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Random walks and the contact process

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Bibliography

- [1] K. S. Alexander. On weak mixing in lattice models. *Probab. Theory Related Fields*, 110(4): 441–471, 1998.
- [2] S. Alili. Asymptotic behaviour for random walks in random environments. *J. Appl. Probab.*, 36(2): 334–349, 1999.
- [3] S. Andres, A. Chiarini, J.-D. Deuschel, and M. Slowik. Quenched invariance principle for random walks with time-dependent ergodic degenerate weights. *ArXiv e-prints*, February 2016. <http://arxiv.org/abs/1602.01760>.
- [4] S. Andres, J.-D. Deuschel, and M. Slowik. Invariance principle for the random conductance model in a degenerate ergodic environment. *Ann. Probab.*, 43(4):1866–1891, 2015.
- [5] L. Avena. Random walks in dynamic random environments. *PhD-thesis, Leiden University*, 2010.
- [6] L. Avena and P. Thomann. Continuity and anomalous fluctuations in random walks in dynamic random environments: numerics, phase diagrams and conjectures. *J. Stat. Phys.*, 147(6):1041–1067, 2012.
- [7] L. Avena, F. den Hollander, and F. Redig. Large deviation principle for one-dimensional random walk in dynamic random environment: attractive spin-flips and simple symmetric exclusion. *Markov Process. Related Fields*, 16(1):139–168, 2010.
- [8] L. Avena, F. den Hollander, and F. Redig. Law of large numbers for a class of random walks in dynamic random environments. *Electron. J. Probab.*, 16(21): 587–617, 2011.
- [9] L. Avena, O. Blondel, and A. Faggionato. L^2 -Perturbed Markov processes and applications to random walks in dynamic random environments. *ArXiv e-prints*, February 2016. <http://arxiv.org/abs/1602.06322>.
- [10] L. Avena, O. Blondel, and A. Faggionato. A class of random walks in reversible dynamic environment: antisymmetry and applications to the East model. *ArXiv e-prints*, May 2016. <http://arxiv.org/abs/1605.04816>.
- [11] L. Avena, T. Franco, M. Jara, and F. Völlering. Symmetric exclusion as a random environment: hydrodynamic limits. *Ann. Inst. Henri Poincaré Probab. Stat.*, 51(3): 901–916, 2015.

Bibliography

- [12] L. Avena, M. Jara, and F. Völlering. Explicit LDP for a slowed RW driven by a symmetric exclusion process. *ArXiv e-prints*, September 2014. <http://arxiv.org/abs/1409.3013>.
- [13] L. Avena, R. S. dos Santos, and F. Völlering. Transient random walk in symmetric exclusion: limit theorems and an Einstein relation. *ALEA Lat. Am. J. Probab. Math. Stat.*, 10(2): 693–709, 2013.
- [14] A. Bandyopadhyay and O. Zeitouni. Random walk in dynamic Markovian random environment. *ALEA Lat. Am. J. Probab. Math. Stat.*, 1: 205–224, 2006.
- [15] G. Barraquand and I. Corwin. Random-walk in beta-distributed random environment. *Probability Theory and Related Fields*, 1–60, 2016.
- [16] E. Baur. An invariance principle for a class of non-ballistic random walks in random environment. *Probability Theory and Related Fields*, 1–52, 2015.
- [17] O. Benichou, A. Bodrova, D. Chakraborty, P. Illien, A. Law, C. Mejía-Monasterio, G. Oshanin and R. Voituriez. Geometry-induced superdiffusion in driven crowded systems. *Physical Review Letters*, 111, 2013.
- [18] I. Benjamini, H. Duminil-Copin, G. Kozma, and A. Yadin. Disorder, entropy and harmonic functions. *Ann. Probab.*, 43(5): 2332–2373, 2015.
- [19] J. van den Berg and S. A. Bethuelsen. Stochastic domination in space-time for the contact process. *ArXiv e-prints*, October 2016. <http://arxiv.org/abs/1606.08024>
- [20] J. van den Berg, O. Häggström, and J. Kahn. Some conditional correlation inequalities for percolation and related processes. *Random Structures Algorithms*, 29(4): 417–435, 2006.
- [21] J. van den Berg and C. Maes. Disagreement percolation in the study of Markov fields. *Ann. Probab.*, 22(2): 749–763, 1994.
- [22] N. Berger, M. Cohen, and R. Rosenthal. Local limit theorem and equivalence of dynamic and static points of view for certain ballistic random walks in i.i.d environments. *Ann. Probab.*, 44(4): 1889–1979, 2016.
- [23] N. Berger. Limiting velocity of high-dimensional random walk in random environment. *Ann. Probab.*, 36(2): 728–738, 2008.
- [24] N. Berger and O. Zeitouni. A quenched invariance principle for certain ballistic random walks in i.i.d. environments. In *In and out of equilibrium. 2*, volume 60 of *Progr. Probab.*, Birkhäuser, Basel, 137–160, 2008.
- [25] N. Berger, A. Drewitz, and A. F. Ramírez. Effective polynomial ballisticity conditions

