

Exploring Multi-Scale Spatiotemporal Twitter User Mobility Patterns

Abstract

Key words:

PACS:

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References

- [1] Zheng, Y., Li, Q., Chen, Y., Xie, X., Ma, W.Y., 2008. Understanding mobility based on GPS data. Proceedings of the 10th international conference on Ubiquitous computing. ACM, pp. 312–321.
- [2] Jiang, B., Yin, J., Zhao, S., 2009. Characterizing the human mobility pattern in a large street network. *Physical Review E*, 80, 021136.
- [3] Belik, V., Geisel, T., Brockmann, D., 2011. Natural human mobility patterns and spatial spread of infectious diseases. *Physical Review X*, 1, 011001.
- [4] Greenwood, M.J., 1985. Human migration: Theory, models, and empirical studies. *Journal of regional Science*, 25, pp. 521–544.
- [5] Brockmann, D., Hufnagel, L., Geisel, T., 2006. The scaling laws of human travel. *Nature*, 439, pp. 462–465.
- [6] Gonzalez, M.C., Hidalgo, C.A., Barabasi, A.L., 2008. Understanding individual human mobility patterns. *Nature*, 453, pp. 779–782.
- [7] Jurdak, R., Zhao, K., Liu, J., AbouJaoude, M., Cameron, M., Newth, D., 2015. Understanding Human Mobility from Twitter. *PLoS ONE*, 10, e0131469.
- [8] Rhee, I., Shin, M., Hong, S., Lee, K., Kim, S.J., Chong, S., 2011. On the levy-walk nature of human mobility. *IEEE/ACM transactions on networking (TON)*, 19, pp. 630–643.

- [9] Sevtsuk, A., Ratti, C., 2010. Does urban mobility have a daily routine? Learning from the aggregate data of mobile networks. *Journal of Urban Technology*, 17, pp. 41–60.
- [10] Kung, K.S., Greco, K., Sobolevsky, S., Ratti, C. 2014. Exploring universal patterns in human home-work commuting from mobile phone data. *PLoS ONE*, 9, e96180.
- [11] Thatcher, J., 2014. Living on fumes: Digital footprints, data fumes, and the limitations of spatial big data. *International Journal of Communication*, 8, pp. 1765–1783.
- [12] Hawelka, B., Sitko, I., Beinat, E., Sobolevsky, S., Kazakopoulos, P., Ratti, C., 2014. Geo-located Twitter as proxy for global mobility patterns. *Cartography and Geographic Information Science*, 41, pp. 260–271.
- [13] Giannotti, F., Pedreschi, D., 2008. *Mobility, data mining and privacy: Geographic knowledge discovery*, Springer Science & Business Media.
- [14] Crampton, J.W. 2014. Collect it all: national security, Big Data and governance. *GeoJournal*, pp. 1–13.
- [15] Wu, L., Zhi, Y., Sui, Z., Liu, Y., 2014. Intra-urban human mobility and activity transition: Evidence from social media check-in data. *PLoS ONE*, 9, e97010.
- [16] Hasan, S., Zhan, X., Ukkusuri, S.V., 2013. Understanding urban human activity and mobility patterns using large-scale location-based data from online social media. Proceedings of the 2nd ACM SIGKDD international workshop on urban computing. ACM, 2013, p. 6.
- [17] Cho, E., Myers, S.A., Leskovec, J. 2011, Friendship and mobility: user movement in location-based social networks. Proceedings of the 17th ACM SIGKDD international conference on Knowledge discovery and data mining. ACM, 2011, pp. 1082–1090.
- [18] Noulas, A., Scellato, S., Lambiotte, R., Pontil, M., Mascolo, C., 2012. A tale of many cities: universal patterns in human urban mobility. *PLoS ONE*, 7, e37027.
- [19] Balcan, D., Colizza, V., Gonçalves, B., Hu, H., Ramasco, J.J., Vespignani, A., 2009. Multiscale mobility networks and the spatial spreading of infectious diseases. *Proceedings of the National Academy of Sciences*, 106, pp. 21484–21489.
- [20] Tamerius, J., Nelson, M.I., Zhou, S.Z., Viboud, C., Miller, M.A., Alonso, W.J., 2011. Global influenza seasonality: reconciling patterns across temperate and tropical regions. *Environmental health perspectives*, 119, 439.
- [21] Tsou, M.H., 2015. Research challenges and opportunities in mapping social media and Big Data. *Cartography and Geographic Information Science* 2015, 42, pp. 70–74.
- [22] Zheng, Y., Xie, X., Ma, W.Y., 2010. GeoLife: A Collaborative Social Networking Service among User, Location and Trajectory.

