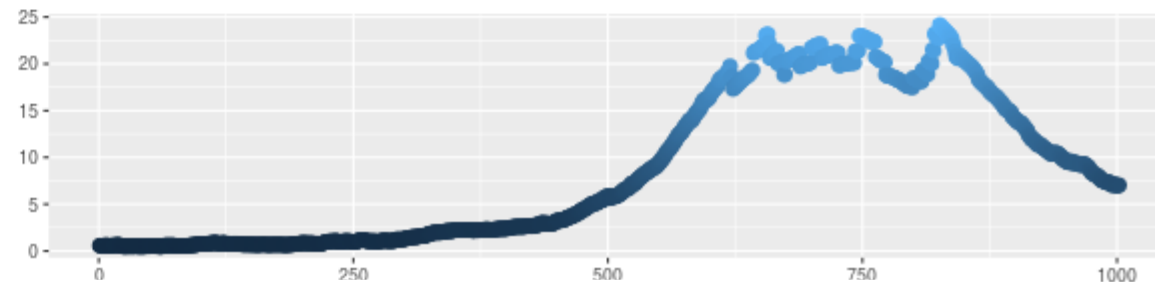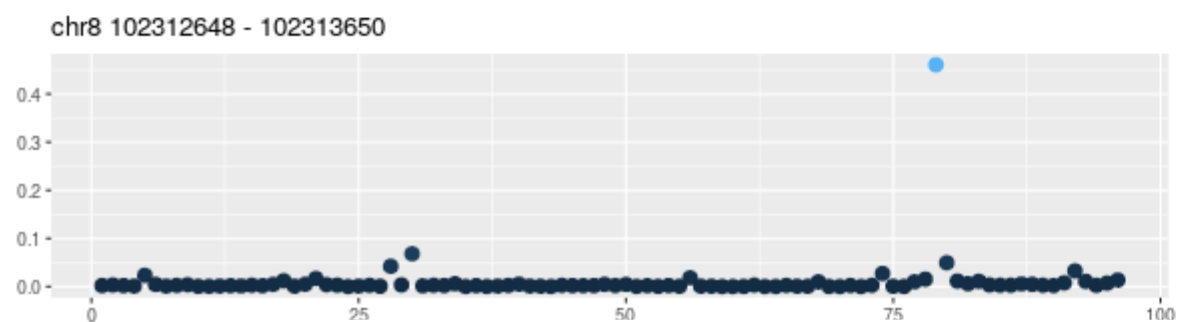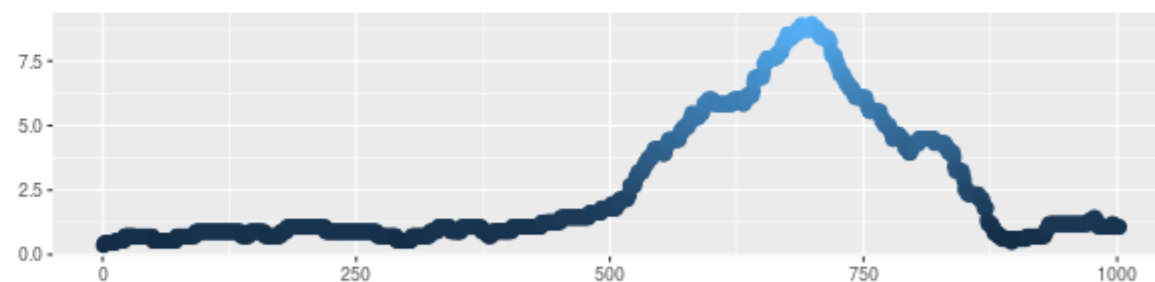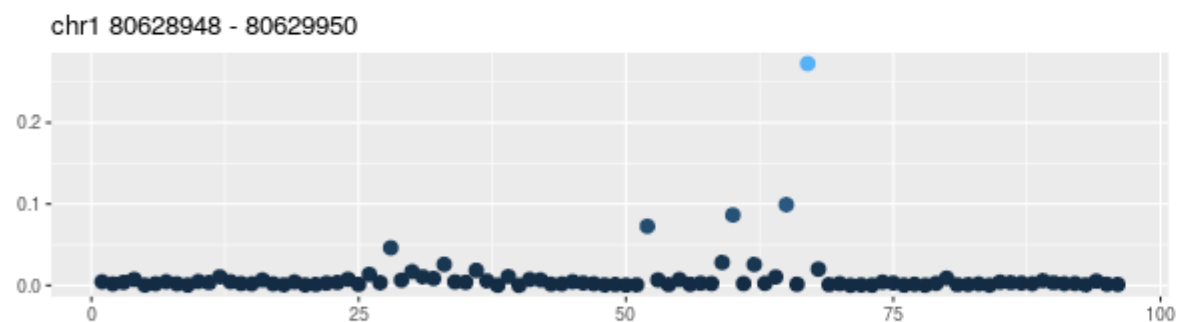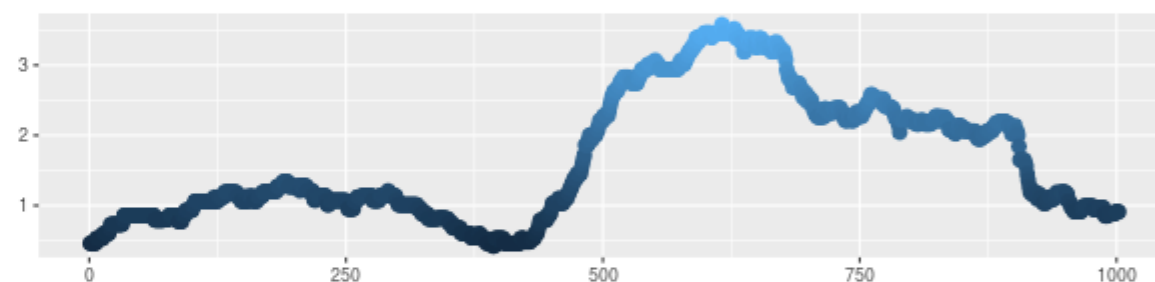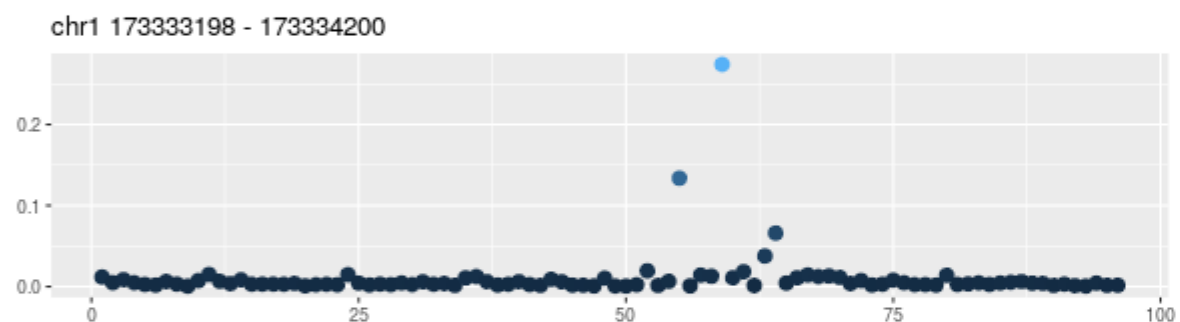
Attention weights   ChIP-seq score
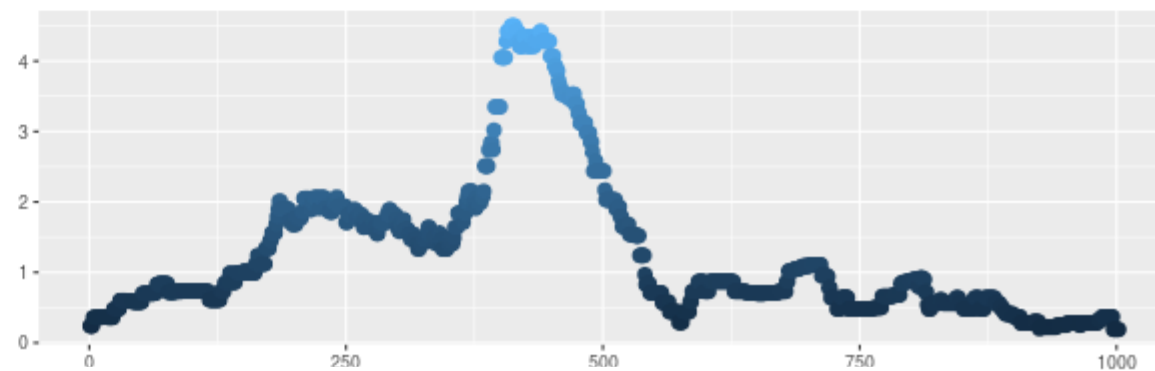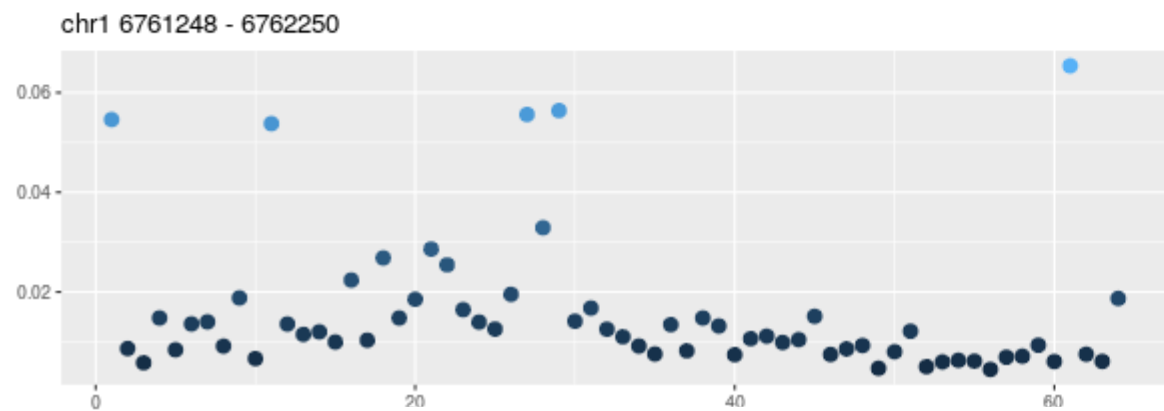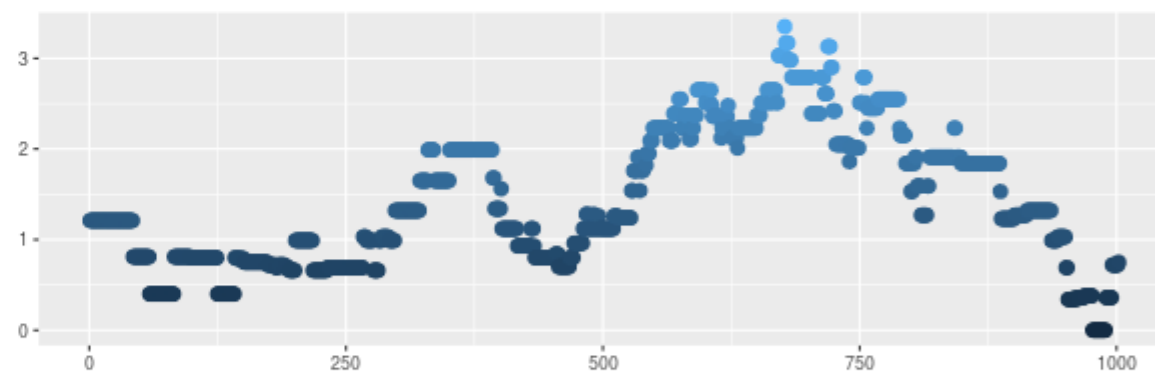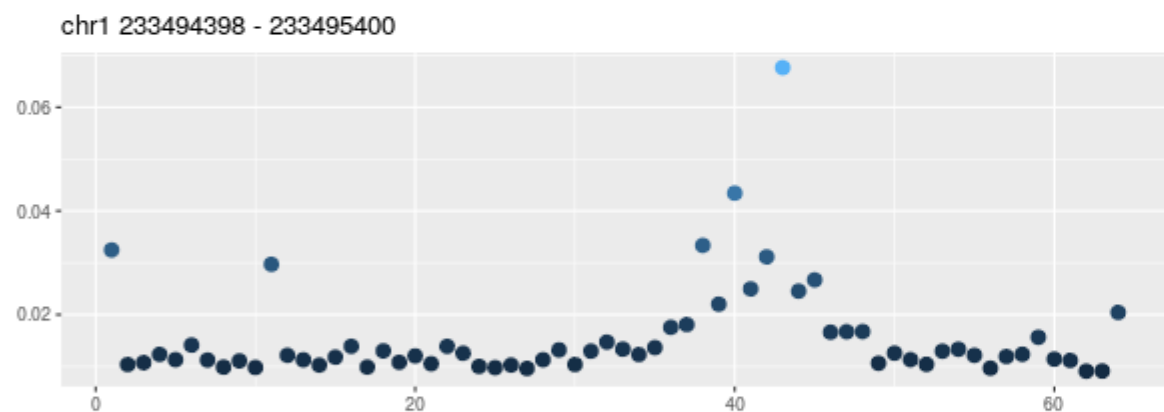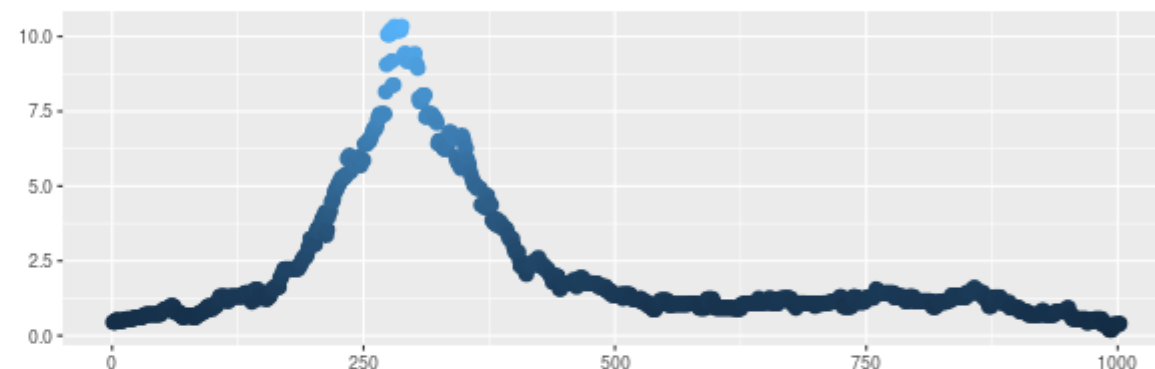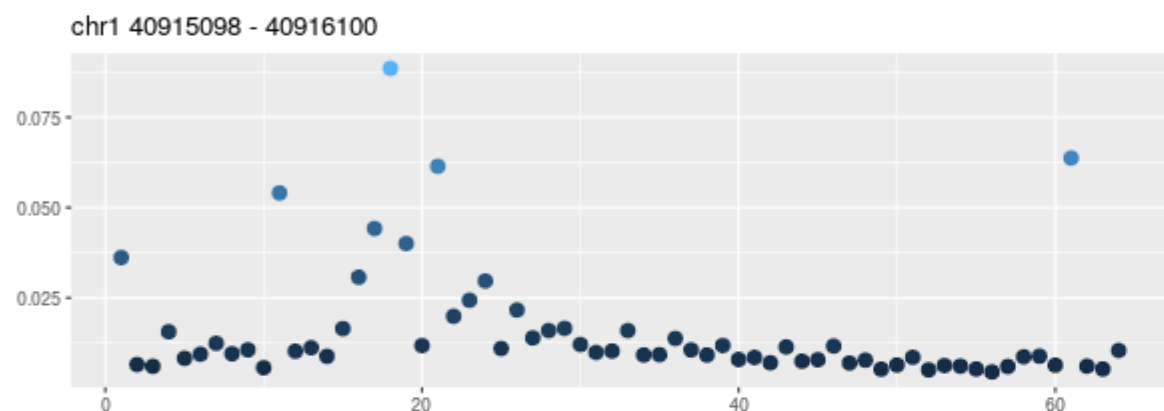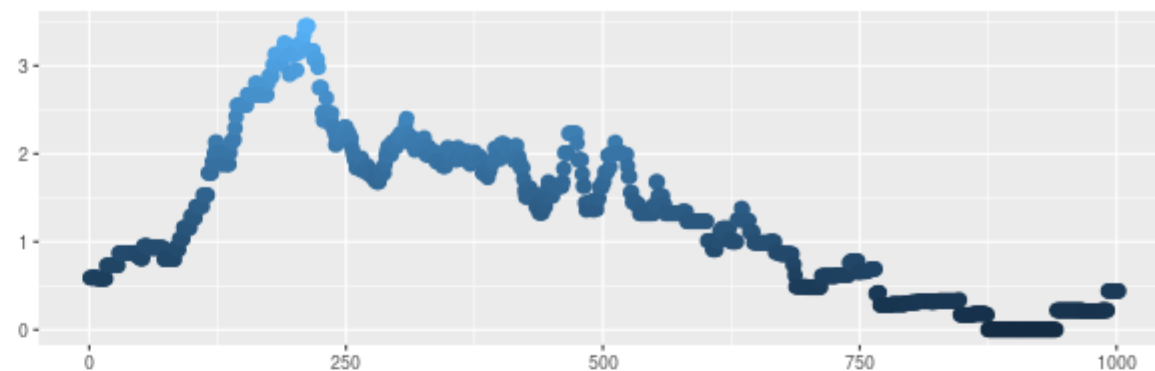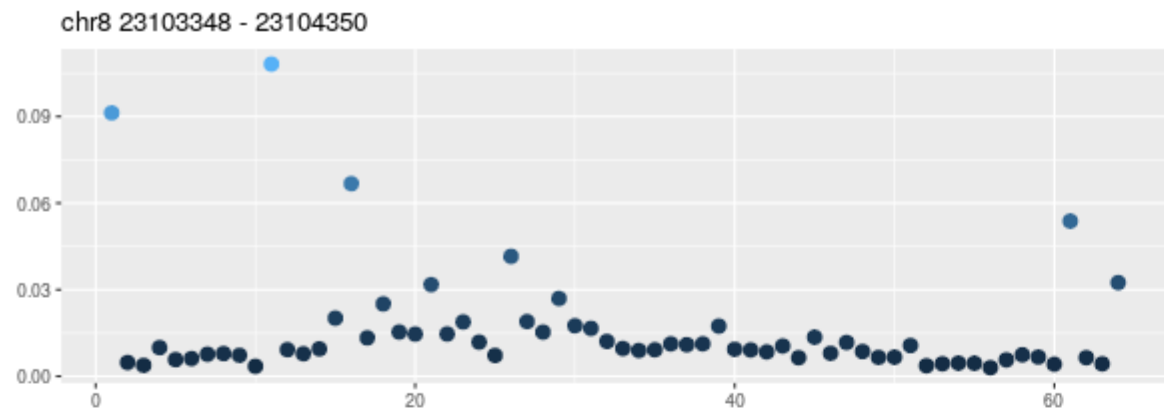
Single attention module

E2F1/K562

Attention weights   ChIP-seq score

Single attention module

EGR1/liver

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chr1 40915098 - 40916100
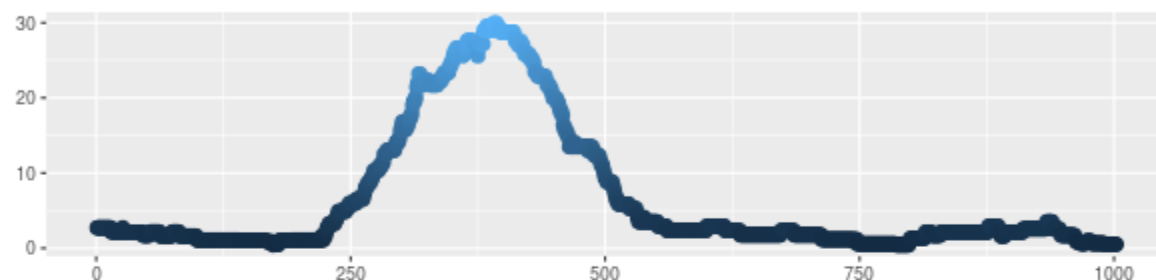
chr1 233494398 - 233495400

chr1 6761248 - 6762250
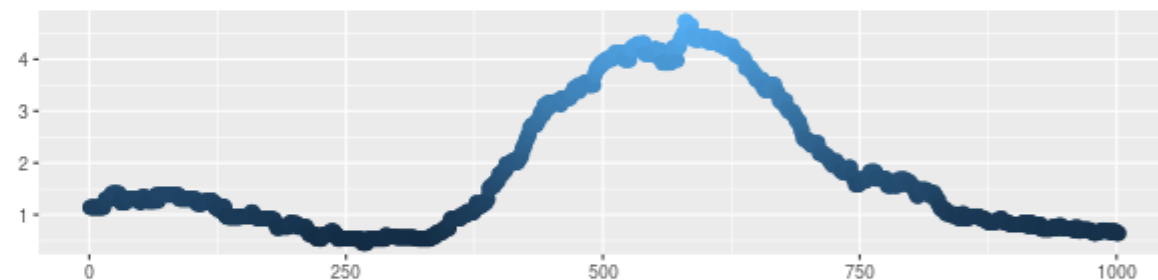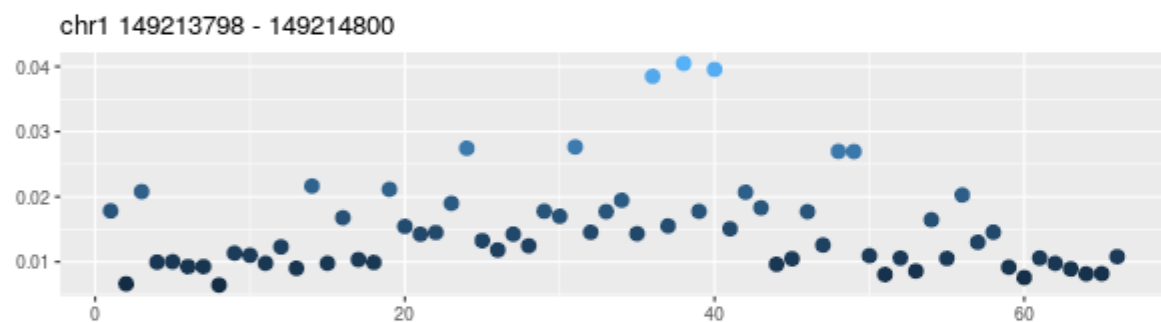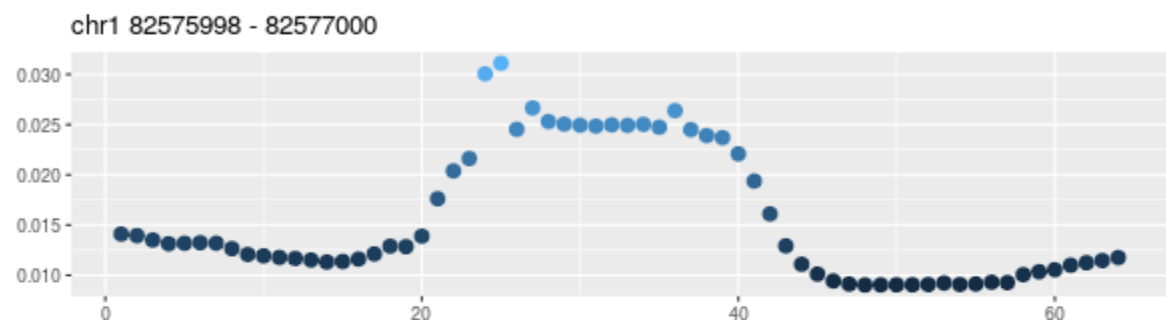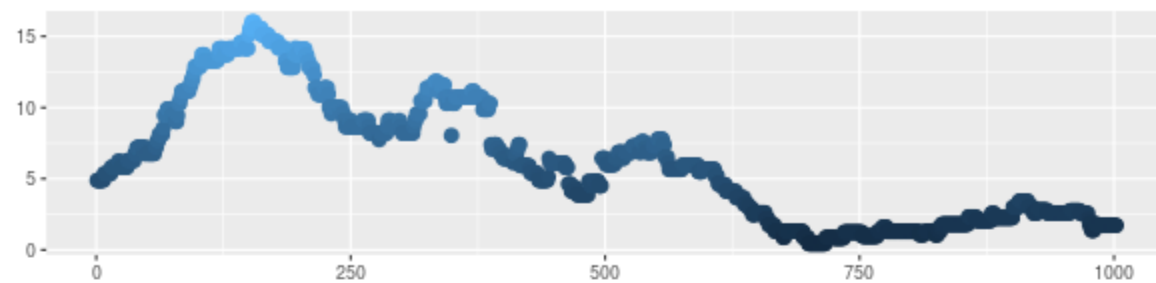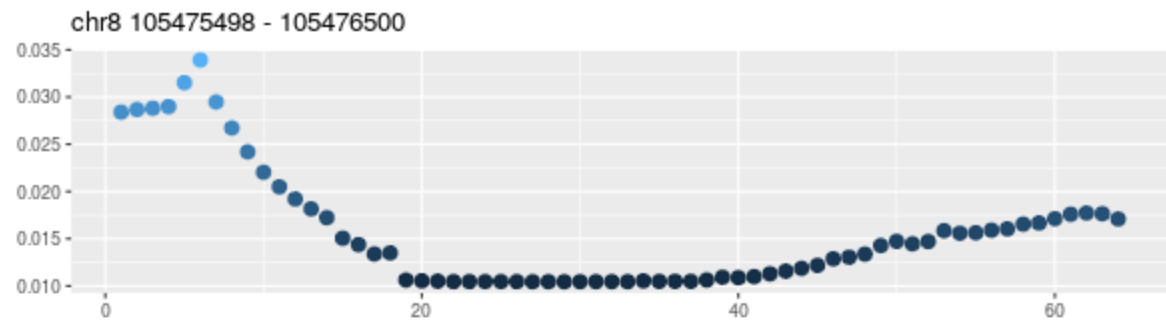
Attention weights
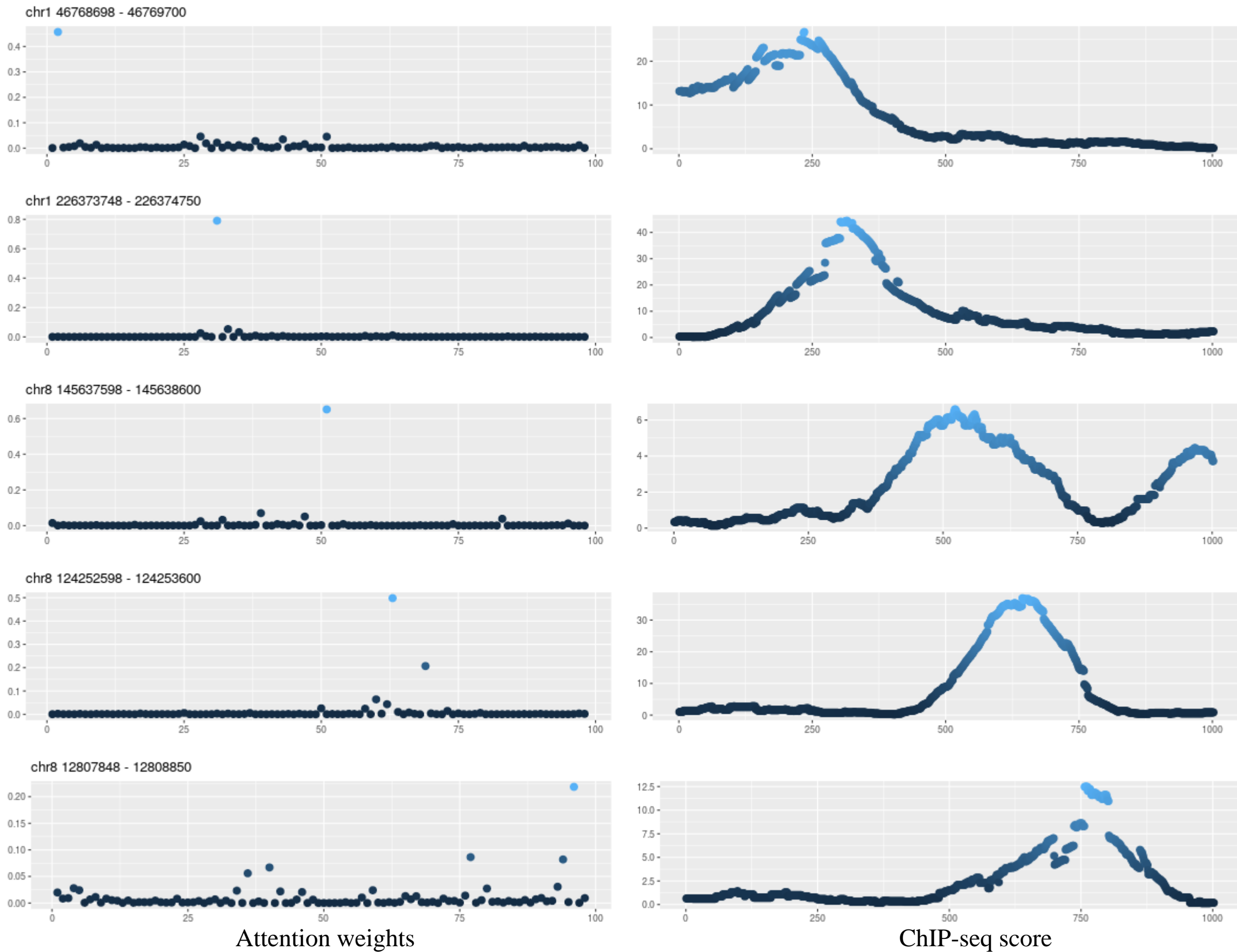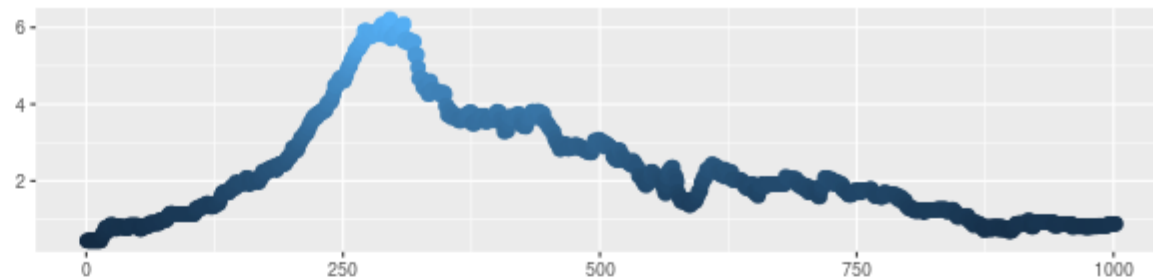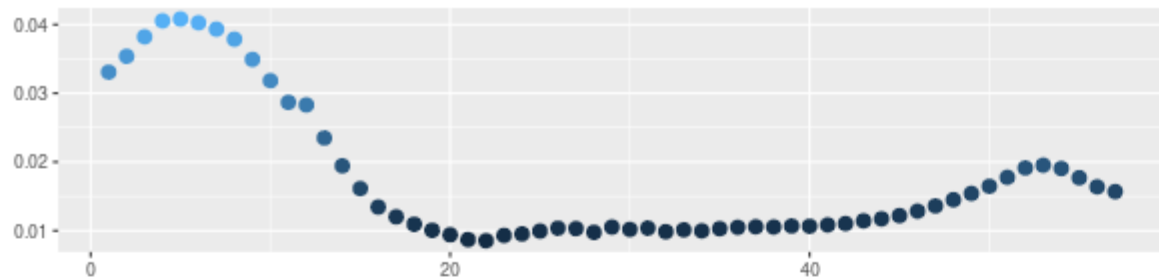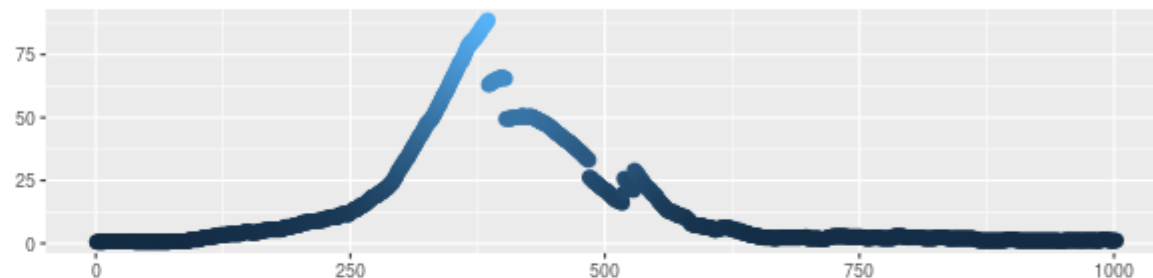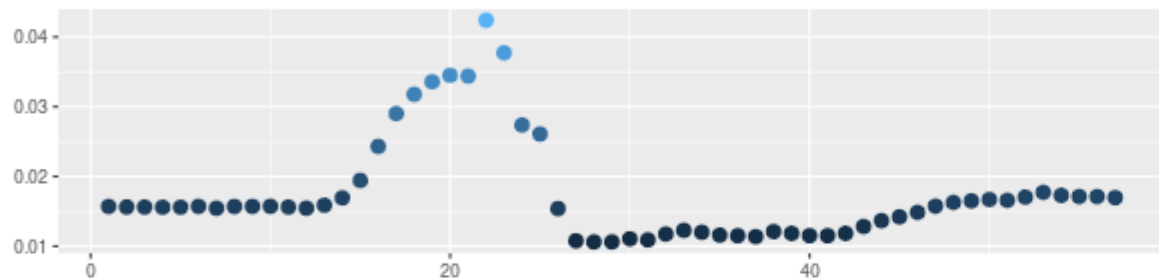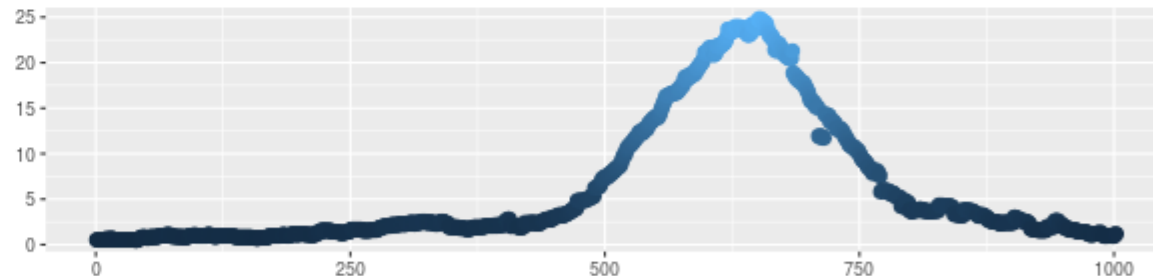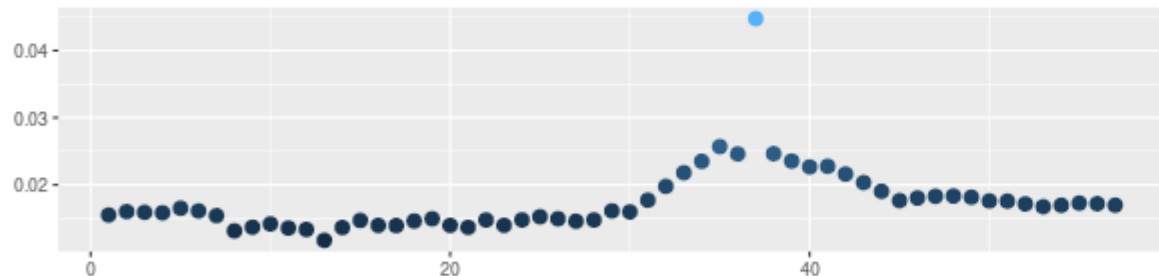
ChIP-seq score