- for random walk in random environment. *Comm. Pure Appl. Math.*, 67(12): 1947–1973, 2014.
- [26] S. A. Bethuelsen. The contact process as seen from a random walk. *ArXiv e-print*, July 2016. <http://arxiv.org/abs/1607.03410>.
- [27] S. A. Bethuelsen and M. Heydenreich. Law of large numbers for random walks on attractive spin-flip dynamics. *ArXiv e-print*. September 2016. <https://arxiv.org/abs/1411.3581>.
- [28] S. A. Bethuelsen and F. Völlering. Absolute continuity and weak uniform mixing of random walk in dynamic random environment. *ArXiv e-prints*, October 2016. <http://arxiv.org/abs/1601.07710>.
- [29] C. Bezuidenhout and L. Gray. Critical attractive spin systems. *Ann. Probab.*, 22(3): 1160–1194, 1994.
- [30] C. Bezuidenhout and G. Grimmett. The critical contact process dies out. *Ann. Probab.*, 18(4): 1462–1482, 1990.
- [31] M. Birkner, J. Černý, A. Depperschmidt, and N. Gantert. Directed random walk on the backbone of an oriented percolation cluster. *Electron. J. Probab.*, 18(80): 1–35, 2013.
- [32] M. Birkner, J. Černý, and A. Depperschmidt. Random walks in dynamic random environments and ancestry under local population regulation. *Electron. J. Probab.*, 21: 1–43, 2016.
- [33] C. Boldrighini, I. A. Ignatyuk, V. A. Malyshev, and A. Pellegrinotti. Random walk in dynamic environment with mutual influence. *Stochastic Process. Appl.*, 41(1): 157–177, 1992.
- [34] C. Boldrighini, R. A. Minlos, and A. Pellegrinotti. Random walk in a fluctuating random environment with Markov evolution. In *On Dobrushin's way. From probability theory to statistical physics*, volume 198 of *Amer. Math. Soc. Transl. Ser. 2*, 13–35, 2000.
- [35] C. Boldrighini, R. A. Minlos, and A. Pellegrinotti. Random walks in quenched i.i.d. space-time random environment are always a.s. diffusive. *Probab. Theory Related Fields*, 129(1): 133–156, 2004.
- [36] C. Boldrighini, G. Cosimi, S. Frigio, and A. Pellegrinotti. Computer simulations for some one-dimensional models of random walks in fluctuating random environment. *J. Stat. Phys.*, 121(3-4): 361–372, 2005.
- [37] E. Bolthausen and A.-S. Sznitman. On the static and dynamic points of view for certain random walks in random environment. *Methods Appl. Anal.*, 9(3): 345–375, 2002.

