

Table 1: Attack performance of RL-MARA and baselines on Mixture target documents; * indicates significant improvements over the best baseline ($p \leq 0.05$).

Method	MS MARCO				ClueWeb09			
BERT	ASR	Boost	T10R	T5R	ASR	Boost	T10R	T5R
TS	94.7	53.0	53.9	16.4	94.9	51.0	51.7	13.9
PRADA	88.6	41.0	39.5	9.6	87.0	38.9	37.5	9.2
PLAT	82.5	37.6	35.6	8.4	81.6	35.2	34.9	7.2
PAT	91.1	48.1	48.5	13.7	88.9	44.4	44.9	11.0
IDEM	95.0	54.5	55.9	17.0	93.1	50.9	52.3	15.2
RL-MARA _{single}	94.8	52.0	53.6	15.6	93.0	50.5	51.1	14.9
RL-MARA _{triple}	96.4	57.6*	59.1*	18.5*	95.8*	56.3*	57.3*	16.9*
RL-MARA _{greedy}	97.1*	59.9*	60.0*	18.4*	96.6*	56.5*	57.3*	17.7*
RL-MARA	99.7*	65.3*	63.9*	20.0*	98.4*	63.0*	61.7*	18.8*
PROP	ASR	Boost	T10R	T5R	ASR	Boost	T10R	T5R
TS	94.5	52.0	52.8	15.1	95.6	49.8	50.7	13.3
PRADA	85.3	38.6	37.6	8.6	84.3	37.1	34.7	7.2
PLAT	80.7	34.9	33.6	7.1	79.1	33.5	33.5	5.8
PAT	89.8	46.6	46.6	12.4	86.5	42.1	43.4	11.1
IDEM	93.7	52.5	53.2	16.0	93.2	50.9	50.7	13.7
RL-MARA _{single}	92.8	50.7	51.1	15.2	91.9	48.8	49.8	14.2
RL-MARA _{triple}	95.2	55.6*	56.8*	16.8*	95.1	55.0*	55.0*	16.0*
RL-MARA _{greedy}	95.8	57.6*	59.2*	18.3*	96.1	54.0*	56.3*	16.5*
RL-MARA	98.6*	63.7*	62.0*	18.7*	97.6*	61.2*	59.5*	18.2*
RankLLM	ASR	Boost	T10R	T5R	ASR	Boost	T10R	T5R
TS	95.3	48.9	49.2	13.0	94.5	46.1	46.1	10.8
PRADA	80.9	35.6	34.0	6.7	80.4	34.7	32.9	6.5
PLAT	76.6	32.2	30.7	6.1	75.7	30.6	30.6	5.2
PAT	85.3	42.7	43.0	11.3	83.6	39.5	40.2	9.8
IDEM	91.9	49.5	50.3	13.5	90.2	47.1	48.8	12.6
RL-MARA _{single}	91.0	47.9	49.2	13.3	89.5	45.7	47.3	12.8
RL-MARA _{triple}	94.0	53.8*	54.5*	15.9*	94.0	52.1*	53.1*	14.4*
RL-MARA _{greedy}	95.0	55.5*	56.7*	16.8*	94.6	52.5*	54.5*	14.9*
RL-MARA	97.9*	61.9*	60.2*	18.2*	95.6*	59.2*	56.9*	16.2*

