Algorithm 1: CTC Loss alpha computation

Data: $out_{m \times n}$ (result of softmax), where m=$\bar{W}/4$, n=$|\hat{A}|$,
l (label encoded by alphabet),
bl=0 (blank index)
begin
- $Loss = 0$
- $L = 2 \times len(l) + 1$
- $T = m$
- $a = zeros(T, L)$
- $a_0^0 = out_0^{bl}$
- $a_0^1 = out_0^{l_0}$
- $c = \sum_{i=0}^{1} a_0^i$
- **for** $i := 0$ **to** 1 **do**
  - $a_0^i = a_0^i / c$
- $Loss = Loss + c$
- **for** $t := 1$ **to** T **do**
  - $s = \max(0, L - 2 \times (T - t))$
  - $e = \min(2 \times t + 2, L)$
  - **for** $s := 1$ **to** L **do**
    - $i = (s - 1)/2$
    - $red = a_{t-1}^s$
    - $blue = 0$
    - **if** $s > 0$ **then**
      - $blue = a_{t-1}^{s-1}$
    - **if** s ***mod*** $2 = 0$ **then**
      - $a_t^s = (red + blue) \times out_t^{bl}$
    - **else if** $s = 1$ ***or*** $l_i = l_{i-1}$ **then**
      - $a_t^s = (red + blue) \times out_t^{l_i}$
    - **else**
      - $orange = a_{t-1}^{s-2}$
      - $a_t^s = (red + blue + orange) \times out_t^{l_i}$
  - $c = \sum_{i=s}^{e} a_t^i$
  - **for** $i := s$ **to** e **do**
    - $a_t^i = a_t^i / c$
  - $Loss = Loss + c$