On Solving a Generalized Constrained Longest Common Subsequence Problem – Supplementary Material –

Marko Djukanovic[1], Christoph Berger, Günther R. Raidl[1], and Christian Blum[2]

[1]Institute of Logic and Computation, TU Wien, Vienna, Austria

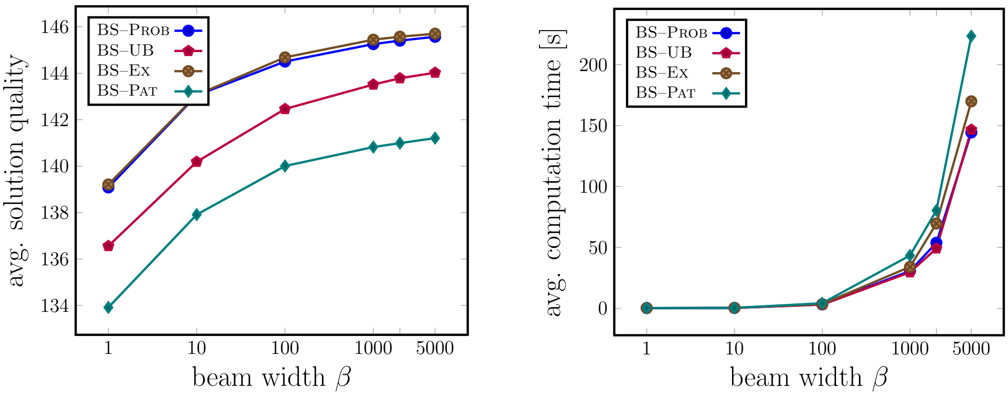
[2]Artificial Intelligence Research Institute (IIIA-CSIC), Campus UAB, Bellaterra, Spain

{djukanovic|raidl}@ac.tuwien.ac.at, christian.blum@iiia.csic.es

This document provides the following supplementary information where

- a study in which we tuned the parameters β and k_{best} that highly influence the solution quality of the general Beam Search (BS) framework. The plots are given, presenting the performance of the four different BS configurations (BS–Prob, BS-UB, BS–Ex, and BS–Pat) executed with several different settings for β and k_{best}. Based on these observations, we made our decision which of these settings to select for the final experimental evaluation.
- we report the remaining numerical results that could not be included into the original paper due to the page restriction of the paper.

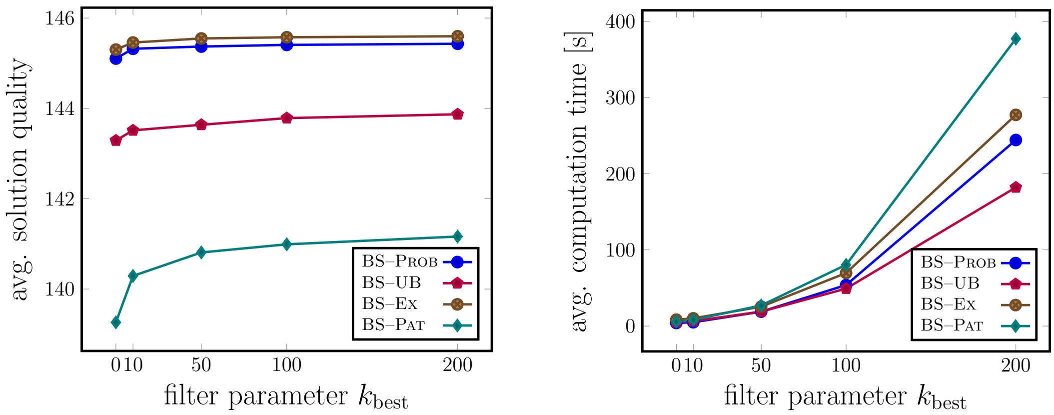
1 Tuning of β and k_{best} parameters for different Beam Search Configurations



(a) Average solution qualities (over all instances) ($k_{best} := 100$)

(b) Average computation times over all instances

Figure 1: Results of Beam search with $k_{\text{best}} = 100$ and varying β.



(a) Average solution qualities over all instances ($\beta := 2000$)

(b) Average computation times (over all instances)

Figure 2: Results of Beam search with $\beta = 2000$ and varying k_{best}.

2 The Numerical Results on the Remaining Benchmark Sets

Table 1: Instances with $p' = \frac{|P|}{n} = \frac{1}{50}$.

