

Helsinki Institute for Information Technology HIIT

Facts and Figures 2015

Appendix to the Annual Report

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www.hiit.fi



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Kumpula Site

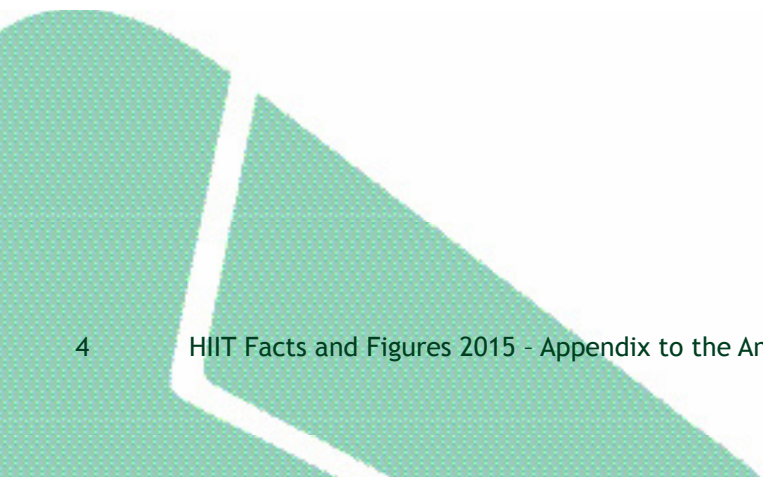
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A. Teaching

Courses given by HIIT researchers at participating departments at Aalto University and University of Helsinki

Spring Term 2015

- Advanced Course in Algorithms, Petteri Kaski, Aalto
- Advanced Course in Computational Logic, Tomi Janhunen, Aalto
- Algorithms in Molecular Biology, Veli Mäkinen, UH
- Approximation Algorithms, Mikko Koivisto, UH
- Artificial intelligence, Jussi Rintanen, Aalto
- Bayesilainen mallintaminen, Aki Vehtari, Aalto
- Bayesian theory with applications, Jukka Corander, UH
- Big Data Frameworks, Sasu Tarkoma, Mohammad Hoque, Ella Peltonen UH
- Biological Sequence Analysis (guided self study), Veli Mäkinen, UH
- Data Compression Techniques, Simon Puglisi, UH
- Data Mining (guided self study), Hannu Toivonen, UH
- Data Mining Project (guided self study), Hannu Toivonen, UH
- Discrete Models and Search, Emilia Oikarinen, Aalto
- Distributed Systems Project, Jussi Kangasharju, UH
- Energy-efficient Mobile Computing, Yu Xiao, Aalto
- Information Retrieval, Tuukka Ruotsalo, Aalto
- Information visualization, Pekka Marttinen, Luana Micallef, Aalto
- Interactive Systems, Salvatore Andolina, UH
- Internet and Computing Forum, Antti Ylä-Jääski, Aalto
- Johdatus ohjelmointiin yhteiskuntatieteissä, Matti Nelimarkka, UH
- Johdatus tietoliikenteeseen ja multimediatekniikkaan, Antti Ylä-jääski, Aalto
- Laboratory Works in Networking and Security, Andrey Lukyanenko, Aalto
- Machine Learning: Advanced Probabilistic Methods, Pekka Marttinen, Aalto
- Methodology for Research on Information and Communication Technology and Social Interaction, Niklas Ravaja, UH
- Mobile Sensing, Petteri Nurmi, UH
- Ohjelmistotekniikan erikoistyö, Keijo Heljanko, Aalto
- Ohjelmointi 2, Petteri Kaski, Aalto
- Overlay and P2P Networks, Sasu Tarkoma, UH
- PhD Student Seminar, Petri Myllymäki, UH
- Programming Parallel Computers, Jukka Suomela, Aalto
- Project in Algorithms in Molecular Biology, Leena Salmela, UH
- Project in Biological Sequence Analysis, Daniel Valenzuela, UH
- Project in Data Compression, Simon Puglisi, UH
- Project in Probabilistic Models, Petri Myllymäki, UH
- Satisfiability, Boolean Modeling and Computation, Matti Järvisalo, UH
- Seminar: Hot Topics in IETF, Jussi Kangasharju, UH
- Seminar on Analysis and Assembly of Big Bioinformatics Data, Esko Ukkonen, UH
- Seminar on Computational Creativity, Hannu Toivonen, Ping Xiao, Anna Kantosalo, UH
- Seminar on Educational Data Mining and Learning Analytics, Hannu Toivonen, UH
- Soveltavan matematiikan pääaine, Jukka Corander, UH
- Special Assignment in Networking and Security, Keijo Heljanko, Aalto
- Special Course in Bioinformatics II, Juho Rousu, Aalto

