

October 15, 2018

Task 1

G1	G2
the number of sources:10	the number of sources:12
The number of sinks:13	The number of sinks:8
Maximum of in-degree:733	Maximum of in-degree:126
Maximum of out-degree:722	Maximum of out-degree:77

Typically, the number of sources should be 1. However, I crawler some redirect urls which has no in-link in the 1000 urls.

Task 2

G1 Top 50	G2 Top 50
Digital_object_identifier 0.054033008963511174	Green_politics 0.029425709752798918
International_Standard_Book_Number 0.046879925533941255	Environmentalism 0.02775180664576244
International_Standard_Serial_Number 0.033050684489762464	Global_Greens 0.019159638036503644
PubMed_Identifier 0.02892004786171314	Green_party 0.0150602984829461
National_Diet_Library 0.020999677213647233	Green_Party_of_Canada 0.014997768973710348

Bibcode 0.019664169877389132	Green_anarchism 0.014775624686141324
PubMed_Central 0.01823864379534081	Federation_of_the_Green_Parties_of_the_Americas 0.014260665284594819
OCLC 0.012789128057859787	Federation_of_Green_Parties_of_Africa 0.013911095096659519
DMOZ 0.009280266826269944	Bright_green_environmentalism 0.012881749772544996
Nature_(journal) 0.008966072407433077	Green_Party_(Ireland) 0.012130881068164331
Carbon_dioxide 0.006335303916077451	Natural_environment 0.012048072521783209
Science_(journal) 0.005834523346347488	Green_liberalism 0.011501626504368952
Oxygen 0.004246441074059934	Green_Party_in_Northern_Ireland 0.011454490129781926
Hydrogen 0.0038448647741861357	Outline_of_green_politics 0.011337363581252214
JSTOR 0.003458860981951121	Green_Italy 0.011292390193743418
Climate_change 0.0033297690072907247	Green 0.011181356405235661
Carbon 0.0032733941551544234	Green_conservatism 0.011176143686063846
Global_warming 0.003271053380886693	Green_Zionism 0.011001980608670218
Nitrogen 0.003228605731519224	Green_libertarianism 0.010961122306870201
Water 0.0027700303175760676	Green_left 0.010882704013593753
Chlorine 0.0025554352817390856	Green_Party_of_England_and_Wales 0.009068940476809588
Sodium 0.0025207148234341593	Carbon_footprint 0.00890967122104094
Mercury_(element) 0.002484213158359868	Green_belt_(United_Kingdom) 0.008570916192977961

Australia 0.0024525128978773545	Scottish_Green_Party 0.00818765475225321
Neptunium 0.002436223412958421	Green_Party_of_the_United_States 0.007839338527894143
Sulfur 0.0023931389267143905	Environmental_technology 0.007804562281562837
Copper 0.0023302065068515868	Green_belt 0.0075857618610835845
Magnesium 0.0023172136227876663	Wales_Green_Party 0.007506992229787372
Calcium 0.002286289863705365	Latvian_Green_Party 0.007163732560193576
Aluminium 0.002282554979707413	Green_Party_of_Switzerland 0.007071330314828886
Potassium 0.00228211492840962	Green_Party_(Brazil) 0.006960697520005001
Boron 0.00225264964933073	Ecologist_Green_Party_of_Mexico 0.006929987206144407
Pressure 0.0022145196127762476	Green_Party_of_Aotearoa_New_Zealand 0.006768767310956042
Methane 0.002214241899372575	Green_Party_(Sweden) 0.006736619254169761
Uranium 0.002198699462369981	The_Greens_%E2%80%93_The_Green_Alternative 0.0067241604230914055
Carbon_monoxide 0.002182404352139012	Green_League 0.006719107339890904
Phosphorus 0.0021431159714419405	Green_Party_(Czech_Republic) 0.006672650825103864
Photosynthesis 0.0021261588136494243	Green_Party_Taiwan 0.006672650825103864
Earth 0.0021184541906760696	Green_Party_of_Pakistan 0.0066693278597377646
Lead 0.0021157939497371417	Metropolitan_Green_Belt 0.006602168590821251
Xenon 0.0021062253154641385	Green_Party_(Norway) 0.006467982534815826

