# Multitask learning without finetuning experiment

## using ELMo word embedding with Simple embedding techniques (CPU relabeled)

Use MLP classifier with 2 hidden layers. All the parameter setting is the same with original one.

## Some analysis:

Compared to Multitask experiment with finetuning (analyzing using average embedding):

The arrow -> indicate *experiments without finetuning -> experiments with finetuning*

|  |  |
| --- | --- |
| CPU | (R@1 : **0.23->0.33** R@5: **0.68->0.81** ) |
| RAM | (R@1 : **0.54->0.65**  R@5: **0.97-> 0.99** ) |
| HD | (R@1 : **0.31->0.46** R@5: **0.92->0.94** ) |
| GPU | (R@1 : 0.61->0.59 R@5: **0.96->0.99** ) |
| Screen | (R@1 : **0.68->0.73** R@5: **0.98->0.99** ) |

\***Bold indicate improved results**

Nearly all of experiment shows certain degree of improvement!

|  |  |
| --- | --- |
|  | MLP |
| Pointwise average of word embedding  (ave) | cur\_sent\_embd\_type: ave  cur\_exp\_param: cpu  ncdg:  0.23277467411545624  0.3817504655493482  0.4639945675046585  0.5133427984171356  0.5470269984899153  precision:  0.23277467411545624  0.1908752327746741  0.1707014276846679  0.1527001862197393  0.1378026070763501  recall:  0.23277467411545624  0.3817504655493482  0.5121042830540037  0.6108007448789572  0.6890130353817505  cur\_exp\_param: gpu  ncdg:  0.6182495344506518  0.7690875232774674  0.8243085631617483  0.8568970175379121  0.873739117574302  precision:  0.6182495344506518  0.3845437616387337  0.2855369335816263  0.23044692737430167  0.19217877094972066  recall:  0.6182495344506518  0.7690875232774674  0.8566108007448789  0.9217877094972067  0.9608938547486033  cur\_exp\_param: ram  ncdg:  0.547486033519553  0.8081936685288641  0.8739889500931135  0.8935420227188119  0.9039680846461008  precision:  0.547486033519553  0.40409683426443205  0.30415890751086283  0.2378957169459963  0.1951582867783985  recall:  0.547486033519553  0.8081936685288641  0.9124767225325885  0.9515828677839852  0.9757914338919925  cur\_exp\_param: hd  ncdg:  0.3165735567970205  0.5567970204841713  0.66958893173717  0.7319725444001125  0.7608447158910667  precision:  0.3165735567970205  0.2783985102420857  0.2451893234016139  0.21508379888268156  0.18547486033519553  recall:  0.3165735567970205  0.5567970204841713  0.7355679702048417  0.8603351955307262  0.9273743016759777  cur\_exp\_param: screen  ncdg:  0.6871508379888268  0.8603351955307262  0.9014572465083823  0.919148121741157  0.9303761884320837  precision:  0.6871508379888268  0.4301675977653631  0.308504034761018  0.24022346368715083  0.1973929236499069  recall:  0.6871508379888268  0.8603351955307262  0.925512104283054  0.9608938547486033  0.9869646182495344 |
| Pointwise maximum of word embedding  (max) | cur\_sent\_embd\_type: max  cur\_exp\_param: gpu  ncdg:  0.6312849162011173  0.6927374301675978  0.7655822061851596  0.8223792266693308  0.8456373648148217  precision:  0.6312849162011173  0.3463687150837989  0.26939788950962135  0.23044692737430167  0.1951582867783985  recall:  0.6312849162011173  0.6927374301675978  0.8081936685288641  0.9217877094972067  0.9757914338919925  cur\_exp\_param: ram  ncdg:  0.29981378026070765  0.813780260707635  0.858427058911947  0.8807734276270309  0.9000215419543335  precision:  0.29981378026070765  0.4068901303538175  0.2948479205462446  0.23230912476722532  0.19478584729981377  recall:  0.29981378026070765  0.813780260707635  0.8845437616387337  0.9292364990689013  0.9739292364990689  cur\_exp\_param: hd  ncdg:  0.2737430167597765  0.4729981378026071  0.677433476948667  0.7211951156823733  0.7388392204824008  precision:  0.2737430167597765  0.23649906890130354  0.26567349472377405  0.22113594040968343  0.1851024208566108  recall:  0.2737430167597765  0.4729981378026071  0.7970204841713222  0.8845437616387337  0.925512104283054  cur\_exp\_param: screen  ncdg:  0.6145251396648045  0.8584729981378026  0.8831462287243962  0.9129413870111748  0.9241694537021012  precision:  0.6145251396648045  0.4292364990689013  0.29919304779639977  0.239292364990689  0.19664804469273742  recall:  0.6145251396648045  0.8584729981378026  0.8975791433891993  0.957169459962756  0.9832402234636871  cur\_exp\_param: cpu  ncdg:  0.1340782122905028  0.27932960893854747  0.35099946921388947  0.42269406884144994  0.5020925404415731  precision:  0.1340782122905028  0.13966480446927373  0.13097454996896338  0.1340782122905028  0.1441340782122905  recall:  0.1340782122905028  0.27932960893854747  0.3929236499068901  0.5363128491620112  0.7206703910614525 |
| The concatenation of the pointwise average and maximum of word embedding  (concat) | cur\_sent\_embd\_type: concat  cur\_exp\_param: gpu  ncdg:  0.5921787709497207  0.7821229050279329  0.8302944504589015  0.8712627931032219  0.8848968740850612  precision:  0.5921787709497207  0.39106145251396646  0.2861576660459342  0.2351024208566108  0.19441340782122904  recall:  0.5921787709497207  0.7821229050279329  0.8584729981378026  0.9404096834264432  0.9720670391061452  cur\_exp\_param: ram  ncdg:  0.6145251396648045  0.8156424581005587  0.8814377396648081  0.9000597135940446  0.9088817659940583  precision:  0.6145251396648045  0.40782122905027934  0.30664183736809436  0.239292364990689  0.19553072625698323  recall:  0.6145251396648045  0.8156424581005587  0.9199255121042831  0.957169459962756  0.9776536312849162  cur\_exp\_param: hd  ncdg:  0.4264432029795158  0.6778398510242085  0.7565592057528637  0.7900787588254895  0.814138901734618  precision:  0.4264432029795158  0.33891992551210426  0.2675356921166977  0.21741154562383613  0.1851024208566108  recall:  0.4264432029795158  0.6778398510242085  0.8026070763500931  0.8696461824953445  0.925512104283054  cur\_exp\_param: screen  ncdg:  0.7318435754189944  0.8752327746741154  0.9257541515895213  0.9359962372506015  0.9424122753597025  precision:  0.7318435754189944  0.4376163873370577  0.31843575418994413  0.24394785847299813  0.19813780260707636  recall:  0.7318435754189944  0.8752327746741154  0.9553072625698324  0.9757914338919925  0.9906890130353817  cur\_exp\_param: cpu  ncdg:  0.2085661080074488  0.4227188081936685  0.5167120675711664  0.5707157919659528  0.6100140253841957  precision:  0.2085661080074488  0.21135940409683426  0.19056486654252017  0.16992551210428306  0.15418994413407822  recall:  0.2085661080074488  0.4227188081936685  0.5716945996275605  0.6797020484171322  0.770949720670391 |