- Special Course in Computer and Information Science II, Aristides Gionis, Aalto
- Special Course in Computer and Information Science III, Jaakko Hollmén, Aalto
- Special Course in Computer and Information Science VI, Manuel Eugster, Aalto
- Special Course in Computer and Information Science with Varying Content, Paul Blomstedt, Aalto
- Special Course in Computer and Information Science with Varying Content, Mrinal Das, Aalto
- Special Course in Computer and Information Science with Varying Content, Aristides Gionis, Aalto
- Statistical Natural Language Processing, Juho Rousu, Aalto
- Tietojenkäsittelyteoria, Tommi Juntila, Aalto
- Tietokoneverkot, Matti Siekkinen, Aalto
- Tietoliikenneohjelmistojen erikoiskurssi, Andrei Gurtov, Aalto
- Tietorakenteet ja algoritmit, Patrik Floréen, UH
- Tilastotieteen pääaine, Jukka Corander, UH
- Unsupervised Machine Learning, Aapo Hyvärinen, UH
- Warehouse-Scale Computing, Jussi Kangasharju, UH
- Work Course on Bayesian Analysis, Aki Vehtari, Aalto
- xBayesian Statistics and Decision Analysis (EuroBayes), Jukka Corander, UH
- Computational Creativity Project, Hannu Toivonen, UH
- Computational Genomics, Elena Czeizler, Aalto
- Computer Networks II - Advanced Features, Matti Siekkinen, Aalto
- Concurrent Programming, Keijo Heljanko, Aalto
- Datasta tietoon, Jaakko Hollmén, Aalto
- Design and Analysis of Algorithms, Veli Mäkinen, Alexandru Tomescu, UH
- Distributed Algorithms, Jukka Suomela, Aalto
- Distributed Systems, Jussi Kangasharju, Ossi Karkulahti, UH
- Fragments of Structural and Algorithmic Graph Theory, Alexandru Tomescu, UH
- High-Throughput Bioinformatics, Elena Czeizler, Aalto
- Human-Computer Interaction, Kumaripaba Athukorala, Yi-Ta Hsieh, UH
- Indoor Localization, Petteri Nurmi, UH
- Introduction to Analytics and Data Science, Aristides Gionis, Aalto
- Introduction to Computational Creativity, Hannu Toivonen, UH
- Introduction to programming in Social Science, Matti Nelimarkka, UH
- Kernel Methods in Machine Learning, Juho Rousu, Aalto
- Kilpaohjelmointi, Topi Talvitie, Tuukka Korhonen, UH
- Laskennallisen tekniikan erikoistyö, Aki Vehtari, Aalto
- Learning Markov Random Fields and Models of Statistical Physics from Data, Onur Dikmen, Michael Gutmann, UH
- Linux Fundamentals, Julien Mineraud, Samu Varjonen, UH
- Machine Learning: Basic Principles, Ritabrata Dutta, Aalto
- Machine Learning: Basic Principles, Pekka Marttinen, Aalto
- Markovian modelling and Bayesian learning, Jukka Corander, UH
- Mobile Cloud Computing, Yu Xiao, Aalto