India 0.0020958803076843347	Green_Alternative_Ecologist_Party_of_Peru 0.006466344248200431
Zinc 0.002093281081936127	Mongolian_Green_Party 0.0064663442482004296
Biodiversity 0.00209066911139491	European_Federation_of_Green_Parties 0.006453974228978164
Fossil_fuel 0.002055655549431307	Green_Party_of_Albania 0.006450871715635837
Renewable_energy 0.002009433531824845	Green_Party_(Romania) 0.006450871715635837
Manganese 0.0020010663879187662	Green_Party_of_Bulgaria 0.006450871715635837
Helium 0.0019978407912193876	Green_Party_(Slovakia) 0.006450871715635836
Nickel 0.0019637849356490124	Democratic_Green_Party_of_Rwanda 0.0064485813202875275
Tin 0.0019263417718974694	Green_Party_of_Malaysia 0.006303178094247712

Task 3 For G1

3.1

1. When d down from 8.5 to 0.5, all the sorted PageRank values simultaneously declined. Since the damping factor represents the probability that users click the link on current page that points to another page and PageRank value represents the quality of page, the larger d settings give the higher probability that users will click the link, which will obviously create higher PageRank value for the link.

2. The variance of PageRank value is increasing when d from 0.5 to 0.85. With higher damping factor, the rank top pages hold more value, and rank low pages hold less values. In other words, an active user that glad to constantly click links will make top pages more important and low pages less important than lazy user.

3. For Top 50, the document Id are similar in all d values because the relative values between each page are stable, despite of different d value.

d = 0.85 Top 50	d = 0.65 Top 50	d = 0.5 Top 50
Digital_object_identifier 0.054033008963511174	Digital_object_identifier 0.030924692210404885	International_Standard_Book_N umber 0.020889223175377156
International_Standard_Book_N umber 0.046879925533941255	International_Standard_Book_N umber 0.029300182231573883	Digital_object_identifier 0.020668740105374936
International_Standard_Serial_ Number 0.033050684489762464	International_Standard_Serial_ Number 0.01879880104485665	International_Standard_Serial_ Number 0.012609614606322761
PubMed_Identifier 0.02892004786171314	PubMed_Identifier 0.01645122440184071	PubMed_Identifier 0.01105618206734513
National_Diet_Library 0.020999677213647233	National_Diet_Library 0.012619897330357342	National_Diet_Library 0.008713421816196673
Bibcode 0.019664169877389132	Bibcode 0.01136638783893738	Bibcode 0.0077034216174443415
PubMed_Central 0.01823864379534081	PubMed_Central 0.010328493844946992	PubMed_Central 0.0069522945700011725
OCLC 0.012789128057859787	OCLC 0.007532236680264008	Carbon_dioxide 0.006164094987414189
DMOZ 0.009280266826269944	Carbon_dioxide 0.006702996613639273	OCLC 0.005207520149202606
Nature_(journal) 0.008966072407433077	DMOZ 0.005289779871231073	Oxygen 0.0036397873597658276
Carbon_dioxide 0.006335303916077451	Nature_(journal) 0.004546345619818509	DMOZ 0.003576055654670668
Science_(journal) 0.005834523346347488	Oxygen 0.0040871447476469	Hydrogen 0.0030089552436387166

Oxygen 0.004246441074059934	Hydrogen 0.0034778935914476826	Nature_(journal) 0.0029078701032568986
Hydrogen 0.0038448647741861357	Science_(journal) 0.0032501677612476036	Climate_change 0.0028590346081713764
JSTOR 0.003458860981951121	Climate_change 0.0032180309841108963	Global_warming 0.0027787734523404047
Climate_change 0.0033297690072907247	Global_warming 0.0031288383777975577	Nitrogen 0.0026084217178911806
Carbon 0.0032733941551544234	Carbon 0.0029793172622565446	Carbon 0.002606224739095099
Global_warming 0.003271053380886693	Nitrogen 0.0029704426549649714	Water 0.0025445981924492145
Nitrogen 0.003228605731519224	Water 0.0027799029882951127	Australia 0.0023922412624150366
Water 0.0027700303175760676	JSTOR 0.002591848619965298	Science_(journal) 0.0022598056998702674
Chlorine 0.0025554352817390856	Australia 0.0025455211452898923	Carbon_monoxide 0.00225136745118865
Sodium 0.0025207148234341593	Carbon_monoxide 0.0023523869405782495	JSTOR 0.0021324120035663904
Mercury_(element) 0.002484213158359868	Sodium 0.002277600682150223	Methane 0.002065596977707158
Australia 0.0024525128978773545	Chlorine 0.002236612439830594	Sodium 0.002017235654284495
Neptunium 0.002436223412958421	Methane 0.0022261196325150515	Chlorine 0.0019446095725818915

