



Multi-channel Reverse Dictionary Model

多通道反向词典模型

THUNLP

岂凡超

qfc17@mails.tsinghua.edu.cn

2019/12/22

研究背景—反向词典

定义: A wide road that allows traffic to travel fast.

(普通) 词典

expressway

研究背景—反向词典

定义: A wide road that allows traffic to travel fast.

(普通) 词典

expressway

freeway

motorway

.....

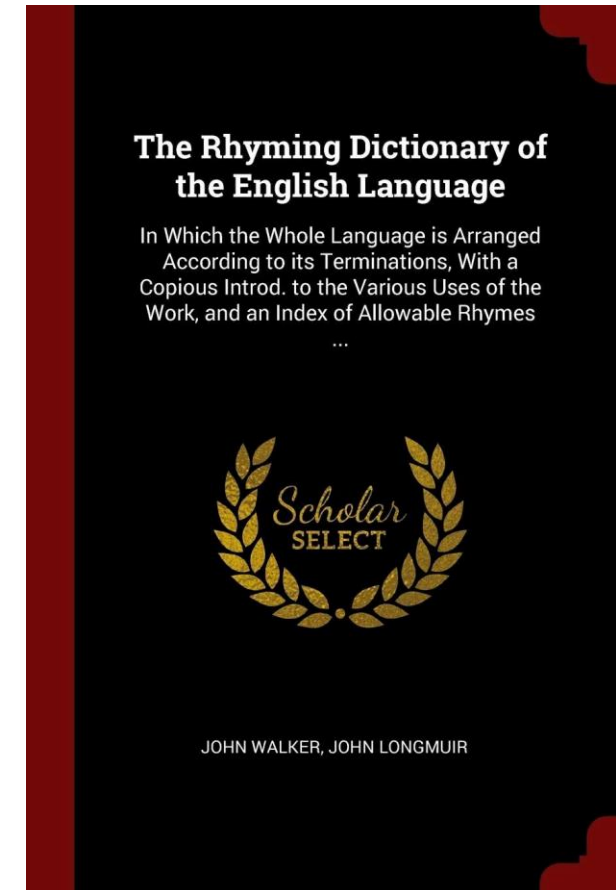
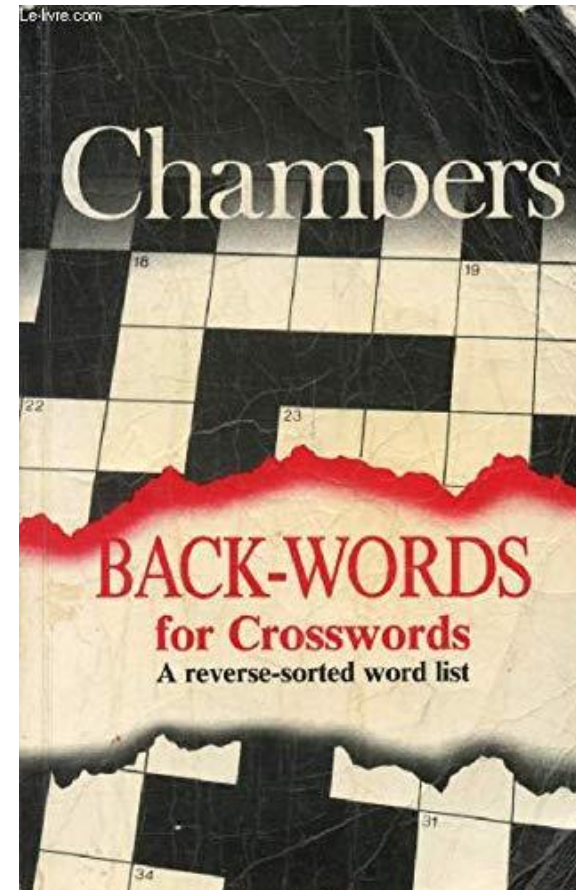
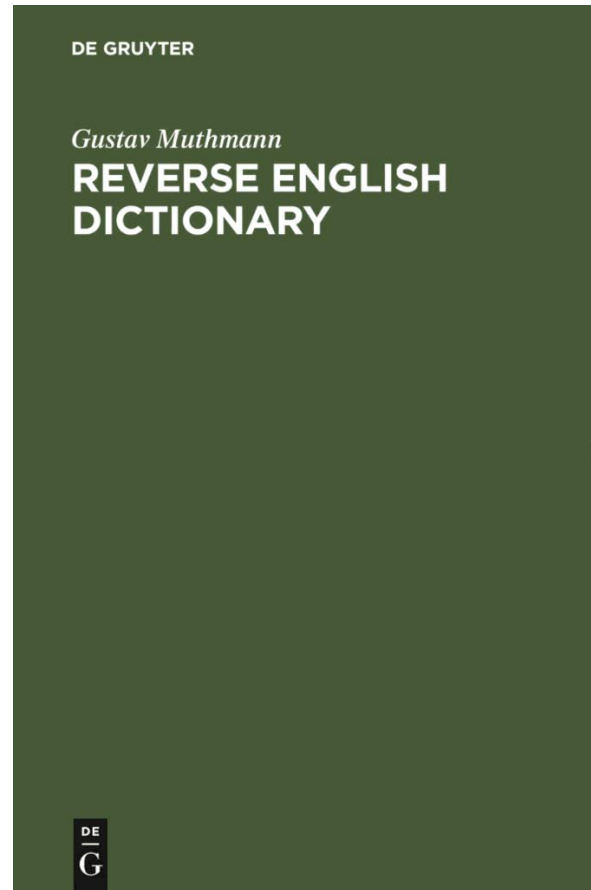
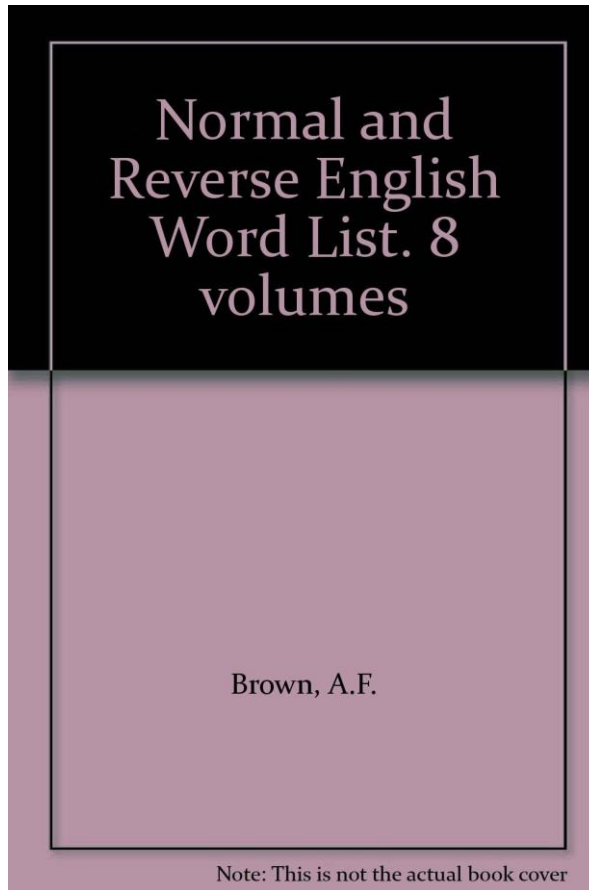
反向词典

