* 1. Implementation of additional features

The features I applied are the features useful talked in section 1.1.

The improvement as follow:

According the results, its obvious my improvement worked both Macro F1 scoreand Micro F1 score. To be specifically, the Macro F1 score improved from 21.57 to 23.51. The Micro F1 score improved from 95.53 to 95.76

The original code’s result

### evaluation of data/twitter\_dev.ner; writing to ./twitter\_dev.ner.pred  
Token-wise accuracy 95.53610123949034  
Token-wise F1 (macro) 21.57803753335646  
Token-wise F1 (micro) 95.53610123949034  
Sentence-wise accuracy 66.61016949152543  
 precision recall f1-score support  
  
 B-company 1.00 0.33 0.50 36  
 B-facility 0.62 0.36 0.45 28  
 B-geo-loc 0.82 0.30 0.44 77  
 B-movie 0.00 0.00 0.00 7  
B-musicartist 0.00 0.00 0.00 13  
 B-other 1.00 0.10 0.17 63  
 B-person 0.70 0.29 0.41 108  
 B-product 1.00 0.16 0.27 19  
 B-sportsteam 0.00 0.00 0.00 11  
 B-tvshow 0.00 0.00 0.00 11  
 I-company 0.00 0.00 0.00 7  
 I-facility 0.67 0.14 0.23 29  
 I-geo-loc 1.00 0.07 0.13 14  
 I-movie 0.00 0.00 0.00 11  
I-musicartist 0.00 0.00 0.00 15  
 I-other 0.58 0.14 0.22 81  
 I-person 0.92 0.20 0.32 61  
 I-product 1.00 0.25 0.40 16  
 I-sportsteam 0.00 0.00 0.00 4  
 I-tvshow 0.00 0.00 0.00 10  
 O 0.96 1.00 0.98 10916  
  
 micro avg 0.96 0.96 0.96 11537  
 macro avg 0.49 0.16 0.22 11537  
 weighted avg 0.94 0.96 0.94 11537

My improvement’s result:

### evaluation of data/twitter\_dev.ner; writing to ./twitter\_dev.ner.pred  
Token-wise accuracy 95.7614631186617  
Token-wise F1 (macro) 23.514567880578184  
Token-wise F1 (micro) 95.7614631186617  
Sentence-wise accuracy 66.27118644067797  
 precision recall f1-score support  
  
 B-company 0.81 0.36 0.50 36  
 B-facility 0.64 0.32 0.43 28  
 B-geo-loc 0.78 0.38 0.51 77  
 B-movie 0.00 0.00 0.00 7  
B-musicartist 0.00 0.00 0.00 13  
 B-other 1.00 0.11 0.20 63  
 B-person 0.68 0.46 0.55 108  
 B-product 0.75 0.16 0.26 19  
 B-sportsteam 0.00 0.00 0.00 11  
 B-tvshow 0.00 0.00 0.00 11  
 I-company 0.00 0.00 0.00 7  
 I-facility 0.31 0.14 0.19 29  
 I-geo-loc 1.00 0.07 0.13 14  
 I-movie 0.00 0.00 0.00 11  
I-musicartist 0.00 0.00 0.00 15  
 I-other 0.60 0.15 0.24 81  
 I-person 0.84 0.43 0.57 61  
 I-product 0.80 0.25 0.38 16  
 I-sportsteam 0.00 0.00 0.00 4  
 I-tvshow 0.00 0.00 0.00 10  
 O 0.96 1.00 0.98 10916  
  
 micro avg 0.96 0.96 0.96 11537  
 macro avg 0.44 0.18 0.24 11537  
 weighted avg 0.94 0.96 0.95 11537