Sulfur 0.0023931389267143905	Mercury_(element) 0.0021543879269898276	India 0.0019274022466556553
Copper 0.0023302065068515868	Sulfur 0.002114670712023525	Pressure 0.0019101304426934172
Magnesium 0.0023172136227876663	Pressure 0.00209953213807136	Earth 0.0018842180915291597
Calcium 0.002286289863705365	India 0.002096523710645654	Mercury_(element) 0.0018725399733205824
Aluminium 0.002282554979707413	Copper 0.00207695347573476	Sulfur 0.0018498348987211538
Potassium 0.00228211492840962	Magnesium 0.0020706869771059985	Renewable_energy 0.0018443884155676367
Boron 0.00225264964933073	Calcium 0.0020683172506340626	Calcium 0.0018406106129208698
Pressure 0.0022145196127762476	Earth 0.0020558987423503	PH 0.0018405334842213103
Methane 0.002214241899372575	Potassium 0.002021684210637067	Copper 0.0018367463960047862
Uranium 0.002198699462369981	Aluminium 0.0020208941524584114	Magnesium 0.0018288423682788673
Carbon_monoxide 0.002182404352139012	Renewable_energy 0.002000331873809398	Gas 0.0017964436822206556
Phosphorus 0.0021431159714419405	Biodiversity 0.0019893944818396682	Biodiversity 0.0017917318095408143
Photosynthesis 0.0021261588136494243	Fossil_fuel 0.0019741228630664885	Emissions_trading 0.0017904249538046155

Earth 0.0021184541906760696	Boron 0.0019366731024539905	Sustainable_development 0.0017877706344858217
Lead 0.0021157939497371417	Emissions_trading 0.0019169289918778236	Fossil_fuel 0.001786658308574375
Xenon 0.0021062253154641385	Sustainable_development 0.0019082265237604016	Aluminium 0.0017847341434262377
India 0.0020958803076843347	Phosphorus 0.0018939944325965282	Potassium 0.001782808504696471
Zinc 0.002093281081936127	Lead 0.0018936859473015284	Italy 0.0017707374709972279
Biodiversity 0.00209066911139491	Uranium 0.0018904385690055483	Photosynthesis 0.0017220867056625098
Fossil_fuel 0.002055655549431307	Photosynthesis 0.001889846899536615	NASA 0.0017110038740193296
Renewable_energy 0.002009433531824845	PH 0.001884818255163597	Kyoto_Protocol 0.0017073389133350307
Manganese 0.0020010663879187662	Italy 0.0018626225821212461	Boron 0.00168753548005684
Helium 0.0019978407912193876	Xenon 0.0018528088782638306	Lead 0.0016867805754432923
Nickel 0.0019637849356490124	Zinc 0.0018505665612630362	Phosphorus 0.0016691741202680677
Tin 0.0019263417718974694	NASA 0.0018446868964582255	Sustainability 0.0016685867479415562

The order of PageRank can be mostly fixed even just in 4 iterations. The higher PageRank value, the more stable relative position is. For instance, the top10 rank are the same both in 4 iterations and final converge. From rank 10 to 20, the position of each page just changes a little bit, just up or drop one rank position.

The PageRank values of converge Top50 at beginning are significantly higher than them of 4 iterations Top50. Meanwhile, the values at the end of converge list are lower than them of 4 iterations list. This show that during the converging process, more vales are distributed to the important pages, or top ones, from less important pages, or low rank.

G1 Pagerank Converge Top50	G1 4 iteration Top50
Digital_object_identifier 0.054033008963511174	Digital_object_identifier 0.048201510529613675
International_Standard_Book_Number 0.046879925533941255	International_Standard_Book_Number 0.04269206827372641
International_Standard_Serial_Number 0.033050684489762464	International_Standard_Serial_Number 0.029243563160601973
PubMed_Identifier 0.02892004786171314	PubMed_Identifier 0.025636850867874802
National_Diet_Library 0.020999677213647233	National_Diet_Library 0.018984967929677358
Bibcode 0.019664169877389132	Bibcode 0.01762536723431988
PubMed_Central 0.01823864379534081	PubMed_Central 0.016130979607635813
OCLC 0.012789128057859787	OCLC 0.0114382566400263
DMOZ 0.009280266826269944	DMOZ 0.008245926930013688
Nature_(journal) 0.008966072407433077	Nature_(journal) 0.007601474616556753
Carbon_dioxide 0.006335303916077451	Carbon_dioxide 0.006570851247944464
Science_(journal) 0.005834523346347488	Science_(journal) 0.005080466230170629
Oxygen 0.004246441074059934	Oxygen 0.00440170011648552
Hydrogen 0.0038448647741861357	Hydrogen 0.004005787169943868