Summer Term 2015

- Johdatus ohjelmointiin yhteiskuntatieteissä, Matti Nelimarkka, UH

Autumn Term 2015

- Algorithmic methods of data mining, Aristide Gionis, Aalto
- Answer Set Programming, Tomi Janhunen, Aalto
- Applications and Services in Internet, Zhonghong Ou, Aalto
- Attitudes and prejudice, Alessio Falco, UH
- Bayesian Data Analysis, Aki Vehtari, Aalto
- Bayesilaisen mallintamisen erikoiskurssi 3, Aki Vehtari, Aalto
- Computational Creativity Project, Hannu Toivonen, UH
- Computational Genomics, Elena Czeizler, Aalto
- Computer Networks II - Advanced Features, Matti Siekkinen, Aalto
- Concurrent Programming, Keijo Heljanko, Aalto
- Datasta tietoon, Jaakko Hollmén, Aalto
- Design and Analysis of Algorithms, Veli Mäkinen, Alexandru Tomescu, UH
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- Mobile Cloud Computing, Yu Xiao, Aalto

- Modelling and Analysis in Bioinformatics, Veli Mäkinen, Leena Salmela, Antti Honkela, UH
- Nonlinear dimensionality reduction, Yang Zhirong, UH
- PhD Student Seminar, Sasu Tarkoma, UH
- Research Project in Computer and Information Science, Aristides Gionis, Aalto
- Robottiohjelmoinnin harjoitustyö, Joel Pyykkö, UH
- Scalable Cloud Computing, Keijo Heljanko, Aalto
- Scientific Writing for MSc in Computer Science, Julien Mineraud, Ashwin Rao, UH
- Seminar: Information-Centric Networks, Jussi Kangasharju, UH
- Seminar: Machine Learning in Computer Vision, Markus Koskela, UH
- Seminar on Combinatorial Pattern Matching, Simon Puglisi, UH
- Seminar on Computational Creativity, Hannu Toivonen, UH
- Seminar on Fairness-aware machine learning, Indre Zliobaite, Aalto
- Seminar on Tractability, Johannes Wallner, Matti Järvisalo, UH
- Seminar: Software-Defined Networking (SDN) and Network Functions Virtualization (NFV), Ashwin Rao, UH
- Software Factory Project (period I), Fabian Fagerholm, UH
- Software Factory Project (period II), Fabian Fagerholm, UH
- Special Course in Computer and Information Science I, Aristides Gionis, Aalto
- Special Course in Computer and Information Science IV, Kerstin Bunte, Aalto
- Tieto- ja viestintäteknologian sosiaalipsykologiaa, Niklas Ravaja, UH
- Tietorakenteet ja algoritmit (ohjattu itseopiskelu), Patrik Floréen, UH
- TVT-ajokortin näyttökoe, Matematiikan ja tilastotieteen pääaineopiskelijat, Minna Vehkala, UH

B. Funding

We first list the funding sources and the distribution of expenses of each site separately. One should note that comparison between different years or between universities is not always straightforward due to different procedures of accounting. In 2015, HIIT operated administratively at University of Helsinki's Kumpula campus (Department of Computer Science and Department of Mathematics and Statistics) and Aalto University's Otaniemi campus (HIIT's own "department" at Open Innovation House, OIH, and Department of Computer Science, CS). In 2016, activities at OIH will be merged with CS at Aalto University.

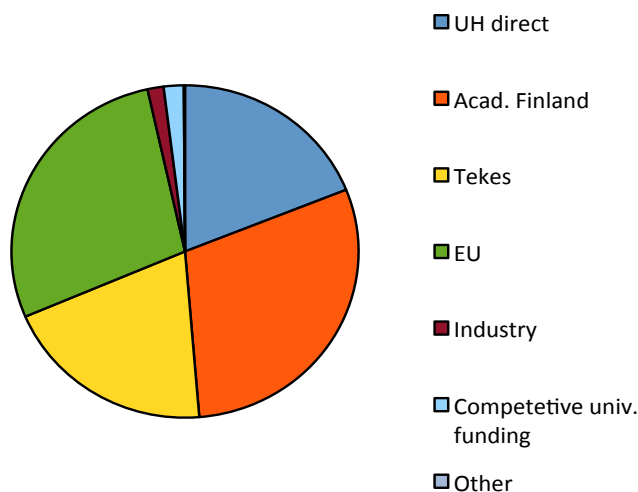
Kumpula's funding figures are shown in Table 1. Direct funding from University of Helsinki (UH) is a bit less than 1 MEur, of which a portion is directly transferred to Aalto University to account for common administrative duties.