描述: road where cars go very quickly without stopping

研究背景—反向词典

- 反向词典具有重要实用价值
 - 解决舌尖现象 (Tip of the tongue, 话到嘴边说不出来)
 - 为新语言学习者提供帮助
 - 帮助选词性命名不能 (word selection anomia) 患者
- 反向词典同样具有自然语言处理研究价值
 - 用于评测句子表示学习质量 [Hill et al. 2016]
 - 有助于包含文本到实体映射的任务, 如问答、信息检索 [Kartsaklis et al. 2018]

研究背景—现有反向词典



研究背景—现有反向词典

road where cars go very quickly without stopping

OneLook
Thesaurus

Hit Enter or select a word to submit your query.

Show filters Alphabetize

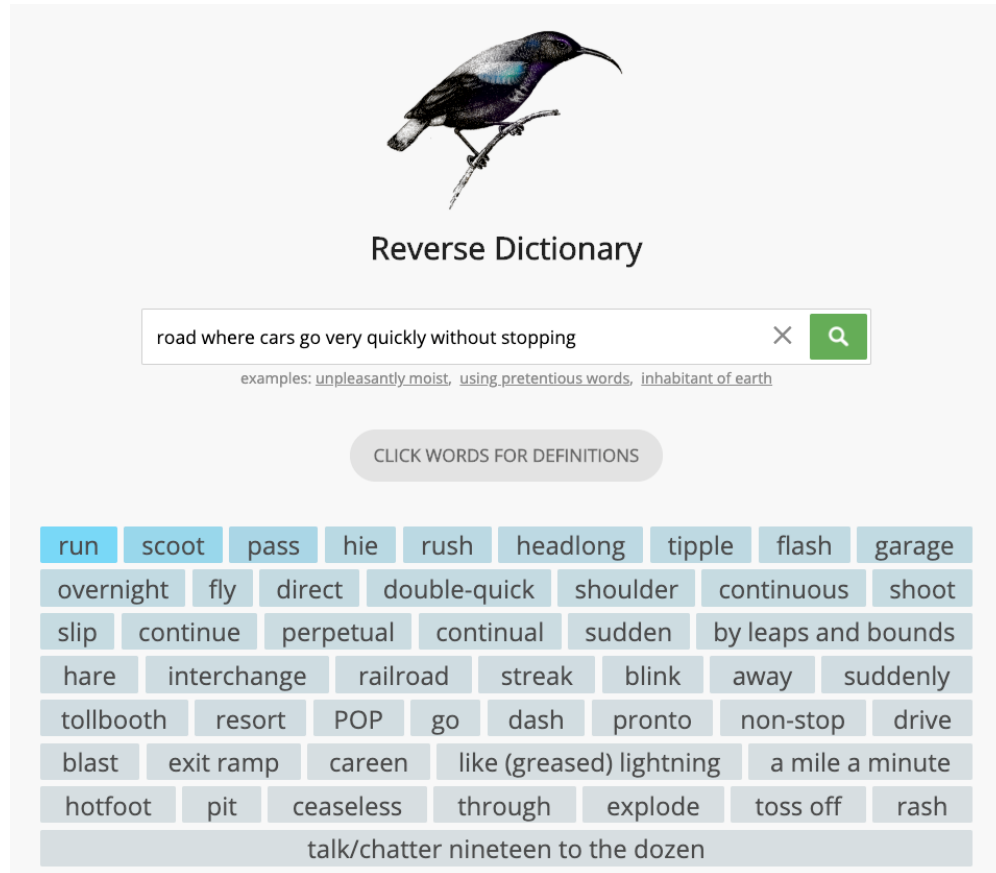
All Nouns Adjectives Verbs Adverbs

1. station	21. part	41. runs	61. hydroplane	81. patt
2. stationing	22. through	42. lay-by	62. freeway	82. sight
3. stations	23. round	43. jump	63. slide	83. drive
4. pass	24. skid	44. darts	64. hotel	84. sights
5. passed	25. bridge	45. whip	65. pit	85. triathlon
6. stump	26. bridged	46. pull-off	66. bomb	86. chamber
7. stumped	27. bridging	47. rest area	67. speed	87. dozen
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18. stop	38. fast	58. shorts	78. gate	98. back
19. stops	39. rope	59. depart	79. interchange	99. plunge
20. frog	40. roping	60. wau	80. chicane	100. buck