Bibliography

- [38] E. Bolthausen and O. Zeitouni. Multiscale analysis of exit distributions for random walks in random environments. *Probab. Theory Related Fields*, 138(3-4): 581–645, 2007.
- [39] E. Bolthausen, A.-S. Sznitman, and O. Zeitouni. Cut points and diffusive random walks in random environment. *Ann. Inst. H. Poincaré Probab. Statist.*, 39(3): 527–555, 2003.
- [40] M. Bramson, O. Zeitouni, and M. P. W. Zerner. Shortest spanning trees and a counterexample for random walks in random environments. *Ann. Probab.*, 34(3): 821–856, 2006.
- [41] J. Brémont. One-dimensional finite range random walk in random medium and invariant measure equation. *Ann. Inst. Henri Poincaré Probab. Stat.*, 45(1): 70–103, 2009.
- [42] J. Bricmont and A. Kupiainen. Random walks in asymmetric random environments. *Comm. Math. Phys.*, 142(2): 345–420, 1991.
- [43] J. Bricmont and A. Kupiainen. Random walks in space time mixing environments. *J. Stat. Phys.*, 134(5-6): 979–1004, 2009.
- [44] J.-R. Chazottes, F. Redig, and F. Völlering. The Poincaré inequality for Markov random fields proved via disagreement percolation. *Indag. Math. (N.S.)*, 22(3-4): 149–164, 2011.
- [45] A. A. Chernov. Replication of a multicomponent chain by the “lightning mechanics”. *Biophysics*, 12(2): 336–341, 1967.
- [46] F. Comets and O. Zeitouni. A law of large numbers for random walks in random mixing environments. *Ann. Probab.*, 32(1B): 880–914, 01 2004.
- [47] F. Comets and O. Zeitouni. Gaussian fluctuations for random walks in random mixing environments. *Israel J. Math.*, 148: 87–113, 2005.
- [48] F. Comets, N. Gantert, and O. Zeitouni. Quenched, annealed and functional large deviations for one-dimensional random walk in random environment. *Probab. Theory Related Fields*, 118(1): 65–114, 2000.
- [49] J. T. Cox, R. Durrett and R. Schinazi. The critical contact process seen from the right edge. *Probab. Theory Related Fields*, 83(3): 325–332, 1991.
- [50] J.-D. Deuschel, X. Guo, and A. F. Ramirez. Quenched invariance principle for random walk in time-dependent balanced random environment. *ArXiv e-prints*, March 2015. <http://arxiv.org/abs/1503.01964>.
- [51] R. L. Dobrushin and S. B. Shlosman. Completely analytical Gibbs fields. In *Statistical*

- physics and dynamical systems (Köszeg, 1984)*, volume 10 of *Progr. Phys.*, Birkhäuser Boston, Boston, MA, 371–403, 1985.
- [52] D. Dolgopyat and C. Liverani. Non-perturbative approach to random walk in Markovian environment. *Electron. Commun. Probab.*, 14: 245–251, 2009.
- [53] D. Dolgopyat, G. Keller, and C. Liverani. Random walk in Markovian environment. *Ann. Probab.*, 36(5):1676–1710, 2008.
- [54] A. Drewitz and A. F. Ramírez. Selected topics in random walks in random environment. In *Topics in percolative and disordered systems*, volume 69 of *Springer Proc. Math. Stat.*, Springer, New York, 23–83. 2014.
- [55] R. Durrett. Ten lectures on particle systems. In *Lectures on Probability Theory*, Springer, 97–201, 1995.
- [56] R. Durrett. On the growth of one-dimensional contact processes. *Ann. Probab.*, 8(5): 890–907, 1980.
- [57] R. Durrett and D. Griffeath. Contact processes in several dimensions. *Z. Wahrsch. Verw. Gebiete*, 59(4): 535–552, 1982.
- [58] R. Durrett and D. Griffeath. Supercritical contact processes on \mathbb{Z} . *Ann. Probab.*, 11(1): 1–15, 1983.
- [59] M. Einsiedler and T. Ward, *Ergodic theory with a view towards number theory*, Springer-Verlag, London, 2011.
- [60] A. Galves and E. Presutti. Edge fluctuations for the one-dimensional supercritical contact process. *Ann. Probab.*, 15(3): 1131–1145, 1987.
- [61] O. Garet and R. Marchand. Asymptotic shape for the contact process in random environment. *Ann. of Applied Probab.*, 22(4): 1362–1410, 2012.
- [62] O. Garet and R. Marchand. Large deviations for the contact process in random environment. *Ann. Probab.* 42(4): 1438–1479, 2014.
- [63] M. Gori, I. Donato, E. Floriani, I. Nardecchia, and M. Pettini. Random walk of passive tracers among randomly moving obstacles. *ArXiv e-prints*, January 2016. <http://arxiv.org/abs/1601.03626>.
- [64] A. Greven and F. den Hollander. Large deviations for a random walk in random environment. *Ann. Probab.*, 22(3): 1381–1428, 1994.
- [65] G. Grimmett. Large deviations in subadditive processes and first-passage percolation. In *Particle systems, random media and large deviations (Brunswick, Maine, 1984)*, volume 41 of *Contemp. Math.*, Amer. Math. Soc., Providence, RI, 175–194, 1985.