Method	Target query: treating tension headaches medication (ID 524332)	Perturbation: Word Phrase Sentence	Rank
Target document: D2020339 Title: Am I having headaches too often?			
Original	Am I having headaches too often? Neurologists in general consider headaches that are more often than 15 days per month to be a daily headache. Patients with daily headaches or near daily headaches need a significant evaluation to determine if there is a systemic cause for which the daily headache is only a symptom. Studies commonly performed may include imaging, blood work, and spinal taps (also known as a lumbar puncture or spinal fluid analysis). Once all...		97
PRADA	Am I having headaches too often? Neurologists in generally consider headaches that exist more often than 15 days per month to be a daily headache. Patients with daily headaches or near daily headaches need an significant evaluation to determine if there is a systemic rationale for which the daily migraine is only a sign . Studies commonly performed might include imaging, blood work, and spinal taps (also known as a lumber puncture or spinal fluid analysis). Once all...		22
PLAT	Am I experiencing migraines too often? Neurologists in general consider headaches that are more often than 15 days per month to be a chronic headache . Patients with chronic headaches or near chronic headaches require comprehensive examination to determine if there is a systemic cause for which the chronic headache represents merely an indicator . Studies frequently conducted may include imaging, blood work, and spinal taps (also known as a lumbar puncture or...		28
PAT	headaches frequenting often, am I troubled by this recurring drugs is scarce Am I having headaches too often? Neurologists in general consider headaches that are more often than 15 days per month to be a daily headache. Patients with daily headaches or near daily headaches need a significant evaluation to determine if there is a systemic cause for which the daily headache is only a symptom. Studies commonly performed may include imaging, blood work, and spinal...		4
IDEM	Am I having headaches too often? Neurologists in general consider headaches that are more often than 15 days per month to be a daily headache. Patients with daily headaches or near daily headaches need a significant evaluation to determine if there is a systemic cause for which the daily headache is only a symptom. In these cases, doctors often suggest a series of tests for identify treating headaches. Studies commonly performed may include imaging, blood work, and...		9
RL-MARA	Am I having headaches over frequent ? Neurologists in general consider headaches that are more often than 15 days per month to be a day headache... The following are other different conditions lead medical headaches or near daily headache: Brain tumors Meningitis (infection of the lining of the brain) Systemic infection Some vitamins and herbs Sleep apnea ... many of patients with daily headaches thus the problem for medication rebound...		2
Target document: D1875904 Title: Headache Locations Chart			
Original	Headache Locations – What does the location of a headache mean? by Melinda Wilson Apr 18, 2015 Headache Locations Headache is an illness caused by overactivity of, or problems with, structures in the head that are sensitive of pain. Did you know? That there is an organization which advocates the welfare of headache sufferers? National Headache Foundation has categorized headache as a neurobiological disease. With their 45 years of further research and...		98
PRADA	Headache Locations – What does the site of a headache mean? by Melinda Wilson Apr 18, 2015 Headache Locations Headache is an {ailment} caused by overactivity of, or issues with, structures in the head that are sensitive of pain. Did you know? That there is an institution which advocates the welfare of headache sufferers? National Headache Foundation has classified headache as a neurobiological illness. With their 45 year of further research and...		18
PLAT	Headache Locations – What does the location of the pain of the migraines mean? by Melinda Wilson Apr 18, 2015 Headache Locations Headache is an illness caused by overactivity of, or problems with, parts within the skull that are sensitive to pain. Did you know? That there is an organization which supports the rights of headache sufferers? National Headache Foundation which labels headache as a neurobiological disease. With their 45 years of further research and...		21
PAT	where do pains in head live, headache locations mean what nervous Headache Locations – What does the location of a headache mean? by Melinda Wilson Apr 18, 2015 Headache Locations Headache is an illness caused by overactivity of, or problems with, structures in the head that are sensitive of pain. Did you know? That there is an organization which advocates the welfare of headache sufferers? National Headache Foundation has categorized headache as a ...		26
IDEM	Headache Locations – What does the location of a headache mean? by Melinda Wilson Apr 18, 2015 Headache Locations Headache is an illness caused by overactivity of, or problems with, structures in the head that are sensitive to pain. This condition can be triggered by tension factors, including headaches with medications . Did you know? That there is an organization which advocates the welfare of headache sufferers? National Headache Foundation has categorized...		7
RL-MARA	Headache Locations – What does the location of a headache signify ? ... if you experience sudden, severe headaches ... if you experience a headache after a blow to you head ... if you have a headache with a stiff neck; ill ; confusion; loss of conscious ; or pain in the eyes or ears ... There are potentially fatal circumstances that have unusual symptoms, intracerebral bleeding and brain aneurysm might involve ... Migraine headache is commonly ...		9
Target document: D1307681 Title: Lyrica vs. Gabapentin			
Original	Lyrica vs. Gabapentin: Differences between Pain Relief and Uses Diabetic Peripheral Neuropathy Slideshow Diabetes and Foot Problems Slideshow Diabetic Neuropathy Quiz: Test Your Medical IQLyrica (pregablin) vs. gabapentin (Neurontin) quick comparison What is Lyrica? What is gabapentin? How do they work? What are the uses for Lyrica vs. gabapentin? What are the side effects of Lyrica vs. gabapentin? Is gabapentin addictive? Is it a narcotic? What is the dosage of...		100
PRADA	Lyrica vs. Gabapentin: Differences among Pain Relief and Uses Diabetic Peripheral Neuropathy Slideshow Diabetes and Foot Problems Slideshow Diabetic Neuropathy Quiz: Evaluate Your Medical IQLyrica (pregablin) vs. gabapentin (Neurontin) rapid comparison What is Lyrica? What is gabapentin? How do they function ? What are the uses for Lyrica vs. gabapentin? What are the side impacts of Lyrica vs. gabapentin? Is gabapentin {habit-forming}? Is they a narcotic? ...		32
PLAT	Lyrica vs. Gabapentin: Differences between the analgesic effects and Uses Diabetic Peripheral Neuropathy Slideshow Diabetes and some podiatric complications Slideshow Diabetic Neuropathy Quiz: Test Your Medical IQLyrica (pregablin) vs. gabapentin (Neurontin) quick comparison What is Lyrica? What is gabapentin? How do these medications function ? What are the uses for Lyrica vs. gabapentin? What are the adverse reactions of Lyrica vs. gabapentin? ...		12
PAT	pain relief and uses, medication and used for treating pain caused by diseases Lyrica vs. Gabapentin: Differences between Pain Relief and Uses Diabetic Peripheral Neuropathy Slideshow Diabetes and Foot Problems Slideshow Diabetic Neuropathy Quiz: Test Your Medical IQ. Lyrica (pregablin) vs. gabapentin (Neurontin) quick comparison What is Lyrica? What is gabapentin? How do they work? What are the uses for Lyrica vs. gabapentin? What are the side effects...		17
IDEM	...Diabetes and Foot Problems Slideshow Diabetic Neuropathy Quiz: Test Your Medical IQLyrica (pregablin) vs. gabapentin (Neurontin) quick comparison What is Lyrica? What is gabapentin? How do they work? What are the uses for Lyrica vs. gabapentin? What are the side effects of Lyrica vs. gabapentin? When comparing both medications, it's important to consider their treating effects and safety profile. Is gabapentin addictive? Is it a narcotic? What is the dosage of...		11
RL-MARA	Lyrica vs. Gabapentin: Distinguishing of Pain Relief and Uses Diabetic Peripheral Neuropathy Slideshow Diabetes and Foot Complications Slideshow Diabetic Neuropathy... brief overview Lyrica (pregablin) and gabapentin (Neurontin) are anti-epileptic medications ... Gabapentin is an anti-seizure ... Lyrica uses Lyrica is used for: ... Injuries spinal cord ... Treating fibromyalgia Gabapentin uses ... managing seizures ... herpes zoster ...		6

Figure 1: Adversarial examples generated by RL-MARA and other baselines for attacking RankLLM on MS MARCO based on a sampled query with different target documents. Due to space limitations, we only show some key sentences in the document.