Next results >>

<https://www.onelook.com/thesaurus/>

研究背景—现有反向词典



The image shows the homepage of the Reverse Dictionary website. At the top, there is a bird illustration and the title "Reverse Dictionary". Below it is a search bar containing the text "road where cars go very quickly without stopping". Under the search bar, there are examples: "examples: unpleasantly moist, using pretentious words, inhabitant of earth". A button labeled "CLICK WORDS FOR DEFINITIONS" is positioned below the examples. At the bottom, there is a grid of words: run, scoot, pass, hie, rush, headlong, tippie, flash, garage, overnight, fly, direct, double-quick, shoulder, continuous, shoot, slip, continue, perpetual, continual, sudden, by leaps and bounds, hare, interchange, railroad, streak, blink, away, suddenly, tollbooth, resort, POP, go, dash, pronto, non-stop, drive, blast, exit ramp, careen, like (greased) lightning, a mile a minute, hotfoot, pit, ceaseless, through, explode, toss off, rash, and talk/chatter nineteen to the dozen.

Reverse Dictionary

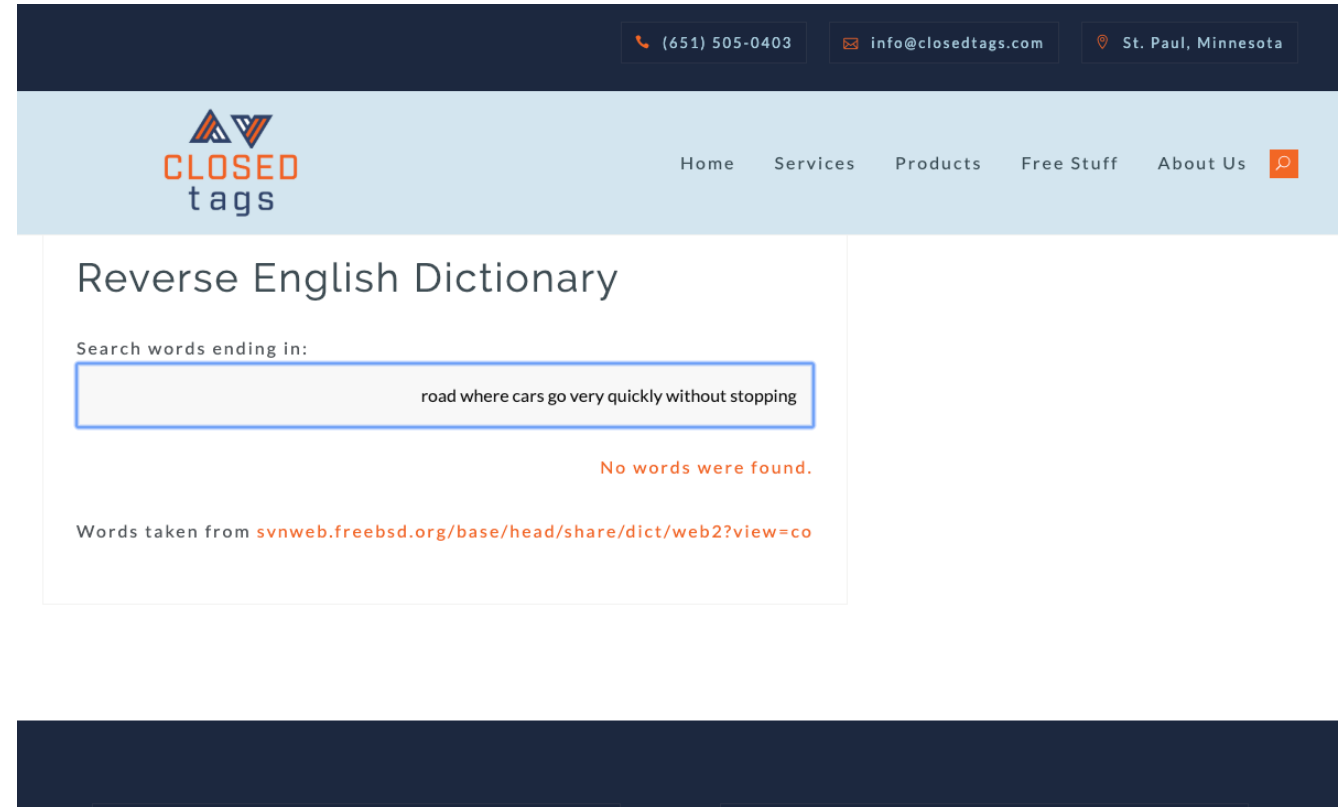
road where cars go very quickly without stopping

examples: unpleasantly moist, using pretentious words, inhabitant of earth

CLICK WORDS FOR DEFINITIONS

run scoot pass hie rush headlong tippie flash garage
overnight fly direct double-quick shoulder continuous shoot
slip continue perpetual continual sudden by leaps and bounds
hare interchange railroad streak blink away suddenly
tollbooth resort POP go dash pronto non-stop drive
blast exit ramp careen like (greased) lightning a mile a minute
hotfoot pit ceaseless through explode toss off rash
talk/chatter nineteen to the dozen

<https://reversedictionary.org/>



The image shows the homepage of the Closed Tags Reverse English Dictionary website. At the top, there is a dark blue header with contact information: "(651) 505-0403", "info@closedtags.com", and "St. Paul, Minnesota". Below the header is a light blue banner with the "CLOSED tags" logo and navigation links: "Home", "Services", "Products", "Free Stuff", and "About Us". The main content area is titled "Reverse English Dictionary" and features a search bar labeled "Search words ending in:". The search bar contains the text "road where cars go very quickly without stopping". Below the search bar, there is a message: "No words were found." At the bottom, there is a note: "Words taken from svnweb.freebsd.org/base/head/share/dict/web2?view=co".