JSTOR 0.003458860981951121	Climate_change 0.0035431209048911293
Climate_change 0.0033297690072907247	Global_warming 0.0034642827164136653
Carbon 0.0032733941551544234	Carbon 0.003393467353146946
Global_warming 0.003271053380886693	Nitrogen 0.003365822237757172
Nitrogen 0.003228605731519224	JSTOR 0.0033155346208810586
Water 0.0027700303175760676	Water 0.0028893631845235876
Chlorine 0.0025554352817390856	Chlorine 0.002650201152853993
Sodium 0.0025207148234341593	Sodium 0.002614093440713529
Mercury_(element) 0.002484213158359868	Mercury_(element) 0.002569160921810569
Australia 0.0024525128978773545	Australia 0.0025507288913482894
Neptunium 0.002436223412958421	Sulfur 0.002494026168657975
Sulfur 0.0023931389267143905	Copper 0.002419305657793628
Copper 0.0023302065068515868	Magnesium 0.0024084379393258287
Magnesium 0.0023172136227876663	Calcium 0.002374138569760754
Calcium 0.002286289863705365	Neptunium 0.002371141331081548
Aluminium 0.002282554979707413	Potassium 0.002367584999571334
Potassium 0.00228211492840962	Aluminium 0.002366698542403892
Boron 0.00225264964933073	Boron 0.0023435479609885787
Pressure 0.0022145196127762476	Methane 0.002303611541632742
Methane 0.002214241899372575	Uranium 0.0022909322750752016
Uranium 0.002198699462369981	Pressure 0.0022707779979338604
Carbon_monoxide 0.002182404352139012	Carbon_monoxide 0.0022618629376950517

Phosphorus 0.0021431159714419405	Phosphorus 0.00223393388704579
Photosynthesis 0.0021261588136494243	Earth 0.0022230092534435337
Earth 0.0021184541906760696	Biodiversity 0.002220329405761222
Lead 0.0021157939497371417	India 0.0022129434263512653
Xenon 0.0021062253154641385	Lead 0.0021994536487811214
India 0.0020958803076843347	Fossil_fuel 0.0021887299711277814
Zinc 0.002093281081936127	Xenon 0.002186393188901668
Biodiversity 0.00209066911139491	Zinc 0.0021751522420778813
Fossil_fuel 0.00205565549431307	Renewable_energy 0.0021362760297564736
Renewable_energy 0.002009433531824845	Manganese 0.002078652853638674
Manganese 0.0020010663879187662	Helium 0.002071670779745239
Helium 0.0019978407912193876	Photosynthesis 0.0020632349289767104
Nickel 0.0019637849356490124	Nickel 0.002037349731638481
Tin 0.0019263417718974694	Emissions_trading 0.0020087604284389814

3.3

Pros:

Sorted in-link count algorithm is simple to implemented, especially when the network are increasing fast or the structure of network are feasible. For instance, when even just one new page creates and points to the current pages, we could get the new sorted in-link count easily. On the contrast, we need get the PageRank from the first iteration again. In other words, it's much simpler to guarantee the fresh of in-link count than PageRank.

To a certain extent, sorted in-link count algorithm can provide reliable results. For instance, the sorted in-link count Top20 here actually covers all the importance pages with respect to PageRank Top20.

Moreover, with the help of keywords, in-link count algorithm can provide reliable result as well as PageRank algorithm. We could check the result of G2 below. To conclusion, despite some influence of sink pages (with no out-links), sorted in-link count algorithm works well.

Cons:

In some situation, in-link count algorithm can be easily cheated by users. For instance, if user creates many pages link to one page, the target one must get very high rank. This kind of link spam can easily decrease the confidence of our result.

Meanwhile, sorted in-link count algorithm can't handle sink links. Damping factor in PageRank algorithm concerns the probability that user stop click links and stop there. With its help, sink links will not decrease the confidence of our result.