Single attention module

FOXA1/liver
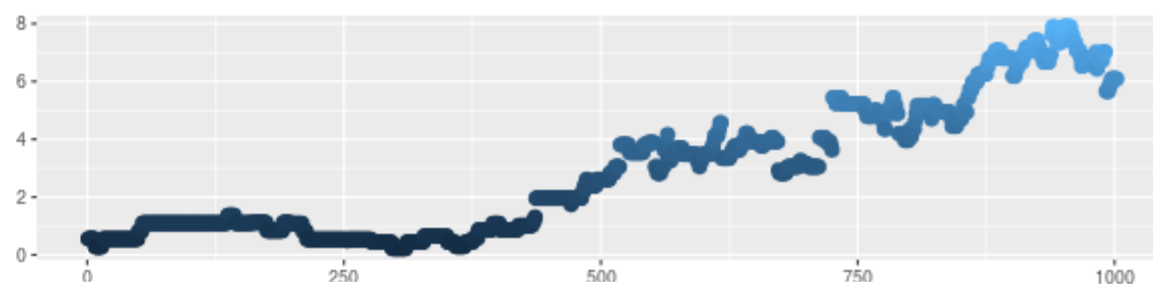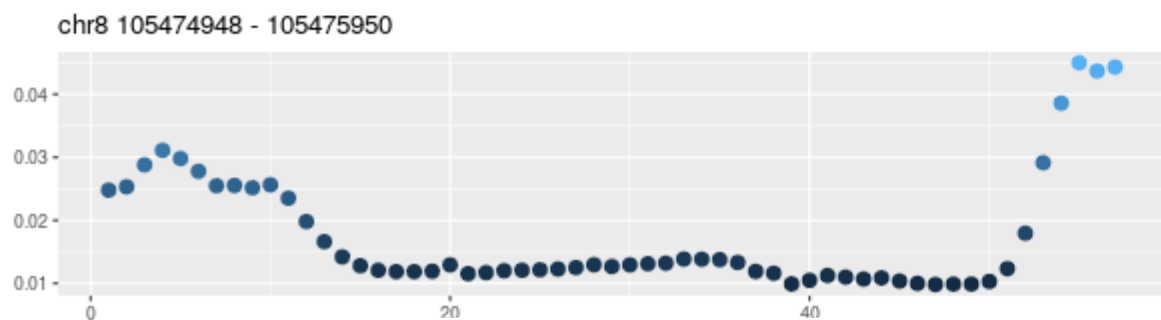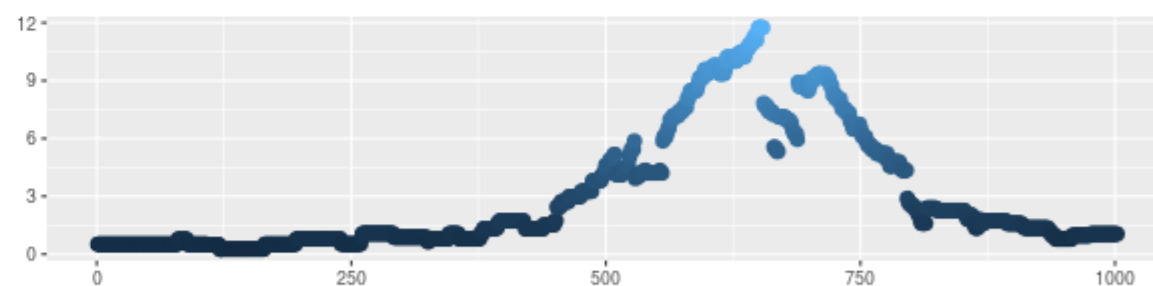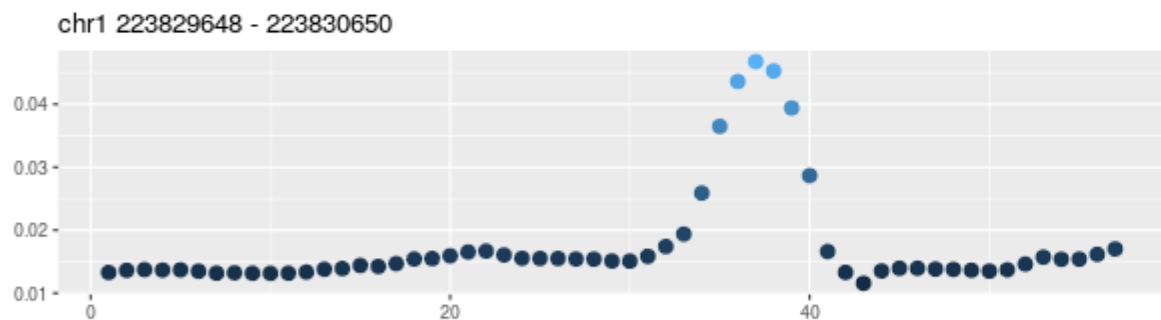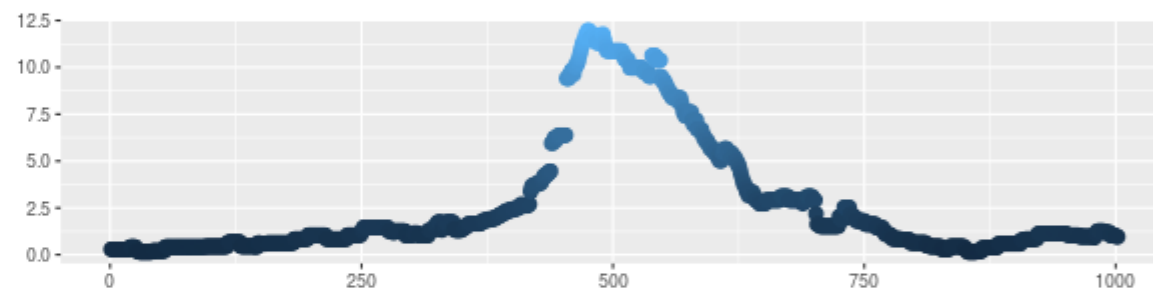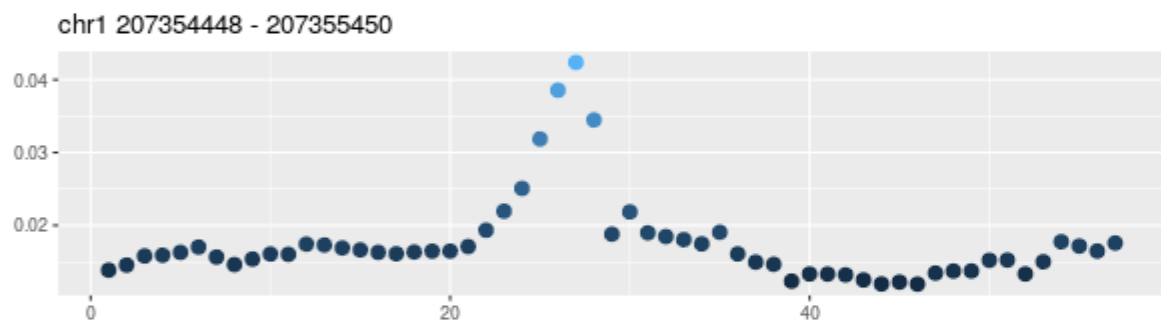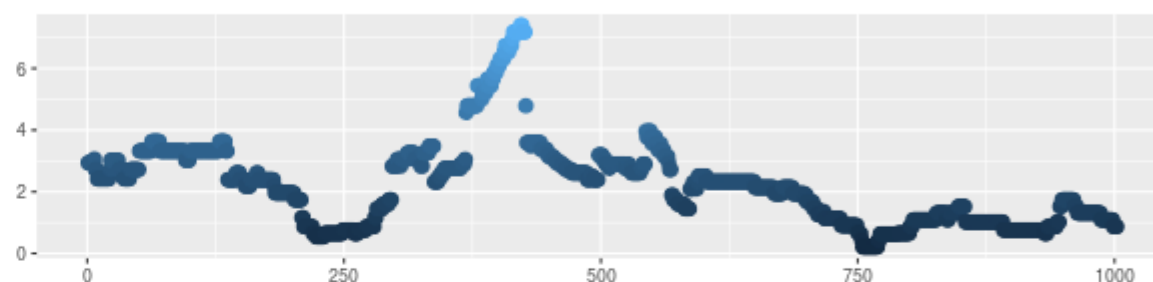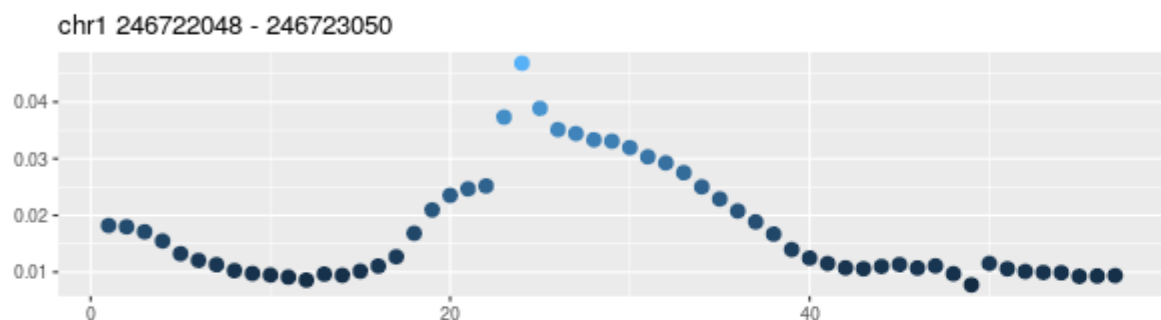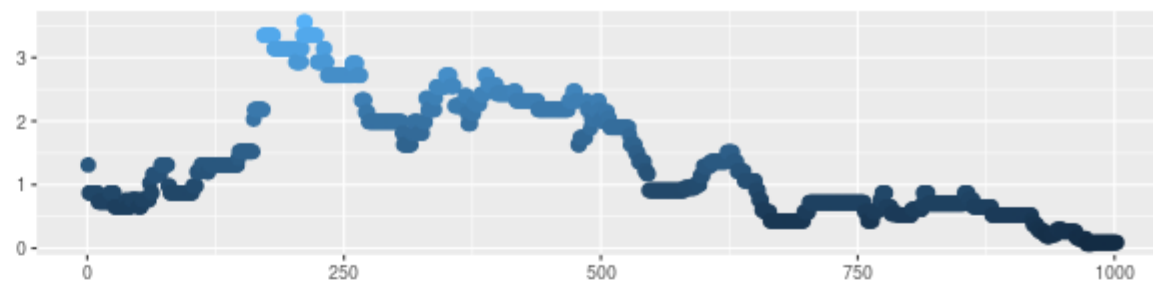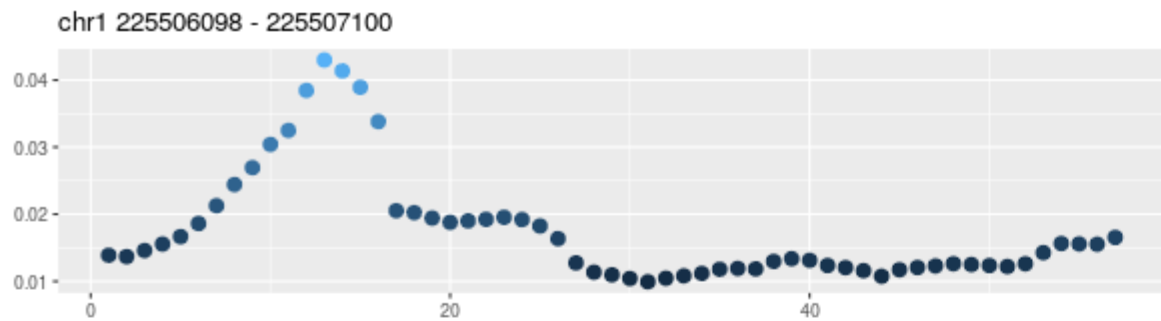
Attention weights   ChIP-seq score
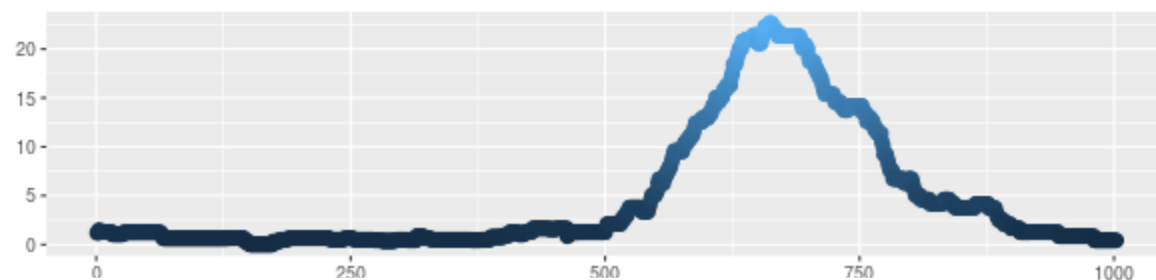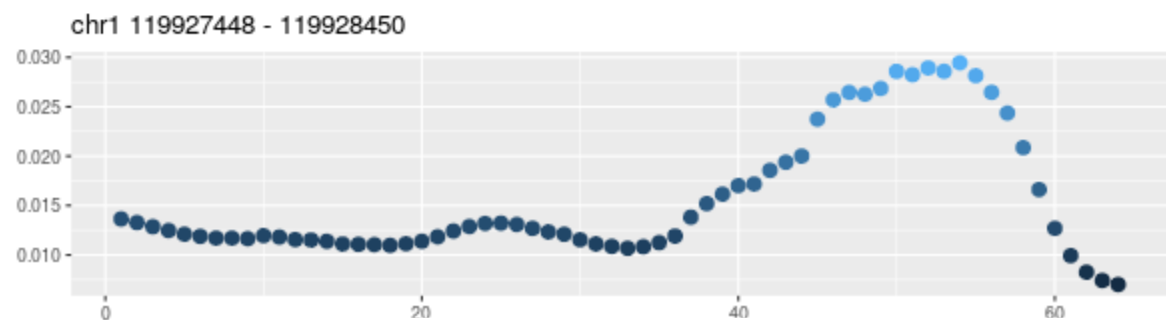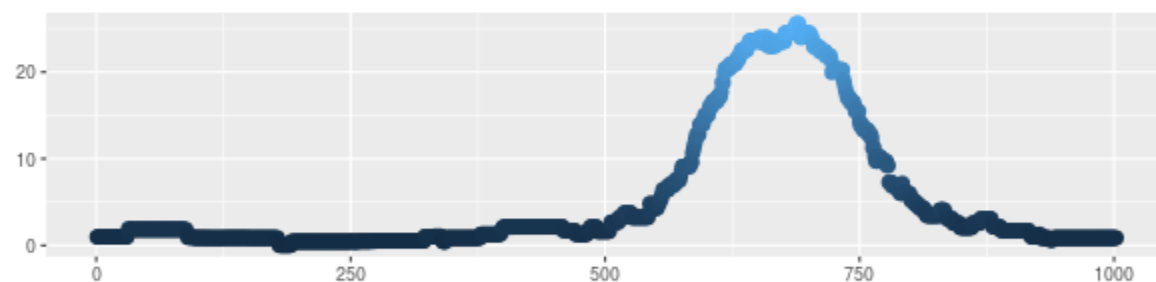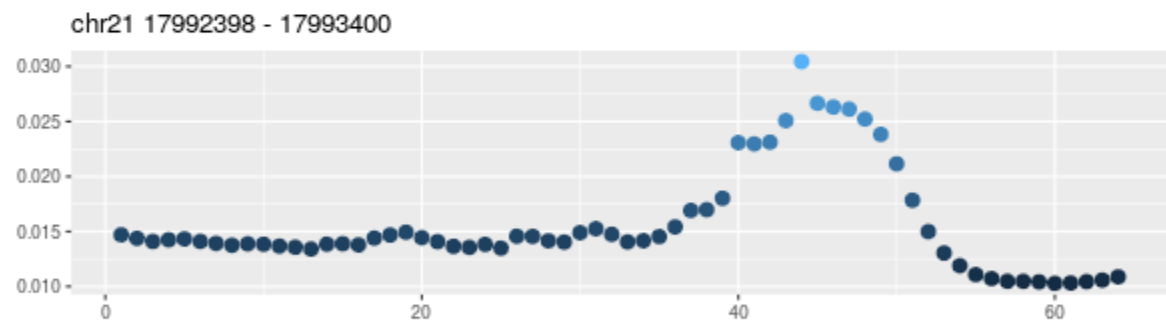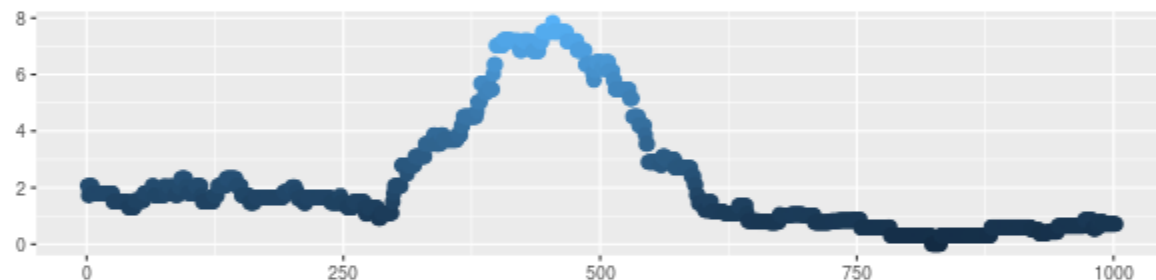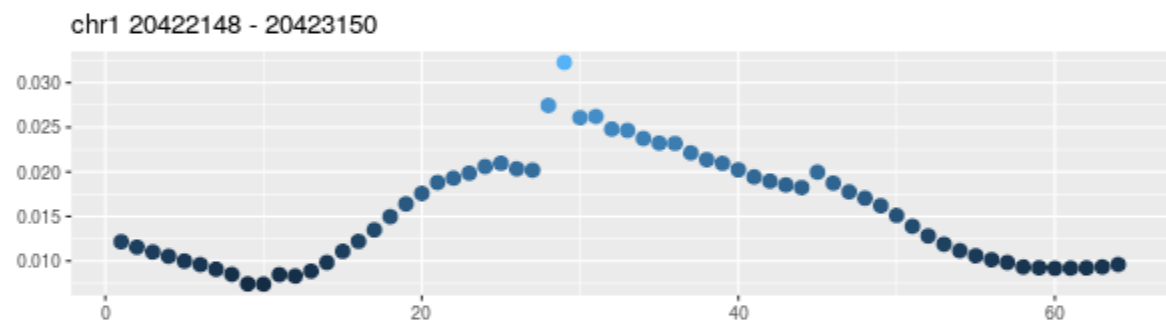
Single attention module

FOXA2/liver

Attention weights   ChIP-seq score

Single attention module

GABPA/liver

Attention weights

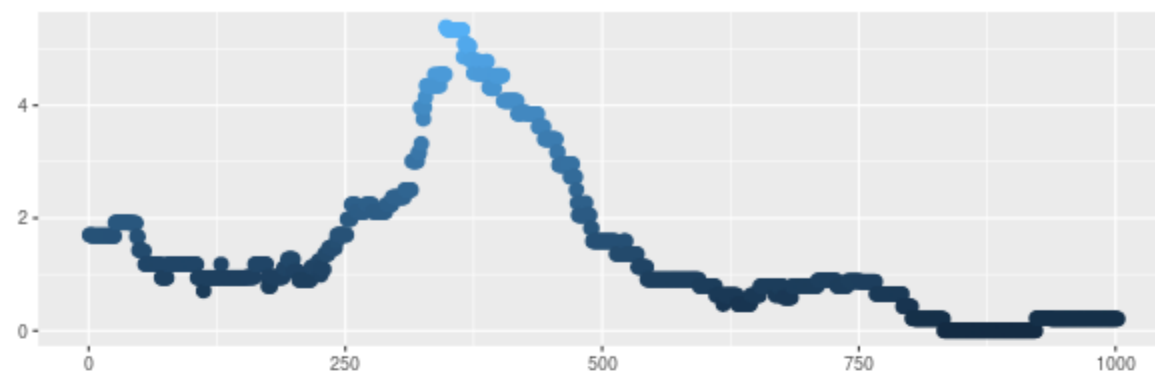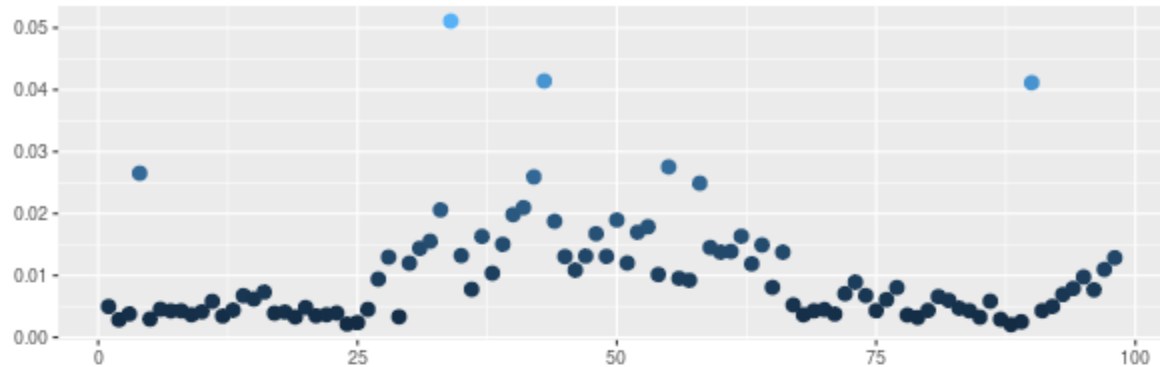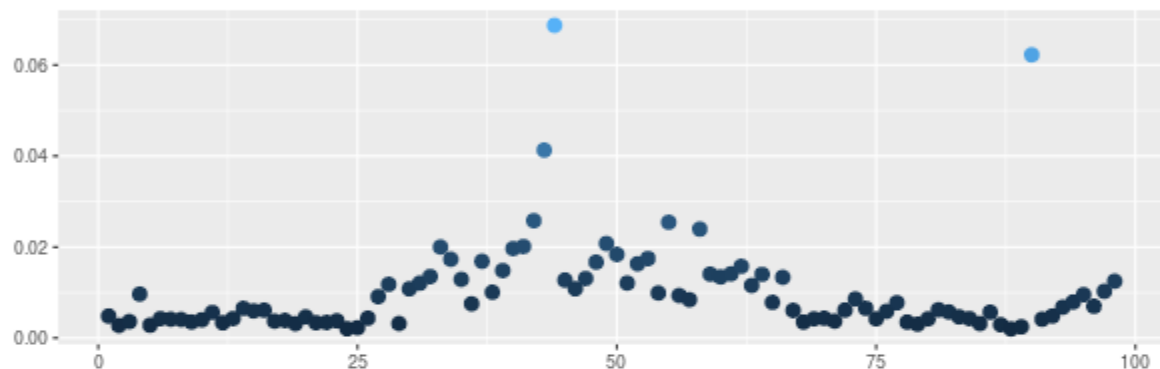ChIP-seq score