Kumpula	2012	2013	2014	2015	%
Total funding	3 792 231	3 879 859	4 290 970	4 334 400	
UH direct funding	810 000	780 000	780 000	821 240	19%
Academy of Finland	1 694 815	1 806 589	1 020 354	1 289 084	30%
National Technology Agency Tekes	342 377	484 742	917 338	862 766	20%
European Union	528 457	325 067	1 107 425	1 210 979	28%
Industry	45 770	0	16 400	64 659	1%
Competitive univ. funding		237 397	449 269	80 816	2%
Other (Foundations, 2012 competitive univ. f.)	370 812	246 064	184	4 857	0%

Total expenses	3 720 441	3 738 007	3 961 395	4 247 727	
Salaries	2 535 348	2 602 229	2 609 278	2 889 940	68%
Other operational expenses	448 765	540 849	650 553	551 656	13%
Service charge to UH (rents included)	736 328	594 928	701 564	806 132	19%

Table 1: Kumpula funding 2012-2015.

Figure 1: Kumpula funding 2015.



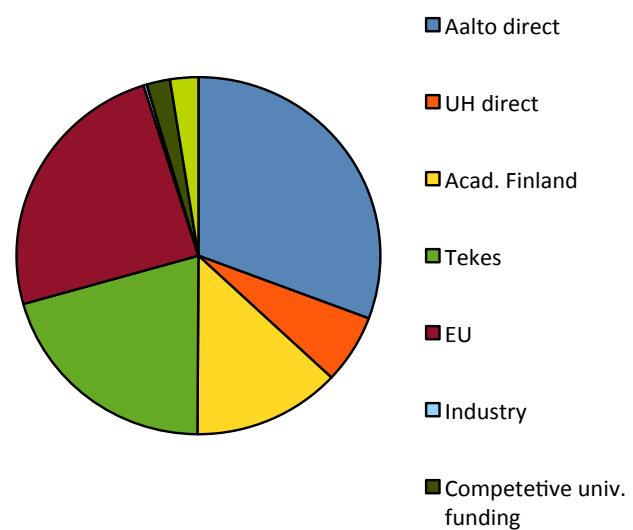
Otaniemi OIH's funding figures are shown in Table 2. HIIT's activities OIH are slightly decreasing.

OIH	2012	2013	2014	2015	%
Total funding	5 976 738	4 882 452	4 065 399	2 694 804	
Aalto direct funding	1 000 000	1 000 000	887 817	827 634	31%
UH direct funding	168 200	168 200	168 200	168 200	6%
Academy of Finland	2 194 628	1 129 727	587 221	353 915	13%
National Technology Agency Tekes	1 135 342	1 191 938	1 208 372	553 788	21%
European Union	519 359	722 156	741 460	659 596	24%
Industry	57 566	25 206	2 275	8 012	0%
Competitive univ. funding	0	233 356	248 357	56 000	2%
Other (Foundations, 2012 competitive univ. f.)	901 642	411 869	221 697	67 659	3%

Total expenses	6 159 939	4 718 032	3 977 803	2 976 962	
Salaries	2 999 485	2 978 904	2 557 426	1 981 379	67%
Other operational expenses	2 310 708	1 079 708	724 290	531 259	18%
Rents	396 274	265 002	322 378	293 714	10%
Service charge to Aalto	453 472	394 418	373 709	170 611	6%

Table 2: OIH funding 2012-2015.

Figure 2: OIH funding 2015.