G1 Sorted by In-link Top 20	G1 PageRank Top 20
International_Standard_Book_Number 733	Digital_object_identifier 0.054033008963511174
Digital_object_identifier 731	International_Standard_Book_Number 0.046879925533941255
Carbon_dioxide 520	International_Standard_Serial_Number 0.033050684489762464
PubMed_Identifier 454	PubMed_Identifier 0.02892004786171314
Bibcode 348	National_Diet_Library 0.020999677213647233
International_Standard_Serial_Number 339	Bibcode 0.019664169877389132
Hydrogen 307	PubMed_Central 0.01823864379534081
Carbon 296	OCLC 0.012789128057859787
Sustainable_development 294	DMOZ 0.009280266826269944
PubMed_Central 293	Nature_(journal) 0.008966072407433077

Oxygen 292	Carbon_dioxide 0.006335303916077451
Nitrogen 291	Science_(journal) 0.005834523346347488
Renewable_energy 271	Oxygen 0.004246441074059934
Climate_change_mitigation 268	Hydrogen 0.0038448647741861357
Climate_change 267	JSTOR 0.003458860981951121
Global_warming 267	Climate_change 0.0033297690072907247
Emissions_trading 263	Carbon 0.0032733941551544234
Efficient_energy_use 252	Global_warming 0.003271053380886693
Sulfur 247	Nitrogen 0.003228605731519224
National_Diet_Library 245	Water 0.0027700303175760676

Task 3 For G2

3.1

1. For Top 50, the document Id are similar in all d values because the relative values between each other are stable. Moreover, since G2 concerns keyword, the top rank is more stable than G1.
2. The variance of PageRank value is increasing when d from 0.5 to 0.85. With higher damping factor, the rank top pages hold more value, and rank low pages hold less values. In other words, an active user that glad to constantly click links will make top pages more important and low pages less important than lazy user.
3. When d down from 8.5 to 0.5, all the sorted PageRank values simultaneously declined. Since the damping factor represents the probability that users click the link on current page that points to another page and PageRank value represents the quality of page, the larger d settings give the higher probability that users will click the link, which will obviously create higher PageRank value for the link.

d = 0.85 Top 50	d = 0.65 Top 50	d = 0.5 Top 50
Green_politics 0.029425709752798918	Green_politics 0.02473438210543311	Green_politics 0.020647121575580123
Environmentalism 0.02775180664576244	Environmentalism 0.02323831893053193	Environmentalism 0.01929197805204901
Global_Greens 0.019159638036503644	Global_Greens 0.014979079632392095	Global_Greens 0.012277703369722674
Green_party 0.0150602984829461	Green_anarchism 0.01306940575844818	Green_anarchism 0.011532401856330603
Green_Party_of_Canada 0.014997768973710348	Green_party 0.012545250743479626	Green_party 0.010759686702510885
Green_anarchism 0.014775624686141324	Green_Party_of_Canada 0.011544358641150256	Green 0.010333979840119486
Federation_of_the_Green_Parties_of_the_Americas 0.014260665284594819	Federation_of_the_Green_Parties_of_the_Americas 0.01146774435185745	Natural_environment 0.009709796194390132
Federation_of_Green_Parties_of_Africa 0.013911095096659519	Green 0.011295703429046138	Federation_of_the_Green_Parties_of_the_Americas 0.00961385219315629
Bright_green_environmentalism 0.012881749772544996	Federation_of_Green_Parties_of_Africa 0.011131168461616969	Green_Party_of_Canada 0.009593378852793622
Green_Party_(Ireland) 0.012130881068164331	Natural_environment 0.010947906399848103	Federation_of_Green_Parties_of_Africa 0.009361555892374893
Natural_environment 0.012048072521783209	Bright_green_environmentalism 0.010698017462448544	Bright_green_environmentalism 0.0090786546811858