Bibliography

- [66] G. Grimmett and H. Kesten. First-passage percolation, network flows and electrical resistances. *Z. Wahrsch. Verw. Gebiete*, 66(3): 335–366, 1984.
- [67] X. Guo. On the limiting velocity of random walks in mixing random environment. *Ann. Inst. Henri Poincaré Probab. Stat.*, 50(2): 375–402, 2014.
- [68] X. Guo and O. Zeitouni. Quenched invariance principle for random walks in balanced random environment. *Probab. Theory Related Fields*, 152(1-2): 207–230, 2012.
- [69] R. van Handel and P. Rebeschini. Phase transitions in nonlinear filtering. *Electron. J. Probab.*, 20:(7), 1–46, 2015.
- [70] T. E. Harris. Contact interactions on a lattice. *Ann. Probability*, 2: 969–988, 1974.
- [71] M. Hilário, F. den Hollander, V. Sidoravicius, R. S. dos Santos, and A. Teixeira. Random walk on random walks. *Electron. J. Probab.*, 20:(95): 1–35, 2015.
- [72] F. den Hollander and R. S. dos Santos. Scaling of a random walk on a supercritical contact process. *Ann. Inst. H. Poincaré Probab. Statist.*, 50(4): 1276–1300, 2014.
- [73] F. den Hollander, R. dos Santos, and V. Sidoravicius. Law of large numbers for non-elliptic random walks in dynamic random environments. *Stochastic Process. Appl.*, 123(1): 156–190, 2013.
- [74] F. den Hollander, H. Kesten, and V. Sidoravicius. Random walk in a high density dynamic random environment. *Indag. Math. (N.S.)*, 25(4): 785–799, 2014.
- [75] R. van der Hofstad and M. Holmes. An expansion for self-interacting random walks. *Braz. J. Probab. Stat.*, 26(1): 1–55, 2012.
- [76] M. Holmes and T. S. Salisbury. Random walks in degenerate random environments. *Canad. J. Math.*, 66(5): 1050–1077, 2014.
- [77] F. Huveneers and F. Simenhaus. Random walk driven by simple exclusion process. *Electron. J. Probab.*, 20(105): 1–42, 2015.
- [78] S. A. Kalikow. Generalized random walk in a random environment. *Ann. Probab.*, 9(5): 753–768, 1981.
- [79] H. Kesten, M. V. Kozlov, and F. Spitzer. A limit law for random walk in a random environment. *Compositio Math.*, 30: 145–168, 1975.
- [80] G. F. Lawler. Weak convergence of a random walk in a random environment. *Comm. Math. Phys.*, 87(1): 81–87, 1982.
- [81] T. M. Liggett. Survival and coexistence in interacting particle systems. In *Probability and phase transition (Cambridge, 1993)*, volume 420 of *NATO Adv. Sci. Inst. Ser. C Math. Phys. Sci.*, Kluwer Acad. Publ., Dordrecht, 209–226, 1994.

- [82] T. M. Liggett. *Interacting particle systems*, volume 276 of *Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences]*. Springer-Verlag, New York, 1985.
- [83] T. M. Liggett. *Stochastic interacting systems: contact, voter and exclusion processes*, volume 324 of *Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences]*. Springer-Verlag, Berlin, 1999.
- [84] T. M. Liggett. Conditional association and spin systems. *ALEA Lat. Am. J. Probab. Math. Stat.*, 1: 1–19, 2006.
- [85] T. M. Liggett and J. E. Steif. Stochastic domination: the contact process, Ising models and FKG measures. *Ann. Inst. H. Poincaré Probab. Statist.*, 42(2): 223–243, 2006.
- [86] R. Lyons and Y. Peres, *Probability on Trees and Networks*. Cambridge University Press, 2016. Available at <http://pages.iu.edu/~rdlyons/>
- [87] N. Madras. A process in a randomly fluctuating environment. *Ann. Probab.*, 14(1): 119–135, 1986.
- [88] P. Mandl. Spectral theory of semi-groups connected with diffusion processes and its application. *Czechoslovak Math. J.*, 11 (86): 558–569, 1961.
- [89] Franz Merkl and M. P. W. Zerner. A zero-one law for planar random walks in random environment. *Ann. Probab.*, 29(4): 1716–1732, 2001.
- [90] K. Miller. Random walks on weighted, oriented percolation clusters. *ALEA Lat. Am. J. Probab. Math. Stat.*, 13: 53–77, 2016.
- [91] T. Mountford and M. E. Vares. Random walks generated by equilibrium contact processes. *Electron. J. Probab.*, 20:(3): 1–17, 2015.
- [92] T. Orenshtein and R. S. dos Santos. Zero-one law for directional transience of one-dimensional random walks in dynamic random environments. *Electron. Commun. Probab.*, 21: 1–11, 2016.
- [93] Y. Peres, S. Popov, and P. Sousi. On recurrence and transience of self-interacting random walks. *Bulletin of the Brazilian Mathematical Society, New Series*, 44(4): 841–867, 2013.
- [94] F. Rassoul-Agha. The point of view of the particle on the law of large numbers for random walks in a mixing random environment. *Ann. Probab.*, 31(3): 1441–1463, 2003.
- [95] F. Rassoul-Agha. On the zero-one law and the law of large numbers for random walk in mixing random environment. *Electron. Comm. Probab.*, 10: 36–44, 2005.