			Approx		Greedy		BS–UB		BS–Prob		BS–Ex		BS–Pat		A*	
$\|\Sigma\|$	m	n	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	#	$\overline{t}[s]$
4	10	100	20.9	<0.1	30	<0.1	34.2	22.9	**34.3**	20	**34.3**	20.8	33.8	26.2	7	290.4
4	10	500	117.8	<0.1	162	<0.1	180.4	149.1	183.6	157.3	**184.8**	143.2	177.7	174.7	0	-
4	10	1000	239.2	0.1	329.9	0.1	363.5	284.7	372.4	372.3	**376.3**	434.2	354.7	428.2	0	-
4	50	100	17.4	<0.1	20.4	<0.1	24.1	15.5	**24.2**	12.1	**24.2**	16.7	24	22	0	-
4	50	500	109.3	0.1	127.5	0.1	137.3	106	140.4	138.1	**141.8**	131.8	136.3	147.2	0	-
4	50	1000	228.9	0.5	263.4	0.5	279.8	257.9	288.7	231.1	**290.4**	340.0	277.2	251.7	0	-
4	100	100	17.0	<0.1	18	<0.1	**21.9**	16.1	**21.9**	16.3	**21.9**	14	21.6	19.4	0	-
4	100	500	108.1	0.2	117.2	0.2	128.4	135	131	118.2	**132.0**	115.2	127.6	160.2	0	-
4	100	1000	225.1	0.9	246.9	0.7	262.4	287.6	270.5	236.6	**272.1**	329.9	261.6	282	0	-
20	10	100	4.3	<0.1	6.8	<0.1	***7.9**	0.1	***7.9**	0.1	***7.9**	0.1	***7.9**	0.1	10	<0.1
20	10	500	23.8	<0.1	40.9	<0.1	48.9	104.5	49.7	137	**50.4**	183.8	41.9	221.7	0	-
20	10	1000	48.9	0.1	82.9	0.1	97.7	246.8	102.0	280.7	**104.9**	344.3	85.6	551.4	0	-
20	50	100	2.8	<0.1	***3.1**	<0.1	***3.1**	<0.1	***3.1**	<0.1	***3.1**	<0.1	***3.1**	<0.1	10	<0.1
20	50	500	20.0	0.1	24.2	0.1	28.3	49	**28.8**	46.8	**28.8**	100.3	26	135.5	0	-
20	50	1000	42.6	0.5	53.8	0.4	59.6	152.5	61.4	158.1	**62.3**	245.4	55.1	211.2	0	-
20	100	100	2.3	<0.1	***2.4**	<0.1	***2.4**	<0.1	***2.4**	<0.1	***2.4**	<0.1	***2.4**	<0.1	10	<0.1
20	100	500	18.5	0.3	22.2	0.2	24.7	60.9	**25.2**	62.6	25.0	118.5	22.8	82.7	0	-
20	100	1000	41.1	1	48.8	1	52.8	166.2	54.7	188.6	**55.0**	334.8	50	342.7	0	-

Table 2: Instances with $p' = \frac{|P|}{n} = \frac{1}{10}$.

			Approx		Greedy		BS–UB		BS–Prob		BS–Ex		BS–Pat		A*	
$\|\Sigma\|$	m	n	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	$\overline{\|s\|}$	$\overline{t}[s]$	#	$\overline{t}[s]$
4	10	100	22.9	<0.1	29.6	<0.1	**34.6**	14.4	**34.6**	17.4	34.3	20.4	32.1	23	8	269.1
4	10	500	121.4	<0.1	163.7	<0.1	182.2	97.6	**185.0**	137	184.8	143.2	165.9	193.9	0	-
4	10	1000	245.5	0.1	329.1	0.1	365	212	375.8	240.5	**376.3**	434.8	330.4	391.7	0	-
4	50	100	19.8	<0.1	21.8	<0.1	24.9	10.1	**25.0**	11.2	24.3	19.6	23.5	19.9	0	-
4	50	500	114.2	0.1	129.5	0.1	138.7	102.4	**142.9**	99.6	141.8	131.8	131.2	145.9	0	-
4	50	1000	233.5	0.4	266.5	0.5	279.6	199	289.2	200.6	**290.4**	340.0	266	351.7	0	-
4	100	100	18.9	<0.1	20.8	<0.1	**23.0**	8.8	**23.0**	8.7	21.9	17.0	21.5	19.3	3	265.1
4	100	500	111.3	0.2	122	0.2	129.2	63.2	**133.3**	78.5	132.0	115.6	124.3	163.8	0	-
4	100	1000	230.3	0.9	253.2	0.7	262.3	122.7	270.9	183.3	**272.1**	329.9	255.2	316.3	0	-
20	10	100	***10.2**	<0.1	10.1	<0.1	***10.2**	<0.1	***10.2**	<0.1	***10.2**	<0.1	***10.2**	<0.1	10	<0.1
20	10	500	51	<0.1	52.5	<0.1	***53.1**	<0.1	***53.1**	<0.1	***53.1**	<0.1	***53.1**	<0.1	10	<0.1
20	10	1000	101	0.1	103.9	0.1	***105.4**	0.1	***105.4**	0.1	***105.4**	0.1	***105.4**	0.1	10	0.1
20	50	100	***10.0**	<0.1	***10.0**	<0.1	***10.0**	<0.1	***10.0**	<0.1	***10.0**	<0.1	***10.0**	<0.1	10	<0.1
20	50	500	***50.0**	0.1	***50.0**	0.1	***50.0**	0.1	***50.0**	0.1	***50.0**	0.1	***50.0**	0.1	10	0.2
20	50	1000	***100.0**	0.5	***100.0**	0.4	***100.0**	0.5	***100.0**	0.5	***100.0**	0.5	***100.0**	0.4	10	0.5
20	100	100	***10.0**	<0.1	***10.0**	<0.1	***10.0**	<0.1	***10.0**	<0.1	***10.0**	<0.1	***10.0**	<0.1	10	<0.1
20	100	500	***50.0**	0.3	***50.0**	0.2	***50.0**	0.3	***50.0**	0.3	***50.0**	0.3	***50.0**	0.2	10	0.3
20	100	1000	***100.0**	1	***100.0**	1	***100.0**	0.8	***100.0**	0.8	***100.0**	1.1	***100.0**	1	10	0.9

