Relation-Constrained Decoding for Text Generation

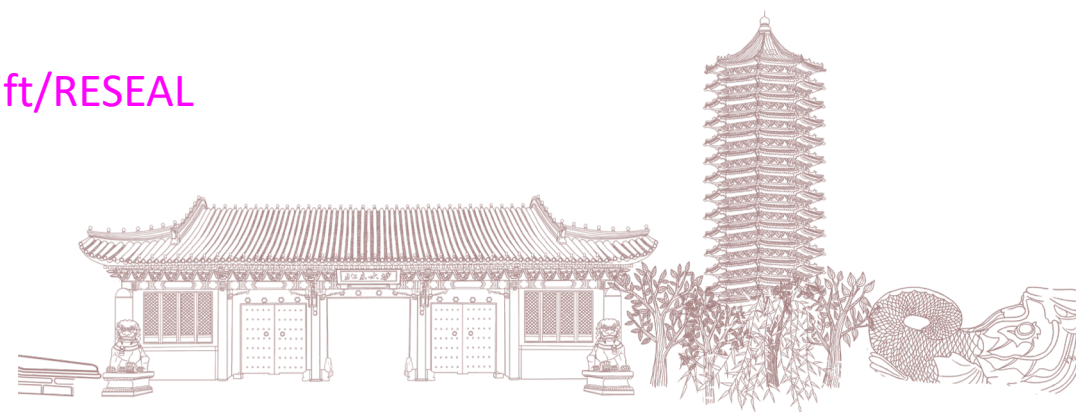**Xiang Chen,** [*] **Zhixian Yang,** [*] **Xiaojun Wan**
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https://github.com/CasparSwift/RESEAL

Problem Description

➤ Incorporating some constraints into neural text generation

➤ Lexically Constrained Decoding (LCD, Previous):
  ➤ preserve lexical constraints (keywords) in the output
  ➤ no guarantee of word relations (syntactical, semantic)

➤ **Relation-Constrained Decoding (RCD, Our paper):**
  ➤ a new constrained decoding scenario
  ➤ preserve relation constraints in the output
  ➤ relation constraints: token pairs and their corresponding relations, i.e. (head, relation, tail)
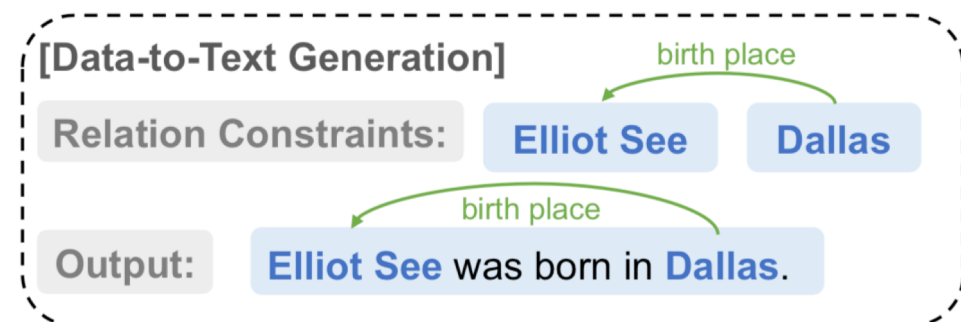
Methodology

➢ **RESEAL** (**RE**lation-guided probability **S**urgery and b**E**am **AL**location):
   ➢ a relation-guided decoding algorithm for RCD (two-step)
   ➢ operate the token probability according to a relation identifier
   ➢ modify the DBA algorithm to satisfy the lexical constraints
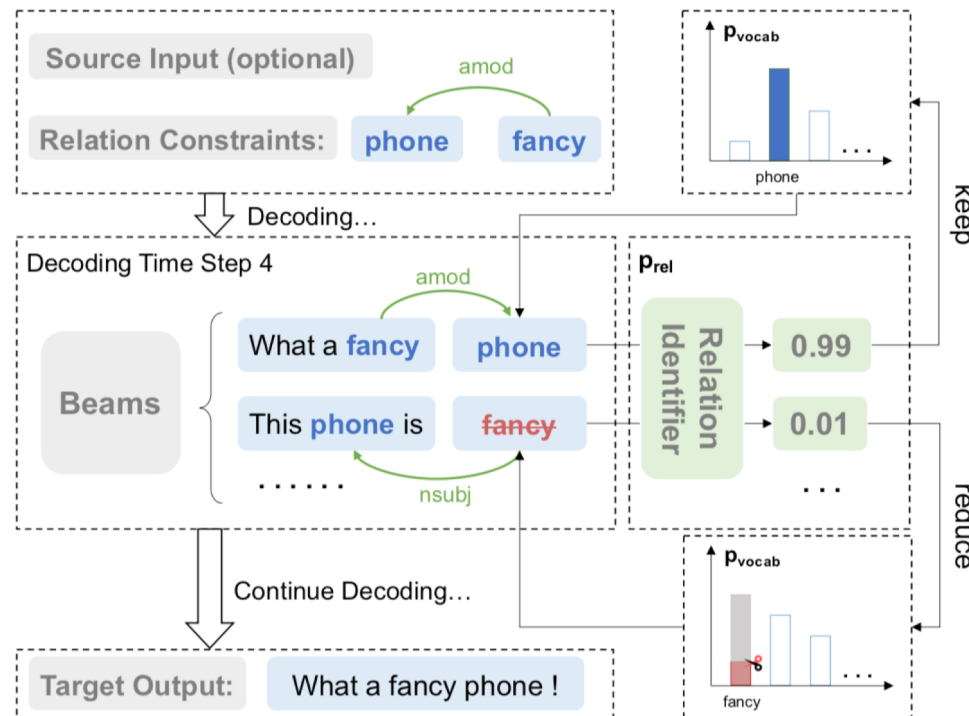
Experiments