Single attention module

HNF4A/liver
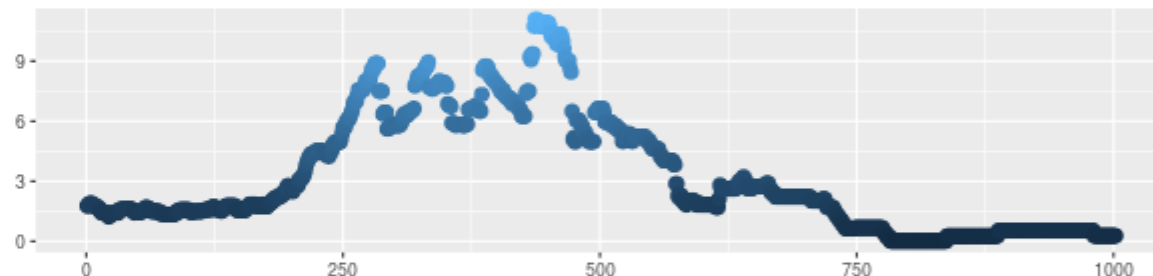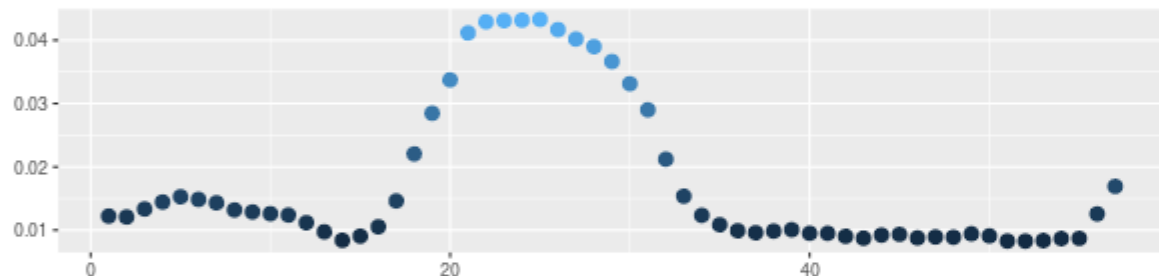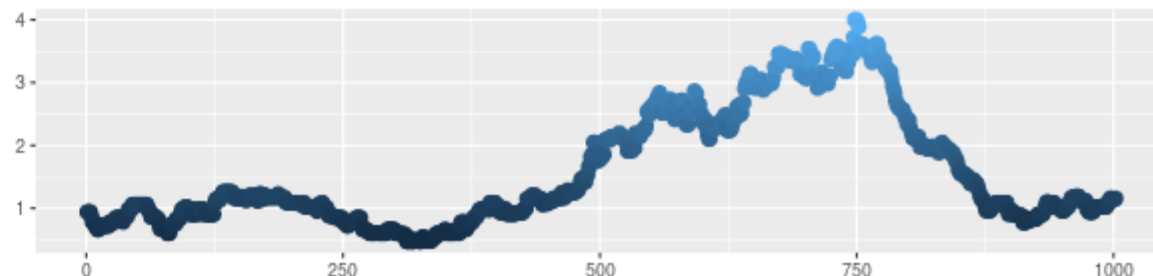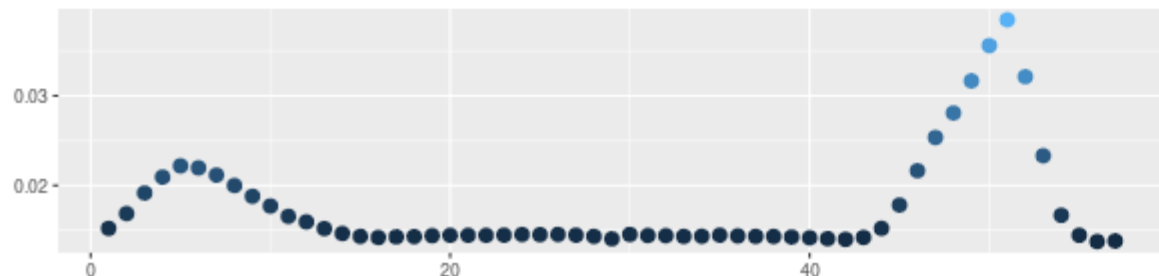
Attention weights
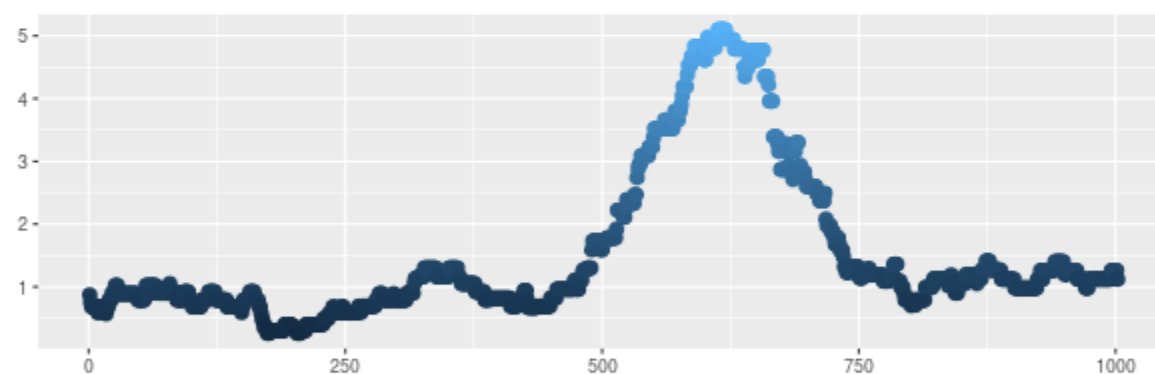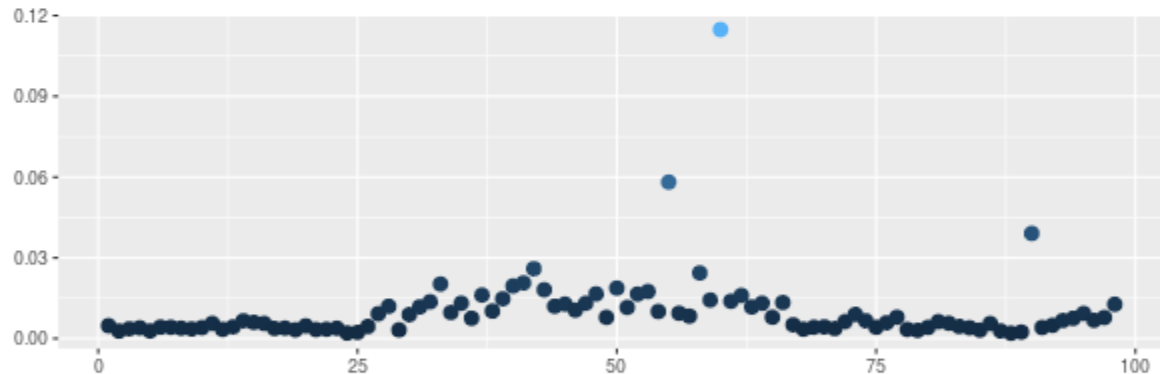
ChIP-seq score

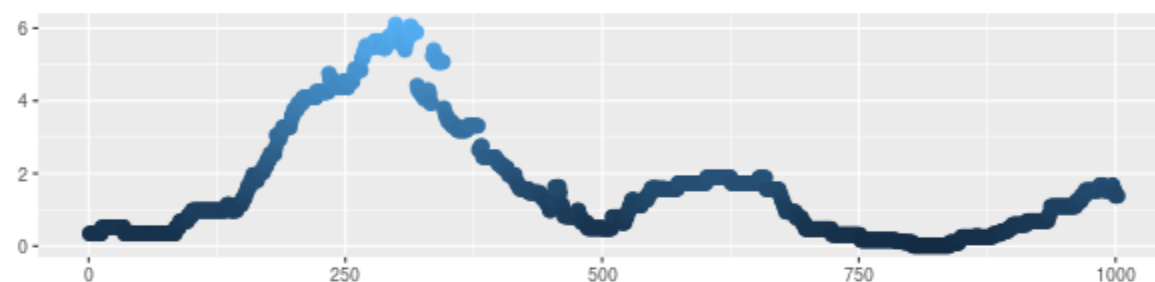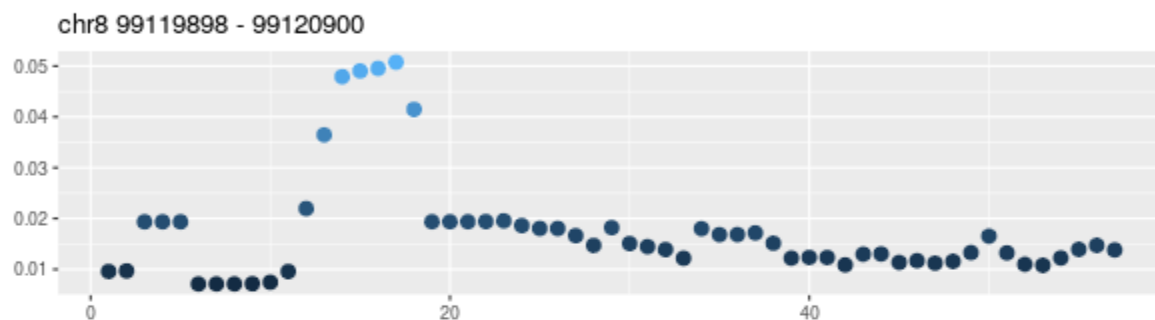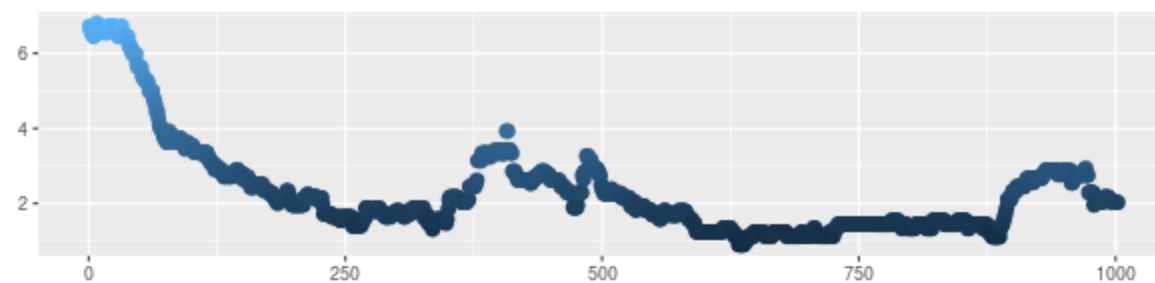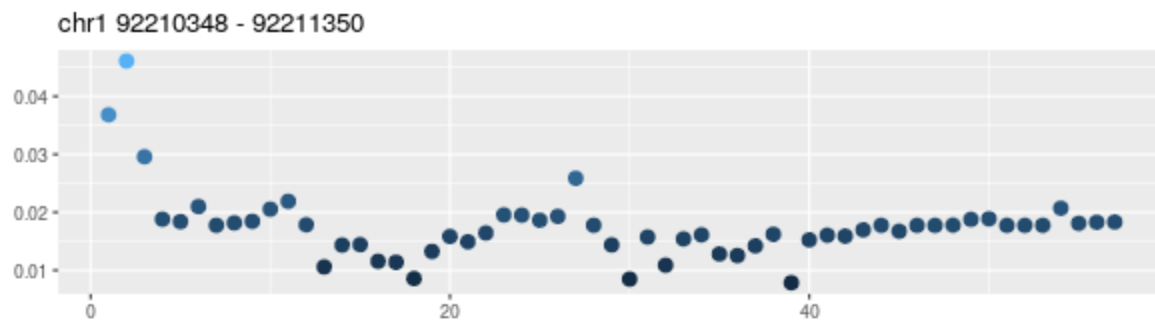# Single attention module

JUND/liver
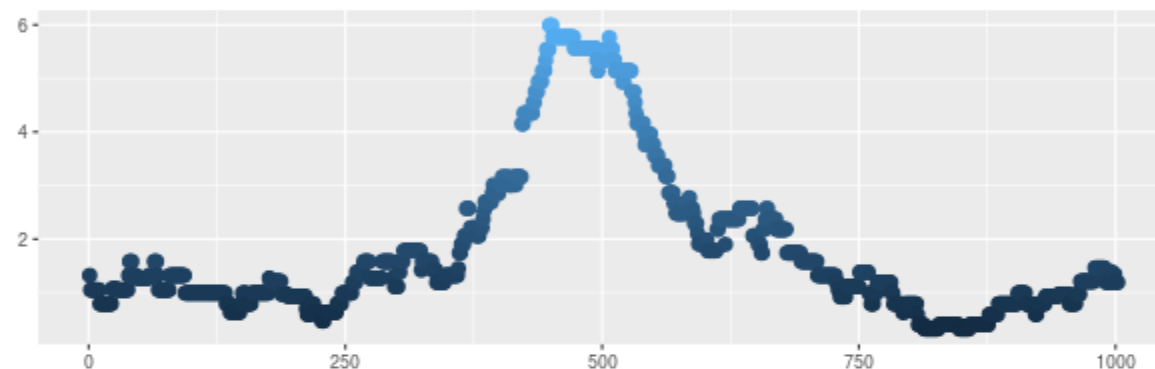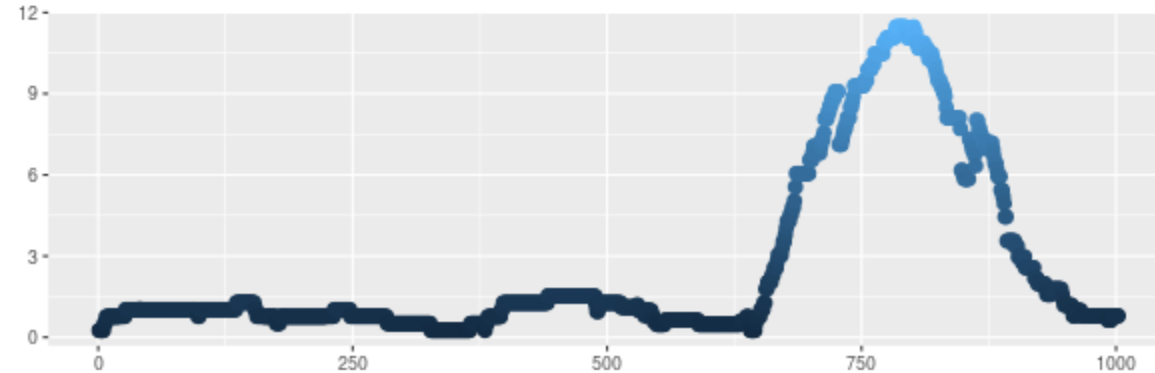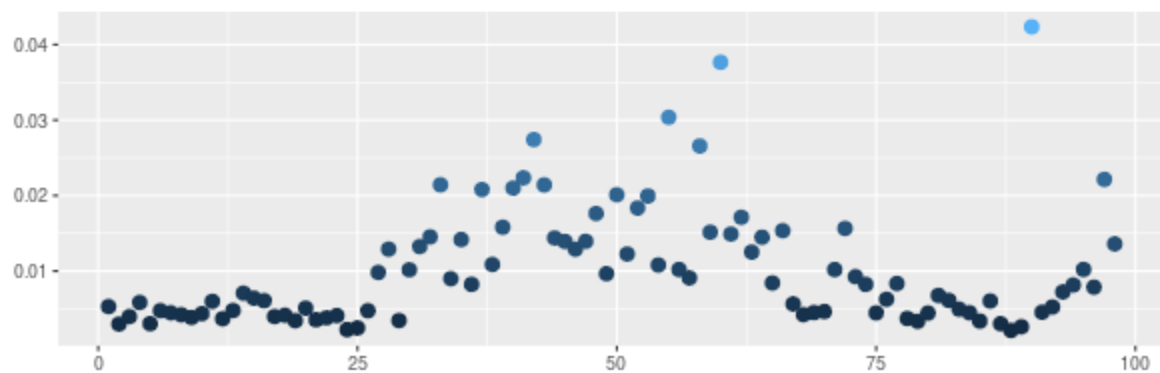
Attention weights   ChIP-seq score

Single attention module
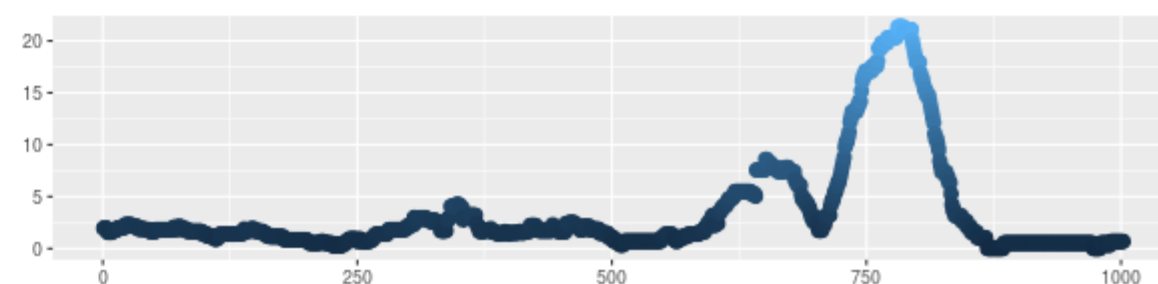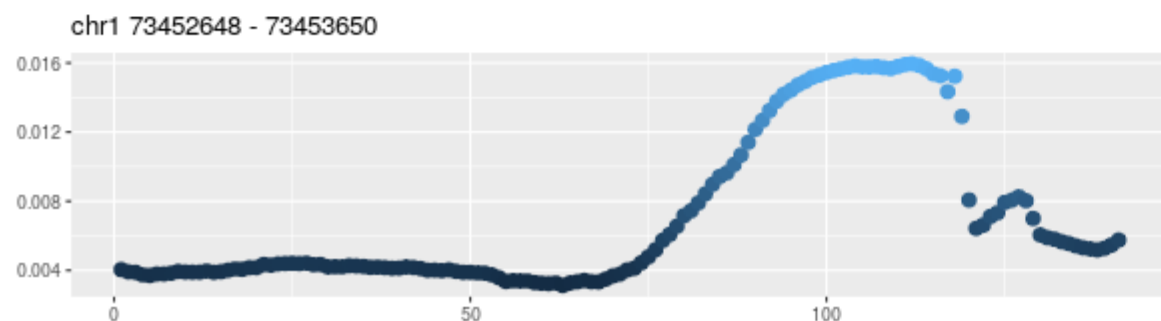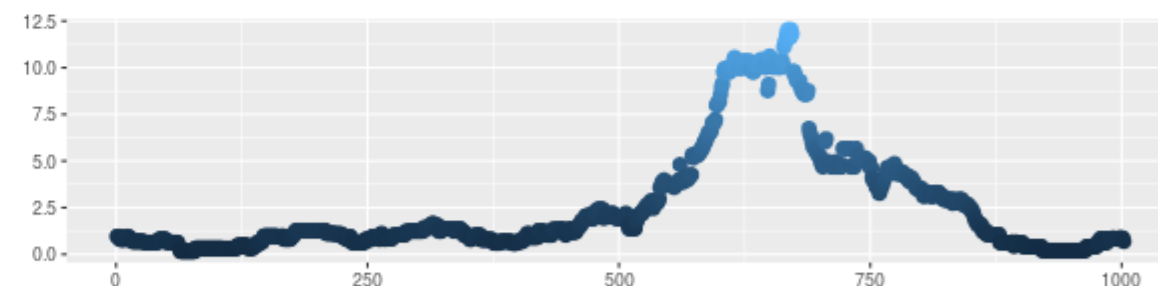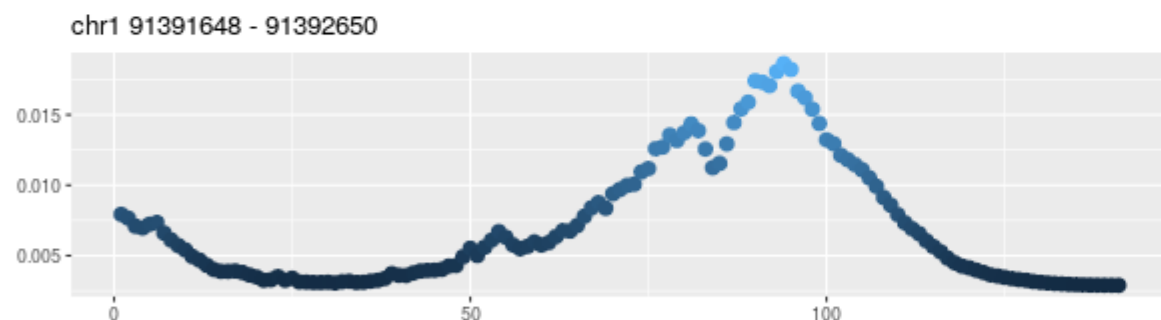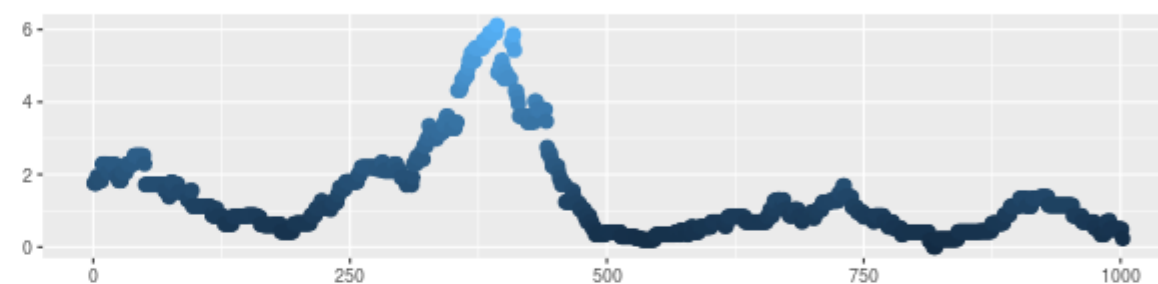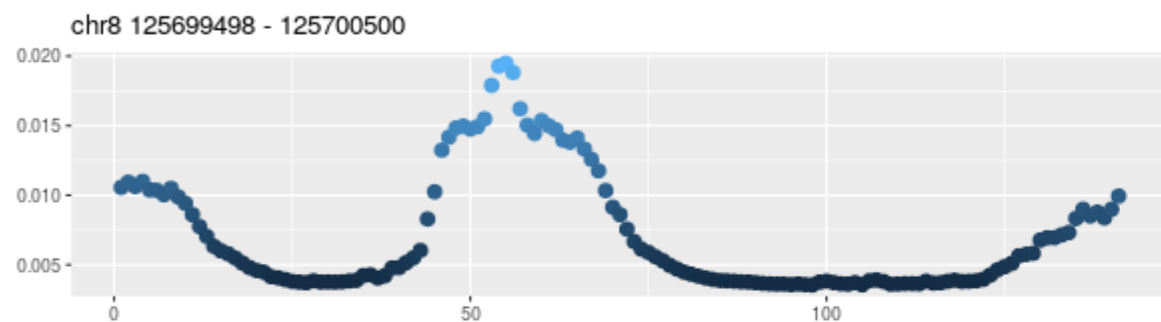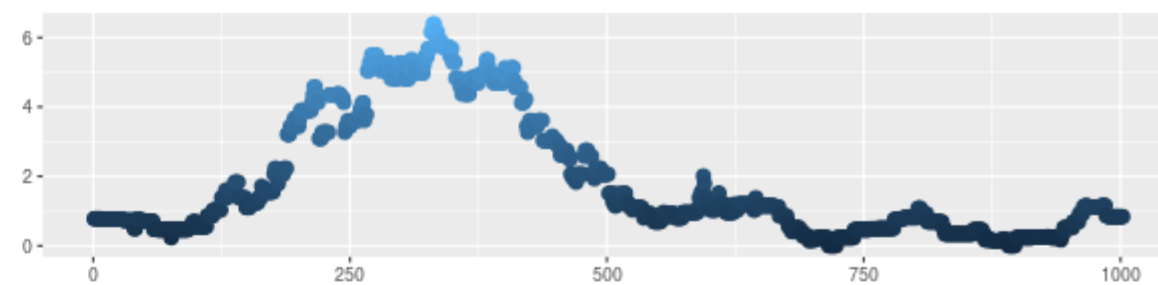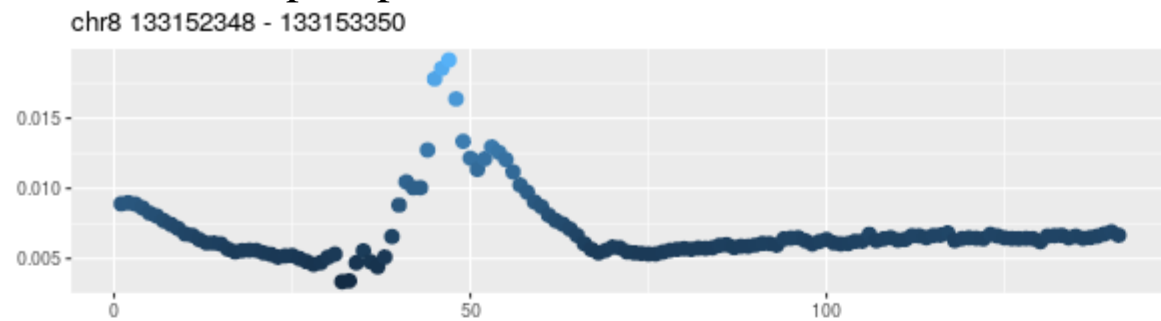
MAX/liver