- [23] Becker, R., Cáceres, R., Hanson, K., Isaacman, S., Loh, J.M., Martonosi, M., Rowland, J., Urbanek, S., Varshavsky, A., Volinsky, C., 2013. Human mobility characterization from cellular network data. *Communications of the ACM*, 56, pp. 74–82.
- [24] Sobolevsky, S., Szell, M., Campari, R., Couronné, T., Smoreda, Z., Ratti, C., 2013. Delineating geographical regions with networks of human interactions in an extensive set of countries. *PLoS ONE*, 8, e81707.
- [25] Twitter, 2016. Twitter streaming API. Available from: <https://dev.twitter.com/streaming/overview>.
- [26] Cranshaw, J., Schwartz, R., Hong, J.I., Sadeh, N.M., 2012. The Livehoods Project: Utilizing Social Media to Understand the Dynamics of a City. ICWSM.
- [27] Mitchell, L., Frank, M.R., Harris, K.D., Dodds, P.S., Danforth, C.M., 2013. The geography of happiness: Connecting twitter sentiment and expression, demographics, and objective characteristics of place.
- [28] Longley, P.A., Adnan, M., Lansley, G., others., 2015. The geotemporal demographics of Twitter usage. *Environment and Planning A*, 47, pp. 465–484.
- [29] Hägerstrand, T., others., 1985. Time-geography: focus on the corporeality of man, society, and environment. *The science and praxis of complexity*, pp. 193–216.
- [30] Kwan, M.P., Lee, J., 2004. Geovisualization of human activity patterns using 3D GIS: a time-geographic approach. *Spatially integrated social science*, 27.
- [31] Andrienko, N., Andrienko, G., 2007. Designing visual analytics methods for massive collections of movement data. *Cartographica: The International Journal for Geographic Information and Geovisualization*, 42, pp. 117–138.
- [32] MacEachren, A.M., Kraak, M.J., 2001. Research challenges in geovisualization. *Cartography and Geographic Information Science*, 28, pp. 3–12.
- [33] MacEachren, A.M., 2004. *How maps work: representation, visualization, and design*, Guilford Press.
- [34] Andrienko, G., Andrienko, N., Wrobel, S., 2007. Visual analytics tools for analysis of movement data. *ACM SIGKDD Explorations Newsletter*, 9, pp. 38–46.
- [35] Black, A., Mascaro, C., Gallagher, M., Goggins, S.P., 2012. Twitter zombie: Architecture for capturing, socially transforming and analyzing the Twittersphere. Proceedings of the 17th ACM international conference on Supporting group work. ACM, pp. 229–238.
- [36] Shvachko, K., Kuang, H., Radia, S., Chansler, R., 2010. The hadoop distributed file system. Mass Storage Systems and Technologies (MSST), 2010 IEEE 26th Symposium on. IEEE, 2010, pp. 1–10.

- [37] Dean, J., Ghemawat, S., 2008. MapReduce: simplified data processing on large clusters. *Communications of the ACM*, 51, pp. 107–113.
- [38] Gao, H., Tang, J., Liu, H., 2012. Exploring Social-Historical Ties on Location-Based Social Networks. ICWSM.
- [39] Buttenfield, B.P., McMaster, R.B., 1991. *Map Generalization: Making rules for knowledge representation*, Longman Scientific & Technical New York.
- [40] Samet, H., 1984. The quadtree and related hierarchical data structures. *ACM Computing Surveys (CSUR)*, 16, pp. 187–260.
- [41] Clauset, A., Shalizi, C.R., Newman, M.E., 2009. Power-law distributions in empirical data. *SIAM review*, 51, pp. 661–703.
- [42] Reynolds, A., 2012. Truncated Lévy walks are expected beyond the scale of data collection when correlated random walks embody observed movement patterns. *Journal of The Royal Society Interface*, 9, pp. 528–534.
- [43] Zhao, K., Musolesi, M., Hui, P., Rao, W., Tarkoma, S., 2015. Explaining the power-law distribution of human mobility through transportation modality decomposition. *Scientific reports*, 5.