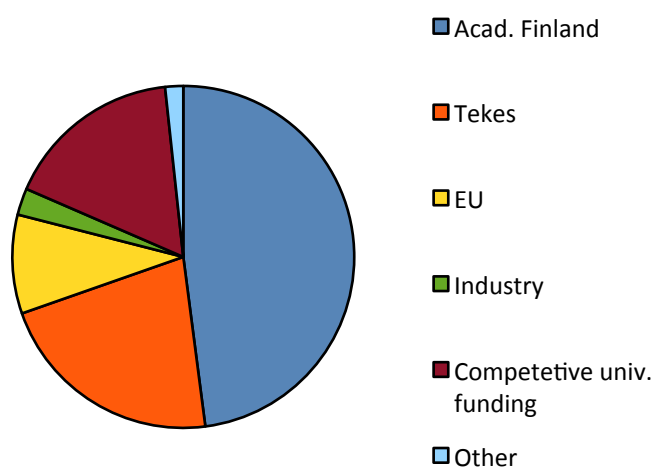
Otaniemi CS department's funding figures are shown in Table 3.

Otaniemi CS dept	2012	2013	2014	2015	%
Total funding	1 713 521	1 266 407	2 101 043	2 054 953	
Academy of Finland	858 812	771 810	1 296 749	985 117	48%
National Technology Agency Tekes	320 361	222 088	272 655	445 920	22%
European Union	72 999	81 071	62 366	192 155	9%
Industry	85 033	0	25 000	51 762	3%
Competitive univ. funding		155 050	320 837	345 000	17%
Other (Foundations, 2012 competitive univ. f.)	376 316	36 388	123 437	35 000	2%

Total expenses	1 637 327	1 117 904	2 016 376	1 725 631	
Salaries	1 070 927	865 979	1 563 122	1 199 999	70%
Other operational expenses	328 914	68 514	144 817	168 326	10%
Service charge to Aalto (rents included)	237 485	183 411	308 438	357 305	21%

Table 3: Otaniemi CS department funding 2012-2015.

Figure 3: Otaniemi CS department funding 2015.

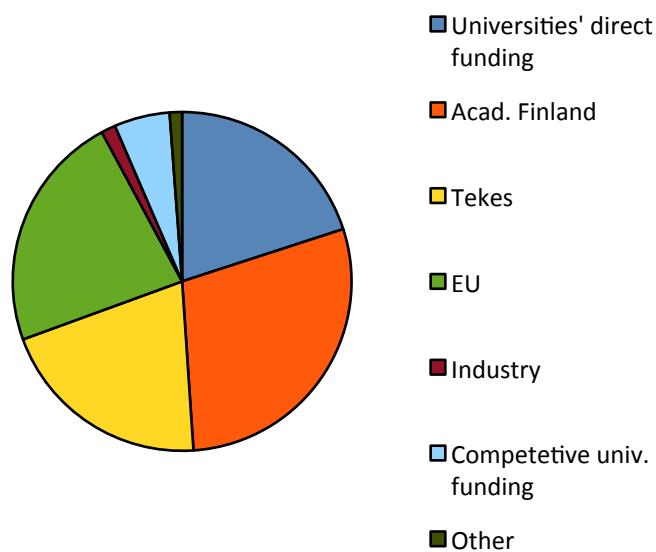


Finally we list the funding sources and the distribution of expenses for the whole HIIT in Table 4.