Attention weights   ChIP-seq score

Single attention module

NANOG/induced pluripotent stem cell

Attention weights
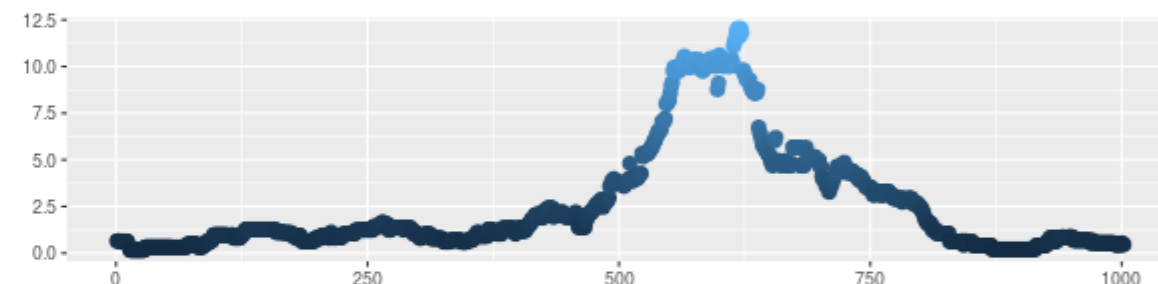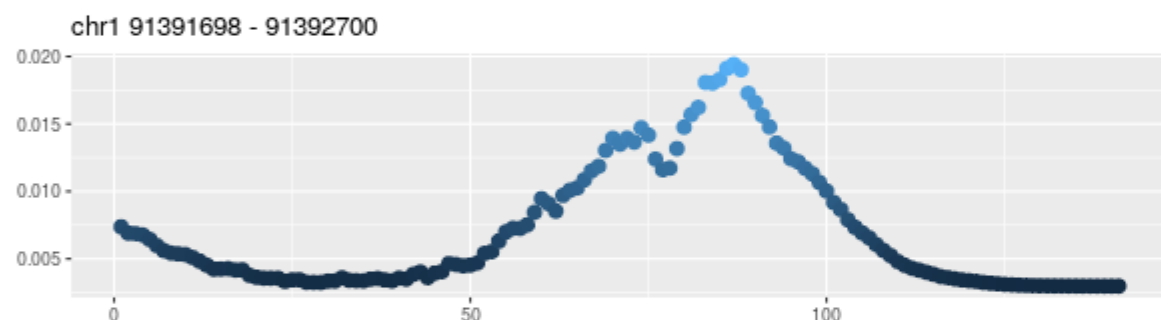
ChIP-seq score
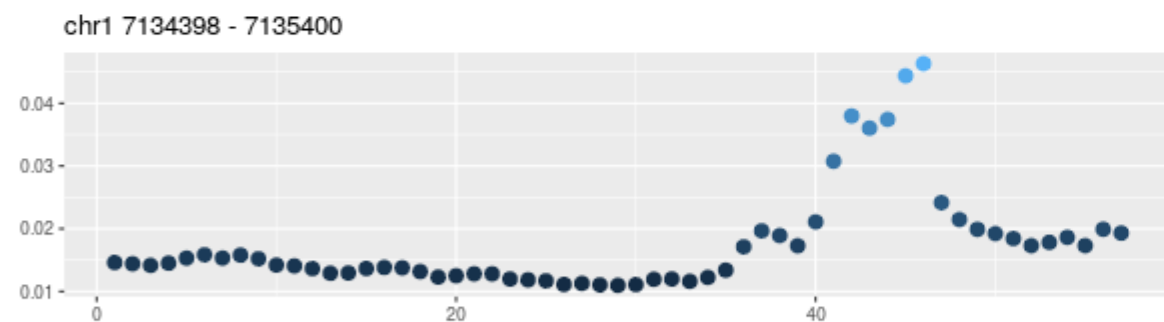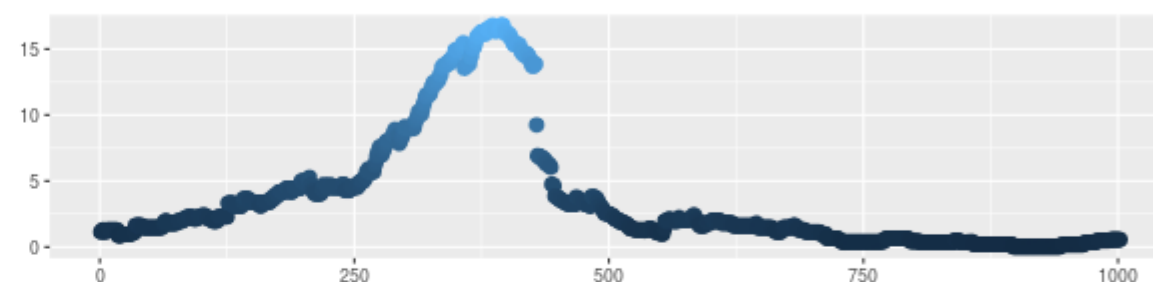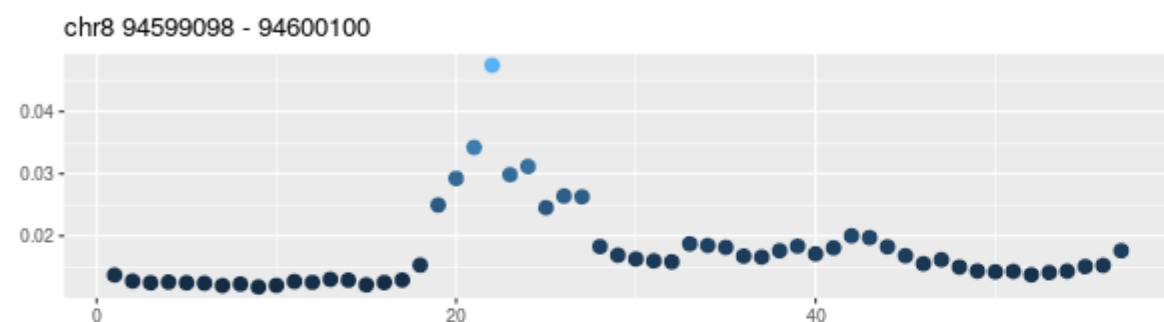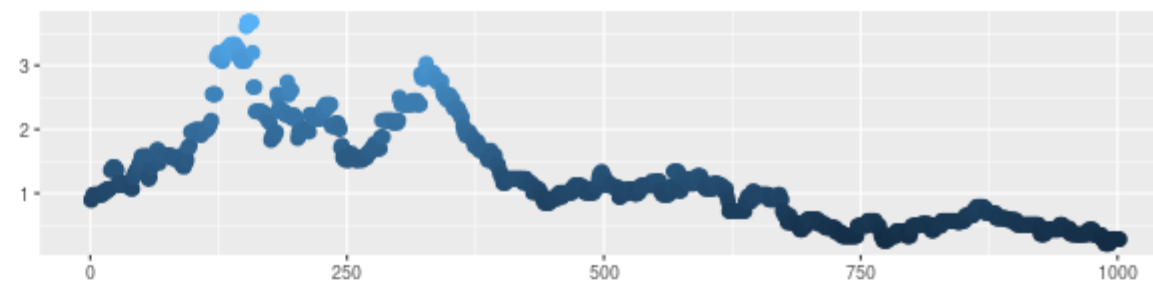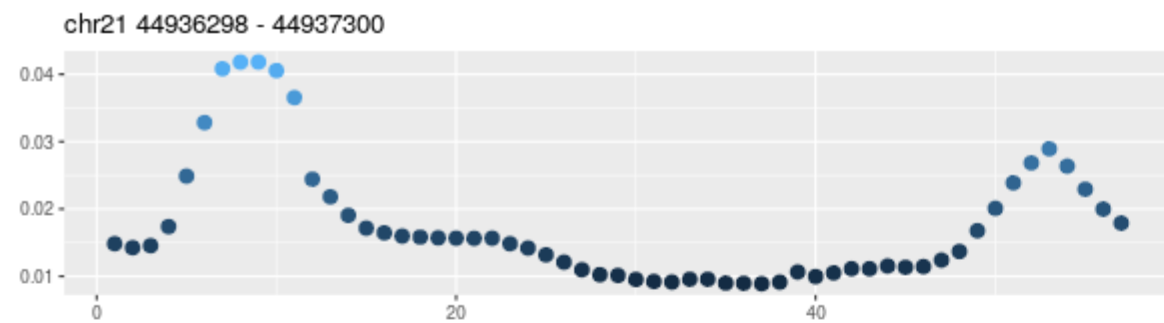
Single attention module

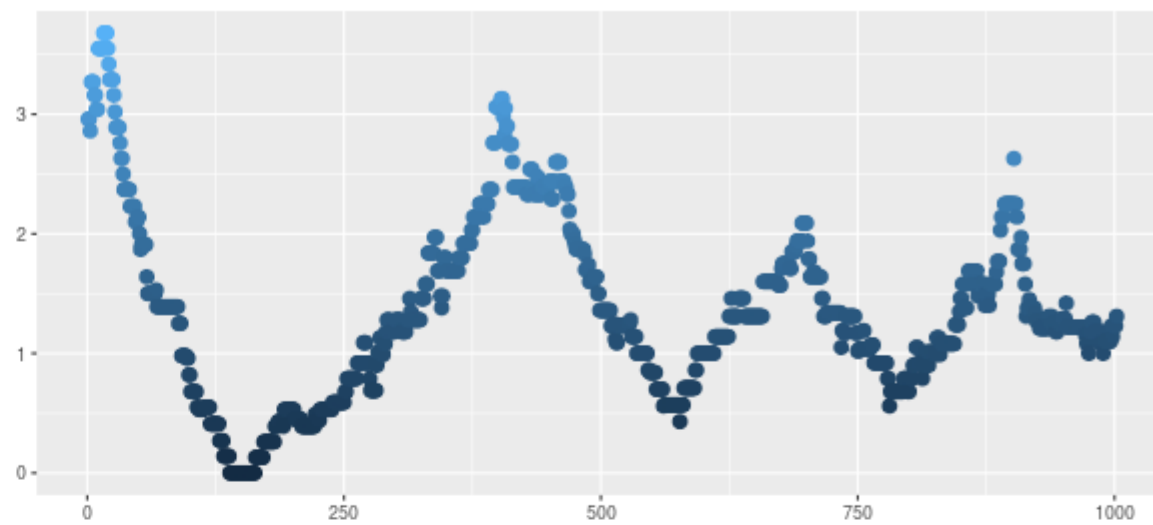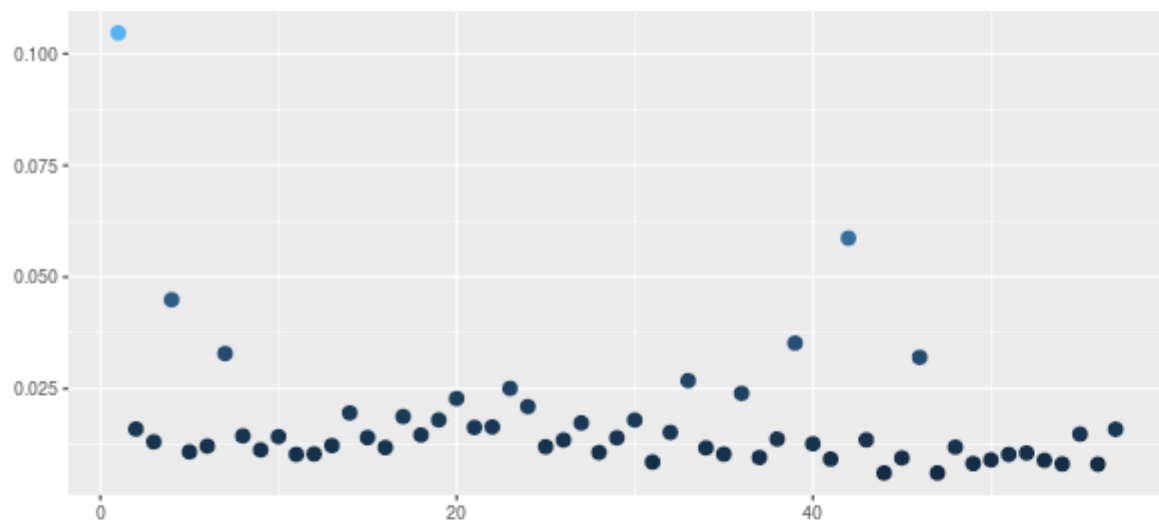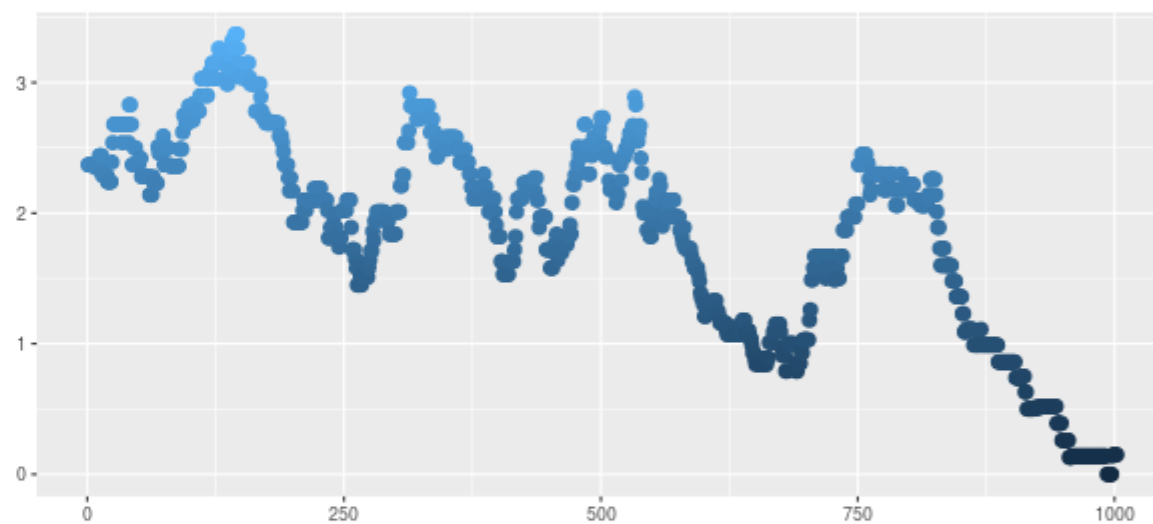REST/liver

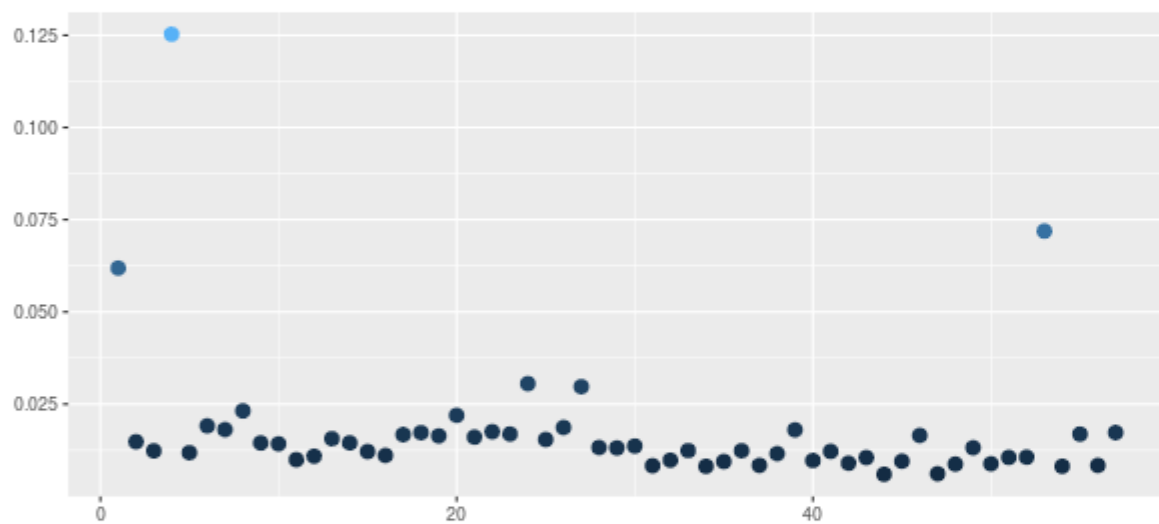
Attention weights
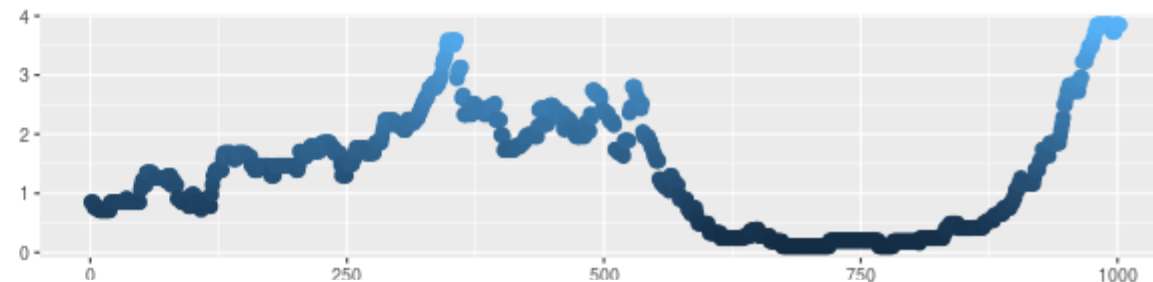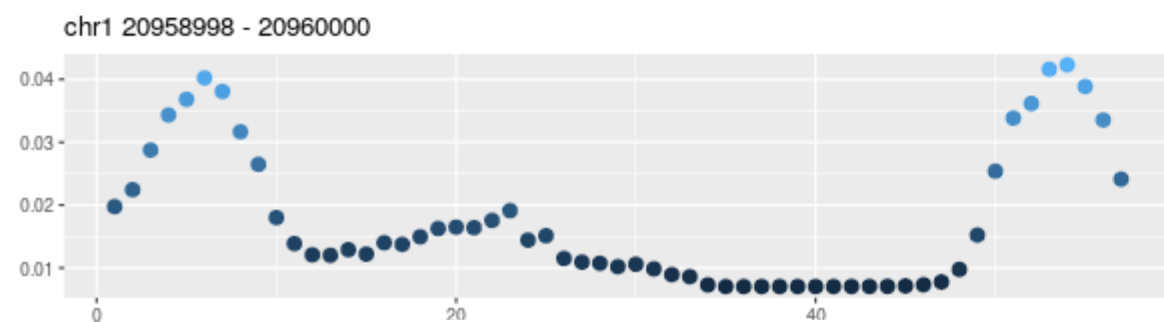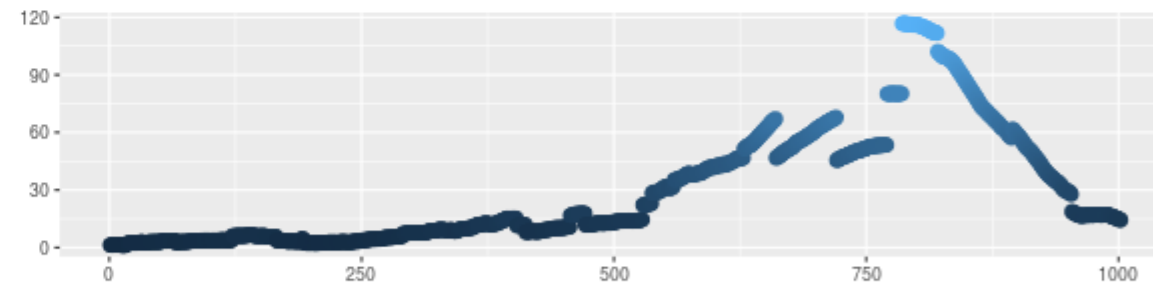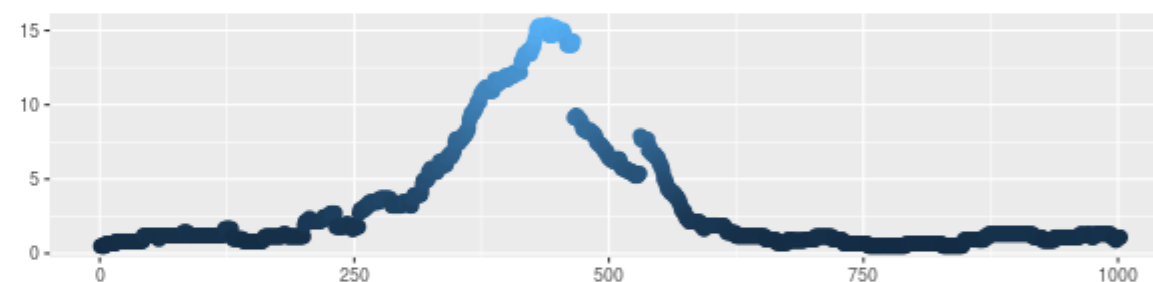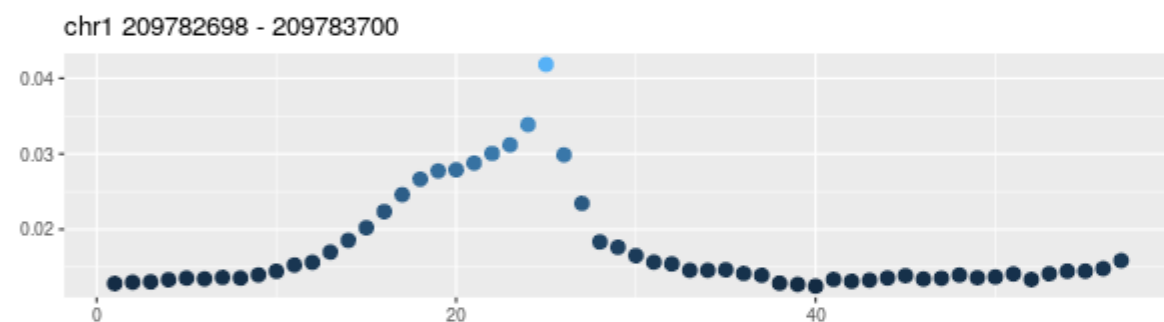
ChIP-seq score
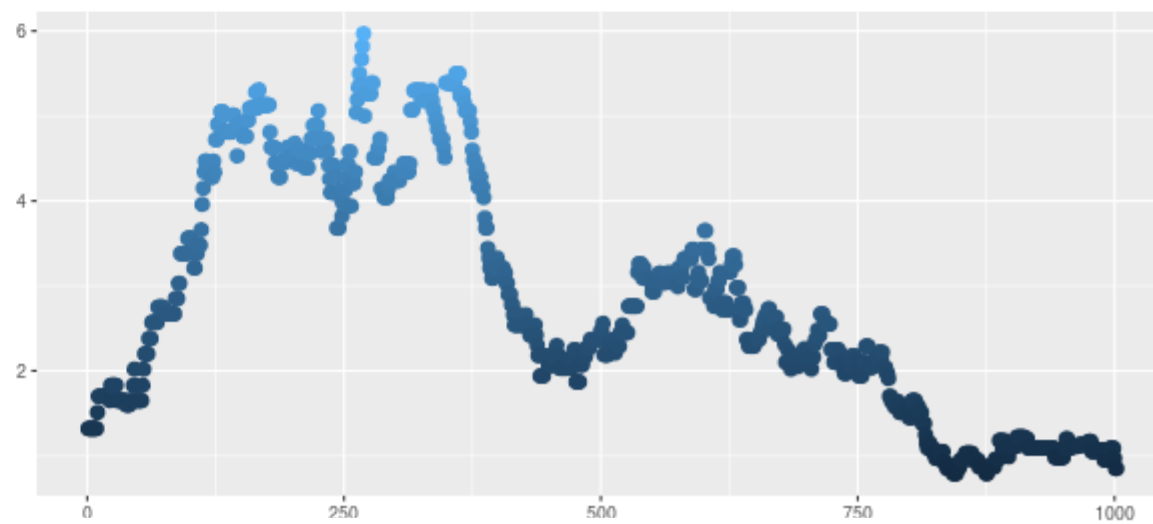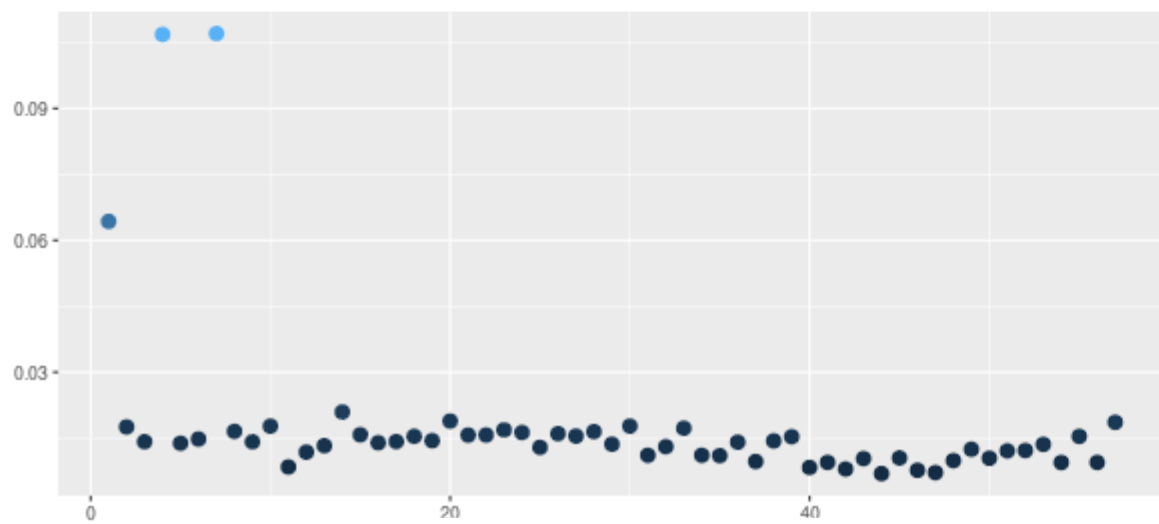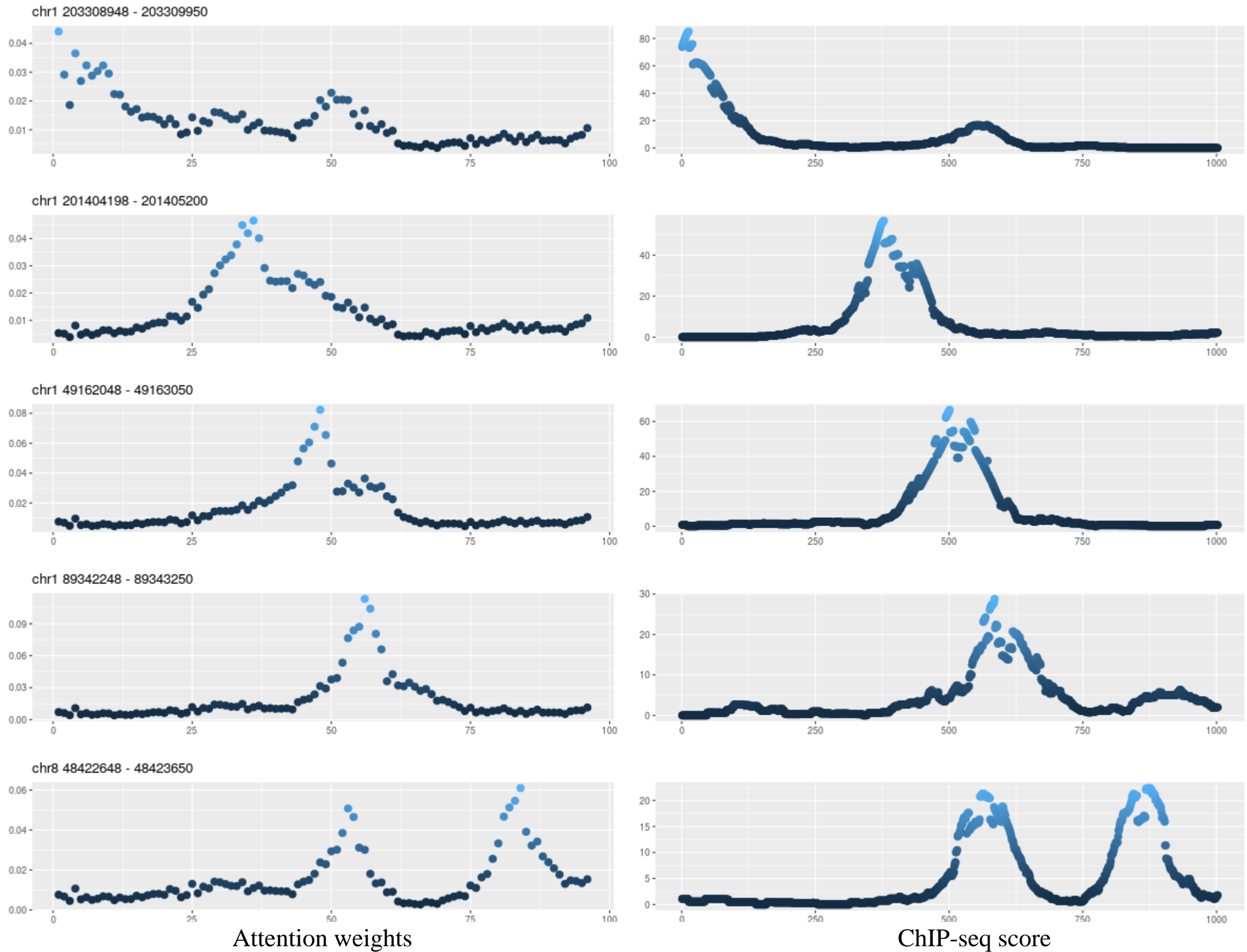
Single attention module

