Self-teaching for machine translation

Anonymous Author(s)
Affiliation
Address
email

Abstract

1

2 1 Introduction

3 In this project, we propose a self-teaching method for machine translation. We have access to the
4 following data: MT training data $\{(x_i, y_i)\}_{i=1}^N$ where x_i is a source sentence and y_i is the target
5 translation; MT validation data D_{val} which contains (source, target) pairs.

6 In our method, there are three learning stages. At the first stage, on $\{(x_i, y_i)\}_{i=1}^N$, we train an MT
7 model W. Each training example (x_i, y_i) is associated with a weight $a_i \in [0, 1]$. At this stage, we
8 solve the following problem:

$$W^*(A) = \text{argmin}_W \sum_{i=1}^{N} a_i l(x_i, y_i; W) \tag{1}$$

9 where $A = \{a_i\}_{i=1}^N$.

10 At the second stage, given a set of unlabeled source sentences $\{u_i\}_{i=1}^M$, we apply $W^*(A)$ to trans-
11 late them into target sentences. Let $g(u_i; W^*(A))$ denote the translated sentence of u_i. Then on
12 $\{(u_i, g(u_i; W^*(A)))\}_{i=1}^M$, we train another MT model V. At this stage, we solve the following
13 optimization problem:

$$V^*(W^*(A)) = \text{argmin}_V \sum_{i=1}^{M} l(u_i, g(u_i; W^*(A)); V) \tag{2}$$

14 At the third stage, we measure the validation performance of $V^*(W^*(A))$ on D_{val} and update A by
15 minimizing the validation loss:

$$\min_A L(D_{val}; V^*(W^*(A))) \tag{3}$$

16 Putting these pieces together, we have the four-level optimization problem:

$$\begin{array}{ll} \min_A & L(D_{val}; V^*(W^*(A))) \\ s.t & V^*(W^*(A)) = \text{argmin}_V \sum_{i=1}^M l(u_i, g(u_i; W^*(A)); V) \\ & W^*(A) = \text{argmin}_W \sum_{i=1}^N a_i l(x_i, y_i; W) \end{array} \tag{4}$$

Submitted to 35th Conference on Neural Information Processing Systems (NeurIPS 2021). Do not distribute.