(651) 505-0403 info@closedtags.com St. Paul, Minnesota

CLOSED tags

Home Services Products Free Stuff About Us

Reverse English Dictionary

Search words ending in:

road where cars go very quickly without stopping

No words were found.

Words taken from svnweb.freebsd.org/base/head/share/dict/web2?view=co

<https://closedtags.com/reverse-english-dictionary/>

研究背景—现有反向词典研究

- 基于句子匹配的方法 [Bilac et al. 2004, Zock and Bilac 2004, Méndez et al. 2013, Shaw et al. 2013]
 - 在数据库中存储足够多的词语及其定义
 - 返回与输入描述最相似的词典定义所对应的词语
 - 使用特征工程衡量相似度

反向词典查询输入非常多变，可能与已存储的词典定义有巨大差别！

Bilac, S.; Watanabe, W.; Hashimoto, T.; Tokunaga, T.; and Tanaka, H. 2004. Dictionary search based on the target word description. In Proceedings of NLP.

Zock, M., and Bilac, S. 2004. Word lookup on the basis of associations: from an idea to a roadmap. In Proceedings of the Workshop on Enhancing and Using Electronic Dictionaries.

Méndez, O.; Calvo, H.; and Moreno-Armendáriz, M. A. 2013. A reverse dictionary based on semantic analysis using wordnet. In Proceedings of MICAI.

Shaw, R.; Datta, A.; VanderMeer, D. E.; and Dutta, K. 2013. Building a scalable database-driven reverse dictionary. IEEE Transactions on Knowledge and Data Engineering 25:528540.

研究背景—现有反向词典研究

- 基于神经语言模型的方法[Hill et al. 2016, Morinaga and Yamaguchi 2018, Kartsaklis et al. 2018, Hedderich et al. 2019, Pilehvar 2019]
 - 使用神经语言模型将输入描述编码到词向量空间
 - 返回与输入描述的句子表示最近的词向量对应的词语

存在大量低频词，其词向量效果较差！

Hill, F.; Cho, K.; Korhonen, A.; and Bengio, Y. 2016. Learning to understand phrases by embedding the dictionary. TACL 4:17 – 30.

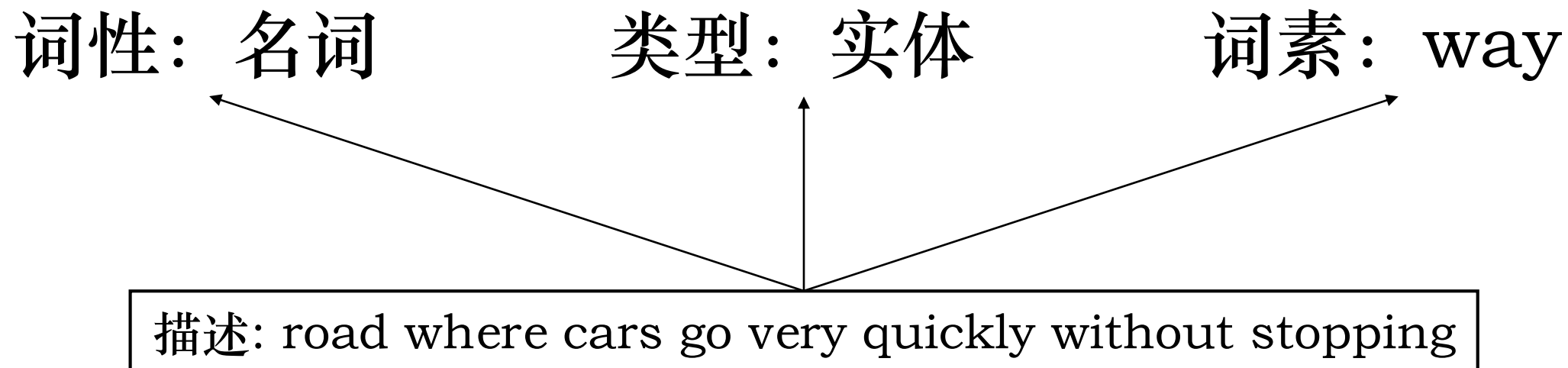
Morinaga, Y., and Yamaguchi, K. 2018. Improvement of reverse dictionary by tuning word vectors and category inference. In Proceedings of ICIST.

Kartsaklis, D.; Pilehvar, M. T.; and Collier, N. 2018. Mapping text to knowledge graph entities using multi-sense LSTMs. In Proceedings of EMNLP.