TAF1/liver

chr1 145476748 - 145477750

chr1 115322348 - 115323350

chr1 205179748 - 205180750

Attention weights

ChIP-seq score

Pairwise attention module
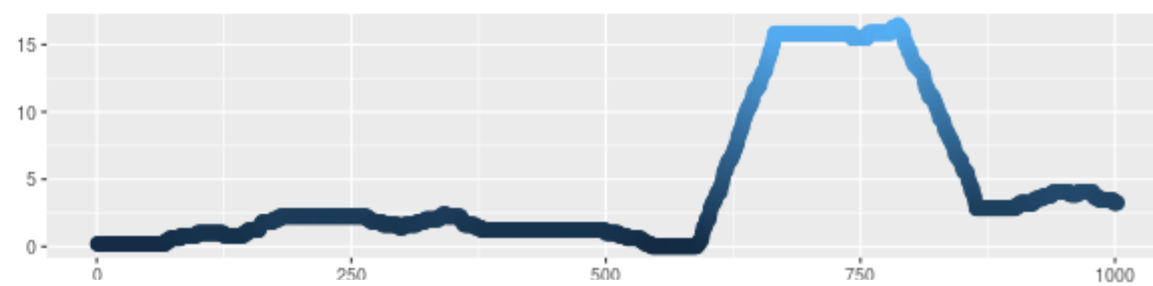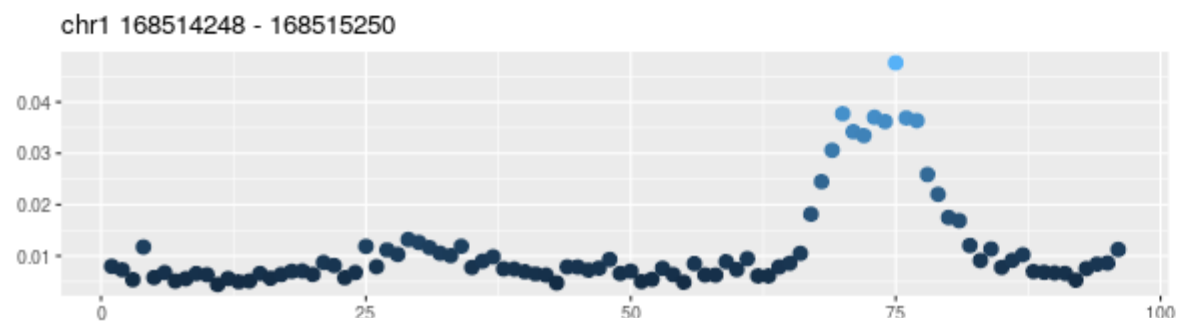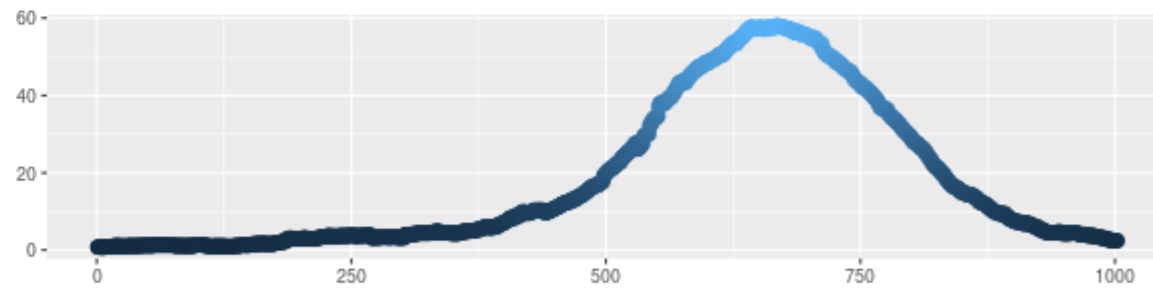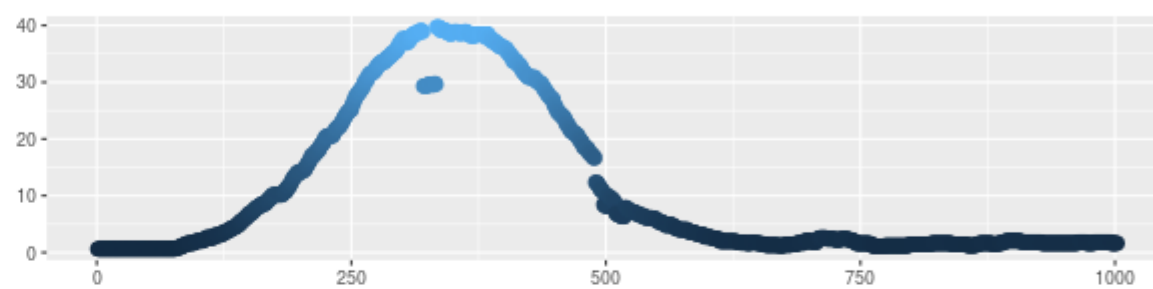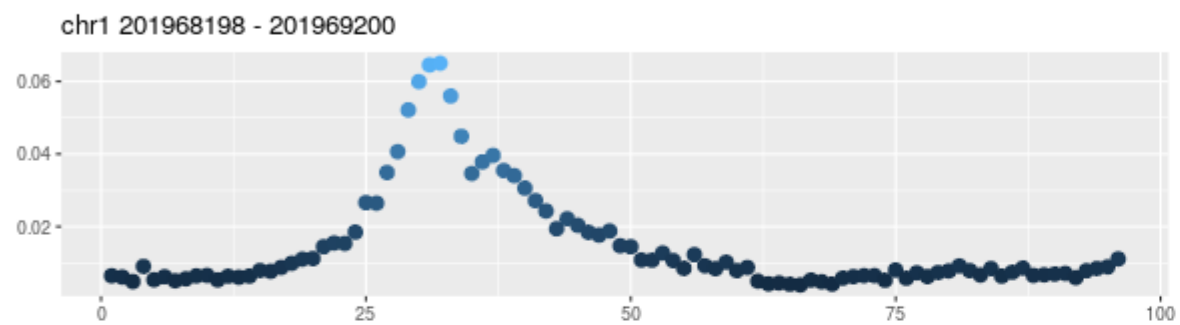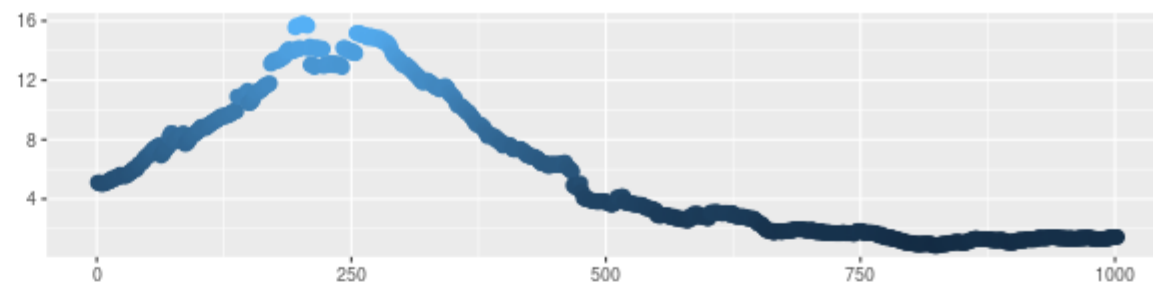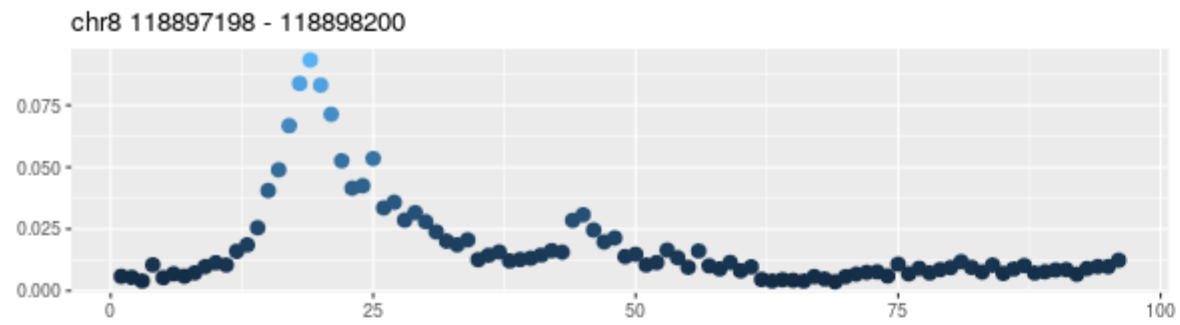
CTCF/induced pluripotent stem cell

Attention weights
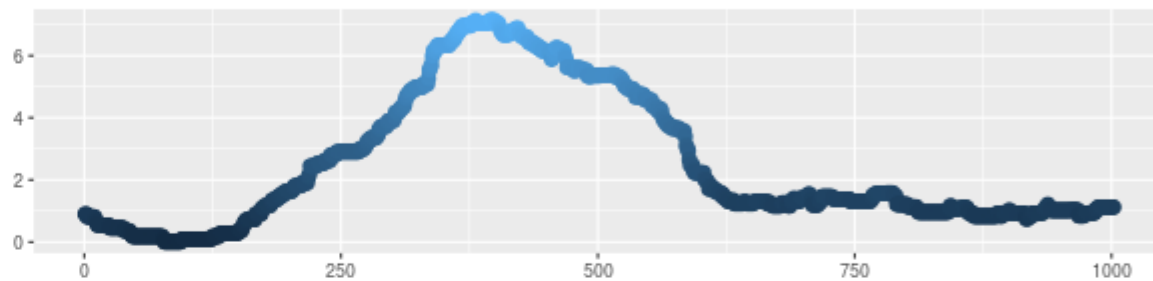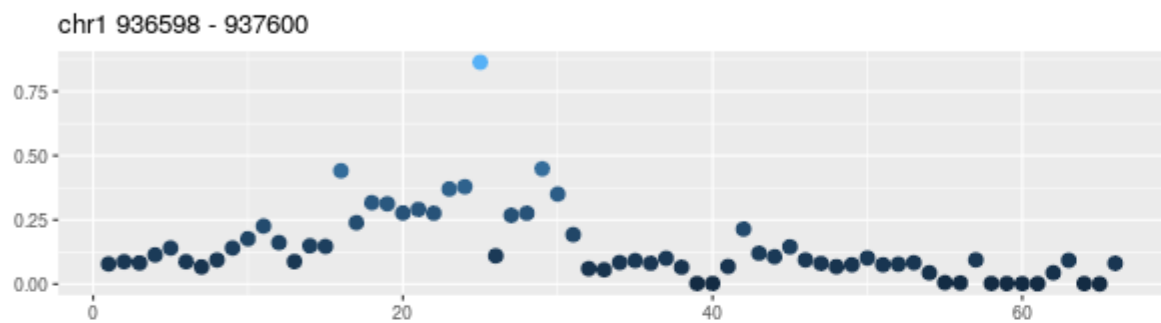
ChIP-seq score

Pairwise attention module
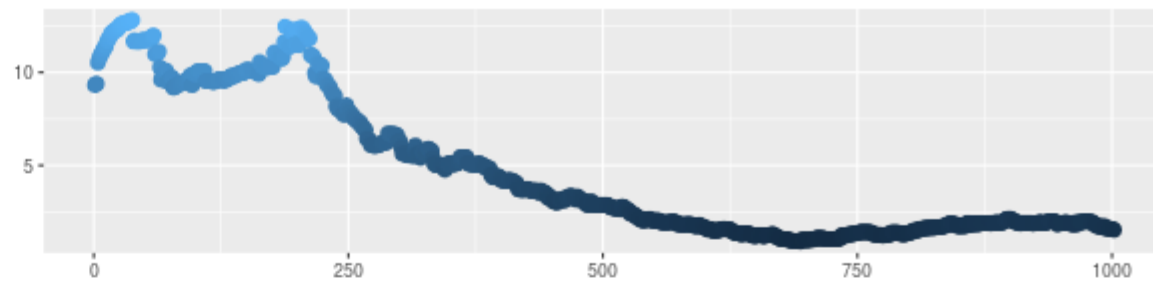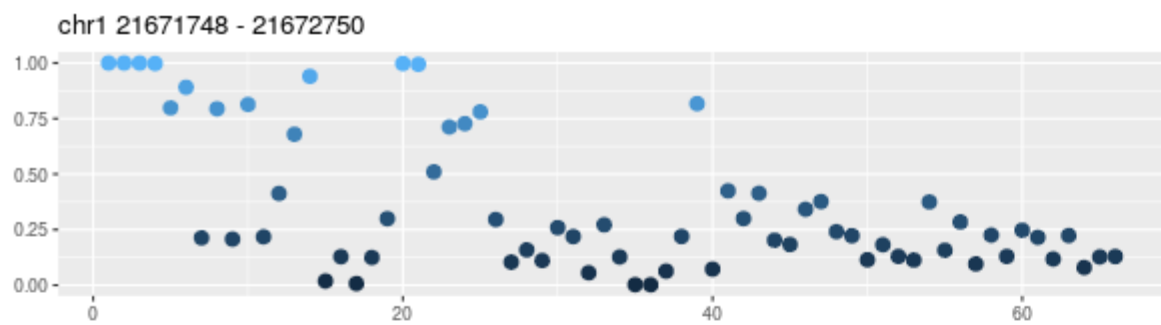
CTCF/PC-3
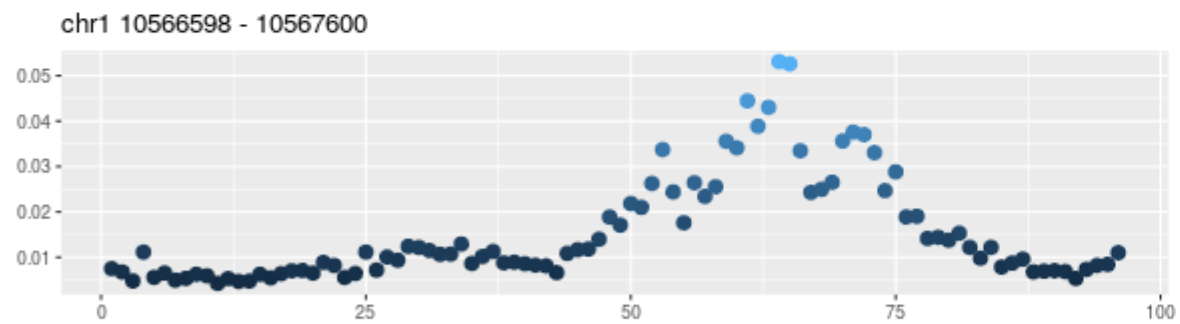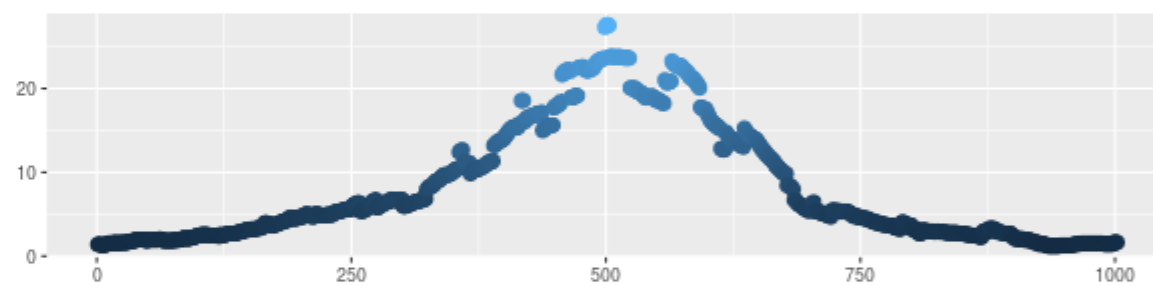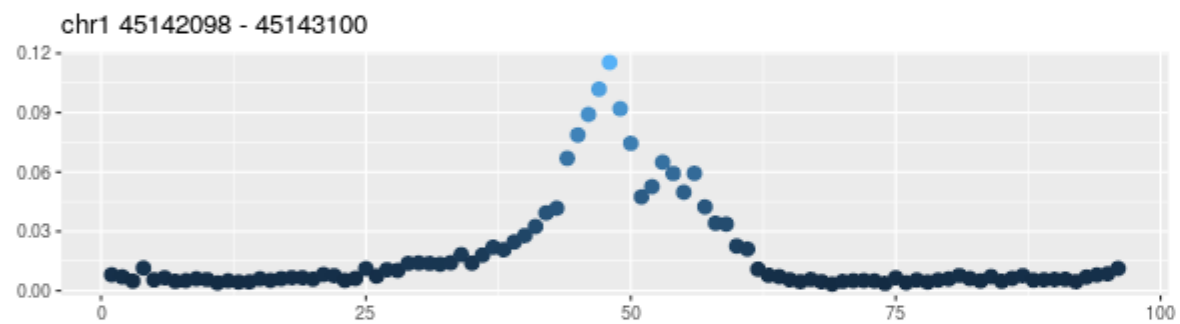
Attention weights   ChIP-seq score

Pairwise attention module

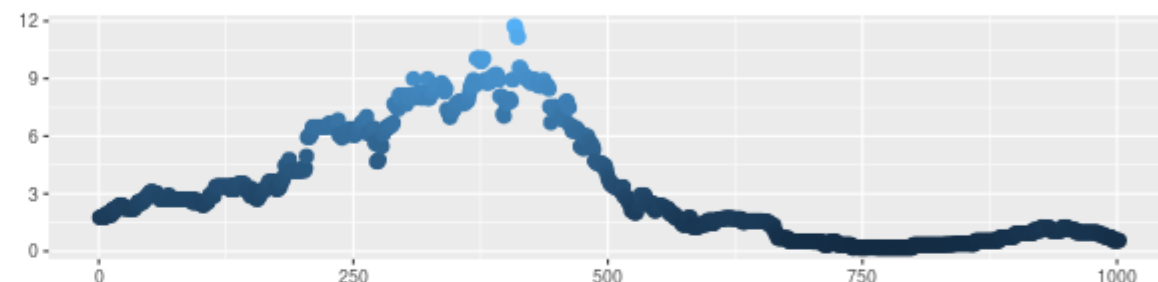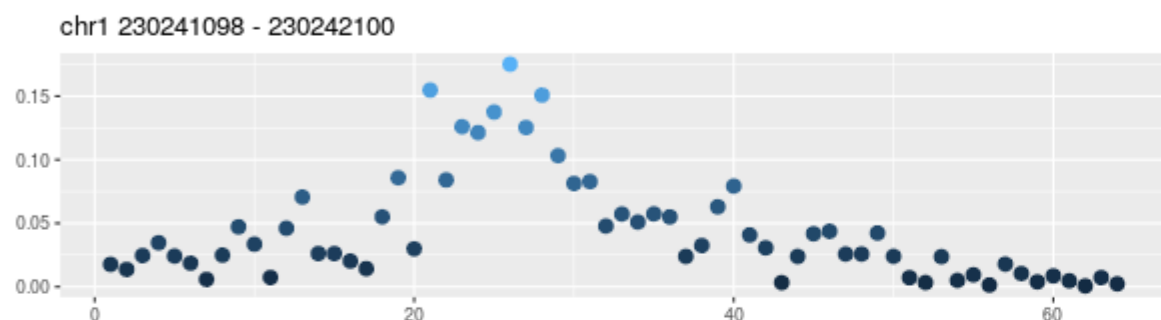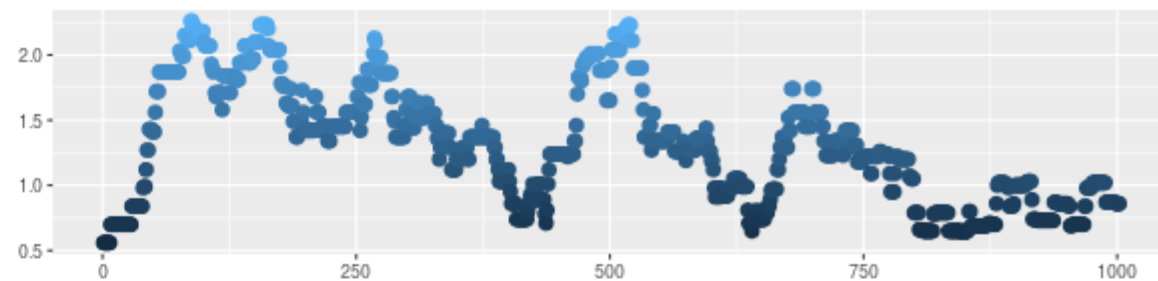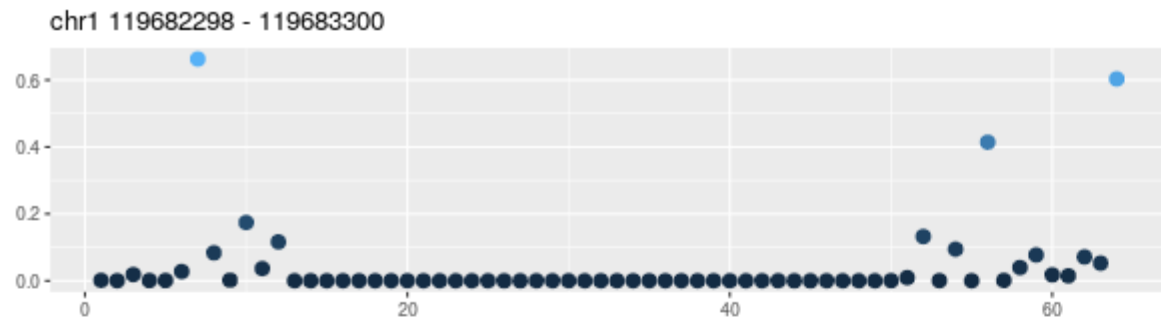E2F1/K562
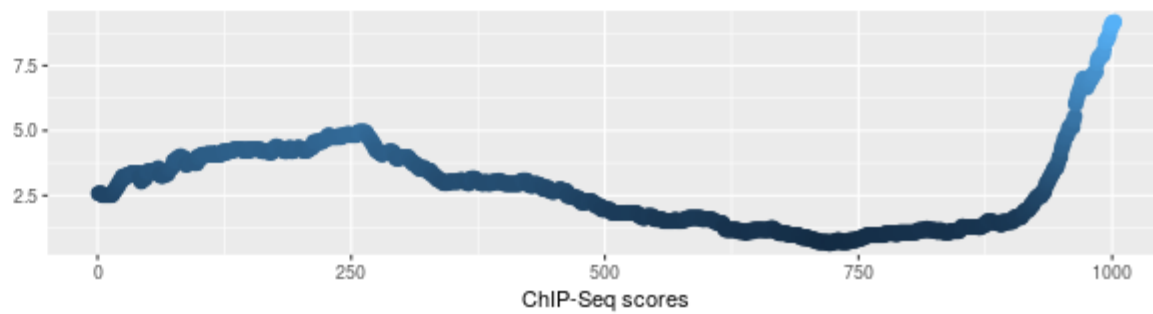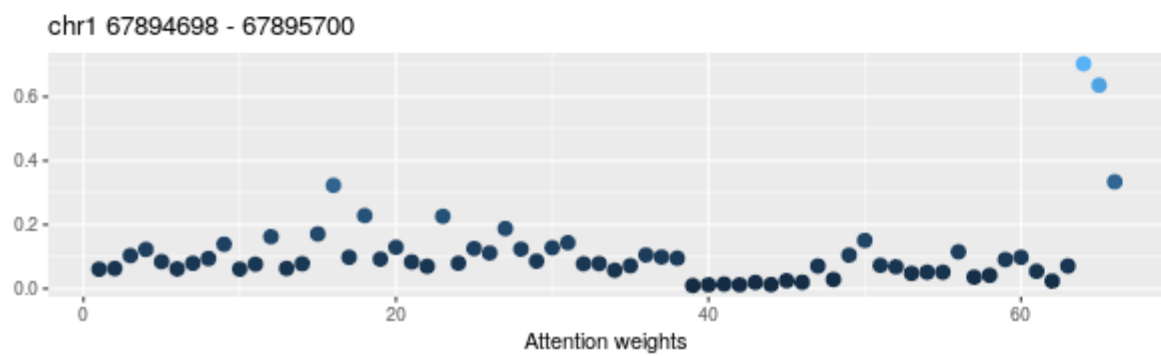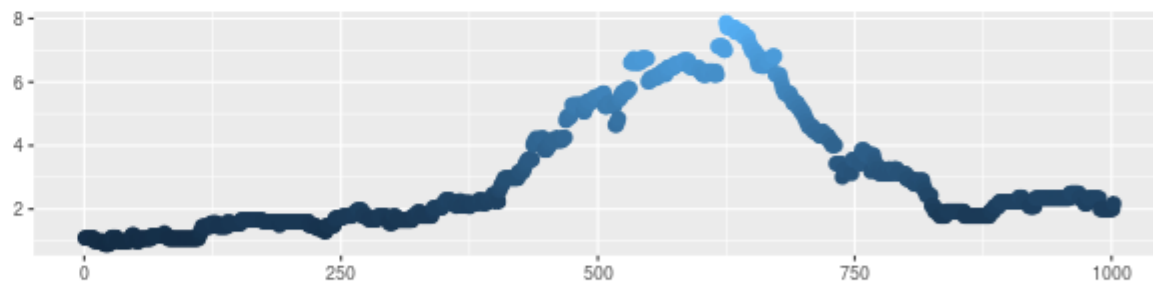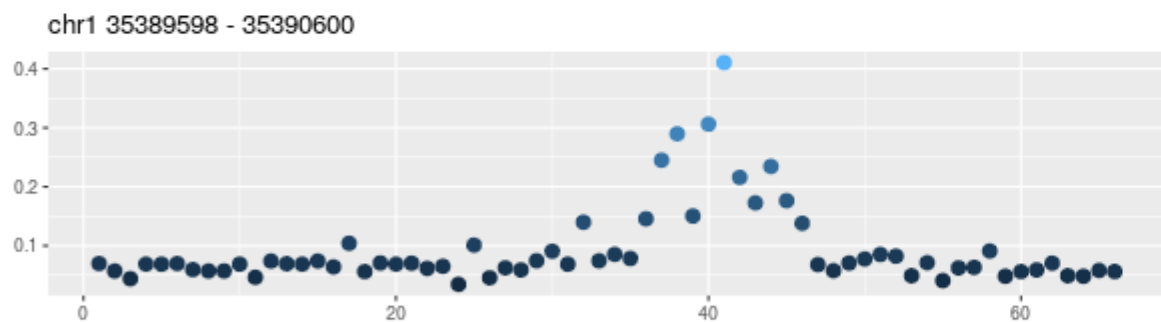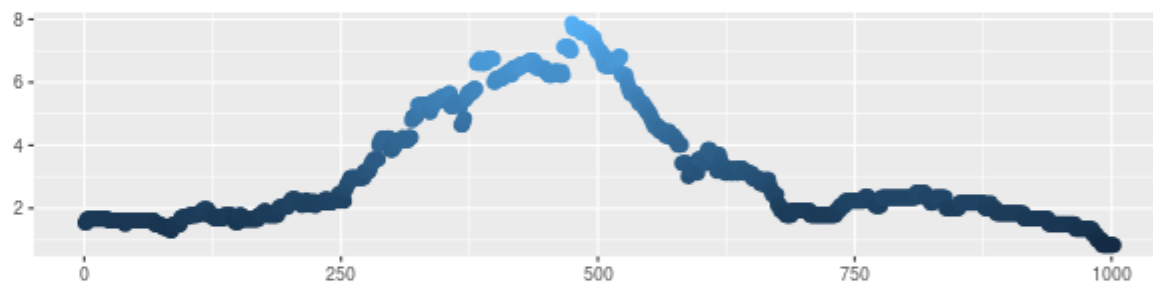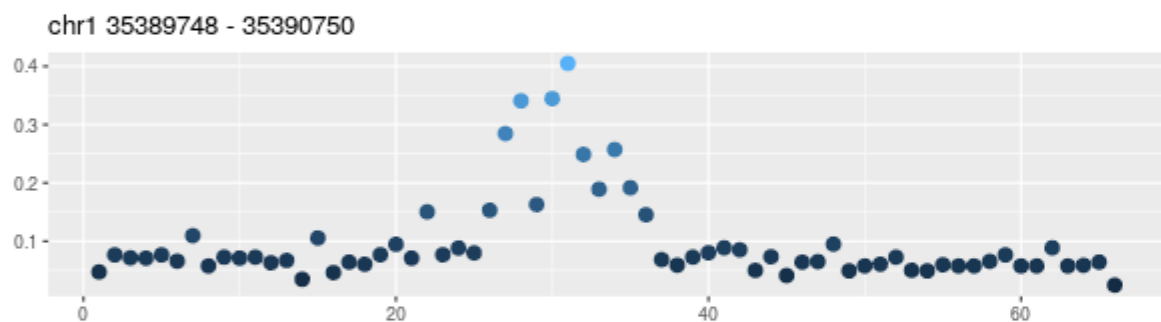
Pairwise attention module
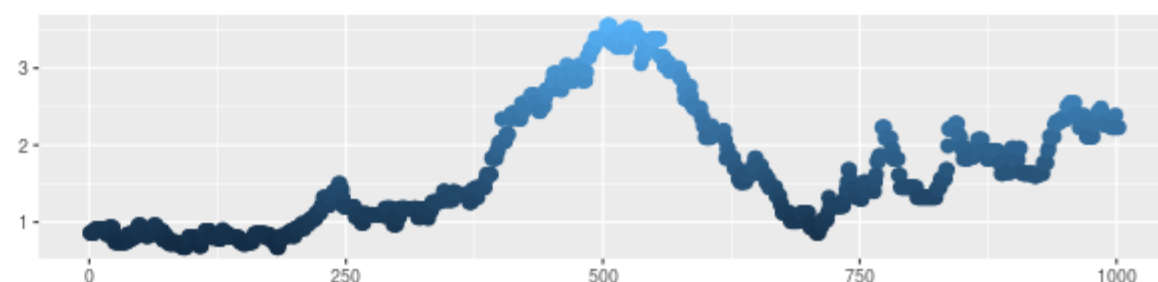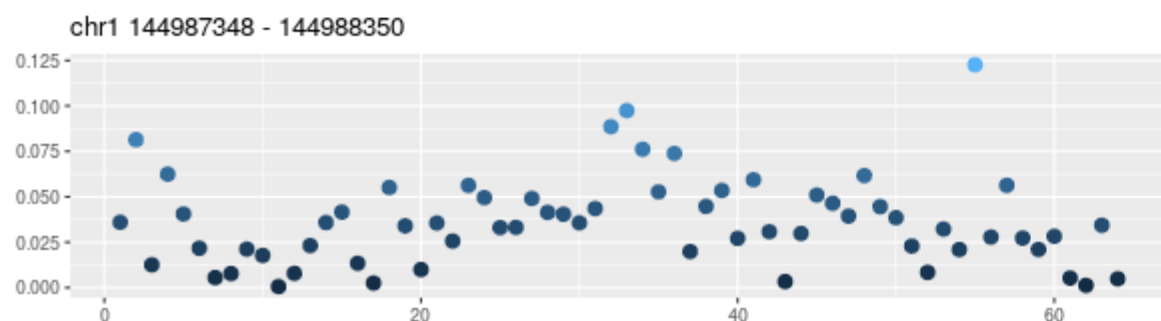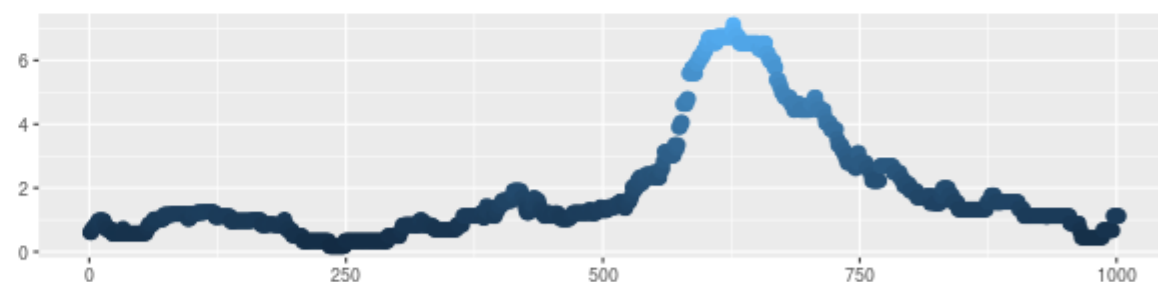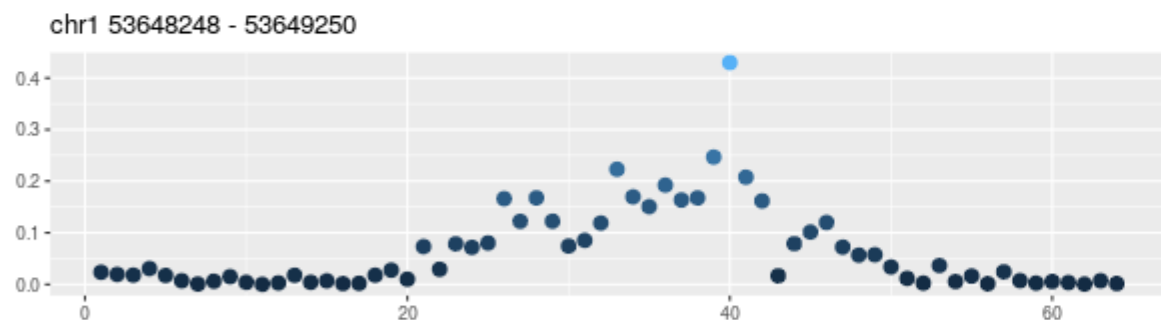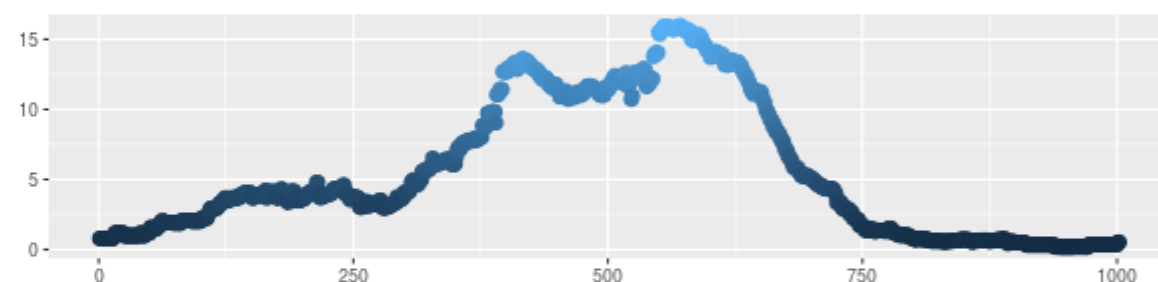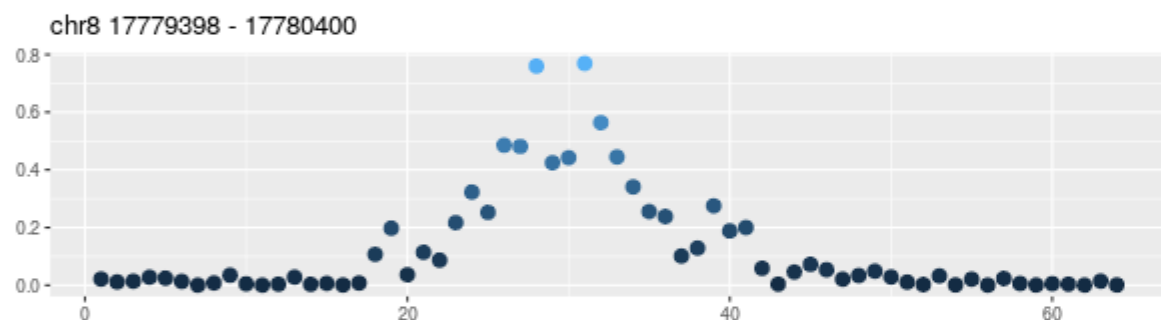
EGR1/liver

