

# Attention Networks for Aspect-Level Sentiment Classification

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# Aspect Level Sentiment Classification

# Aspect Level Sentiment Classification

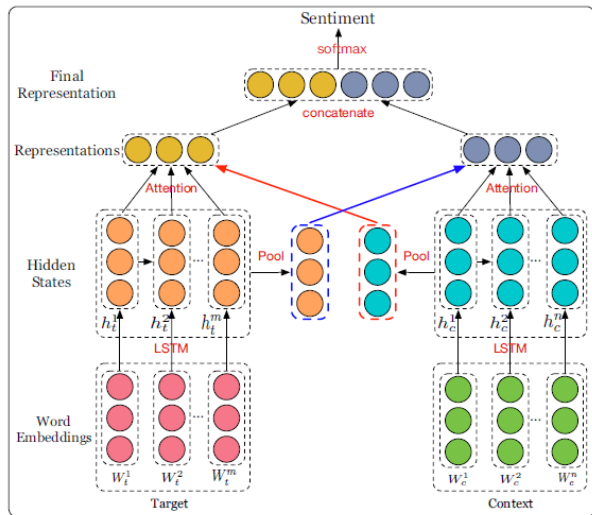
- Context : 분석할 문장
  - ▶ ex) "a group of friendly staff, the pizza is not bad, but the beef cubes are not worth the money!"
- Aspect : Context에서 분류할 대상
  - ▶ ex) staff, pizza, beef cubes
- Sentiment polarity : Context에서 한 Aspect에 대한 평가
  - ▶ ex) staff : positive, pizza : neutral, beef cubes : negative
- 목표 : Context와 Aspect가 주어졌을 때 Sentiment polarity를 분류

# Interactive Attention Networks

# Interactive Attention Networks - Motivation

- target에 따라 context에서 중요한 단어가 정해지고 context에 따라 target에서 중요한 단어가 정해질 것이다.
- target, context를 서로의 attention에 사용

## Interactive Attention Networks - Architecture



# Interactive Attention Networks - Attention Weights

- $h_c^i$  :  $i$ th hidden state of context  
 $t_{avg}$  : pooled hidden state of target
- Attention Weights

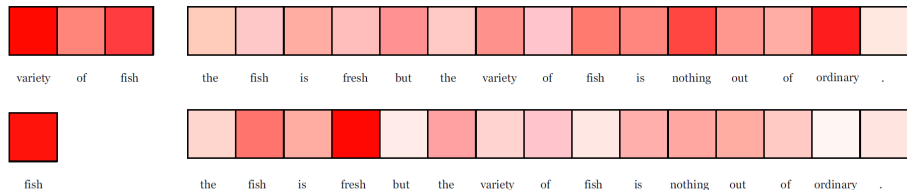
$$\alpha_i = \frac{\exp(\gamma(h_c^i, t_{avg}))}{\sum_{j=1}^n \exp(\gamma(h_c^j, t_{avg}))}$$

- Score function

$$\gamma(h_c^i, t_{avg}) = \tanh(h_c^i \cdot W_a \cdot t_{avg}^T + b_a)$$

# Illustration of Attention Weights

- Context :  
“the fish is fresh but the variety of fish is nothing out of ordinary.”
- Target 1 : variety of fish
- Target 2 : fish



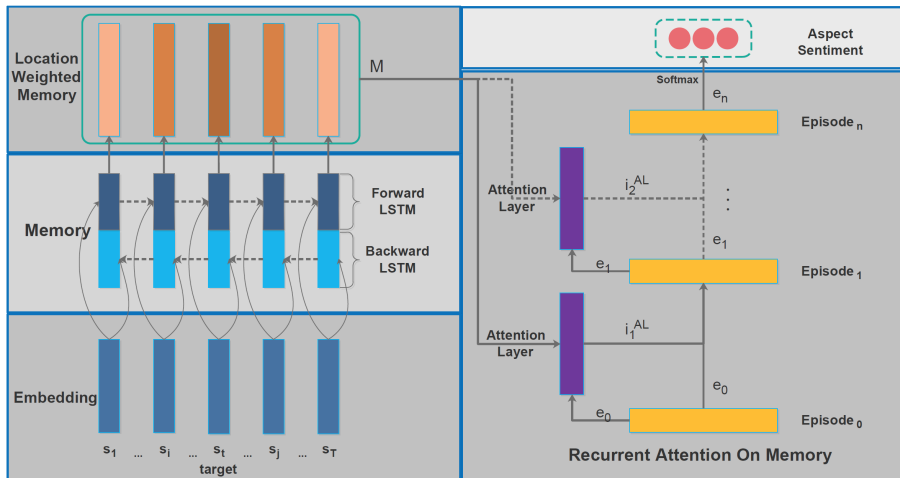


# Recurrent Attention on Memory

## Recurrent Attention on Memory - Motivation

- 하나의 attention으로는 문장의 여러 부분이 결합되어 생기는 의미를 반영하기 어려움.
  - ▶ ex) “Except Patrick, all other actors don't play well”
- 여러 attention이 GRU에 입력되어 의미가 비선형적으로 결합될 수 있도록 함.

# Recurrent Attention on Memory - Architecture



# Recurrent Attention on Memory - Position-Weighted Memory

- $u_t = \frac{t-\tau}{t_{max}}$ , where  $\tau$  is the index of the target.
- Position-Weight

$$w_t = 1 - |u_t|$$

- Position-Weighted Memory

$$m_t = (w_t \cdot m_t^*, u_t)$$

$$\text{where } m_t^* = (\vec{h}_t, \overleftarrow{h}_t)$$

# Recurrent Attention on Memory - Attention Weights

- Attention Weights

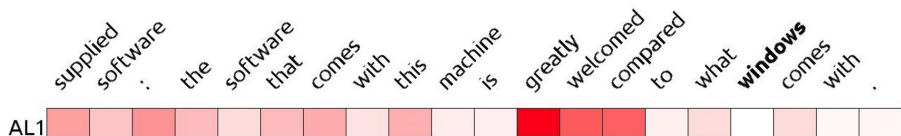
$$g_j^t = W_t^{AL}(m_j, e_{t-1}, v_\tau) + b_t^{AL}$$

$$\alpha_j^t = \frac{\exp(g_j^t)}{\sum_k \exp(g_k^t)}$$

# Illustration of Attention Weights



(a) Example of multiple attentions. The target is “windows”.



(b) Example of single attention. The target is “windows”.