# PROJECT PERIODIC REPORT

**Grant Agreement number: 288956**

**Project acronym: NADINE**

**Project title: New tools and Algorithms for Directed Network analysis**

**Funding Scheme: Small or medium-scale focused research project (STREP)**

**Periodic report:** **1st 2nd X**

**Period covered:** **from 1.11.2013 to 30.04.2015**

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It is based on milestones M10 with deliverable publications (WP1.4)

[17] P2.5 L.Ostroumova, K.Avrachenkov, N.Litvak, **"Quick detection of popular entities in large directed networks"**, preprint submitted to Computer Science Conference, Oct 2013 [reported in period 1]

[49] P2.12 N.Litvak and S.Vigna, **"Introduction to Special Issue on Searching and Mining the Web and Social Networks"**, Internet Mathematics, v.10(3-4), p.219-221 (2014)

[50] P2.13 K.Avrachenkov, N.Litvak, L.Ostroumova-Prokhorenkova and E.Suyargulova, **"Quick detection of high-degree entities in large directed networks"**, IEEE International Conference on Data Mining (ICDM 2014), 14-17 Dec 2014, Shenzhen, China. pp. 20-29. IEEE Computer Society (2014) (arXiv:1410.0571v2[cs.SI])

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**NADINE DELIVERABLE D2.2.**

It is based on milestones M6 (WP2.3), M11 (WP2.4) with deliverable publications:

[12] P1.12 K.M.Frahm, Y.-H.Eom and D.L. Shepelyansky, **"Google matrix of the citation network of Physical Review"**, submitted to Phys. Rev. E Oct 21, 2013 (arXiv:1310.5624 [physics.soc-ph], 2013); published Phys. Rev. E v.89, p.052814 (2014) [M6-WP2.3]

[reported in period 1]

[35] P1.15 L.Ermann, K.M.Frahm and D.L.Shepelyansky, **"Google matrix analysis of directed networks"**, submitted to Rev. Mod. Phys. (2014) (arXiv:1409.0428[physics.soc-ph]) [M6-WP2.3; M11-WP2.4]

[40] P1.20 O.V.Zhirov and D.L.Shepelyansky, **"Anderson transition for Google matrix eigenstates"**, Ann. der Physik (Berlin) DOI 10.1002/andp.201500110 (2015) (arXiv:1501.03371[q-fin.ST]) [M11-WP2.4]

**NADINE DELIVERABLE D3.2.**

It is based on milestones M5* [WP3.1,WP3.2] (promised to be finished), M12 [WP3.3, WP3.4] with deliverable publications:

[41] P1.21 Young-Ho Eom and D.L.Shepelyansky, **"Opinion formation driven by PageRank node influence on directed networks"**, submitted to Physica A Feb (2015) (arXiv:1502.02567[physics.soc-ph]) [M12-WP3.3,WP3.4]

[53] P3.9 R.Palovics, F. Ayala-Gomez, B. Csikota, B.Daroczy, L. Kocsis, D. Spadacene, A.A. Benczur, **"RecSys Challenge 2014: an ensemble of binary classifiers and matrix factorization"**, Proceedings of the 2014 Recommender Systems Challenge (p. 13) ACM (2014) [M12-WP3.3,WP3.4]

[54] P3.10 Andrea N. Ban, Levente Kocsis, Robert Palovics, **"Peer-to-peer Online Collaborative Filtering"**, preprint (2015) [M12-WP3.3,WP3.4]

[60] P3.16 Robert Palovics, Balint Daroczym Andras A. Benczur, Julia Pap, Leonardo Ermann, Samuel Phan, Alexei D. Chepelianskii, Dima L. Shepelyansky, , **"Statistical analysis of NOMAO customer votes for spots of France"**, preprint arXiv (2015) [M12-WP3.3,WP3.4]

[61] P3.17 Robert Palovics, Ferenc Beres, Nelly Litvak, Frederick Ayala-Gomez and Andras A. Benczur, **"Centrality prediction in temporally evolving networks"**, preprint arXiv (2015) [M12-WP3.3,WP3.4]

*[71] P4.18 Paolo Boldi, Corrado Monti, Massimo Santini, and Sebastiano Vigna, **"Liquid FM: Recommending Music through Viscous Democracy"**, submitted to CoRR (2015) (arXiv:1503.08604[cs.SI], 2015) [M12-WP3.3,WP3.4] **AND [M5-WP3.1-WP3.2 promised to be finished in report; the software is open and available herehttps://github.com/corradomonti/fbvoting ]**

[72] P4.19 Paolo Boldi and Corrado Monti, "LlamaFur: Learning Latent Category Matrix

to Find Unexpected Relations in Wikipedia", submitted to CoRR (2015) [M12-WP3.3,WP3.4]

**NADINE DELIVERABLE D4.2.**

It is based on milestones M7(WP4.1-WP5.2), M8(WP4.4), M13(WP4.3) with deliverable publications:

