COMS4721 Machine Learning for Data Science Homework 4

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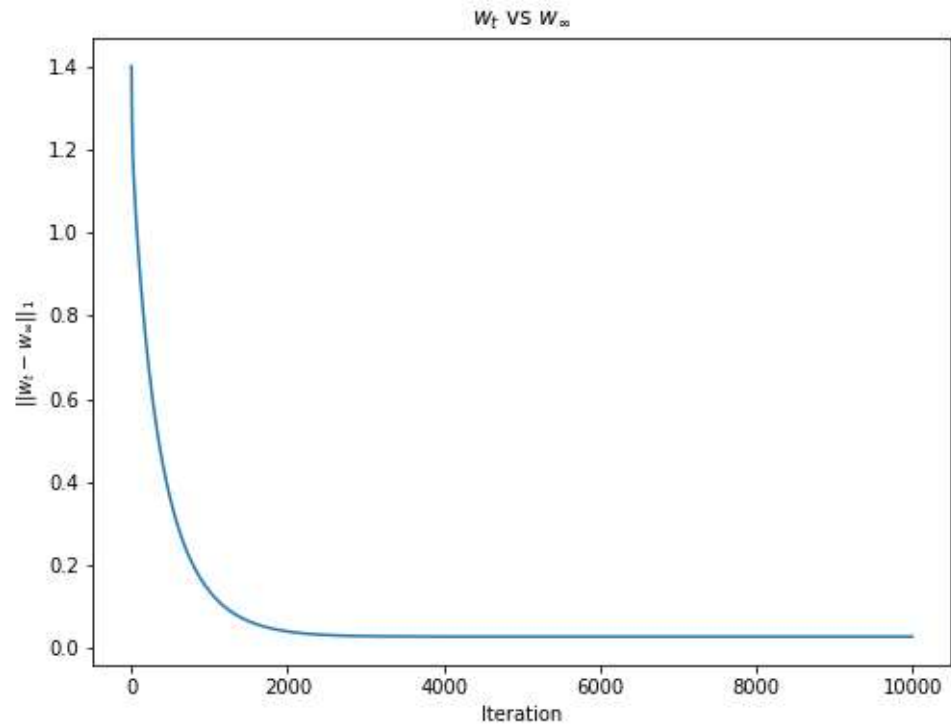**UNI: pl2441**