Green_liberalism 0.011501626504368952	Green_Party_(Ireland) 0.009490658179719056	Carbon_footprint 0.008192935440597845
Green_Party_in_Northern_Ireland 0.011454490129781926	Green_liberalism 0.009340248222814486	Green_Party_(Ireland) 0.008025696296765854
Outline_of_green_politics 0.011337363581252214	Green_Party_in_Northern_Ireland 0.009147008776606657	Green_liberalism 0.007973692000243837
Green_Italy 0.011292390193743418	Outline_of_green_politics 0.009034758785279555	Green_Party_in_Northern_Ireland 0.00784842052698731
Green 0.011181356405235661	Green_conservatism 0.008964493910344738	Outline_of_green_politics 0.007630539722972829
Green_conservatism 0.011176143686063846	Carbon_footprint 0.008887914666310871	Green_conservatism 0.007604932386595555
Green_Zionism 0.011001980608670218	Green_Zionism 0.008857170962974982	Green_Zionism 0.007534647392256995
Green_libertarianism 0.010961122306870201	Green_libertarianism 0.008815586553050007	Green_libertarianism 0.007495357779281727
Green_left 0.010882704013593753	Green_left 0.008766695454310493	Green_left 0.007463050450248948
Green_Party_of_England_and_Wales 0.009068940476809588	Green_Italy 0.008753357006149643	Green_Italy 0.007432500482621313
Carbon_footprint 0.00890967122104094	Green_Party_of_England_and_Wales 0.007562405026250562	Green_Party_of_England_and_Wales 0.006701940414946479
Green_belt_(United_Kingdom) 0.008570916192977961	Scottish_Green_Party 0.006978005048220704	Green_Party_of_the_United_States 0.0063015247591406325
Scottish_Green_Party 0.00818765475225321	Green_Party_of_the_United_States 0.006920970154451219	Scottish_Green_Party 0.006289759652570934

Green_Party_of_the_United_States 0.007839338527894143	Environmental_technology 0.006901254475124426	Environmental_technology 0.006103873643382925
Environmental_technology 0.007804562281562837	Green_belt_(United_Kingdom) 0.006502977068528617	Wales_Green_Party 0.005868108750636587
Green_belt 0.0075857618610835845	Wales_Green_Party 0.006447491113093795	Green_belt_(United_Kingdom) 0.00569677843557897
Wales_Green_Party 0.007506992229787372	Green_belt 0.006213581610970416	Green_Party_of_Switzerland 0.005631085572999286
Latvian_Green_Party 0.007163732560193576	Green_Party_of_Switzerland 0.006128904875371473	Green_belt 0.005532609415281896
Green_Party_of_Switzerland 0.007071330314828886	Latvian_Green_Party 0.006003558395384032	Latvian_Green_Party 0.005421645010988915
Green_Party_(Brazil) 0.006960697520005001	Green_Party_(Brazil) 0.005866143789242969	Shades_of_green 0.005336889518392917
Ecologist_Green_Party_of_Mexico 0.006929987206144407	Ecologist_Green_Party_of_Mexico 0.005834428070037544	Green_Party_(Brazil) 0.005323445467375533
Green_Party_of_Aotearoa_New_Zealand 0.006768767310956042	Green_Party_(Sweden) 0.005767403743227238	Ecologist_Green_Party_of_Mexico 0.005293861914324088
Green_Party_(Sweden) 0.006736619254169761	Green_Party_of_Aotearoa_New_Zealand 0.0057641631951027275	Green_Party_(Sweden) 0.005286542454705028
The_Greens_%E2%80%93_The_Green_Alternative 0.0067241604230914055	The_Greens_%E2%80%93_The_Green_Alternative 0.005749289974111079	Green_Party_of_Aotearoa_New_Zealand 0.0052682545779468145

Green_League 0.006719107339890904	Green_League 0.005745969561818084	The_Greens_%E2%80%93_The_ Green_Alternative 0.005267603968041321
Green_Party_(Czech_Republic) 0.006672650825103864	Green_Party_(Czech_Republic) 0.00570135352683148	Green_League 0.0052653405918223995
Green_Party_Taiwan 0.006672650825103864	Green_Party_Taiwan 0.00570135352683148	Green_Party_(Czech_Republic) 0.005223984102071169
Green_Party_of_Pakistan 0.0066693278597377646	Green_Party_of_Pakistan 0.005699174525796192	Green_Party_Taiwan 0.005223984102071169
Metropolitan_Green_Belt 0.006602168590821251	European_Federation_of_Gree n_Parties 0.005617636064706475	Green_Party_of_Pakistan 0.005222444259032852
Green_Party_(Norway) 0.006467982534815826	Green_Party_(Norway) 0.005562867996492227	European_Federation_of_Green _Parties 0.005204575811603323
Green_Alternative_Ecologist_P arty_of_Peru 0.006466344248200431	Mongolian_Green_Party 0.0055617866316930685	Green_Party_(Norway) 0.005125027797993552
Mongolian_Green_Party 0.0064663442482004296	Green_Alternative_Ecologist_P arty_of_Peru 0.005561786631693067	Mongolian_Green_Party 0.005124259437824917
European_Federation_of_Gree n_Parties 0.006453974228978164	Green_Party_of_Albania 0.005551567569938222	Green_Alternative_Ecologist_Par ty_of_Peru 0.005124259437824917
Green_Party_of_Albania 0.006450871715635837	Green_Party_(Romania) 0.005551567569938222	European_United_Left%E2%80% 93Nordic_Green_Left 0.005117852955220661