Attention weights

ChIP-seq score

Pairwise attention module

FOXA1/liver

chr8 50934698 - 50935700

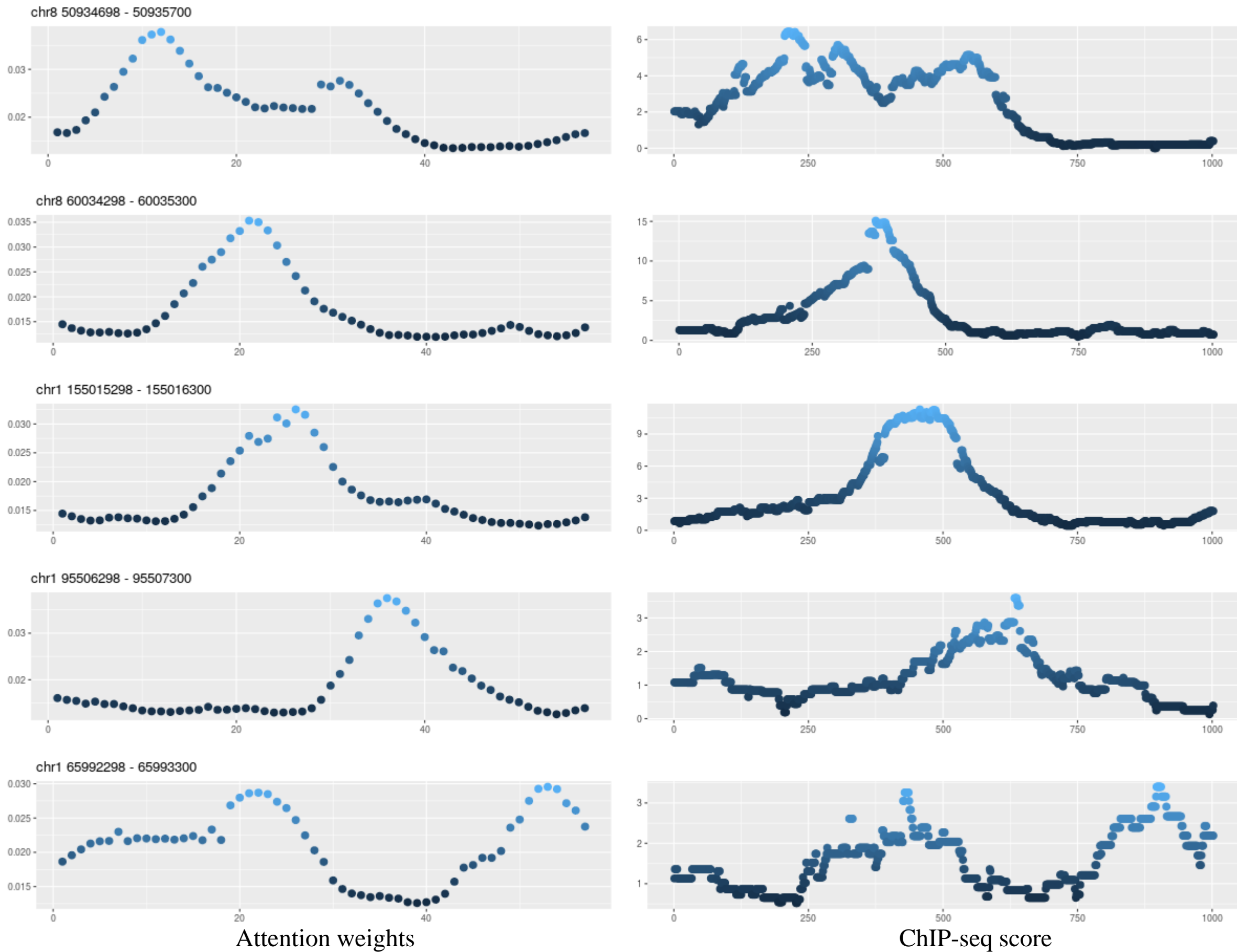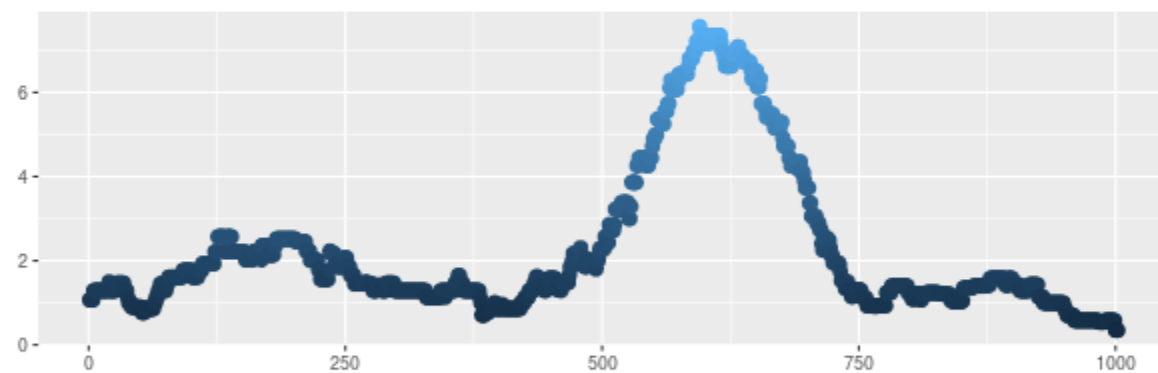chr8 60034298 - 60035300

chr1 155015298 - 155016300

chr1 95506298 - 95507300

chr1 65992298 - 65993300

Attention weights

ChIP-seq score

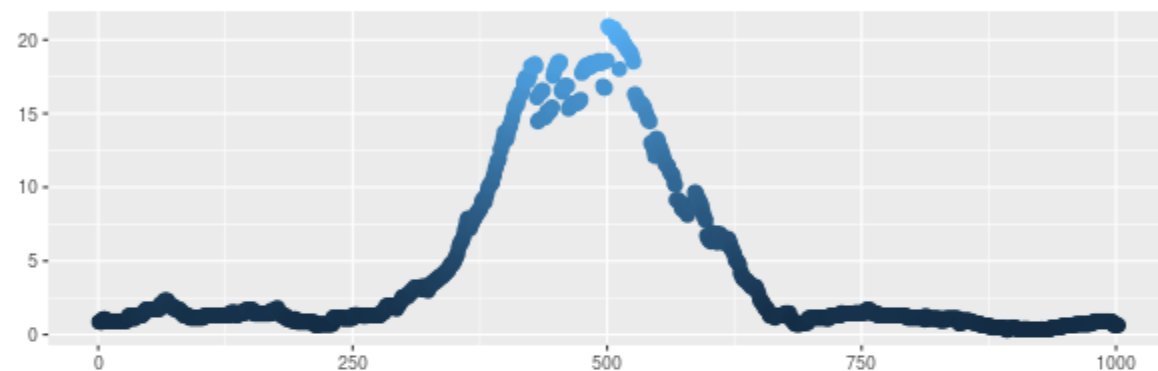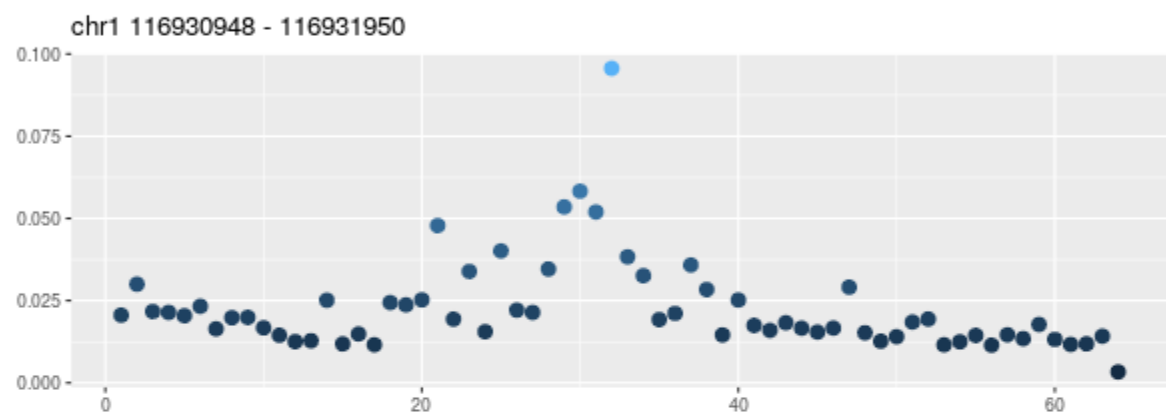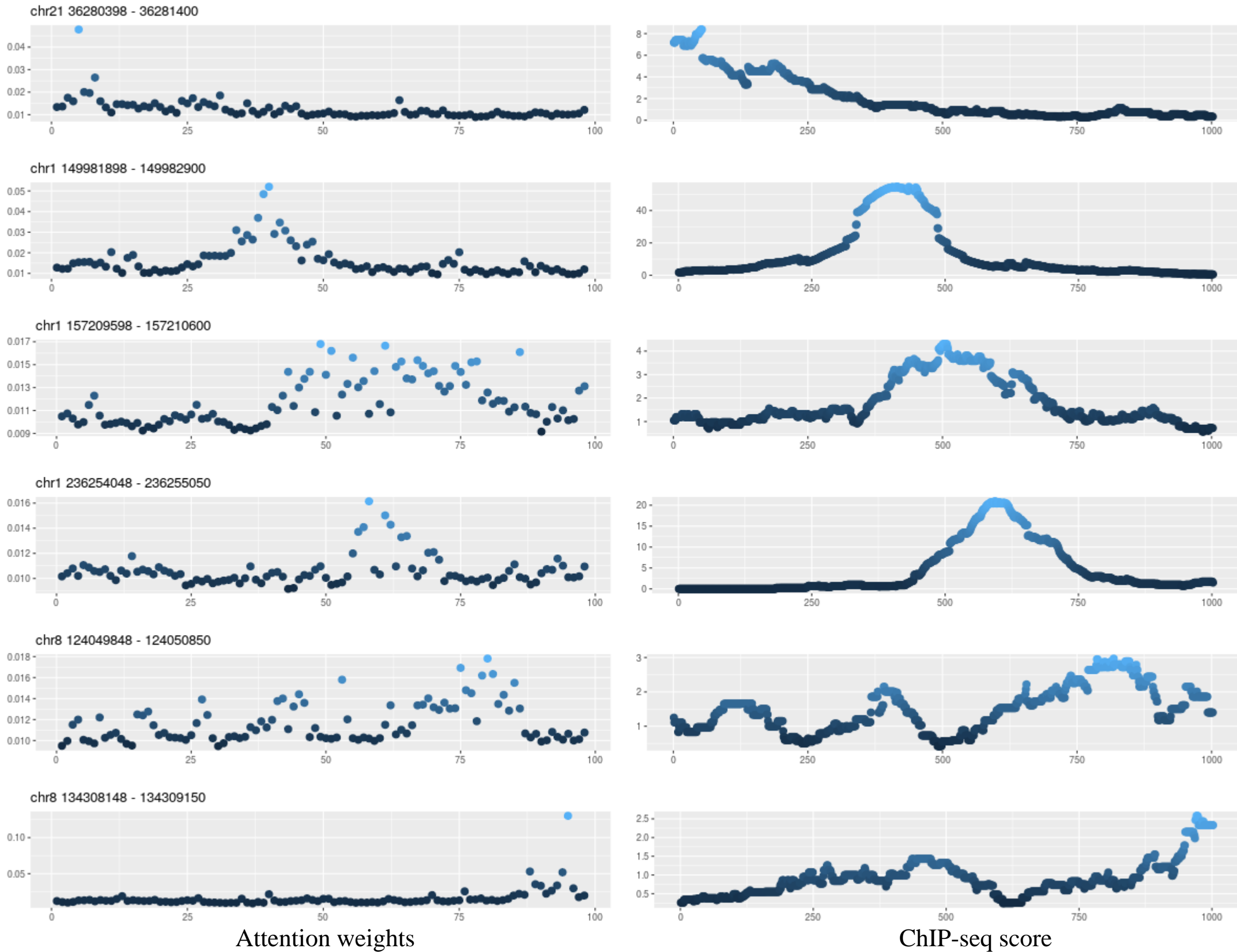# Pairwise attention module

FOXA2/liver

chr1 111652298 - 111653300

chr1 116930948 - 116931950

chr1 204462148 - 204463150

chr21 43805298 - 43806300

Attention weights

ChIP-seq score

Pairwise attention module
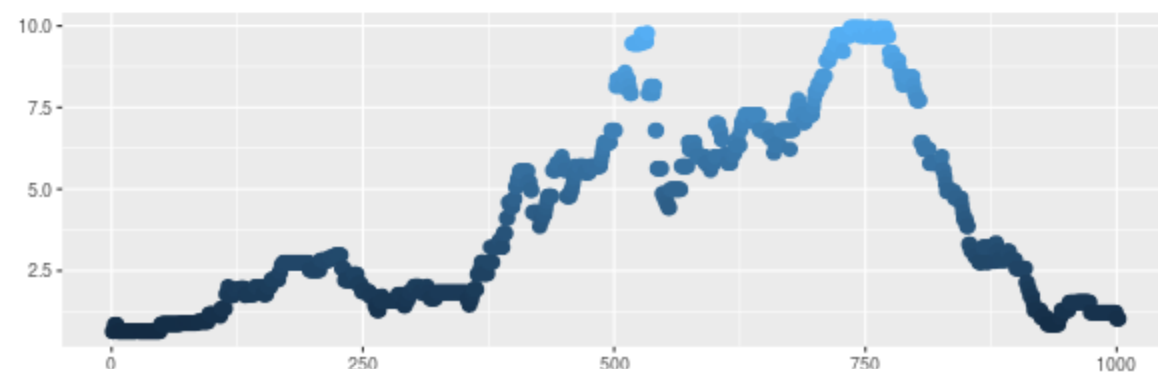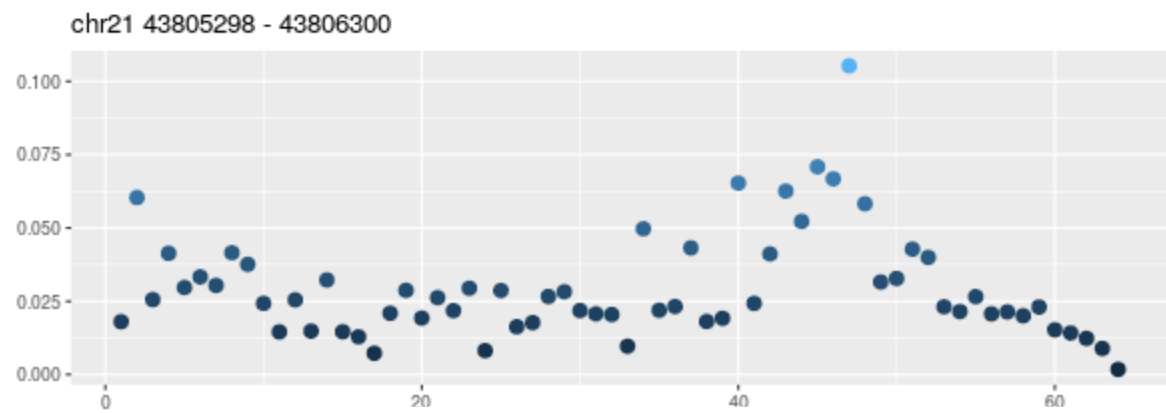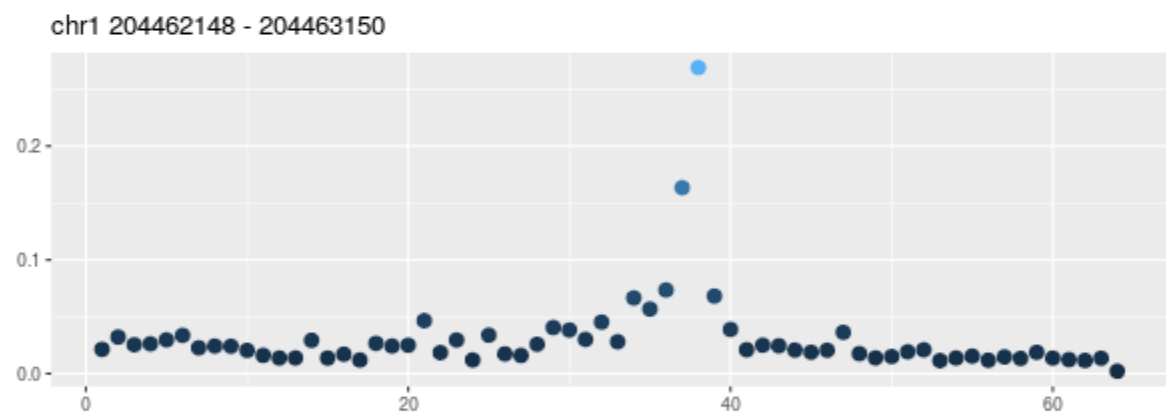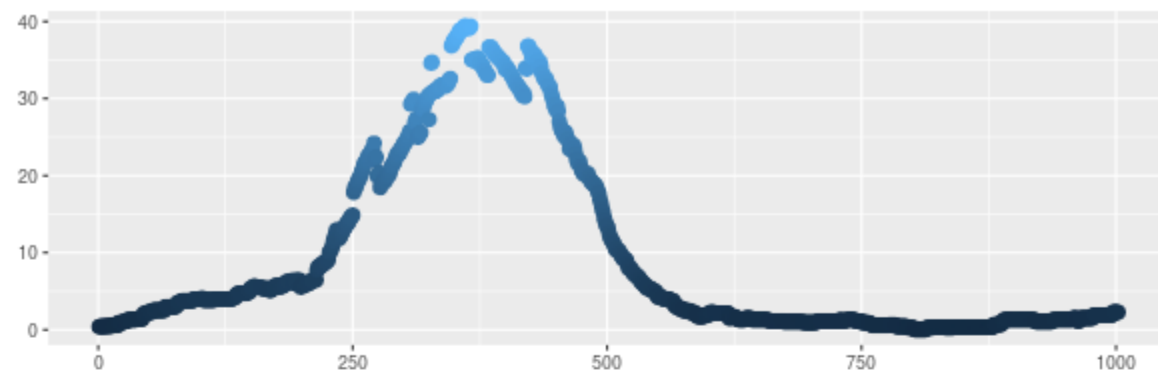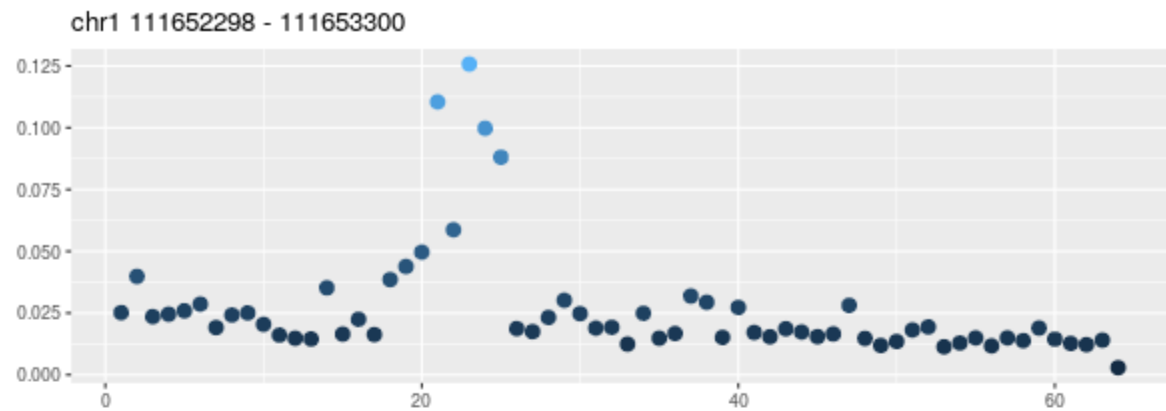
GABPA/liver