HIIT	2012	2013	2014	2015	%
Total funding	11 482 489	10 028 717	10 457 412	9 084 157	
Universities' direct funding	1 978 200	1 948 200	1 836 017	1 817 074	20%
Academy of Finland	4 748 256	3 708 126	2 904 324	2 628 116	29%
National Technology Agency Tekes	1 798 080	1 898 768	2 398 365	1 862 474	21%
European Union (EU)	1 120 815	1 128 294	1 911 251	2 062 730	23%
Industry	188 369	25 206	43 675	124 432	1%
Competitive univ. funding	0	625 803	1 018 463	481 816	5%
Other (Foundations, 2012 competitive univ. f.)	1 648 770	694 321	345 318	107 516	1%
Total expenses	11 517 707	9 573 942	9 955 574	8 950 320	
Salaries	6 605 761	6 447 112	6 729 826	6 071 318	68%
Other operational expenses	3 088 387	1 689 071	1 519 659	1 251 241	14%
Service charge to UH/Aalto incl.rents	1 427 286	1 172 757	1 383 711	1 334 047	15%
Rents at OIH	396 274	265 002	322 378	293 714	3%
Rents at OIH	473 016	396 274	265 002	322 378	3%

Table 4: HIIT funding 2012-2015.

Figure 4: HIIT funding 2015.



C. Personnel

In 2015 HIIT faculty and staff completed 138 person-years on HIIT funding. In addition, many persons affiliated with HIIT are funded by participating departments or personal grants either from the Academy of Finland or Foundations. The diversity of affiliations is characteristic of HIIT personnel: the most common is an affiliation with one or both of the parent universities, but there are also some who share their time between HIIT and some other organisation. Thus the total number of personnel (almost 300) is much higher than the number of person-years completed by HIIT funding.

The distribution of person-years per sites is shown in Table 1. In 2015 HIIT's activities at Aalto University were administratively at HIIT's own "department" at Open Innovation House (OIH) and at Computer Science department (CS). In 2016, these will be joined.

Staff (person-years)	2011	2012	2013	2014	2015
Kumpula	40	58	57	60	64
Otaniemi OIH	66	50	60	47	41
Otaniemi CS dept	29	36	37	27	33
total	135	144	154	134	138

Table 5: Number of person-years paid by HIIT 2011-2015

Another way to visualize the personnel is to look at the distribution of personnel groups per person years, again only listing the person years completed by HIIT funding; see Table 6.

Staff (person-years)	Kumpula	Otaniemi OIH	Otaniemi CS dept	total
senior researchers	4	4	6	14
postdocs	12	13	10	35
doctoral students	21	11	9	41
project researchers		4	1	5
research assistants	23	5	7	35
administration	4	4	0	8
total	64	41	33	138

Table 6: Distribution of person-years by personnel groups 2015.

The number of non-Finnish staff members is large. Almost all non-Finns come from Europe, China, India and India's neighbouring countries.

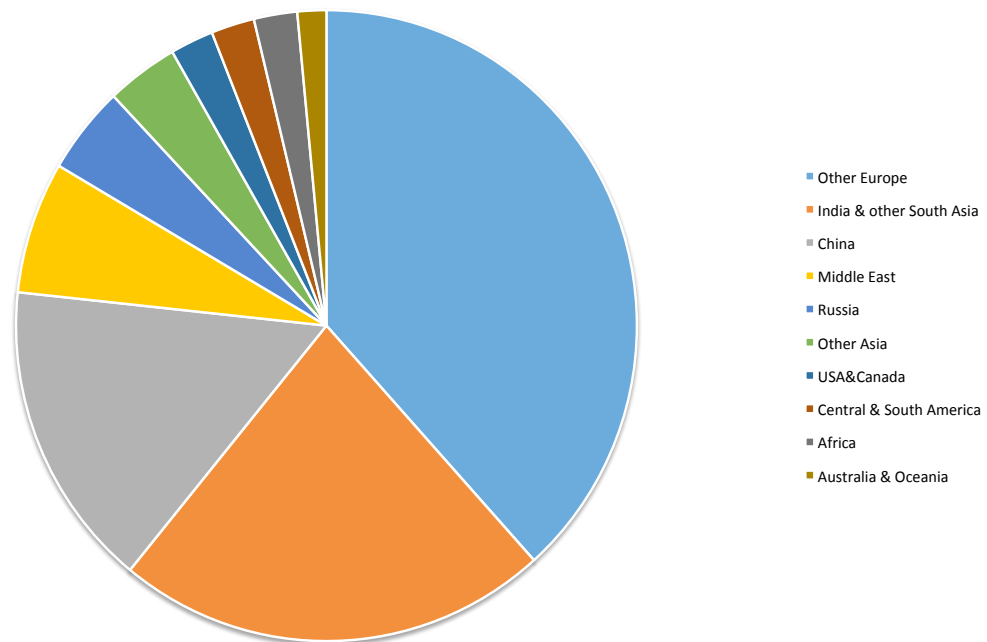


Figure 5: Nationalities of non-Finnish staff members 2015.

