Basic alignment algorithms:

Needleman–Wunsch algorithm for pairwise global.
Smith–Waterman algorithm for pairwise local.

The ASM algorithm is a combination of Needleman–Wunsch and Smith–Waterman. We can use it to find approximate matches across the input sequence. It is initialized as:

0	0	0	0	0	0	0	0	0	0	0
-1										
-2										
-3										
-4										
-5										

Then it is filled follow the same rule:

$$D(i,j) = \max \begin{cases} D(i-1,j-1) + s(x_i, y_j) \\ D(i-1,j) + g \\ D(i,j-1) + g \end{cases}$$

The **EINN** network structure published on NIPS. It uses a differentiable alignment score to replace the “sum of Hadamard product” in CNN. They made dynamic programming differentiable by using a “log-sum-exp” function to replace the max function. (complicated but not necessary).

Later the **DTWnet** claimed it is not necessary to use soft-max function in dynamic programming.