➢ Dependency Placement
  ➢ better preservation of the input
    dependency relations constraints

➢ Downstream tasks:
  ➢ sentence summarization
  ➢ fact-based text editing
  ➢ data-to-text generation

Results

Dependency Placement

Method	Stanza UC↑	Stanza LC↑	spaCy UC↑	spaCy LC↑	BLEU-4↑	METEOR↑	PPL↓	Word%↑
Base [21]	80.52	69.69	81.04	71.02	11.92	20.12	865.40	97.11
Rerank ($k = 20$)	84.32	74.86	84.04	74.93	11.66	20.18	346.44	**99.88**
CGMH [26]	39.46	25.70	37.50	24.69	1.47	14.50	2341.83	96.20
X-MCMC [13]	51.78	37.36	52.30	37.99	4.62	17.04	513.18	99.86
X-MCMC-C [13]	58.17	44.90	58.90	46.23	6.39	17.65	557.58	**99.88**
DBA [31]	79.54	67.39	79.78	68.47	11.47	20.12	318.67	99.82
DDBA [25]	79.22	68.72	79.96	70.11	12.22	20.12	796.76	97.01
NeuroLogic [24]	82.47	71.72	83.03	72.87	12.23	20.13	436.27	98.93
RESEAL	**86.45**	**79.26**	**86.73**	**80.66**	**12.62**	**20.40**	**260.80**	99.60
Reference	86.80	81.49	90.50	86.49	100.00	100.00	527.35	100.00

Sentence Summarization

Methods	Gigaword RG-1	Gigaword RG-2	Gigaword RG-L	DUC2004 RG-1	DUC2004 RG-2	DUC2004 RG-L	MSR-ATC RG-1	MSR-ATC RG-2	MSR-ATC RG-L
SEASS [49]	46.86	24.58	43.53	29.21	9.56	25.51	25.75	10.63	22.90
Keyword [22]	47.14	25.06	44.39	-	-	-	-	-	-
SemSum [18]	-	-	-	31.00	11.11	26.94	33.82	17.08	30.62
BART [21]	50.14	27.37	46.69	31.38	11.43	27.51	40.39	22.09	35.32
BART+RESEAL	**50.73**	**27.84**	**47.18**	**32.67**	**11.63**	**28.38**	**43.77**	**25.28**	**37.78**
BART+RESEAL (gold)	53.74	31.00	48.99	35.53	12.41	28.68	69.42	41.76	51.71

Fact-Based Text Editing

Methods	BLEU-4	SARI	KEEP	ADD	DELETE
EncDecEditor [17]	71.03	69.59	89.49	43.82	75.48
FactEditor [17]	75.68	72.20	91.84	47.69	**77.07**
Seq2Seq	82.96	73.74	93.62	64.56	63.05
Seq2Seq+RESEAL	**84.12**	**78.33**	**96.07**	**69.63**	69.29

Data-to-Text Generation

Methods	BLEU-4
Castro Ferreira et al. [4]	51.68
Moryossef et al. [27]	47.24
Zhao et al. [48]	52.78
Harkous et al. [12]	52.90
Nan et al. [28]	45.89

	BLEU-4
T5-small [34]	56.34
T5-small + RESEAL	**56.87**
T5-base [34]	59.17
T5-base + RESEAL	**59.59**

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Thanks