Table 3: Instances with $p' = \frac{|P|}{n} = \frac{1}{2}$.

			Approx		Greedy		BS–UB		BS–Prob		BS–Ex		BS–Pat		A*	
$\|\Sigma\|$	m	n	$\overline{\|s\|}$	$\bar{t}[s]$	$\overline{\|s\|}$	$\bar{t}[s]$	$\overline{\|s\|}$	$\bar{t}[s]$	$\overline{\|s\|}$	$\bar{t}[s]$	$\overline{\|s\|}$	$\bar{t}[s]$	$\overline{\|s\|}$	$\bar{t}[s]$	#	$\bar{t}[s]$
4	10	100	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	10	<0.1
4	10	500	250.1	<0.1	***250.6**	<0.1	***250.6**	<0.1	***250.6**	<0.1	***250.6**	0.1	***250.6**	<0.1	10	<0.1
4	10	1000	500.1	0.1	501.5	0.1	***501.7**	0.1	***501.7**	0.1	***501.7**	0.1	***501.7**	0.1	10	0.1
4	50	100	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	10	<0.1
4	50	500	***250.0**	0.1	***250.0**	0.1	***250.0**	0.1	***250.0**	0.1	***250.0**	0.1	***250.0**	0.1	10	0.1
4	50	1000	***500.0**	0.4	***500.0**	0.5	***500.0**	0.5	***500.0**	0.3	***500.0**	0.5	***500.0**	0.3	10	0.5
4	100	100	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	10	<0.1
4	100	500	***250.0**	0.2	***250.0**	0.2	***250.0**	0.2	***250.0**	0.2	***250.0**	0.2	***250.0**	0.2	10	0.2
4	100	1000	***500.0**	1	***500.0**	0.7	***500.0**	1	***500.0**	0.8	***500.0**	1	***500.0**	0.8	10	0.8
20	10	100	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	10	<0.1
20	10	500	***250.0**	<0.1	***250.0**	<0.1	***250.0**	<0.1	***250.0**	0.1	***250.0**	<0.1	***250.0**	<0.1	10	<0.1
20	10	1000	***500.0**	0.1	***500.0**	0.1	***500.0**	0.1	***500.0**	0.1	***500.0**	0.1	***500.0**	0.1	10	0.1
20	50	100	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	10	<0.1
20	50	500	***250.0**	0.1	***250.0**	0.1	***250.0**	0.1	***250.0**	0.1	***250.0**	0.1	***250.0**	0.1	10	0.1
20	50	1000	***500.0**	0.5	***500.0**	0.4	***500.0**	0.4	***500.0**	0.4	***500.0**	0.5	***500.0**	0.4	10	0.5
20	100	100	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	***50.0**	<0.1	10	<0.1
20	100	500	***250.0**	0.2	***250.0**	0.2	***250.0**	0.3	***250.0**	0.2	***250.0**	0.2	***250.0**	0.2	10	0.3
20	100	1000	***500.0**	1	***500.0**	1	***500.0**	0.7	***500.0**	0.8	***500.0**	1	***500.0**	1.1	10	0.7