Green_Party_(Romania) 0.006450871715635837	Green_Party_of_Bulgaria 0.005551567569938222	Green_Party_of_Albania 0.005116994941353701
Green_Party_of_Bulgaria 0.006450871715635837	Green_Party_(Slovakia) 0.005551567569938222	Green_Party_of_Bulgaria 0.005116994941353701
Green_Party_(Slovakia) 0.006450871715635836	Democratic_Green_Party_of_R wanda 0.005550053877818012	Green_Party_(Slovakia) 0.005116994941353701
Democratic_Green_Party_of_R wanda 0.0064485813202875275	Green_Party_of_Malaysia 0.005478324693193283	Green_Party_(Romania) 0.0051169949413537
Green_Party_of_Malaysia 0.006303178094247712	Green_Party_of_South_Africa 0.005355537008807034	Democratic_Green_Party_of_Rw anda 0.005115918372882485

3.2

The order of PageRank can be mostly fixed even just in 4 iterations. The higher PageRank value, the more stable relative position is. For instance, the top10 rank are the same both in 4 iterations and final converge. From rank 10 to 20, the position of each page just changes a little bit, just up or drop one rank position.

The PageRank values of converge Top50 at beginning are significantly higher than them of 4 iterations Top50. Meanwhile, the values at the end of converge list are lower than them of 4 iterations list. This show that during the converging process, more vales are distributed to the important pages, or top ones, from less important pages, or low rank.

G2 PageRank Converge Top50	G2 4 iteration Top50
Green_politics 0.029425709752798918	Green_politics 0.02957771278687562
Environmentalism 0.02775180664576244	Environmentalism 0.028402596229969043
Global_Greens 0.019159638036503644	Global_Greens 0.018745227165404
Green_party 0.0150602984829461	Green_party 0.014799757136658372

Green_Party_of_Canada 0.014997768973710348	Green_anarchism 0.014682972648272574
Green_anarchism 0.014775624686141324	Green_Party_of_Canada 0.014380061015683263
Federation_of_the_Green_Parties_of_the_Americas 0.014260665284594819	Federation_of_the_Green_Parties_of_the_Americas 0.014063208012732063
Federation_of_Green_Parties_of_Africa 0.013911095096659519	Federation_of_Green_Parties_of_Africa 0.013672164991753647
Bright_green_environmentalism 0.012881749772544996	Bright_green_environmentalism 0.01301766959810559
Green_Party_(Ireland) 0.012130881068164331	Natural_environment 0.012356196239720561
Natural_environment 0.012048072521783209	Green 0.011969381859262806
Green_liberalism 0.011501626504368952	Green_Party_(Ireland) 0.01170428087136651
Green_Party_in_Northern_Ireland 0.011454490129781926	Green_liberalism 0.011347277649176167
Outline_of_green_politics 0.011337363581252214	Outline_of_green_politics 0.011187787938788498
Green_Italy 0.011292390193743418	Green_Party_in_Northern_Ireland 0.011054314216161421
Green 0.011181356405235661	Green_conservatism 0.011026316655685537
Green_conservatism 0.011176143686063846	Green_Zionism 0.01085467387121405
Green_Zionism 0.011001980608670218	Green_libertarianism 0.010817116018437233
Green_libertarianism 0.010961122306870201	Green_Italy 0.010814745047393808
Green_left 0.010882704013593753	Green_left 0.010739716624687642
Green_Party_of_England_and_Wales 0.009068940476809588	Carbon_footprint 0.009481279084424386