[2] P1.2 L.Ermann and D.L. Shepelyansky **"Ecological analysis of world trade"**, Phys. Lett. A v.377, p.250 (2013) (arXiv:1201.3584[q-fin.GN], 2012) [M8-WP4.4 – reported in period 1]

[33] P1.13 V.Kandiah and D.L.Shepelyansky, **"Google matrix analysis of C.elegans neural network"**, Phys. Lett. A v.378, p.1932 (2014) (arXiv:1311.2013[physics.soc-ph]) [M13-WP4.3]

[34] P1.14 K.M.Frahm and D.L.Shepelyansky, **"Poisson statistics of PageRank probabilities of Twitter and Wikipedia networks"**, Eur. Phys. J. B v.87, p. 93 (2014) (arXiv:1402.5839[physics.soc-ph]) [M13-WP4.3]

[35] P1.15 L.Ermann, K.M.Frahm and D.L.Shepelyansky, **"Google matrix analysis of directed networks"**, submitted to Rev. Mod. Phys. (2014) (arXiv:1409.0428[physics.soc-ph]) [M8-WP4.4, M13-WP4.3]

[36 ] P1.16 Young-Ho Eom and Hong-Hyun Jo, **"Generalized friendship paradox in complex networks: the case of scientific collaboration"**, Scientific Reports v.4, p.4603 (2014) [M13-WP4.3]

[37] P1.17 Hong-Hyun Jo and Young-Ho Eom, **"Generalized friendship paradox in networks with tunable degree-attribute correlation"**, Phys. Rev. E v.90, p.022809 (20124) [M13-WP4.3]

[38] P1.18 V.Kandiah, B.Georgeot and O.Giraud, **"More ordering and communities in complex networks describing the game of go"**, Eur. Phys. J. B v.87, p.246 (20124) [M13-WP4.3]

[39] P1.19 L.Ermann and D.L.Shepelyansky, **"Google matrix analysis of the multiproduct world trade network"**, Eur.Phys. J. B v.88, p.84 (2015) (arXiv:1502.00584[cond-mat.dis-nn]) [M8-WP4.4]

[42] P1.22 V.Kandiah, H.Escaith and D.L.Shepelyansky, **"Google matrix of the world network of economic activities"**, submitted to Eur. Phys. J. B April (2015) (arXiv:1504.XXXX[q-fin.ST] [M8-WP4.4]

[43] P1.23 D.L.Shepelyansky and other Wikipedia authors, **"Top 100 historical figures of Wikipedia"**, Wikipedia article (2014) [M13-WP4.3]

[44] P2.7 P. van der Hoorn and N. Litvak, **"Convergence of rank based degree-degree correlations in random directed networks"**, to appear in Moscow Journal of Combinatorics (2015) (arXiv:1407.7662[math.PR], 2014) [M13-WP4.3]

[45] P2.8 P. van der Hoorn and N. Litvak, **"Phase transitions for scaling of structural correlations in directed networks"**, (arXiv:1504.01535[physics.soc-ph], 2015 [M13-WP4.3]

[46] P2.9 M. Ten Thij, T. Ouboter, D. Worm, N. Litvak, J.L. van den Berg and S. Bhulai, **Modelling of trends in Twitter using retweet graph dynamics**, Proceedings 11th International Workshop Algorithms and Models for the Web Graph, WAW 2014, 17-18 Dec 2014, Beijing, China. pp. 132-147; Lecture Notes in Computer Science 2014 (8882), Springer (2014), (arXiv:1502.00166[cs.SI], 2015) [M13-WP4.3]

[62] P4.9 Robert Meusel, Sebastiano Vigna, Oliver Lehmberg, and Christian Bizer, **"Graph structure in the web - Revisited, or a trick of the heavy-tail"**, WWW'14 Companion, pp.427-432, International World Wide Web Conferences Steering Committee, 2014; a revised version is to appear in the Journal of Web Science (2015) [M13-WP4.3]

[63] P4.10 Djamal Belazzougui, Paolo Boldi, Giuseppe Ottaviano, Rossano Venturini, and Sebastiano Vigna, **"Cache-oblivious peeling of random hypergraphs"**, 2014 Data Compression Conference (DCC 2014), IEEE pp.352-361. (2014) [M7-WP4.1]

[64] P4.11 Paolo Boldi, Irene Crimaldi, and Corrado Monti, "**A network model characterized by a latent attribute structure with competition**", submitted CoRR (2014), (arXiv:1407.7729[cs.SI], 2014 [M7-WP4.1]

[65] P4.12 Roi Blanco, Paolo Boldi, and Andrea Marino, "E**ntity-linking via graph-distance minimization"**, Proceedings 3rd Workshop on GRAPH Inspection and Traversal Engineering, GRAPHITE 2014, Grenoble, France, 5th April 2014., pp.30-43 (2014) [M7-WP4.1]

[69] P4.16 Young Ho Eom, Pablo Aragon, David Laniado, Andreas Kaltenbrunner, Sebastiano Vigna, and Dima L. Shepelyansky, **"Interactions of cultures and top people of Wikipedia from ranking of 24 language editions"**, PLoS ONE v.10(3), p.e0114825 (2015) (arXiv:1405.7183[cs.SI], 2014) [M13-WP4.3-WP5.2]