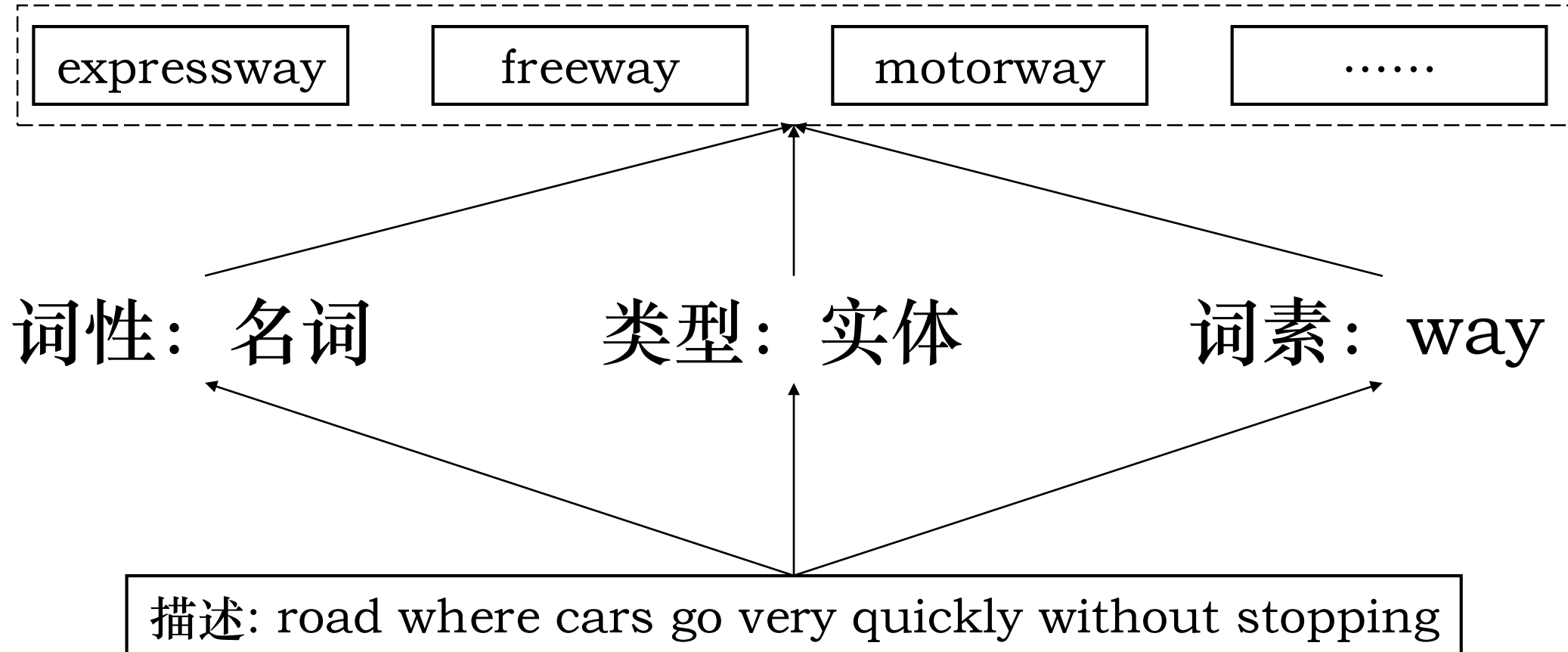
Hedderich, M. A.; Yates, A.; Klakow, D.; and de Melo, G. 2019. Using multi-sense vector embeddings for reverse dictionaries. In Proceedings of IWCS.

Pilehvar, M. T. 2019. On the importance of distinguishing word meaning representations: A case study on reverse dictionary mapping. In Proceedings of NAACL.