Attention weights   ChIP-seq score

Pairwise attention module

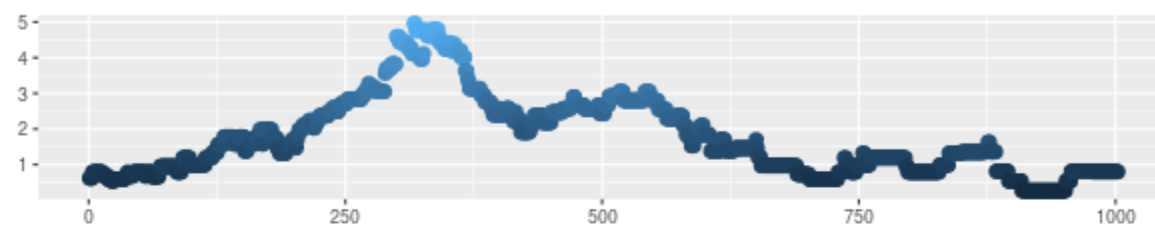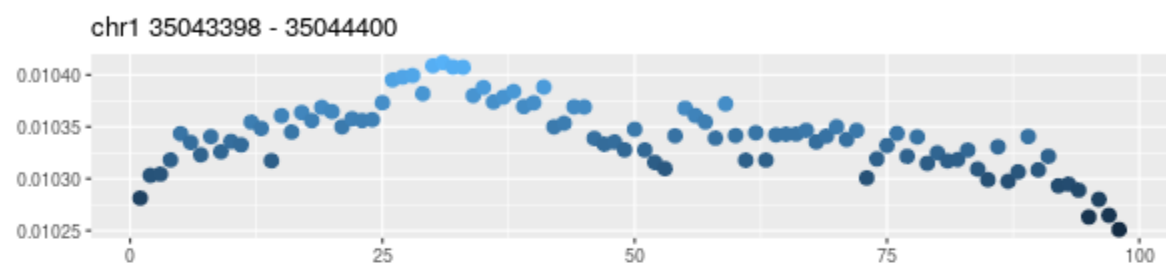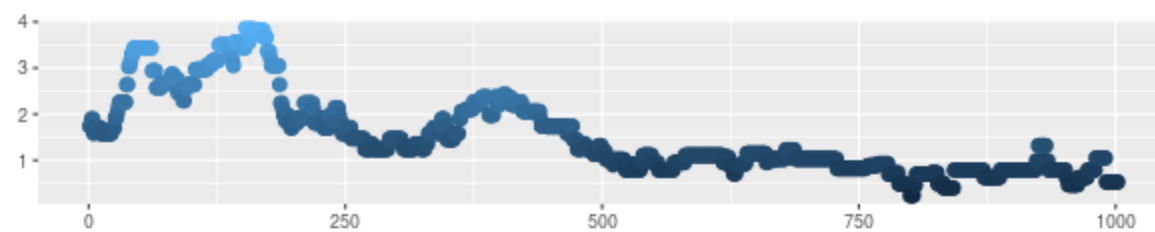## HNF4A/liver
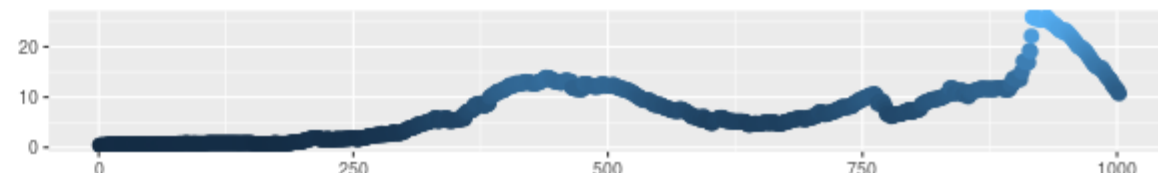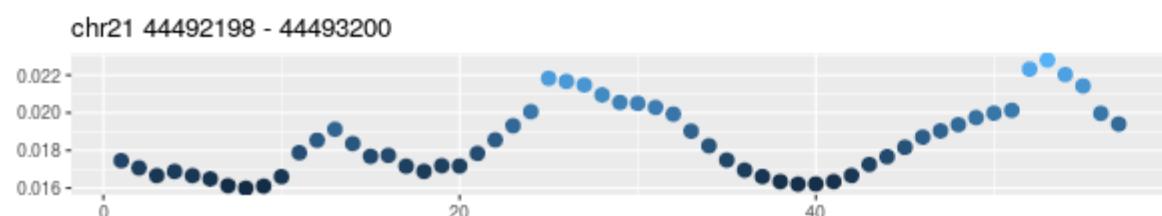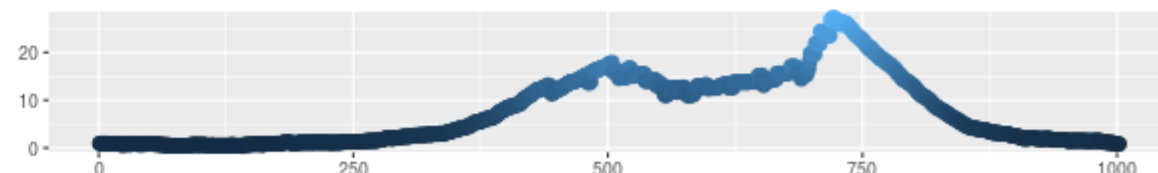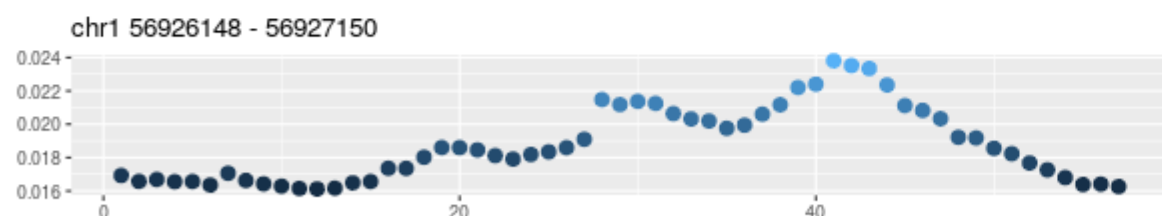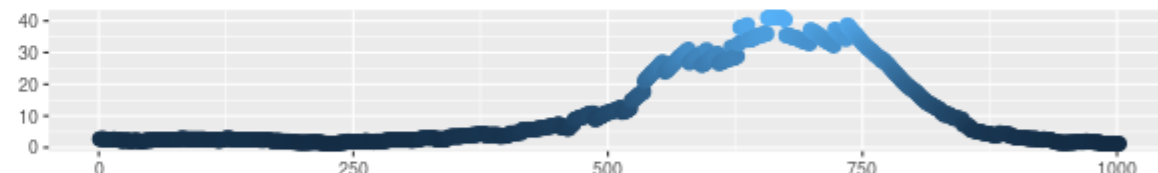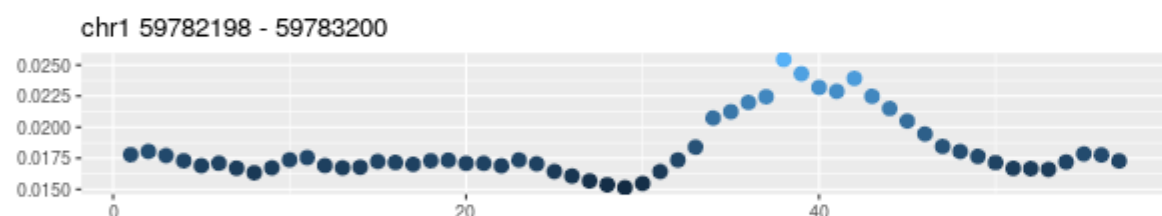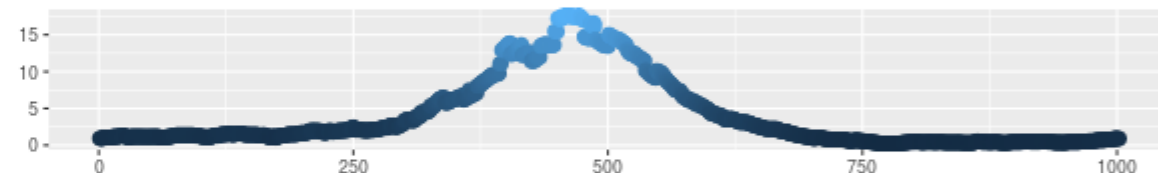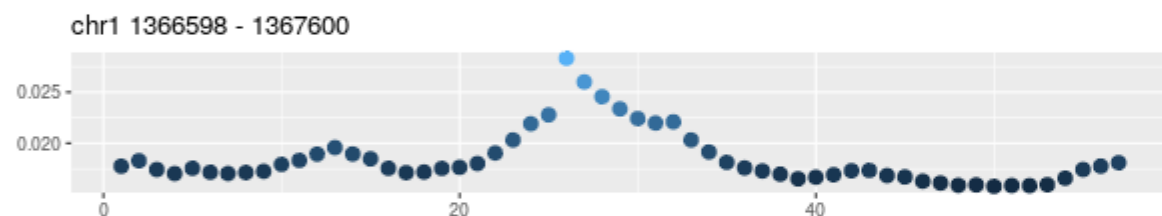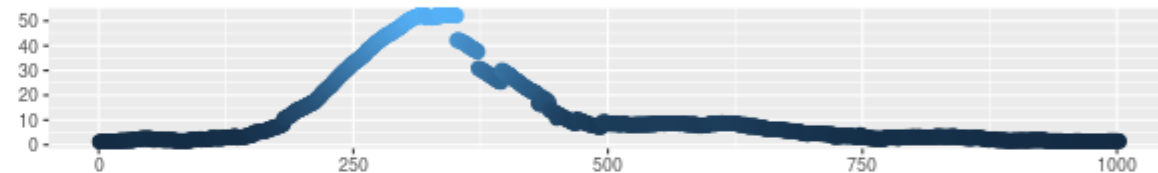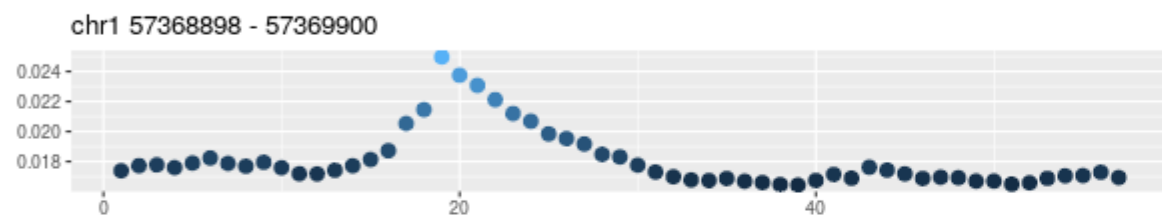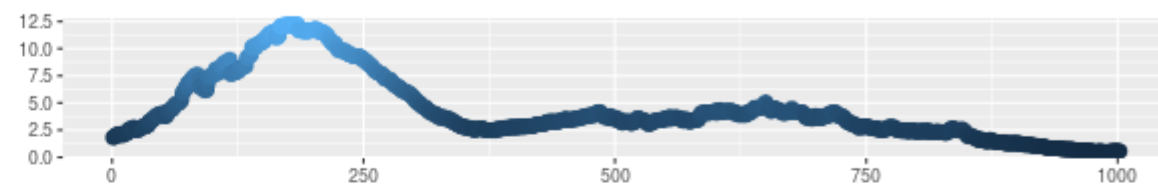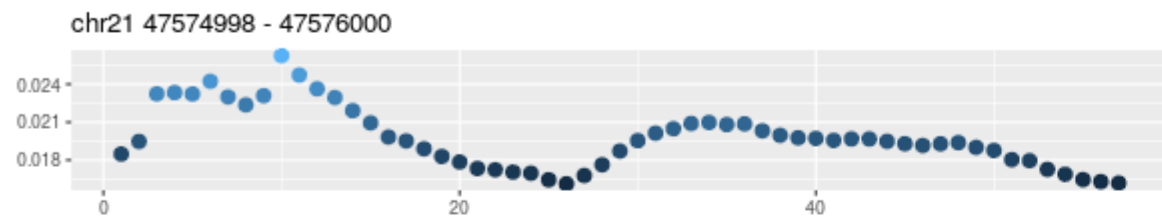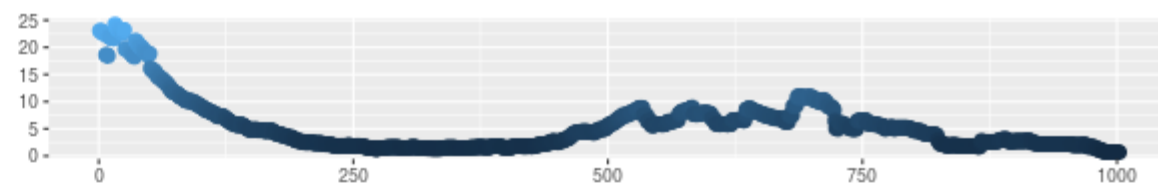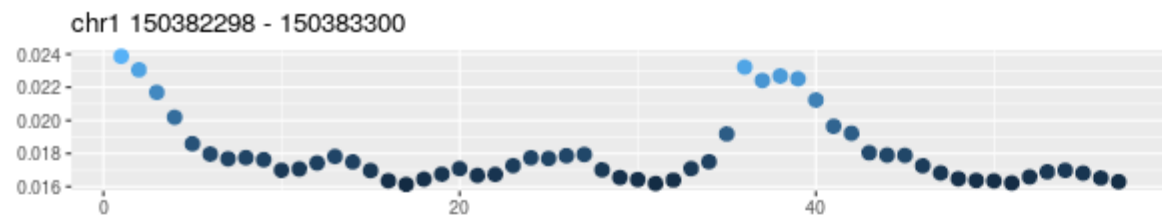
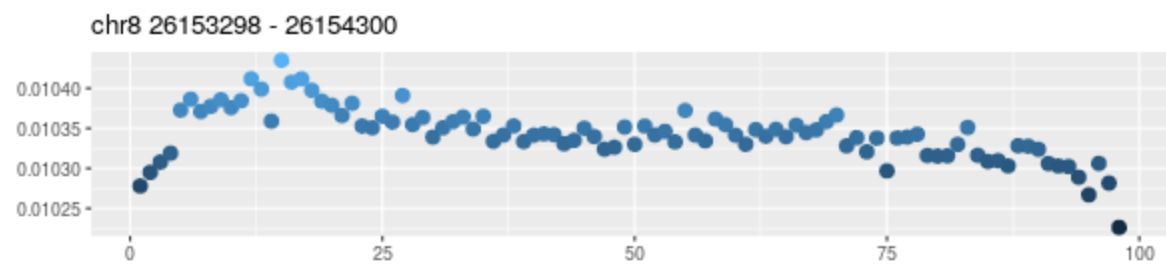Attention weights   ChIP-seq score

Pairwise attention module
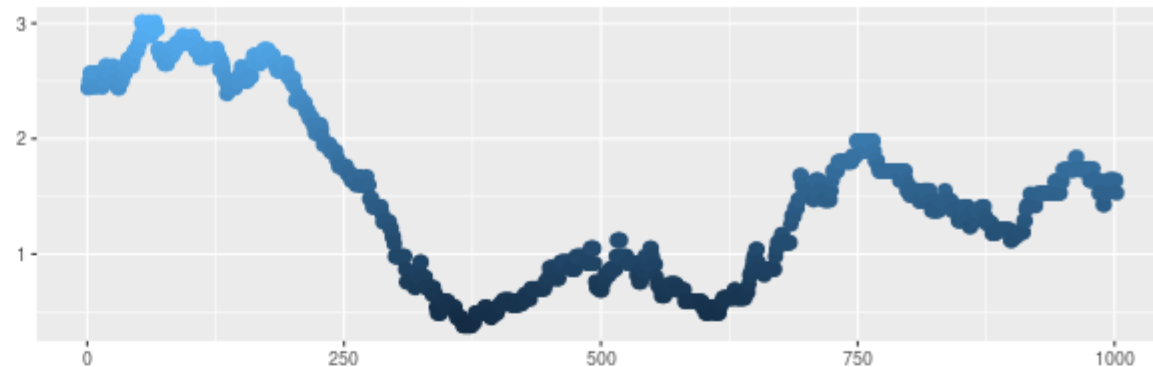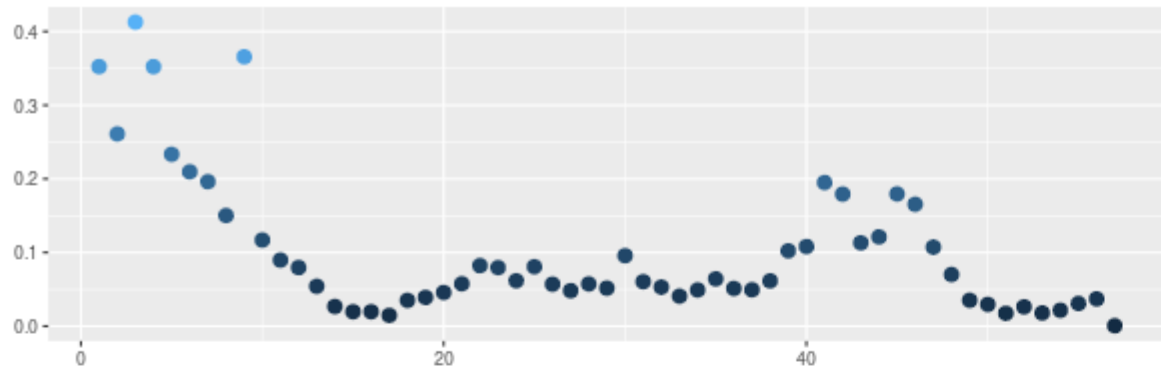
JUND/liver
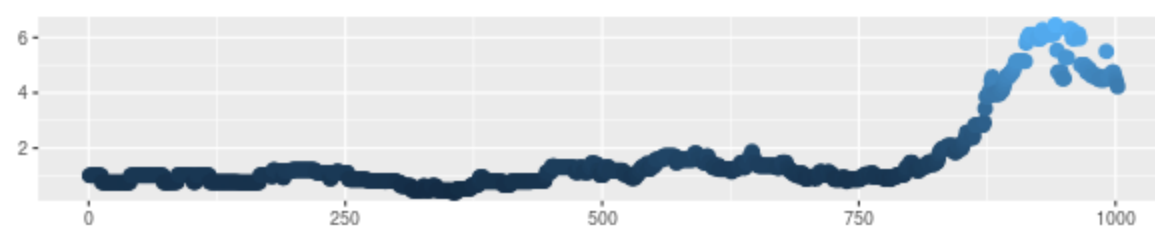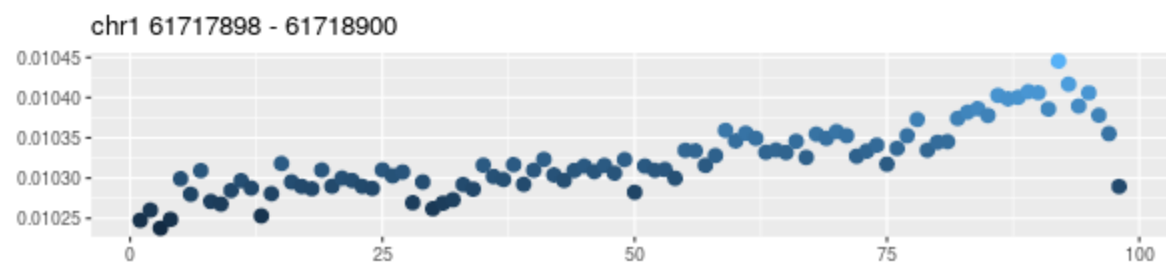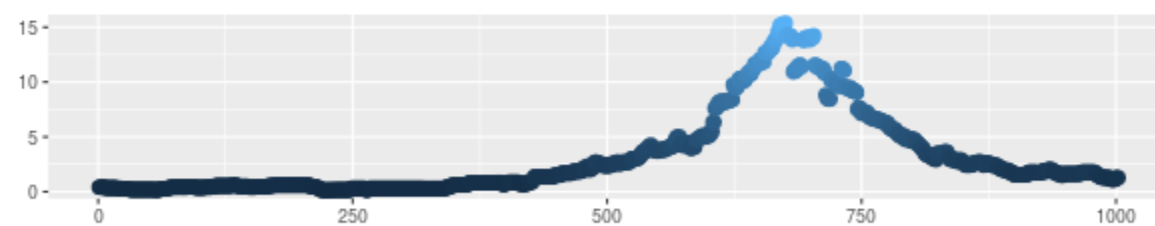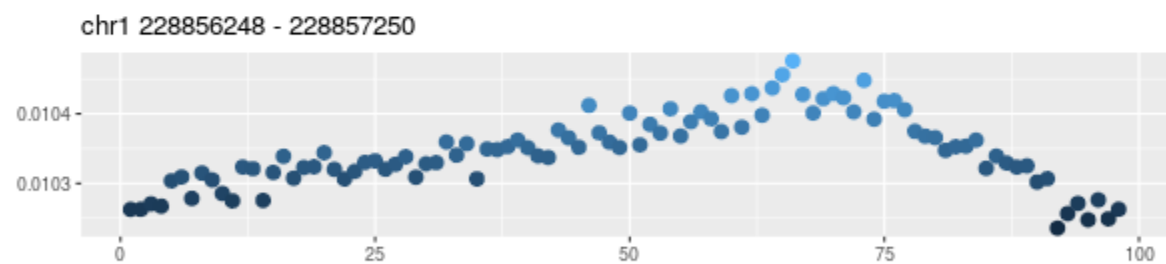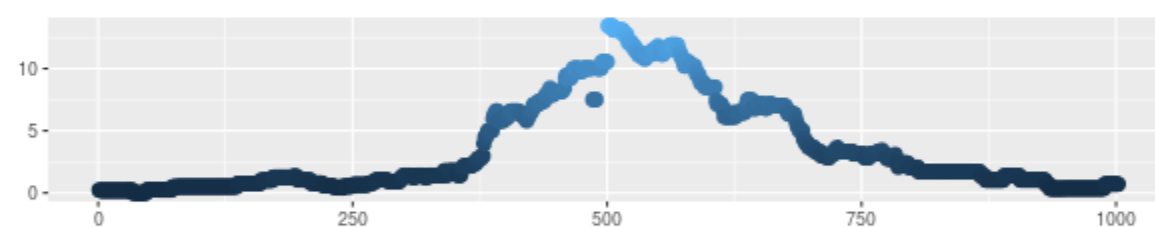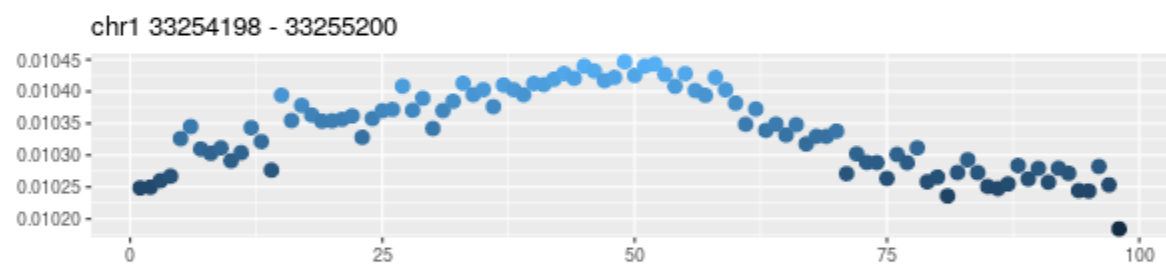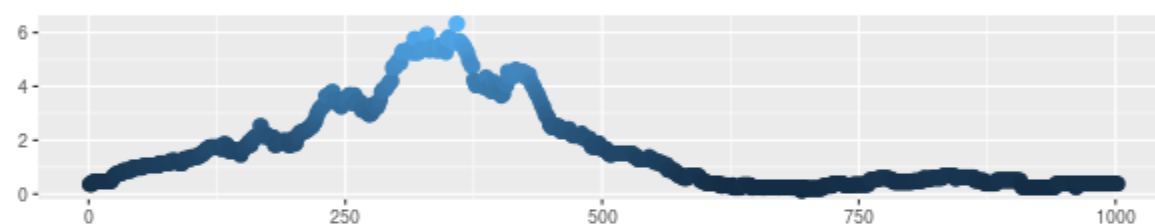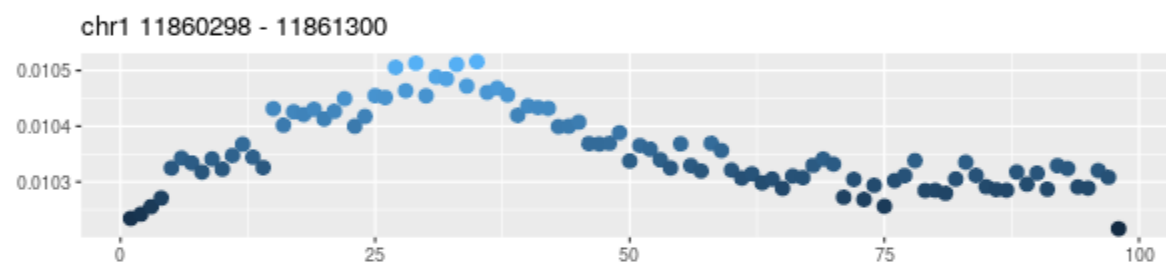
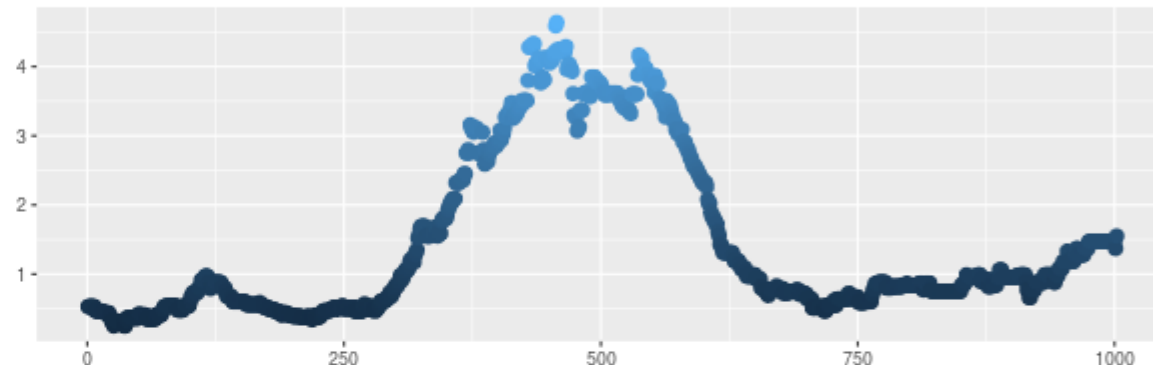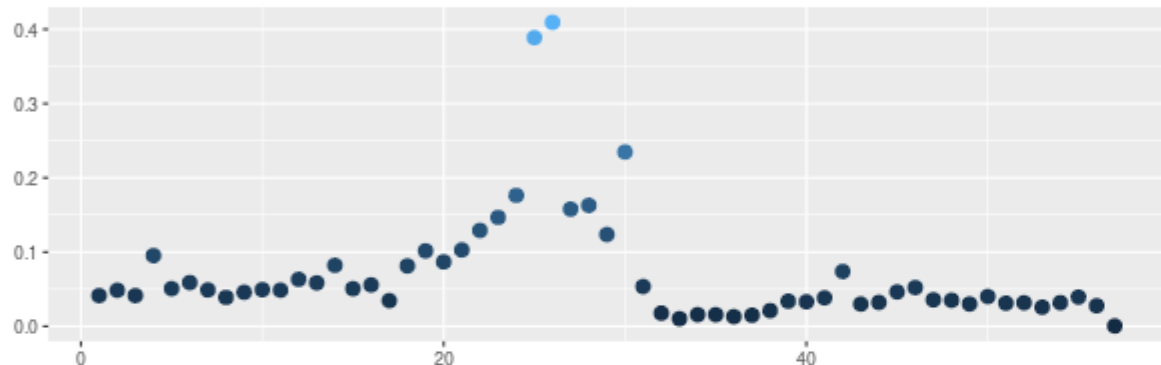Attention weights   ChIP-seq score
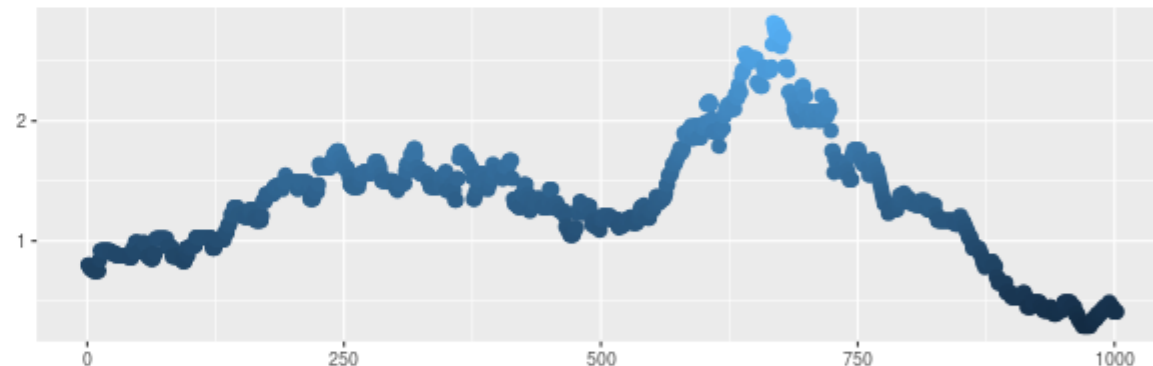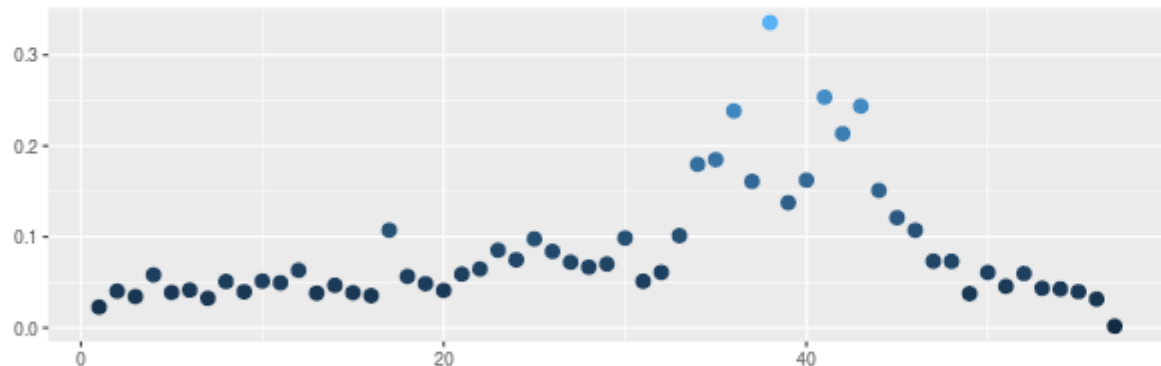
Pairwise attention module
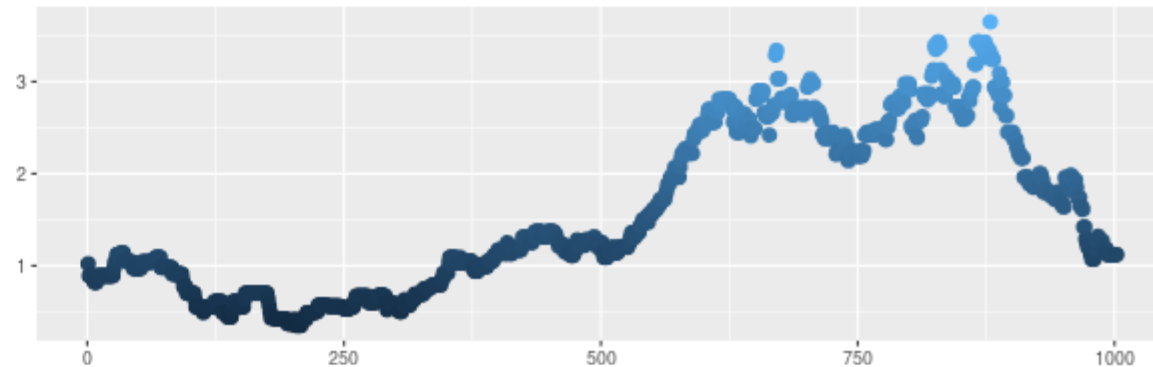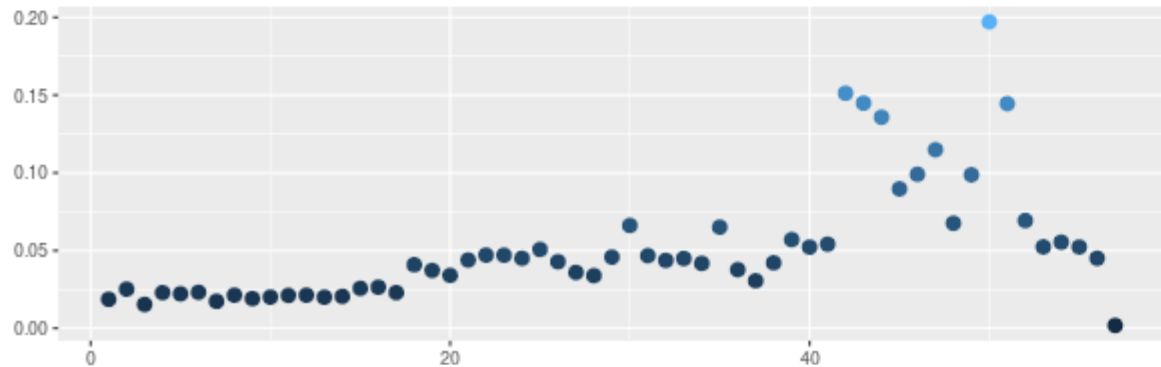
MAX/liver