D. Publications

Publications 2008 - 2015	2008	2009	2010	2011	2012	2013	2014	2015
Articles in international scientific journals with referee practice	67	51	69	79	81	101	122	128
Articles in international edited works and conference proceedings with referee practice	126	126	153	134	128	137	152	161
Scientific monographs and edited books	3	6	8	9	8	5	10	12
Other publications	40	25	25	29	31	16	13	9
Computer programs and algorithms	0	1	10	8	3	2	3	10
Doctoral theses	14	13	10	7	10	18	22	20
Licentiate theses	1	1	0	0	0	1	0	1
Master's theses	76	27	33	53	55	53	45	74
Total	327	250	308	319	316	333	367	415

D.1. Articles in international scientific journals with referee practice

1. Prem Raj Adhikari and Jaakko Hollmen. Fast progressive training of mixture models for model selection. *Journal of Intelligent Information Systems*, 44(2):223–241, 2015.
2. Ijaz Ahmad, Suneth Namal, Mika Ylianttila, and Andrei Gurtov. Security in software defined networks: A survey. *IEEE Communications Surveys and Tutorials*, 17(4):2317–2346, 2015.
3. Bilal Alsallakh, Luana Micalef, Wolfgang Aigner, Helwig Hauser, Silvia Miksch, and Peter Rodgers. The state-of-the-art of set visualization. *Computer Graphics Forum*, (-), 2015.
4. Mario Alviano, Wolfgang Faber, and Martin Gebser. Rewriting recursive aggregates in answer set programming: back to monotonicity. *Theory and Practice of Logic Programming*, 15(4-5):559–573, 2015.
5. Diego Arroyuelo, Francisco Claude, Sebastian Maneth, Veli Mäkinen, Gonzalo Navarro, Kim Nguyen, Jouni Sirén, and Niko Välimäki. Fast in-memory XPath search using compressed indexes. *Software: Practice & Experience*, 45(3):399–434, 3 2015.
6. Giorgio Audrito, Alexandru I. Tomescu, and Stephan Wagner. Enumeration of the adjunctive hierarchy of hereditarily finite sets. *Journal of Logic and Computation*, 25(3):943–963, 6 2015.
7. Abiyad Baig, Alan Mcnally, Steven Dunn, Konrad Paszkiewicz, Jukka Corander, and Georgina Manning. Genetic import and phenotype specific alleles associated with hyper-invasion in *Campylobacter jejuni*. *BMC Genomics*, 16:852. doi: 10.1186/s12864-015-2087-y, 2015.
8. Adrian Balint, Anton Belov, Matti Järvisalo, and Carsten Sinz. Overview and analysis of the SAT challenge 2012 solver competition. *Artificial Intelligence*, 223:120–155, 2015.
9. Mark de Been, Mette Pinholt, Janetta Top, Stefan Bletz, Alexander Mellmann, Willem van Schaik, Ellen Brouwer, Malbert Rogers, Yvette Kraat, Marc Bonten, Jukka Corander, Henrik Westh, Dag Harmsen, and Rob J. L. Willems. A core genome MLST scheme for high-resolution typing of *Enterococcus faecium*. *Journal of Clinical Microbiology*, doi: 10.1128/JCM.01946-15, 2015.