Bibliography

- [96] F. Rassoul-Agha and T. Seppäläinen. An almost sure invariance principle for random walks in a space-time random environment. *Probab. Theory Related Fields*, 133(3): 299–314, 2005.
- [97] F. Rassoul-Agha and T. Seppäläinen. Almost sure functional central limit theorem for ballistic random walk in random environment. *Ann. Inst. Henri Poincaré Probab. Stat.*, 45(2): 373–420, 2009.
- [98] F. Rassoul-Agha, T. Seppäläinen, and Atilla Yilmaz. Quenched free energy and large deviations for random walks in random potentials. *Comm. Pure Appl. Math.*, 66(2): 202–244, 2013.
- [99] F. Redig and F. Völlering. Limit theorems for random walks in dynamic random environment. *ArXiv e-prints*, 2011. <http://arxiv.org/abs/1106.4181>.
- [100] F. Redig and F. Völlering. Random walks in dynamic random environments: a transference principle. *Ann. Probab.*, 41(5): 3157–3180, 2013.
- [101] C. Sabot. Ballistic random walks in random environment at low disorder. *Ann. Probab.*, 32(4): 2996–3023, 2004.
- [102] C. Sabot. Random Dirichlet environment viewed from the particle in dimension $d \geq 3$. *Ann. Probab.*, 41(2): 722–743, 2013.
- [103] R. S. dos Santos. Some case studies of random walks in dynamic random environments. *PhD-thesis, Leiden University*, 2012.
- [104] R. S. dos Santos. Non-trivial linear bounds for a random walk driven by a simple symmetric exclusion process. *Electron. J. Probab.*, 19(49), 1–18, 2014.
- [105] Ya. G. Sinai. The limit behavior of a one-dimensional random walk in a random environment. *Teor. Veroyatnost. i Primenen.*, 27(2): 247–258, 1982.
- [106] F. Solomon. Random walks in a random environment. *Ann. Probability*, 3: 1–31, 1975.
- [107] A.-S. Sznitman. An effective criterion for ballistic behavior of random walks in random environment. *Probab. Theory Related Fields*, 122(4): 509–544, 2002.
- [108] A.-S. Sznitman. Topics in random walks in random environment. In *School and Conference on Probability Theory*, ICTP Lect. Notes, XVII, Abdus Salam Int. Cent. Theoret. Phys., Trieste, 203–266, 2004.
- [109] A.-S. Sznitman and M. Zerner. A law of large numbers for random walks in random environment. *Ann. Probab.*, 27(4): 1851–1869, 1999.
- [110] D. E. Temkin. One-dimensional random walks in a two-component chain. *Dokl. Akad. Nauk SSSR*, 206: 27–30, 1972.

- [111] S. R. S. Varadhan. Large deviations for random walks in a random environment. *Comm. Pure Appl. Math.*, 56(8): 1222–1245, 2003.
- [112] A. Yilmaz. Large deviations for random walk in a space-time product environment. *Ann. Probab.*, 37(1): 189–205, 2009.
- [113] O. Zeitouni. Random walks in random environment. In *Lectures on probability theory and statistics*, volume 1837 of *Lecture Notes in Math.*, Springer, Berlin, 189–312, 2004.
- [114] M. P. W. Zerner. The zero-one law for planar random walks in i.i.d. random environments revisited. *Electron. Comm. Probab.*, 12: 326–335 2007.

