



**EVALITA 2011**

*Evaluation of NLP and Speech Tools for Italian*

# Domain Adaptation through Active Learning

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# Approach

- Domain adaptation
  - Self Training
  - Active Learning
- Previous results in learning how to parse questions with AL [LREC 2010]



# Active learning

- Goal: select minimum number of examples to annotate in order to achieve most learning improvement
- Selection criteria: evaluation of perplexity produced by the parser itself
  - Overall log likelihood of a parse tree
  - Select sentences with lowest likelihood
- Other criteria:
  - 50–100 sentences per iteration
  - sentence length  $< 40$



# DeSR: Dependency Shift Reduce

- Multilanguage statistical transition based dependency parser
- Linear algorithm, using beam search
- Handles non-projectivity
- Available classifiers: MLP, MaxEnt, SVM
- Customizable feature model
- Available from:  
<http://desr.sourceforge.net/>



# Feature Model

Field	Tokens
LEMMA	-2 -1 0 1 2 3 prev(0) leftChild(-1) leftChild(0) rightChild(-1) rightChild(0)
POSTAG	-2 -1 0 1 2 3 next(-1) leftChild(-1) leftChild(0) rightChild(-1) rightChild(0)
CPOSTAG	-1 0 1
FEATS	-1 0 1
DEPREL	leftChild(-1) leftChild(0) rightChild(-1)



# Parser Combination

Type	Classifier	Features	Stacked Parser Features
Forward Revision	MLP	EXTRA -1 0 SEM -1 0 1 LexCutoff 0	EXTRA -1 0 SEM -1 0 1 PLOC -1 0 1 LexCutoff 0
Reverse Revision	MLP	EXTRA -1 0 SEM -2 -1 0 1 2 3 LexCutoff 2	EXTRA -1 0 SEM -1 0 1 PLOC -1 0 1 LexCutoff 0
Reverse Revision	SVM	EXTRA -1 0 SEM -2 -1 0 1 2 3 LexCutoff 2	EXTRA -1 0 SEM -1 0 1 PLOC -1 0 1 LexCutoff 0
Forward Revision	SVM	EXTRA -1 0 1 SEM -2 -1 0 1 2 3 LexCutoff 2	EXTRA -1 0 1 SEM -2 -1 0 1 2 PLOC 0 1 PHDEP -1 0 1 PHHLEMMA 0 1 LexCutoff 2

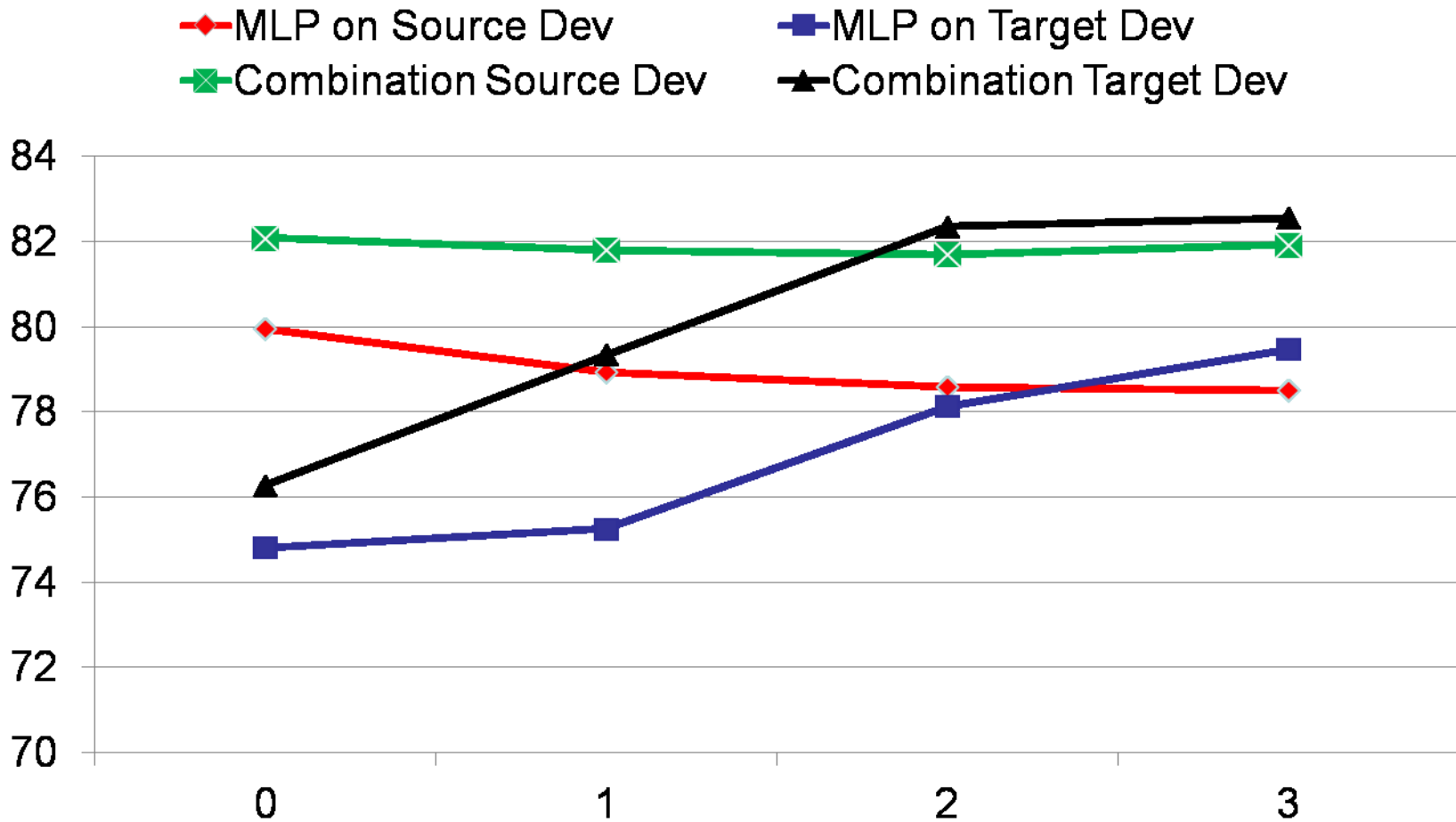


# Three steps of AL

Step	Training Corpus	<i>LAS of the MLP Parser</i>		<i>LAS of parser Combination</i>	
		<i>Source Dev</i>	<i>Target Dev</i>	<i>Source Dev</i>	<i>Target Dev</i>
0	Source domain training set	79.96	74.82	82.09	76.28
1	+ 50 revised sentences	78.94	75.26	81.80	79.34
2	+ 89 revised sentences	78.59	78.14	81.70	82.36
3	+ 50 revised sentences	78.51	79.48	81.92	82.55



# Three steps of AL: graph







# Results

<i>Task</i>	<i>Adaptation</i>	<i>LAS on Source Domain Dev Set</i>	<i>LAS on Target Domain Test Set</i>
Open task	Before	82.09	80.29
	After	82.34	<b>81.39</b>
Closed task	Before	82.09	75.85
	After	81.92	<b>80.83</b>



# Conclusions

- Alternative approach of self training did not provide significant improvements
- AL proved effective on both Closed and Open tasks