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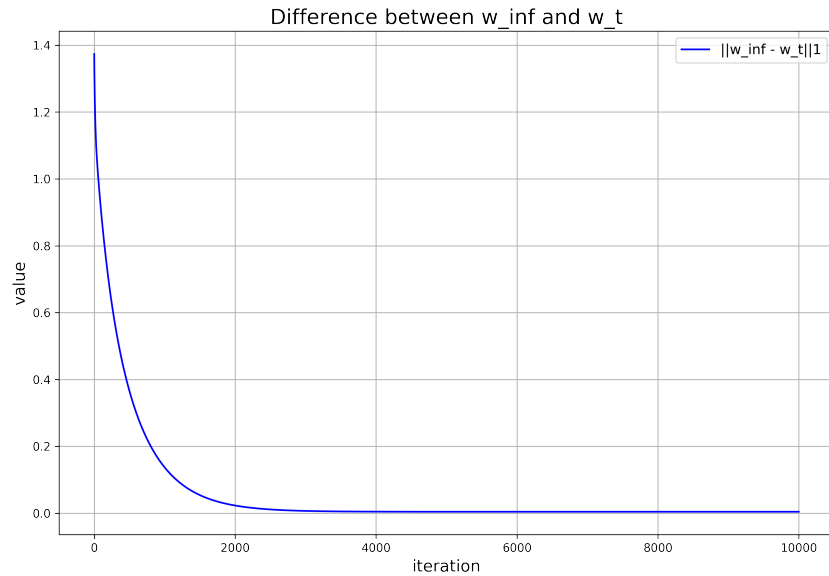
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Homework 4

1. **Solution to problem 1**

(a) The top 25 team names and their corresponding values are listed as table below.

Ranking	t=10 Team_name	t=10 Team_score	t=100 Team_name	t=100 Team_score	t=1000 Team_name	t=1000 Team_score	t=10000 Team_name	t=10000 Team_score
1	NorthCentral	0.01281	LSU	0.04364	LSU	0.08442	LSU	0.09137
2	LSU	0.01258	Wheaton	0.02582	Clemson	0.04553	Clemson	0.04926
3	Morningside	0.01151	NorthCentral	0.02444	OhioState	0.04345	OhioState	0.04701
4	Wheaton	0.01109	Clemson	0.0237	Georgia	0.03272	Georgia	0.03538
5	MinnSt-Mankato	0.00963	OhioState	0.02269	Alabama	0.02468	Alabama	0.0267
6	Muhlenberg	0.00951	Morningside	0.02262	Florida	0.0237	Florida	0.02562
7	OhioState	0.00924	Georgia	0.01716	Oregon	0.01927	Oregon	0.02078
8	UW-Whitewater	0.00917	StJohnsMN	0.01499	Auburn	0.01904	Auburn	0.02058
9	NorthDakotaSt	0.00914	WestFlorida	0.01337	Oklahoma	0.0187	Oklahoma	0.0202
10	Clemson	0.00894	Alabama	0.01292	PennState	0.01797	PennState	0.01943
11	WestFlorida	0.00878	UW-Whitewater	0.01284	Wisconsin	0.01516	Wisconsin	0.01639
12	MarianIN	0.00852	Florida	0.01244	NotreDame	0.01465	NotreDame	0.01582
13	StJohnsMN	0.00849	Muhlenberg	0.01124	Minnesota	0.0142	Minnesota	0.01535
14	MountUnion	0.00765	Oregon	0.01053	Baylor	0.0127	Baylor	0.01372
15	FerrisSt	0.00712	Auburn	0.01002	Michigan	0.01205	Michigan	0.01302
16	GrandView	0.00711	Oklahoma	0.01001	Utah	0.0117	Utah	0.01262
17	Georgia	0.00701	MinnSt-Mankato	0.00975	Memphis	0.01166	Memphis	0.01259
18	MaryHardin-Baylor	0.00678	MarianIN	0.00958	Iowa	0.01101	Iowa	0.01189
19	Lenoir-Rhyne	0.00616	PennState	0.00953	AppalachianSt	0.01092	AppalachianSt	0.01179
20	SlipperyRock	0.00609	ValdostaSt	0.00889	Texas	0.01019	Texas	0.011
21	Oregon	0.0059	Lenoir-Rhyne	0.00807	NorthDakotaSt	0.00922	Navy	0.00979
22	DelawareValley	0.00584	Wisconsin	0.00802	Navy	0.00907	NorthDakotaSt	0.00972
23	JamesMadison	0.00567	NotreDame	0.00787	TexasA&M	0.00893	TexasA&M	0.00966
24	ValdostaSt	0.00554	Minnesota	0.00753	BoiseSt	0.00831	BoiseSt	0.00894
25	Florida	0.00544	GrandView	0.00752	KansasSt	0.00733	KansasSt	0.00792