10. Sergei S. Belanov, Dmitrii Bychkov, Christian Benner, Samuli Ripatti, Teija Ojala, Matti Kankainen, Hong Kai Lee, Julian Wei-Tang, and Denis Kainov. Genome-wide analysis of evolutionary markers of human influenza A(H1N1)pdm09 and A(H3N2) viruses may guide selection of vaccine strain candidates. *Genome Biology and Evolution*, 7(12):3472–3483, 11 2015.
11. Djamel Belazzougui. Improved space-time tradeoffs for approximate full-text indexing with one edit error. *Algorithmica*, 72(3):791–817, 7 2015.
12. Djamel Belazzougui and Gonzalo Navarro. Optimal lower and upper bounds for representing sequences. *ACM Transactions on Algorithms*, 11(4), 2015.
13. Michael A. Bender, Sándor P. Fekete, Alexander Kröller, Vincenzo Liberatore, Joseph S. B. Mitchell, Valentin Polishchuk, and Jukka Suomela. The minimum backlog problem. *Theoretical Computer Science*, (605):51–61, 2015.
14. Sourav Bhattacharya, Henrik Blunck, Mikkel Baun Kjaergaard, and Petteri Nurmi. Robust and energy-efficient trajectory tracking for mobile devices. *IEEE transactions on mobile computing.*, 14(2):430–443, 2 2015.
15. Concha Bielza, Joao Gama, Alipio Jorge, and Indre Zliobaite. Guest editors introduction: special issue of the ECML PKDD 2015 journal track. *Machine Learning*, 100(2):157–159, 2015.
16. Concha Bielza, Joao Gama, Alipio Jorge, and Indre Zliobaite. Guest editors introduction: special issue of the ECML PKDD 2015 journal track. *Data Mining and Knowledge Discovery*, 29(5):1113–1115, 2015.
17. Andreas Björklund, Thore Husfeldt, Petteri Kaski, Mikko Koivisto, Jesper Nederlof, and Pekka Parviainen. Fast Zeta transforms for lattices with few irreducibles. *ACM Transactions on Algorithms*, 12(1):4, 2015.
18. Paul Blomstedt and Jukka Corander. Posterior predictive comparisons for the two-sample problem. *Communications in Statistics: Theory and Methods*, 44(2):376–389, 2015.
19. Paul Blomstedt, Jing Tang, Jie Xiong, Christian Granlund, and Jukka Corander. A Bayesian predictive model for clustering data of mixed discrete and continuous type. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 37(3):489–498, 2015.
20. Francesco Bonchi, Aristides Gionis, Francesco Gullo, Charalampos E. Tsourakakis, and Antti Ukkonen. Chromatic correlation clustering. *ACM Transactions on Knowledge Discovery from Data*, 9(4):000034/1–24, 2015.
21. Monica Bugallo, Luca Martino, and Jukka Corander. Adaptive importance sampling in signal processing. *Digital Signal Processing*, doi:10.1016/j.dsp.2015.05.014, 2015.
22. Ho-Lin Chen, David Doty, and Shinnosuke Seki. Program size and temperature in self-assembly. *Algorithmica*, 72(3):884–899, 2015.
23. Anna Cichonska, Juho Rousu, and Tero Aittokallio. Identification of drug candidates and repurposing opportunities through compound-target interaction networks. *Expert Opinion on Drug Discovery*, 10(12):1333–1345, 2015.
24. Maxime Crochemore, Roberto Grossi, Juha Kärkkäinen, and Gad M. Landau. Computing the Burrows-Wheeler transform in place and in small space. *Journal of Discrete Algorithms*, 32:44–52, 2015.
25. Yaqiong Cui, Jukka Sirén, Timo Koski, and Jukka Corander. Simultaneous predictive Gaussian classifiers. *Journal of Classification*, doi: 10.1007/s00357-016-9197-3, 2015.
26. Giovanna D'Agostino, Eugenio G. Omodeo, Alberto Policriti, and Alexandru I. Tomescu. Mapping sets and hypersets into numbers. *Fundamenta Informaticae*, 140(3-4):307–328, 9 2015. 140 (2015) : 3-4 is a Special Issue on the Italian Conference on Computational Logic: CILC 2013.
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