

2018
DIN

2019
DIEN

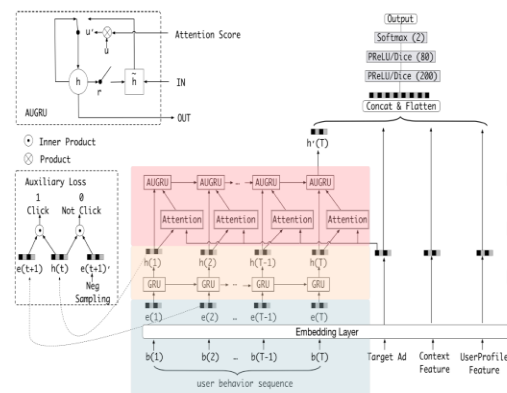
2019
DSIN

2019
DSTN

Activation Unit \rightarrow AUGRU
model (Stacked RNN)

Activation Unit \rightarrow + Multi-Head Self
Attention + Bi-LSTM

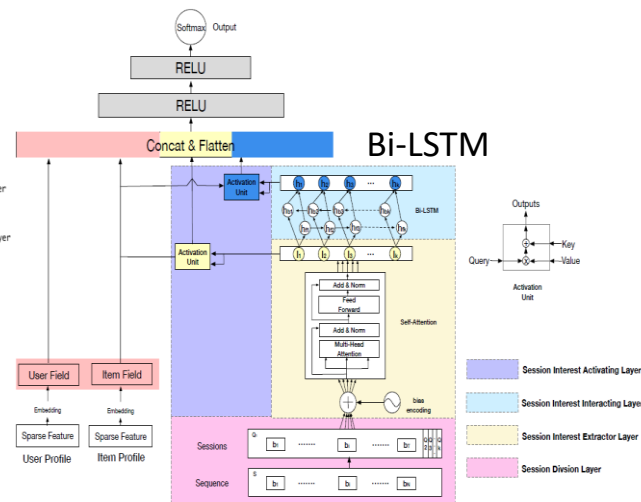
Activation Unit \rightarrow Interactive
Attention



GRU with attentional
update gate, AUGRU

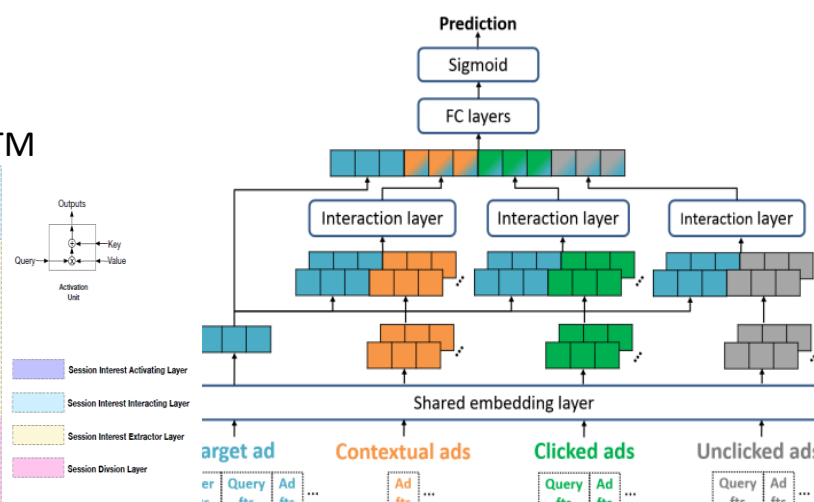
$$\tilde{u}'_t = a_t * u'_t,$$

$$h'_t = (1 - \tilde{u}'_t) \circ h'_{t-1} + \tilde{u}'_t \circ \tilde{h}'_t,$$



Multi-head Self-attention

Deep Session Interest
Network (DSIN)



(c) DSTN - Interactive attention model

$$\tilde{\mathbf{x}}_c = \sum_{i=1}^{n_c} \alpha_{ci}(\mathbf{x}_t, \mathbf{x}_{ci}) \mathbf{x}_{ci}.$$

$$\alpha_{ci}(\mathbf{x}_t, \mathbf{x}_{ci}) = \exp(\mathbf{h}^T \text{ReLU}(\mathbf{W}_{tc}[\mathbf{x}_t, \mathbf{x}_{ci}] + \mathbf{b}_{tc1}) + b_{tc2})$$

Deep Spatio Temporal
neural Networks (DSTNs)