Figure 1: ranking table with different t

(b) The difference of w^{∞} and w_t is plotted as below.

Figure 2: difference of w^{∞} and w_t

2. **Solution to problem 2**

(a) The objective function of iteration is plotted as below. The iteration starts at 1 and ends after running the 100th iteration.
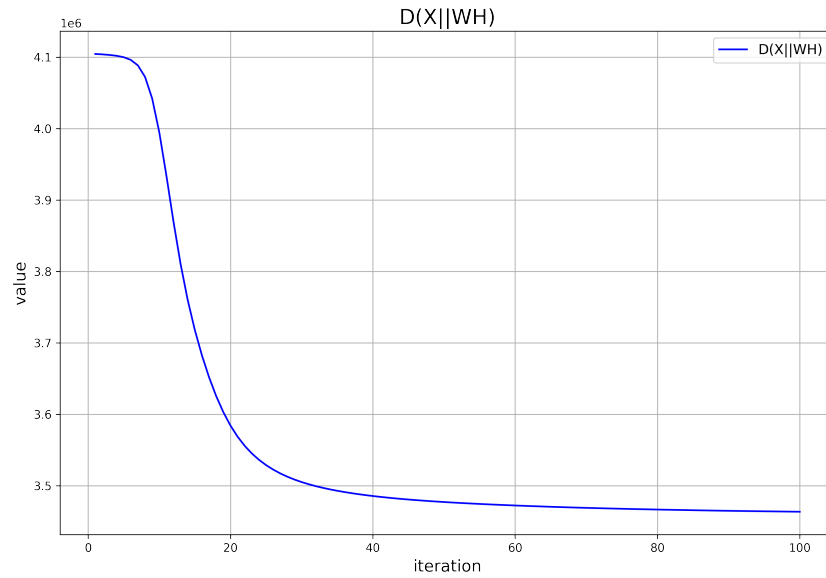

Figure 3: Objective function of iteration

(b) Since the initialization is random and the topic words are different in every running. I show one of my outcome as below.

Topic_1	Topic_2	Topic_3	Topic_4	Topic_5
0.0123 study	0.0186 pay	0.0261 percent	0.0144 military	0.0239 thing
0.0115 research	0.0186 money	0.0196 price	0.0131 government	0.0162 really
0.0098 develop	0.0145 cost	0.0182 market	0.0128 war	0.0159 lot
0.0097 system	0.0143 program	0.0144 rate	0.0126 american	0.0159 feel
0.0090 result	0.0134 budget	0.0139 rise	0.0120 states	0.0140 ask
0.0088 test	0.0132 tax	0.0103 fall	0.0111 force	0.0139 tell
0.0086 percent	0.0123 state	0.0103 economy	0.0108 official	0.0116 happen
0.0083 number	0.0116 cut	0.0094 stock	0.0106 country	0.0090 guy
0.0075 problem	0.0111 health	0.0092 increase	0.0093 leader	0.0089 kind
0.0074 program	0.0101 worker	0.0089 low	0.0089 attack	0.0086 put