[70] P4.17 Sebastiano Vigna, **"A weighted correlation index for rankings with ties"**, Proceedings of the 24th international conference on World Wide Web, ACM (2015) (arXiv:1404.3325[cs.SI], 2014) [M13-WP4.3-WP5.2]

[73] P4.20 Michele Trevisio, Luca Maria Aiello, Paolo Boldi and Roi Blanco, **"Local Ranking Problem on the BrowseGraph"**, accepted for publication in SIGIR (2015)

[M13-WP4.3-WP5.2]

**NADINE DELIVERABLE D5.2.**

It is based on milestones M7[WP4.1-WP5.2], M9[WP5.1], M14[WP5.3] with deliverable publications:

[47] P2.10 N.Chen, N.Litvak and M.Olvera-Cravioto, **"PageRank in scale-free random graphs"**, Proceedings 11th International Workshop Algorithms and Models for the Web Graph, WAW 2014, 17-18 Dec 2014, Beijing, China pp. 120-131, Lecture Notes in Computer Science 2014 (8882), Springer (2014). (arXiv:1408.3610[math.PR], 2014 [M7-WP5.2]

[48] P2.11 N.Chen, N.Litvak and M.Olvera-Cravioto, **"Ranking algorithms on directed configuration networks"**, Submitted to Random Structures and Algorithms (2014) (arXiv:1409.7443v2[math.PR], 2014) [M7-WP5.2]

[51] P3.7 Marton Balassi, Robert Palovics and Andras A. Benczur, **"Distributed Frameworks for Alternating Least Squares (Poster presentation)"**, Large-Scale Recommender Systems in conjunction with RecSys, Foster City, Silicon Valley, USA, 6th-10th October 2014 [M7-WP5.2]

[52] P3.8 Balint Daroczy, Krisztian Buza, Andras A. Benczur, **"Similarity Kernel Learning"**, preprint (2015) [M7-WP5.2]

[55] P3.11 R.Palovics, A.A.Benczur, L.Kocsis, T.Kiss, E.Frigo, **"Exploiting temporal influence in online recommendation"**, Proceedings of the 8th ACM Conference on Recommender systems (pp. 273-280), ACM (2015) [M14-WP5.3]

[56] P3.12 Balint Daroczy, David Siklosi, Robert Palovics, Andras A. Benczur, **"Text Classification Kernels for Quality Prediction over the C3 Data Set"**, preprint, WebQuality 2015 in conjunction with WWW 2015 [M14-WP5.3]

[57] P3.13 Frederick Ayala, Robert Palovics, Andras A. Benczur, **"Temporally Evolving Models for Dynamic Networks"**, accepted poster presentation at the International Conference on Computational Social Science, Helsinki, June 2015 [M14-WP5.3]

[58] P3.14 Balint Daroczy, Robert Palovics, Vilmos Wieszner, Richard Farkas, Andras A. Benczur, **"Temporal Twitter prediction by content and network"**, preprint (2015) [M14-WP5.3]

[59] P3.15 Robert Palovics, Andras A. Benczur, **"Modeling Community Growth: densifying graphs or sparsifying subgraphs? "**, preprint (2015) [M14-WP5.3]

[66] P4.13 Sebastiano Vigna, "**Supremum-norm convergence for step-asynchronous successive overrelaxation on M-matrices**", submitted to CoRR (2014) (arXiv:1404.3327[cs.DS], 2014) [M7-WP5.2]

[67] P4.14 Sebastiano Vigna, "**An experimental exploration of Marsaglia's xorshift generators, scrambled**", submitted to CoRR (2014) (arXiv:1402.6246v2[cs.DS], 2014)

[M7-WP5.2]

[68] P4.15 Sebastiano Vigna, "**Further scramblings of Marsaglia's xorshift generators**", submitted to CoRR (2014) (arXiv:1403.0930[cs.NI], 2014) [M7-WP5.2]

[69] P4.16 Young Ho Eom, Pablo Aragon, David Laniado, Andreas Kaltenbrunner, Sebastiano Vigna, and Dima L. Shepelyansky, **"Interactions of cultures and top people of Wikipedia from ranking of 24 language editions"**, PLoS ONE v.10(3), p.e0114825 (2015) (arXiv:1405.7183[cs.SI], 2014) [M13-WP4.3-WP5.2]

[70] P4.17 Sebastiano Vigna, **"A weighted correlation index for rankings with ties"**, Proceedings of the 24th international conference on World Wide Web, ACM (2015) (arXiv:1404.3325[cs.SI], 2014) [M13-WP4.3-WP5.2]

[73] P4.20 Michele Trevisio, Luca Maria Aiello, Paolo Boldi and Roi Blanco, **"Local Ranking Problem on the BrowseGraph"**, accepted for publication in SIGIR (2015) [M13-WP4.3-WP5.2]