Evaluation of Propaganda Detection Tasks

Shared Task at SemEval 2020 Task 11: ”Detection Of Propaganda Techniques In News Articles”.

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The evaluation measure for the overall task of detecting propagandistic fragments and identifying the technique(s) applied in those fragments is described in section 1. Section 2 describes a measure for the span identification task alone as a special case of the formulas in section 1.

1 Fragment-Level Classification (FLC) Task

Let document \( d \) be represented as a sequence of characters. The \( i \)-th propagandistic text fragment is then represented as a sequence of contiguous characters \( t \subseteq d \). A document includes a set of (possibly overlapping) fragments \( T \). Similarly, a learning algorithm produces a set \( S \) with fragments \( s \subseteq d \), predicted on \( d \). A labeling function \( l(x) \in \{1, \ldots, 18\} \) associates \( t \in T \), \( s \in S \) with one of the eighteen techniques. An example of (gold) annotation is in Figure 1: an annotation \( t_1 \) flags the words “stupid and petty” with the technique ”Loaded language”.

We define the following function to handle partial overlaps between fragments with same labels:

\[
C(s, t, h) = \frac{|s \cap t|}{h} \delta(l(s), l(t)), \tag{1}
\]

where \( h \) is a normalizing factor and \( \delta(a, b) = 1 \) if \( a = b \), and 0 otherwise. For example, still with reference to Figure 1, \( C(t_1, s_1, |t_1|) = \frac{6}{18} \) and \( C(t_1, s_2, |t_1|) = 0 \).

Given (1), we now define variants of precision and recall able to account for the imbalance in the corpus:

\[
P(S, T) = \frac{1}{|S|} \sum_{s \in S} C(s, t, |s|), \tag{2}
\]

\[
R(S, T) = \frac{1}{|T|} \sum_{t \in T} C(s, t, |t|), \tag{3}
\]

We define (2) to be zero if \( |S| = 0 \) and Eq. (3) to be zero if \( |T| = 0 \). Following Potthast et al. (2010), in (2) and (3) we penalize systems predicting too many or too few instances by dividing by \( |S| \) and \( |T| \), respectively; e.g., in Figure 1 \( R(\{s_3, s_4, s_5\}, \{t_1\}) = \frac{24}{24} < R(\{s_1\}, \{t_1\}) = \frac{9}{21} < R(\{t_1\}, \{t_1\}) = 1 \).

Finally, we combine Eqs. (2) and (3) into an \( F_1 \)-measure, the harmonic mean of precision and recall:

\[
F_1(S, T) = \frac{2P(S, T)R(S, T)}{P(S, T) + R(S, T)} \tag{4}
\]

Notice that (4) can be computed with respect to one technique only simply by replacing the \( \delta \) function in (1) with \( \delta_{L}(a, b) = 1 \) if \( a = b = L \), where \( L \) is a predetermined propaganda technique.

![Figure 1: Example of gold annotation (top) and the predictions of a supervised model (bottom) in a document represented as a sequence of characters.](image)

2 Span Identification Task (SI)

The span identification task is a special case of the FLC one (section 1), in which \( \forall a, b, \delta(a, b) = 1 \). Moreover, in order for (2) and (3) to get values less or equal than 1, all overlapping annotations, independently of their techniques, are first merged. For example, in Figure 2 after the merging process, the three annotations \( (t_1, s_1 + s_2 \) and \( s_3 + s_4) \)
Figure 2: Example of equivalent annotations for the Span Identification task.

becoming equivalent to each other with respect to the evaluation of the SI task.

References