研究动机—人的推断过程



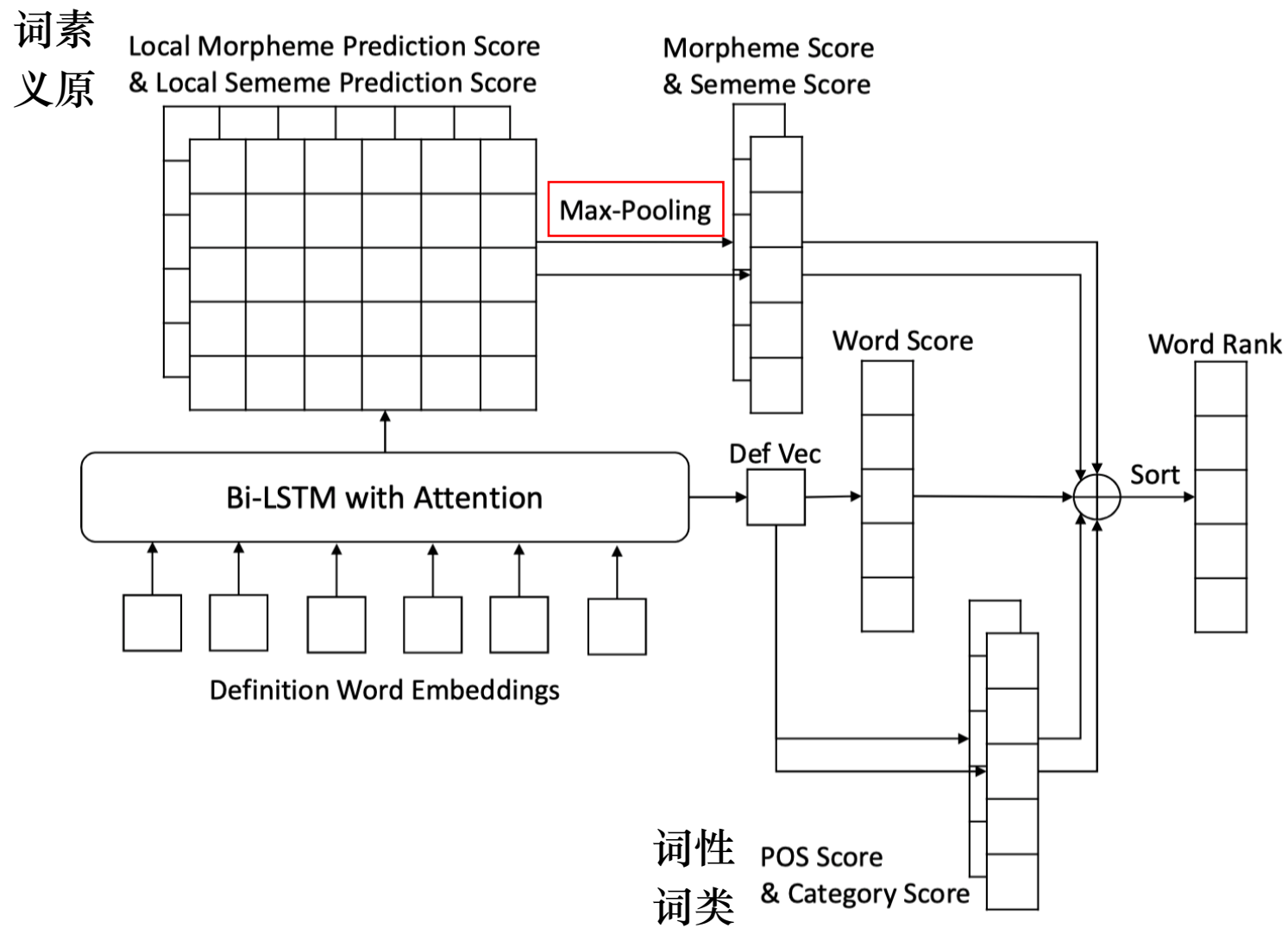
研究动机—人的推断过程



模型

- 多通道反向词典模型——包含多个特征预测器
 - 内部通道——词本身的特征
 - 词性 (Part-of-speech)
 - 词素 (Morpheme)
 - 外部通道——外部知识库提供的特征
 - 词类 (Word Category) ——借助WordNet/ 同义词词林
 - 义原 (Sememe) ——借助HowNet

模型



模型

词素

expressway

描述: road where cars go very quickly without stopping

模型

词素

expressway

义原

AlterLocation | 变空间位置

fast | 快

route | 道路

描述: road where cars go very quickly without stopping

实验结果

• 英文数据集

Model	Seen Definition			Unseen Definition			Description		
OneLook	0	.66/.94/.95	200	-	-	-	5.5	.33/.54/.76	332
BOW	172	.03/.16/.43	414	248	.03/.13/.39	424	22	.13/.41/.69	308
RNN	134	.03/.16/.44	375	171	.03/.15/.42	404	17	.14/.40/.73	274
RDWECI	121	.06/.20/.44	420	170	.05/.19/.43	420	16	.14/.41/.74	306
SuperSense	378	.03/.15/.36	462	465	.02/.11/.31	454	115	.03/.15/.47	396
SOTA MS-LSTM	0	.92/.98/.99	65	276	.03/.14/.37	426	1000	.01/.04/.18	404
BiLSTM	25	.18/.39/.63	363	101	.07/.24/.49	401	5	.25/.60/.83	214
+Mor	24	.19/.41/.63	345	80	.08/.26/.52	399	4	.26/.62/.85	198
+Cat	19	.19/.42/.68	309	68	.08/.28/.54	362	4	.30/.62/.85	206
+Sem	19	.19/.43/.66	349	80	.08/.26/.53	393	4	.30/. 64 /.87	218
Multi-channel	16	.20/.44/.71	310	54	.09/.29/.58	358	2	.32/. 64 /.88	203
				<i>median rank</i>			<i>accuracy@1/10/100</i>		
							<i>rank variance</i>		

实验结果

• 中文数据集

Model	Seen Definition			Useen Definition			Description			Question		
BOW	59	.08/.28/.56	403	65	.08/.28/.53	411	40	.07/.30/.60	357	42	.10/.28/.63	362
RNN	69	.05/.23/.55	379	103	.05/.21/.49	405	79	.04/.26/.53	361	56	.07/.27/.60	346
RDWECI	56	.09/.31/.56	423	83	.08/.28/.52	436	32	.09/.32/.59	376	45	.12/.32/.61	384
BiLSTM	4	.28/.58/.78	302	14	.15/.45/.71	343	13	.14/.44/.78	233	4	.30/.61/.82	243
+POS	4	.28/.58/.78	309	14	.16/.45/.71	346	13	.14/.44/.79	255	5	.25/.59/.79	271
+Mor	1	.43/.73/.87	260	11	.19 /.47/.73	332	8	.22/.52/ .83	251	1	.42/.73/.86	227
+Cat	4	.29/.58/.78	319	16	.14/.43/.70	356	13	.16/.45/.77	289	3	.33/.62/.82	246
+Sem	4	.29/.60/.80	298	14	.16/.45/.72	340	12	.15/.45/.75	244	4	.34/.61/.83	231
Multi-channel	1	.49/.78/.90	220	10	.18/.49/.76	310	5	.24/.56/.82	260	0	.50/.73/.90	223
						<i>median rank</i>	<i>accuracy@1/10/100</i>			<i>rank variance</i>		