Carbon_footprint 0.00890967122104094	Green_Party_of_England_and_Wales 0.00880987495856594
Green_belt_(United_Kingdom) 0.008570916192977961	Environmental_technology 0.008018850676009697
Scottish_Green_Party 0.00818765475225321	Scottish_Green_Party 0.00795061648222705
Green_Party_of_the_United_States 0.007839338527894143	Green_belt_(United_Kingdom) 0.007884764682544338
Environmental_technology 0.007804562281562837	Green_Party_of_the_United_States 0.0076920156829866915
Green_belt 0.0075857618610835845	Wales_Green_Party 0.007283275685456063
Wales_Green_Party 0.007506992229787372	Green_belt 0.007274625989533716
Latvian_Green_Party 0.007163732560193576	Latvian_Green_Party 0.006968277003277662
Green_Party_of_Switzerland 0.007071330314828886	Green_Party_of_Switzerland 0.006875065837037877
Green_Party_(Brazil) 0.006960697520005001	Green_Party_(Brazil) 0.0067678994523899996
Ecologist_Green_Party_of_Mexico 0.006929987206144407	Ecologist_Green_Party_of_Mexico 0.006737949089768717
Green_Party_of_Aotearoa_New_Zealand 0.006768767310956042	Green_Party_of_Aotearoa_New_Zealand 0.006576477806665757
Green_Party_(Sweden) 0.006736619254169761	Green_Party_(Sweden) 0.006541104412445176
The_Greens_%E2%80%93_The_Green_Alternative 0.0067241604230914055	The_Greens_%E2%80%93_The_Green_Alternative 0.0065287375883735345
Green_League 0.006719107339890904	Green_League 0.006523858051745984
Green_Party_(Czech_Republic) 0.006672650825103864	Green_Party_(Czech_Republic) 0.006484303646631294

Green_Party_Taiwan 0.006672650825103864	Green_Party_Taiwan 0.006484303646631294
Green_Party_of_Pakistan 0.0066693278597377646	Green_Party_of_Pakistan 0.006481116121967904
Metropolitan_Green_Belt 0.006602168590821251	Green_Party_(Norway) 0.006282359422287235
Green_Party_(Norway) 0.006467982534815826	Mongolian_Green_Party 0.006280788384764092
Green_Alternative_Ecologist_Party_of_Peru 0.006466344248200431	Green_Alternative_Ecologist_Party_of_Peru 0.006280788384764092
Mongolian_Green_Party 0.0064663442482004296	Green_chemistry 0.006278078016093192
European_Federation_of_Green_Parties 0.006453974228978164	European_Federation_of_Green_Parties 0.006270851598567253
Green_Party_of_Albania 0.006450871715635837	Green_Party_of_Albania 0.006265950227868176
Green_Party_(Romania) 0.006450871715635837	Green_Party_(Romania) 0.006265950227868176
Green_Party_of_Bulgaria 0.006450871715635837	Green_Party_of_Bulgaria 0.006265950227868176
Green_Party_(Slovakia) 0.006450871715635836	Green_Party_(Slovakia) 0.006265950227868176
Democratic_Green_Party_of_Rwanda 0.0064485813202875275	Democratic_Green_Party_of_Rwanda 0.00626375362435096
Green_Party_of_Malaysia 0.006303178094247712	Green_Party_of_Malaysia 0.0061246592955508

3.3

The statement here are same as G1.

G2 Sorted by In-link Top 20	G2 PageRank Top 20
Green_politics 126	Green_politics 0.029425709752798918
Global_Greens 114	Environmentalism 0.02775180664576244
Federation_of_the_Green_Parties_of_the_Americas 105	Global_Greens 0.019159638036503644
Federation_of_Green_Parties_of_Africa 101	Green_party 0.0150602984829461
Green_party 101	Green_Party_of_Canada 0.014997768973710348
Environmentalism 94	Green_anarchism 0.014775624686141324
Green_Party_of_Canada 93	Federation_of_the_Green_Parties_of_the_Americas 0.014260665284594819
Bright_green_environmentalism 91	Federation_of_Green_Parties_of_Africa 0.013911095096659519
Green_Party_of_England_and_Wales 85	Bright_green_environmentalism 0.012881749772544996
Green_Party_(Ireland) 85	Green_Party_(Ireland) 0.012130881068164331
Green_Party_in_Northern_Ireland 82	Natural_environment 0.012048072521783209
Scottish_Green_Party 81	Green_liberalism 0.011501626504368952
Green_Party_of_the_United_States 80	Green_Party_in_Northern_Ireland 0.011454490129781926
Green_anarchism 80	Outline_of_green_politics 0.011337363581252214
Wales_Green_Party 77	Green_Italy 0.011292390193743418

Green_conservatism 76	Green 0.011181356405235661
Green_Zionism 76	Green_conservatism 0.011176143686063846
Green_liberalism 76	Green_Zionism 0.011001980608670218
European_Federation_of_Green_Parties 75	Green_libertarianism 0.010961122306870201
Latvian_Green_Party 75	Green_left 0.010882704013593753