Topic_6	Topic_7	Topic_8	Topic_9	Topic_10
0.0213 lawyer	0.0515 father	0.0238 music	0.0137 wall	0.0179 write
0.0207 charge	0.0476 mrs	0.0190 play	0.0130 room	0.0164 book
0.0206 case	0.0463 son	0.0151 performance	0.0112 wear	0.0163 life
0.0203 police	0.0399 graduate	0.0111 production	0.0110 house	0.0131 story
0.0153 court	0.0326 daughter	0.0105 audience	0.0100 floor	0.0118 man
0.0125 judge	0.0305 mother	0.0102 perform	0.0086 white	0.0103 love
0.0122 trial	0.0241 retire	0.0101 theater	0.0082 window	0.0096 character
0.0111 officer	0.0228 marry	0.0101 dance	0.0073 color	0.0092 film
0.0107 man	0.0217 receive	0.0099 song	0.0072 dress	0.0091 friend
0.0101 crime	0.0211 president	0.0099 stage	0.0071 glass	0.0087 movie

Topic_11	Topic_12	Topic_13	Topic_14	Topic_15
0.0109 hour	0.0112 american	0.0246 deal	0.0198 computer	0.0288 school
0.0102 car	0.0110 television	0.0236 contract	0.0126 service	0.0250 child
0.0100 night	0.0107 world	0.0155 pay	0.0120 system	0.0221 student
0.0090 morning	0.0076 country	0.0150 sign	0.0119 technology	0.0207 woman
0.0081 walk	0.0066 great	0.0116 owner	0.0113 company	0.0141 young
0.0079 foot	0.0061 view	0.0110 return	0.0103 site	0.0127 parent
0.0077 minute	0.0060 question	0.0106 yesterday	0.0101 information	0.0120 life
0.0075 drive	0.0058 far	0.0104 offer	0.0094 internet	0.0109 black
0.0074 stop	0.0058 power	0.0093 money	0.0089 flight	0.0107 class
0.0069 head	0.0055 fact	0.0092 club	0.0077 available	0.0093 college

Topic_16	Topic_17	Topic_18	Topic_19	Topic_20
0.0162 food	0.0216 political	0.0273 game	0.0289 city	0.0174 cause
0.0109 restaurant	0.0204 campaign	0.0230 team	0.0217 building	0.0123 plant
0.0105 serve	0.0164 leader	0.0206 play	0.0148 resident	0.0120 damage
0.0096 fresh	0.0163 election	0.0180 season	0.0146 build	0.0120 water
0.0093 eat	0.0157 republican	0.0178 player	0.0143 area	0.0115 official
0.0093 taste	0.0157 vote	0.0175 win	0.0111 local	0.0101 safety
0.0077 fish	0.0150 party	0.0147 second	0.0106 house	0.0096 problem
0.0077 cook	0.0141 candidate	0.0112 victory	0.0103 community	0.0079 report
0.0074 add	0.0124 democratic	0.0106 score	0.0102 neighborhood	0.0077 gas
0.0071 pound	0.0118 state	0.0097 coach	0.0100 town	0.0076 state

Topic_21	Topic_22	Topic_23	Topic_24	Topic_25
0.0161 official	0.0163 law	0.0213 art	0.0457 company	0.0232 editor
0.0126 member	0.0123 state	0.0126 artist	0.0218 executive	0.0130 visit
0.0107 report	0.0119 issue	0.0116 image	0.0190 business	0.0130 article
0.0103 issue	0.0119 rule	0.0097 museum	0.0154 sell	0.0129 event
0.0099 public	0.0108 decision	0.0094 collection	0.0150 sale	0.0124 child
0.0089 comment	0.0105 require	0.0091 photograph	0.0148 president	0.0122 free
0.0084 office	0.0101 allow	0.0087 century	0.0132 industry	0.0114 ticket
0.0084 statement	0.0089 proposal	0.0086 exhibition	0.0119 chief	0.0110 church
0.0082 meeting	0.0082 agree	0.0078 history	0.0115 share	0.0106 member
0.0076 president	0.0072 bill	0.0076 picture	0.0103 buy	0.0090 information

Figure 4: topic words in 25 topics (arranged as 5 × 5 table)