实验结果

- 给定先验知识
 - 英文

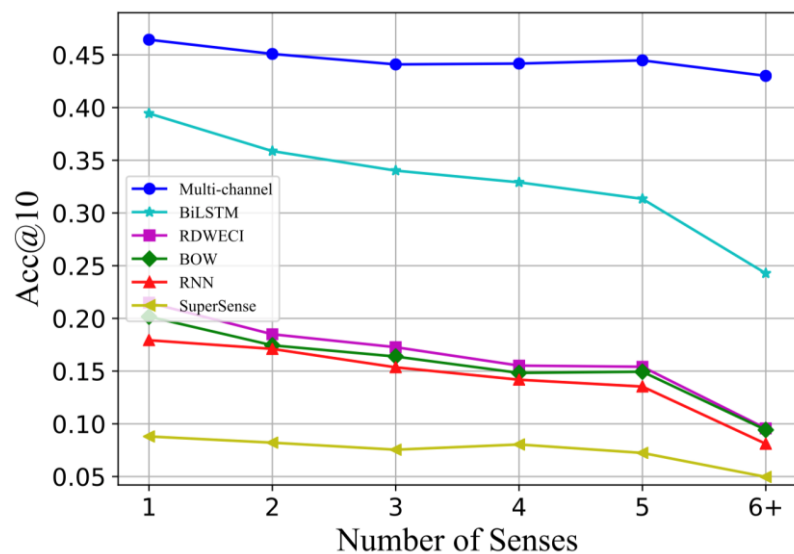
Prior Knowlege	Seen Definition			Unseen Definition			Description		
None	16	.20/.44/.71	310	54	.09/.29/.58	358	2.5	.32/.64/.88	203
POS Tag	13	.21/.45/.72	290	45	.10/.31/.60	348	3	.35/.65/.91	174
Initial Letter	1	.39/.73/.90	270	4	.26/.63/.85	348	0	.62/.90/.97	160
Word Length	1	.40/.71/.90	269	6	.25/.56/.84	346	0	.55/.85/.95	163
				<i>median rank</i>	<i>accuracy@1/10/100</i>		<i>rank variance</i>		

- 中文

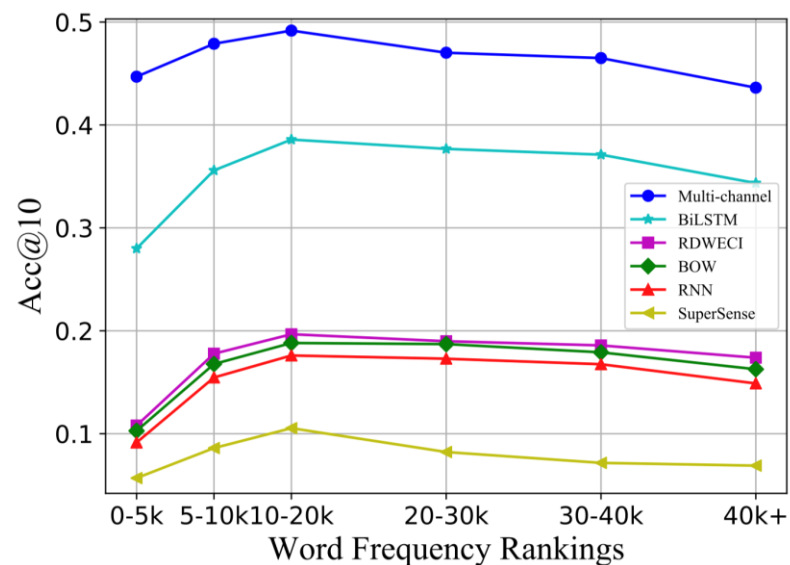
Prior Knowledge	Seen Definition			Useen Definition			Description		Question	
None	1	.49/.78/.90	220	10	.18/.49/.76	310	5	.24/.56/.82	260	0 .50/.73/.90 223
POS Tag	1	.50/.79/.90	222	9	.18/.51/.77	307	4	.24/.61/.85	252	0 .50/.74/.90 223
Initial Char	0	.74/.89/.92	220	0	.55/.82/.86	304	0	.61/.88/.93	239	0 .84/.95/.95 213
Word Length	0	.54/.82/.91	217	6	.23/.57/.81	297	3	.32/.68/.88	242	0 .62/.85/.94 212
				<i>median rank</i>	<i>accuracy@1/10/100</i>		<i>rank variance</i>			

实验结果

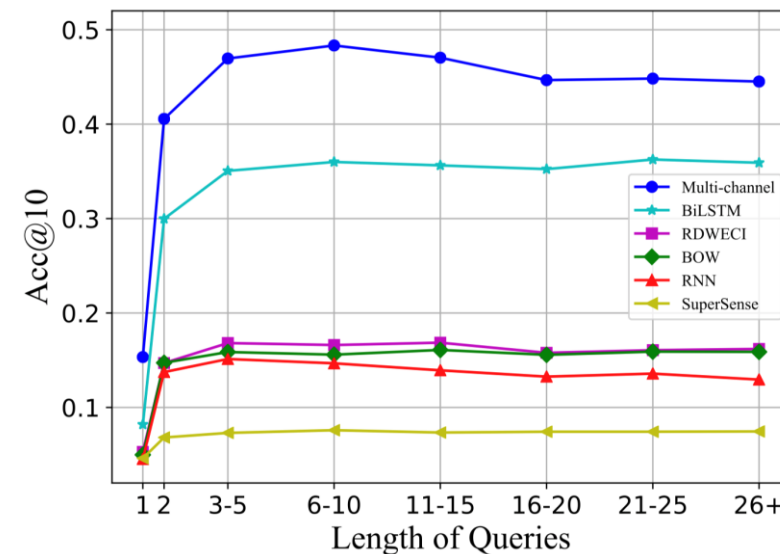
• 模型鲁棒性



义项数



词频



查询长度

结论

- 主要贡献

- 基于人的描述-词的推断过程，提出多通道反向词典模型，包含内部通道：词性、词素，和外部通道：词类、义原
- 在真实场景数据集实现了当前最佳性能（state-of-the-art）