Problem 1

(a) The top 25 team names and W_t at different step:
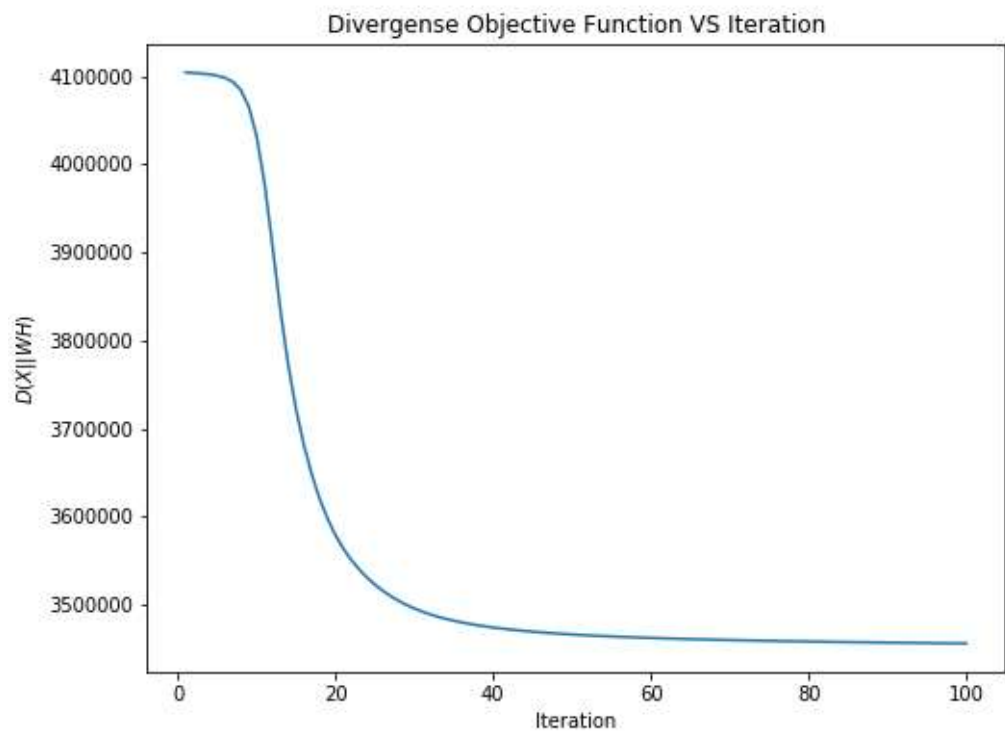
Rank	T = 10	W_{10}	T = 100	W_{100}	T = 1000	W_{1000}	T = 10000	W_{10000}
1	Mary Hardin-Baylor	0.01764	Mary Hardin-Baylor	0.060847	Clemson	0.097376	Clemson	0.103882
2	Clemson	0.014032	Clemson	0.048803	Alabama	0.053666	Alabama	0.057223
3	Mount Union	0.012249	Alabama	0.027211	Georgia	0.023191	Georgia	0.024716
4	Morningside	0.011157	Mount Union	0.021396	Ohio State	0.022592	Ohio State	0.024055
5	North Dakota St	0.010944	St John's MN	0.014651	Notre Dame	0.022337	Notre Dame	0.023797
6	Valdosta St	0.010343	Morningside	0.013446	Oklahoma	0.019113	Oklahoma	0.020352
7	St John's MN	0.009912	Valdosta St	0.012792	Texas A&M	0.016575	Texas A&M	0.017669
8	Alabama	0.009898	North Dakota St	0.012502	LSU	0.015152	LSU	0.016144
9	UW-Whitewater	0.009683	Georgia	0.011877	Florida	0.015051	Florida	0.016036
10	Ferris St	0.009671	Ohio State	0.011871	North Dakota St	0.014736	North Dakota St	0.015302
11	Johns Hopkins	0.009448	Notre Dame	0.011583	Kentucky	0.014335	Kentucky	0.015276
12	Brockport St	0.006859	UW-Whitewater	0.011481	Texas	0.013914	Texas	0.014817
13	Princeton	0.006811	Ferris St	0.011187	Michigan	0.013782	Michigan	0.014679
14	Minn St-Mankato	0.006735	Oklahoma	0.010029	Syracuse	0.013223	Syracuse	0.014091
15	Benedictine KS	0.006551	Johns Hopkins	0.00989	Central Florida	0.012441	Central Florida	0.013244
16	Kansas Wesleyan	0.005917	Texas A&M	0.008446	Mary Hardin-Baylor	0.011884	Washington	0.012022
17	Ohio State	0.005844	LSU	0.0078	Washington	0.011317	Washington St	0.011908
18	Marian IN	0.005659	Florida	0.007782	Washington St	0.011222	Penn State	0.010773
19	Bethel MN	0.005655	Kentucky	0.007376	Penn State	0.010118	Auburn	0.010624
20	Muhlenberg	0.00554	Texas	0.007278	Auburn	0.009977	Missouri	0.010359
21	Tarleton St	0.005476	Michigan	0.007193	Missouri	0.009722	Iowa	0.010259
22	Ouachita Baptist	0.005418	Syracuse	0.006816	Iowa	0.009648	Northwestern	0.009784
23	Georgia	0.005409	Central Florida	0.006538	Northwestern	0.009192	West Virginia	0.009764
24	Notre Dame	0.005299	Washington St	0.00638	West Virginia	0.009174	Fresno St	0.009452
25	Notre Dame OH	0.005249	Washington	0.006269	Fresno St	0.008901	South Carolina	0.008896

(b) Plot the difference between W_t and stationary W:

W_t VS W_∞

Problem 2

(a) Plot the objective as a function of iteration:

Divergense Objective Function VS Iteration

(b) The 5 by 5 table:

company	0.041928	report	0.015755	job	0.029102	question	0.013183	government	0.015723
executive	0.01772	drug	0.015648	worker	0.017657	issue	0.012485	american	0.015496
business	0.015547	cause	0.01444	handle	0.013887	public	0.008752	states	0.015261
sell	0.015031	test	0.011773	problem	0.013827	view	0.00818	military	0.013847
sale	0.013931	official	0.010564	keep	0.010671	concern	0.007158	official	0.013171
president	0.012899	problem	0.010476	employee	0.010552	statement	0.006567	country	0.013136
share	0.012765	agency	0.010004	office	0.010145	clear	0.006464	war	0.012982
chief	0.011609	percent	0.00785	check	0.0099	believe	0.00629	leader	0.009422
market	0.011304	treatment	0.007254	apply	0.009194	action	0.006242	force	0.009219
buy	0.010912	risk	0.007187	pay	0.008845	suggest	0.006182	international	0.00803
computer	0.01873	building	0.024477	care	0.023268	mile	0.013954	case	0.021508
system	0.012498	city	0.020756	life	0.020012	water	0.012832	lawyer	0.020332
information	0.011648	build	0.014432	family	0.018445	road	0.008699	court	0.020216
company	0.011397	house	0.013389	health	0.015595	town	0.008098	law	0.016712
service	0.011102	project	0.01263	child	0.015531	car	0.007619	charge	0.016368
technology	0.010716	area	0.011944	woman	0.014581	land	0.007597	judge	0.013323
site	0.00947	resident	0.011391	doctor	0.013611	city	0.007337	legal	0.011163
program	0.008911	space	0.011097	death	0.01353	area	0.007296	trial	0.009561
internet	0.008498	plan	0.010985	hospital	0.013425	plant	0.007196	file	0.009019
television	0.008399	property	0.010928	medical	0.011573	local	0.006916	investigation	0.008939
study	0.015601	state	0.017534	game	0.030517	win	0.034907	thing	0.012827
research	0.011136	bill	0.014275	team	0.024239	second	0.01897	tell	0.012377
different	0.007629	proposal	0.012299	play	0.020514	race	0.015357	feel	0.010344
far	0.00703	tax	0.011871	season	0.020307	final	0.014629	ask	0.009934
decade	0.006999	budget	0.011602	player	0.02001	finish	0.012633	man	0.009078
professor	0.006841	law	0.010711	coach	0.010806	victory	0.011802	friend	0.008676
science	0.006523	propose	0.01044	second	0.010005	third	0.011017	life	0.007634
important	0.00644	plan	0.010221	score	0.009451	round	0.010661	little	0.007298
expert	0.006079	government	0.0097	ball	0.009369	match	0.010196	lot	0.00684
scientist	0.005817	pay	0.009409	hit	0.008139	play	0.009986	really	0.006659
campaign	0.02225	book	0.030934	food	0.01442	school	0.033402	percent	0.031047
political	0.018878	write	0.025734	restaurant	0.009701	student	0.025052	rate	0.018551
party	0.016126	editor	0.020045	serve	0.009092	program	0.020101	price	0.015999
candidate	0.015401	writer	0.014402	taste	0.007999	education	0.013465	rise	0.015782
election	0.014978	article	0.012499	red	0.007845	city	0.011595	market	0.014128
vote	0.013424	story	0.011297	dinner	0.00734	college	0.011029	increase	0.012315
leader	0.012162	page	0.011186	add	0.007243	child	0.010844	economy	0.012284
democratic	0.011108	life	0.010945	eat	0.007219	group	0.010602	low	0.010545

republican	0.010038	publish	0.010553	fresh	0.007157	class	0.009978	fall	0.009799
voter	0.009252	author	0.010273	pound	0.007047	public	0.009434	economic	0.008937
police	0.031262	music	0.017997	father	0.055373	art	0.016569	deal	0.018718
kill	0.022524	play	0.016259	mother	0.046361	design	0.010671	contract	0.011313
man	0.017109	film	0.013426	son	0.046175	artist	0.010662	sign	0.01122
officer	0.016905	performance	0.01025	mrs	0.043479	collection	0.008902	change	0.009352
arrest	0.011117	audience	0.009915	daughter	0.035955	museum	0.008766	lot	0.009115
fire	0.010394	movie	0.009873	graduate	0.031157	photograph	0.00816	offer	0.009097
official	0.00935	production	0.008149	marry	0.02448	exhibition	0.007584	money	0.008801
attack	0.009268	stage	0.007906	retire	0.019262	color	0.007035	thing	0.00843
death	0.009056	theater	0.007851	receive	0.018626	display	0.00681	big	0.008409
crime	0.00899	dance	0.007594	family	0.018172	image	0.006609	ago	0.00802