chr1 150980398 - 150981400

chr1 28558698 - 28559700

chr1 171453548 - 171454550

chr1 234667348 - 234668350

Attention weights

ChIP-seq score

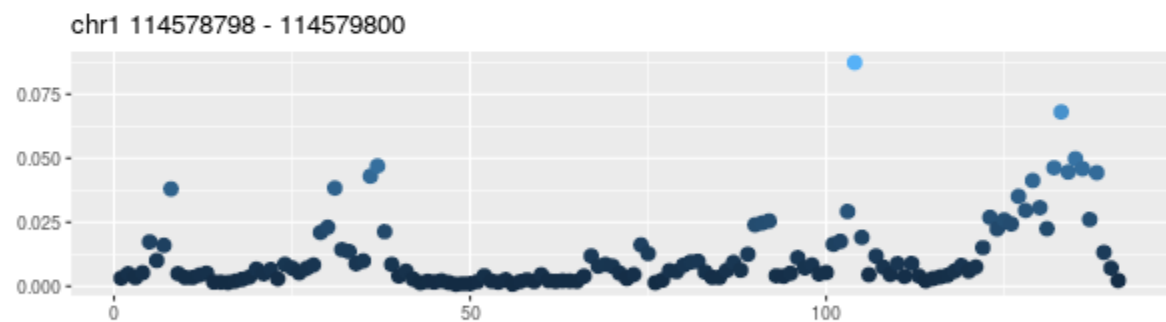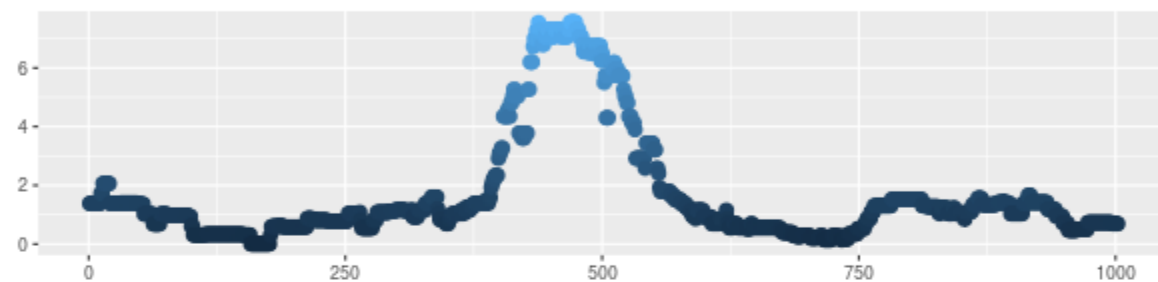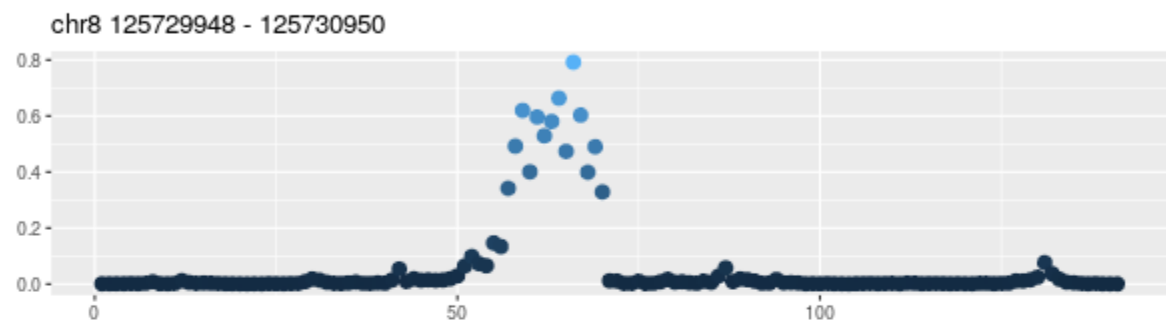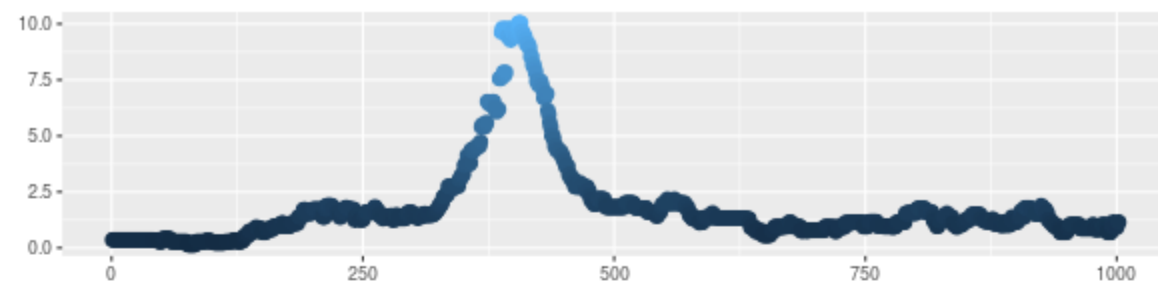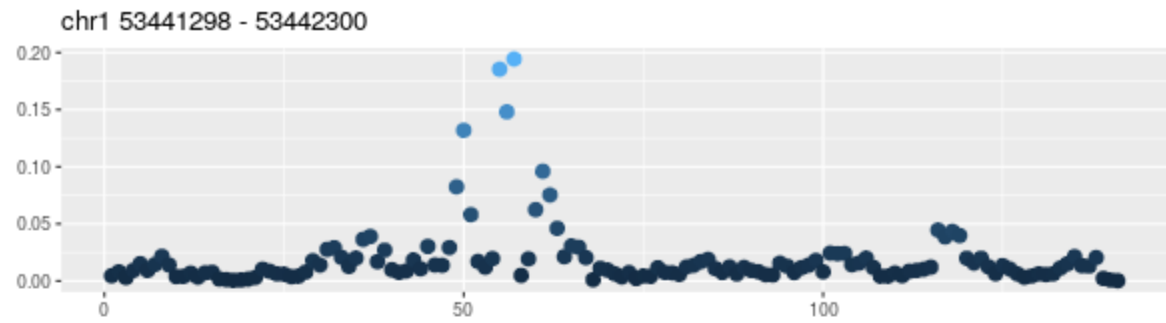# Pairwise attention module

NANOG/induced pluripotent stem cell
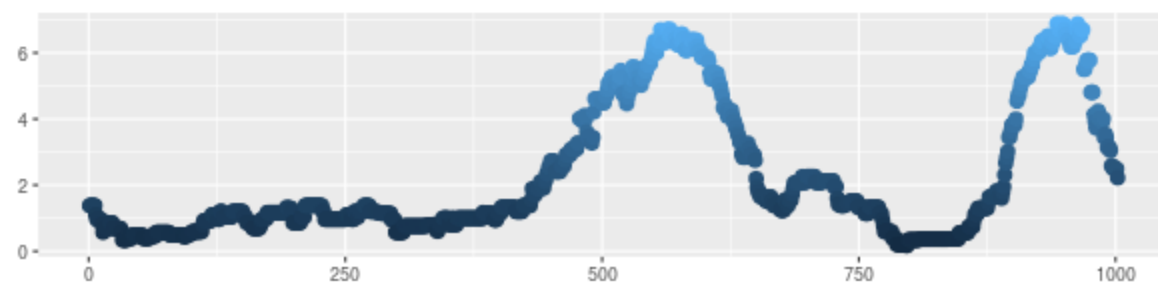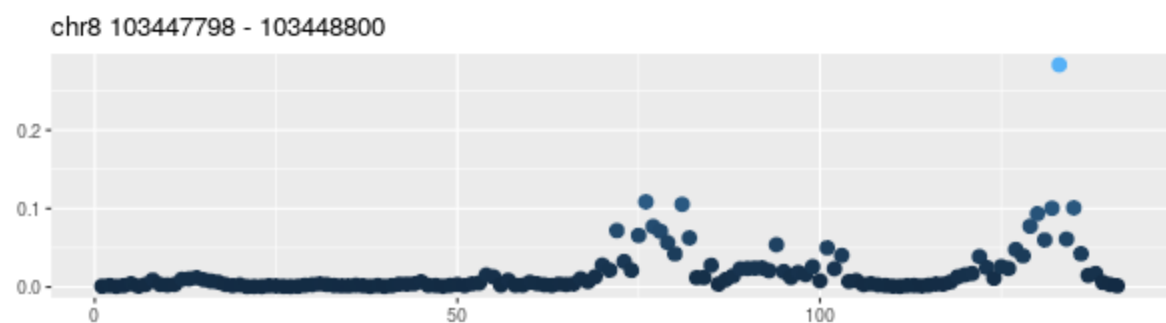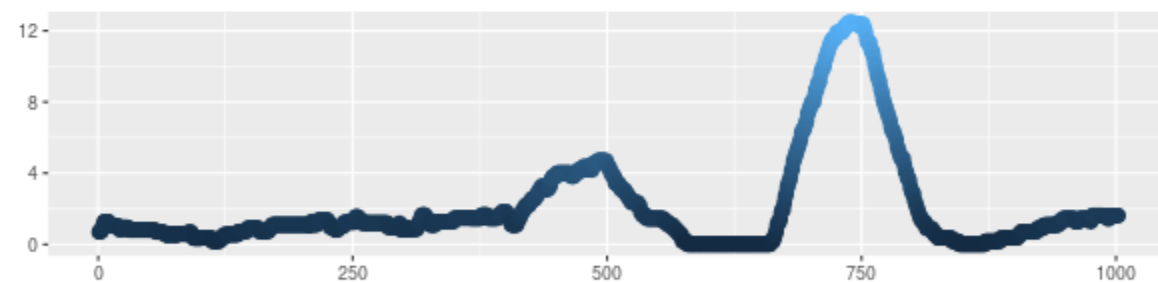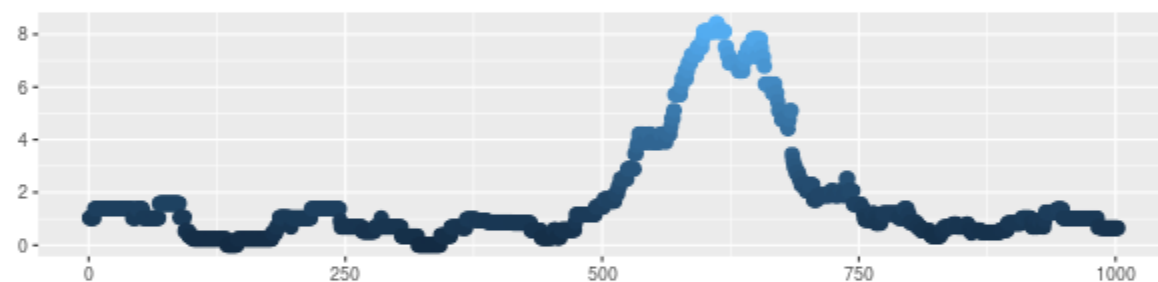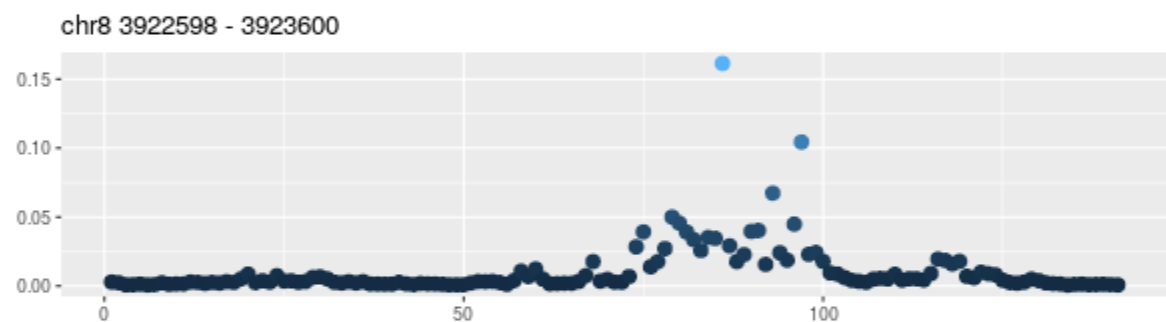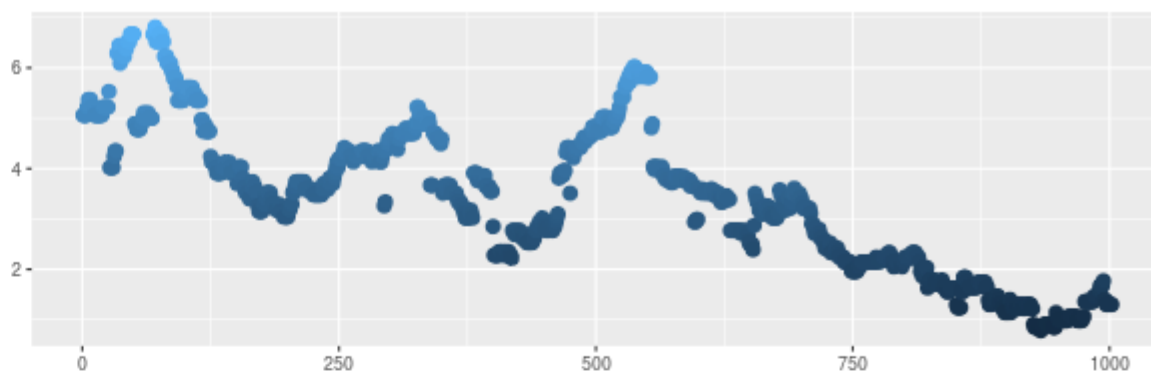

Attention weights   ChIP-seq score

Pairwise attention module

REST/liver

chr8 124428098 - 124429100

chr1 44433348 - 44434350
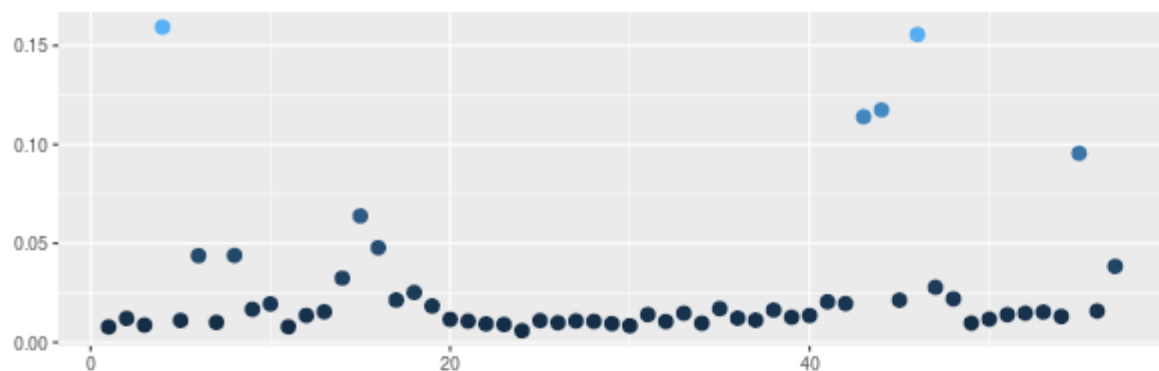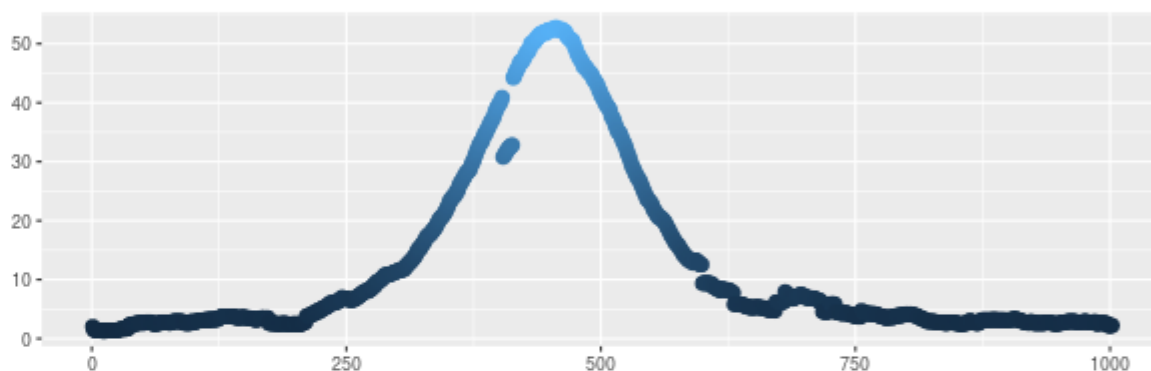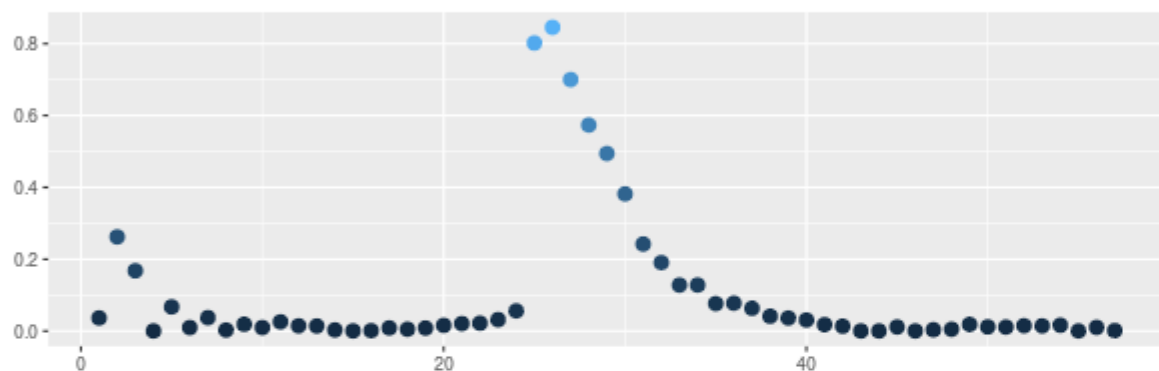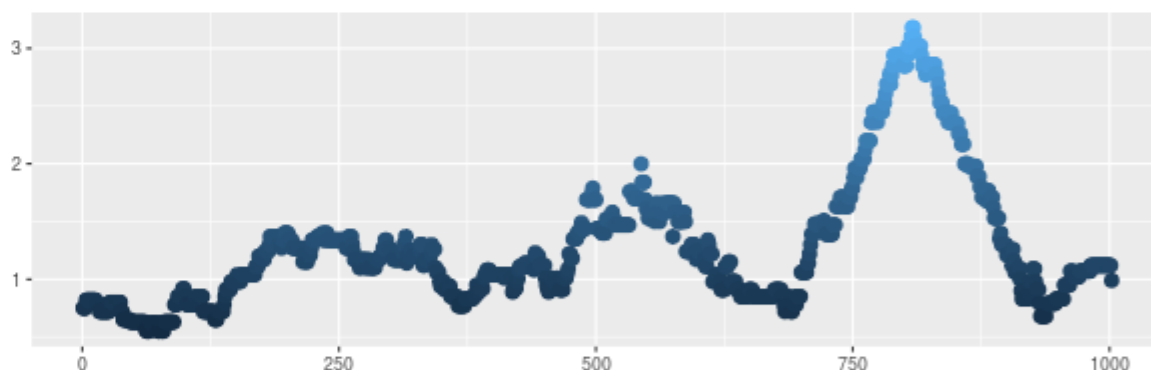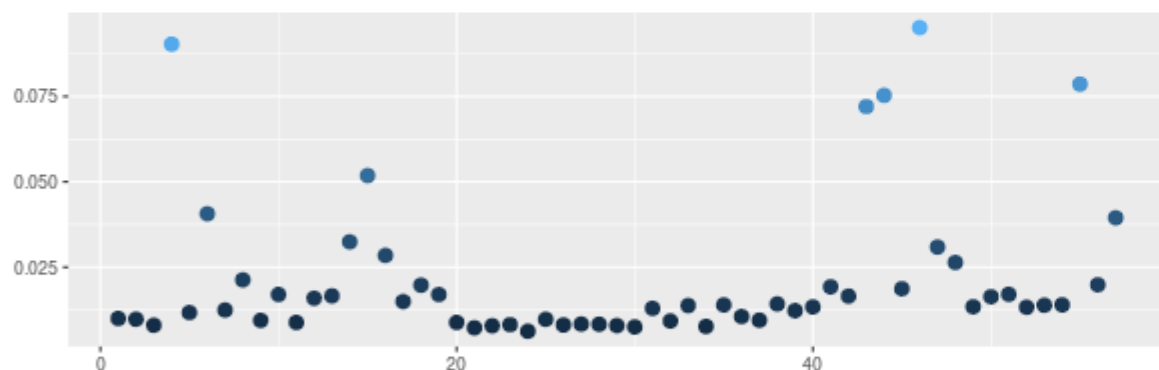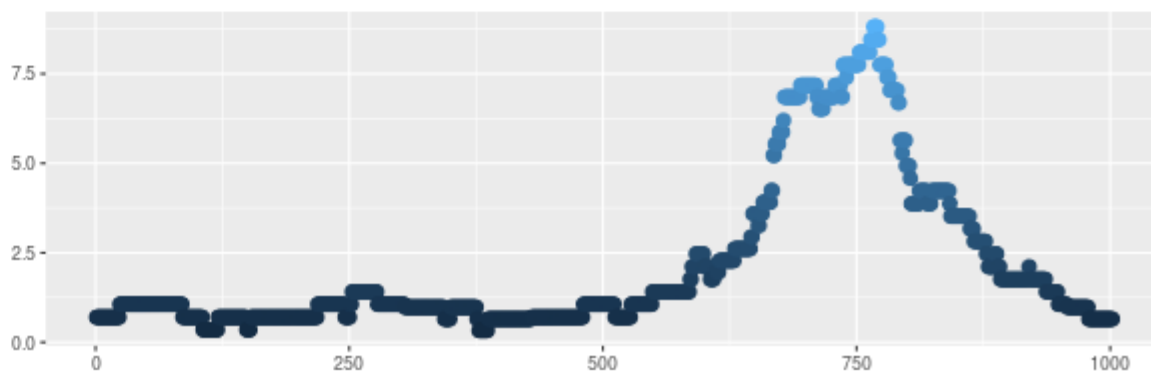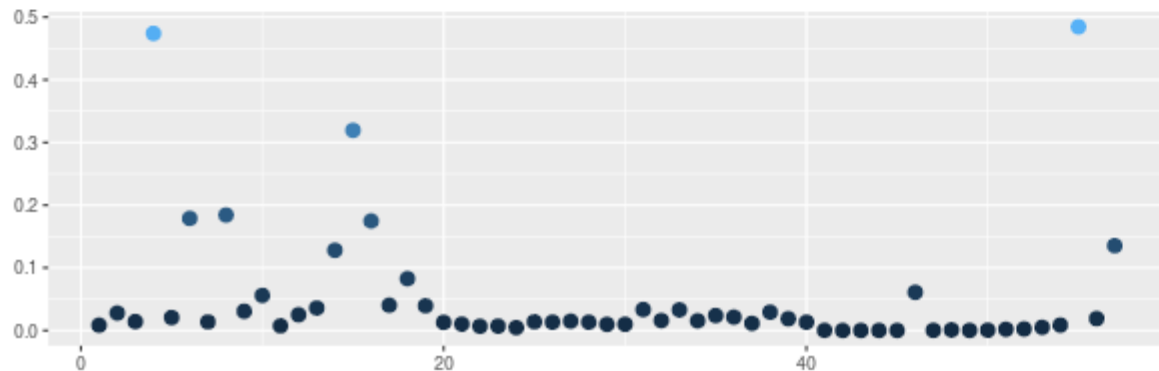
chr1 28051348 - 28052350
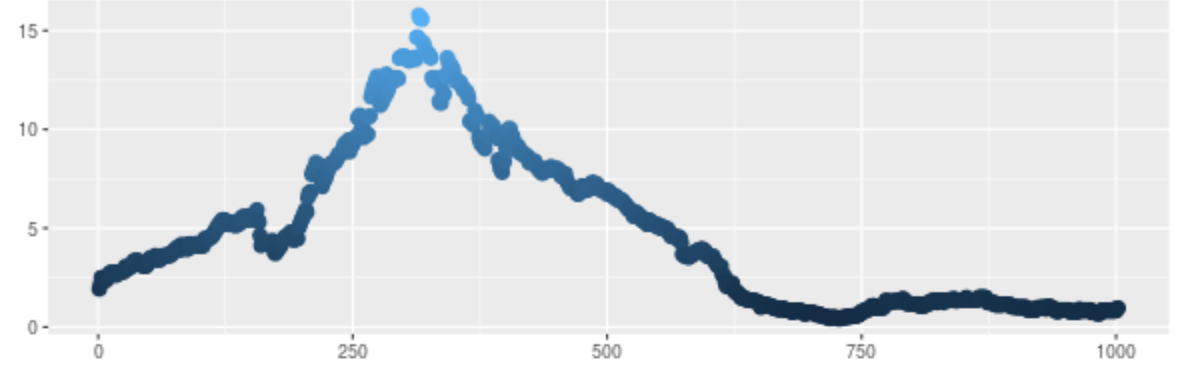
chr1 211326348 - 211327350
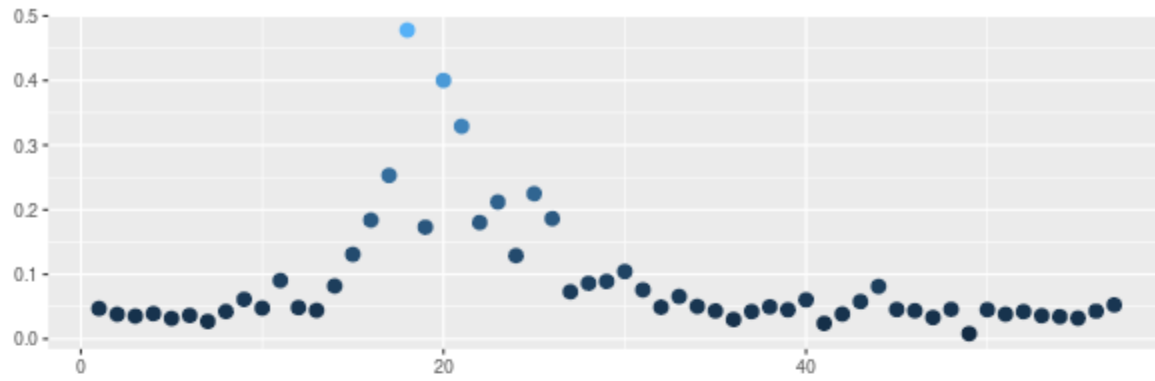
Attention weights

ChIP-seq score

Pairwise attention module
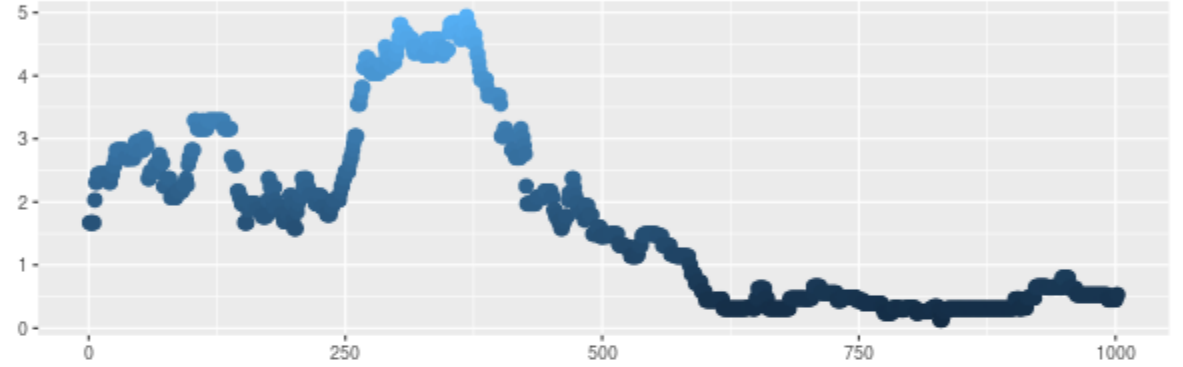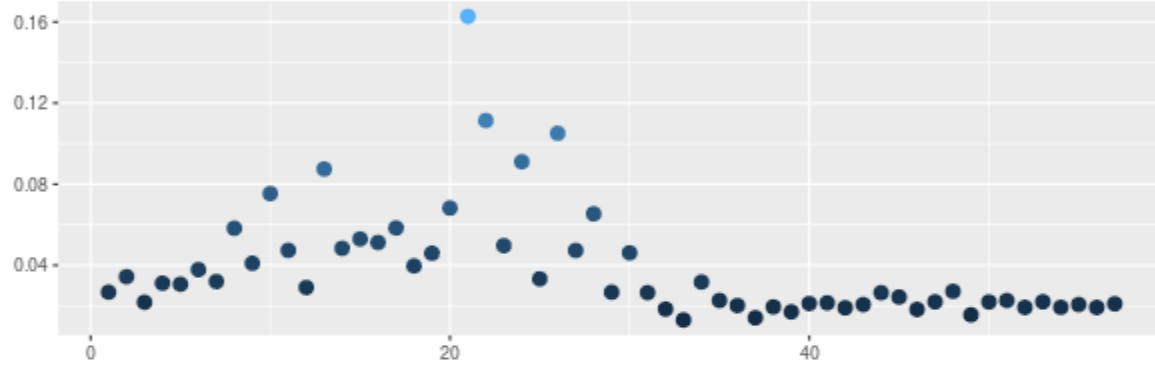
TAF1/liver