- 未来工作

- 和基于文本匹配的方法相结合，更好的解决极端情况（如输入只有单个词）
- 迁移到其他任务



论文地址



项目地址

One More Thing

WANTWORDS
万词王

反向词典主页 关于我们 GitHub链接

汉语 English 汉-英 En-Ch

Reverse Dictionary

road where cars go very quickly without stopping

▼ Filter: POS: All word length initial word shape Rank by relevance Clear

0. autobahn	20. esses	40. bumpy	60. raceway	80. speed
1. chicane	21. roundabout	41. bogging	61. fastest	81. carriageway
2. dragstrip	22. turnpike	42. expressway	62. clearway	82. streetcar
3. motorway	23. tollbooth	43. corniche	63. jaywalk	83. getaway
4. freeway	24. traffic	44. racetrack	64. minicab	84. snowplow
5. superhighway	25. hairpin	45. limo	65. tootle	85. careening
6. lanes	26. speedway	46. plowing	66. darting	86. shuttling
7. twisty	27. quickest	47. stops	67. straightaway	87. campervan
8. rubberneck	28. runway	48. skidding	68. suv	88. roadside
9. autostrada	29. driving	49. motorcar	69. motorcade	89. bumper
10. car	30. autocross	50. cavalcade	70. tailpipe	90. moped
11. swerving	31. motoring	51. parkway	71. fast	91. backstretch
12. gridlock	32. mown	52. juke	72. cruising	92. straightway
13. contraflow	33. limos	53. boulevard	73. dicing	93. dodgem
14. speeder	34. kart	54. slick	74. minicar	94. supercar
15. highway	35. tarmac	55. turnoff	75. smoggy	95. maglev
16. chevy	36. drivable	56. dawdling	76. monorail	96. street
17. roads	37. overtaking	57. thruway	77. intersection	97. speedometer
18. stoplight	38. dragster	58. pileup	78. myki	98. motorbike
19. tollway	39. beltway	59. driverless	79. nascar	99. layby

点我反馈推荐词 点我反馈意见建议

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网站地址

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One More Thing

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road where cars go very quickly without stopping

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汉语 English 汉-英 En-Ch

English-Chinese Reverse Dictionary

road where cars go very quickly without stopping

Filter: length stroke shape initials POS: All Rhymes: All Rank by relevance Clear

0. 慢车	20. 急刹车	40. 飞车	60. 径道	80. 驶
1. 大路		41. 路霸	61. 隘路	81. 通衢
2. 国道		42. 滚滚	62. 飙	82. 卡丁车
3. 开快车		43. 吉普	63. 干道	83. 间道
4. 公路		44. 热线	64. 要道	84. 尿流屁滚
5. 快车道	<div>快车道 kuàichēdào {名} 机动车分道行驶时, 专供快速行驶用的车道, 一般在内侧。</div>	45. 环路	65. 特快	85. 路签
6. 奔驰		46. 车技	66. 行驶	86. 滚
7. 马路		47. 车行道	67. 路程	87. 狂奔
8. 快车		48. 抄道	68. 滔滔滚滚	88. 机车
9. 单行道		49. 驰	69. 公车	89. 十字路口
10. 车道		50. 狂飙	70. 急弯	90. 华里
11. 飙车		51. 盘道	71. 房车	91. 风驰电掣
12. 大道		52. 抄近路	72. 里程	92. 街
13. 疾驶		53. 巷子	73. 飞驰	93. 开车
14. 奔驰		54. 山路	74. 熟路	94. 路段
15. 计程车		55. 大街	75. 驱车	95. 直快
16. 车辙		56. 斑马线	76. 跑道	96. 爬
17. 单行线		57. 越野车	77. 路肩	97. 行路
18. 跑车		58. 通途	78. 普快	98. 程限
19. 道班		59. 长川	79. 沿路	99. 路道



网站地址

One More Thing

WANT WORDS

万词王

汉语

English

汉-英

En-Ch

反向词典主页

关于我们

GitHub链接

反向词典

车行驶很快不能停下的道路

▼ 筛选:

字数

笔画数

词形

拼音字母

全部词性

全部韵脚

按相关性排序

清空

0. 慢车

1. 车辙

2. 急刹车

3. 窄道

4. 车道

5. 高速公路

6. 辅路

7. 隘路

8. 快车道

9. 国道

10. 开快车

11. 急弯

12. 大路

13. 公路

14. 单行道

15. 慢车道

16. 路口

17. 弯路

18. 回头路

19. 十字路口

31. 道口

32. 车速

33. 衢

34. 道班

35. 近路

36. 封山

37. 刹住

38. 计程车

39. 安全岛

40. 歧路

41. 抄近路

42. 线路

43. 僻路

44. 干路

45. 截道

46. 堵车

47. 死巷

48. 奔波

49. 路障

50. 安全线

51. 煞车

52. 山路

53. 直快

54. 路上

55. 翻车

56. 抄道

57. 马路

58. 沿线

59. 隧道

60. 通途

61. 近道

62. 间道

63. 老路

64. 下坡路

65. 干道

66. 急不择路

67. 熟路

68. 冰封

69. 慢道

70. 煞住

71. 稀里糊涂

72. 甩车

73. 特快

74. 路途

75. 路肩

76. 岔道

77. 失速

78. 刹车

79. 半路

80. 飞车

81. 程限

82. 塞车

83. 翻浆

84. 乌涂

85. 巷子

86. 列车

87. 油门

88. 飙车

89. 上坡路

90. 路卡

91. 三岔路口

92. 死路

93. 陡坡

94. 岔口

95. 驾车

96. 卡脖子

97. 路程

98. 空挡

99. 急速

👍

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高速公路

gāosùgōnglù

专供汽车高速行驶的公路。道路平直，全线封闭，中间设有隔离带，双向有四条或六条车道，与其他道路相交时采用立体交叉。

查看义原

百度汉语

上报错误



网站地址

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感谢聆听，欢迎指教！



论文地址



项目地址



网站地址