

吕欣

Flowminder 基金会

Center for Global Health, Karolinska Institutet, Stockholm, Sweden

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研究领域 大数据, 复杂网络, 统计抽样, 社会网络, 流行病学, 手机数据, 人类行为动力学, 应急管理, 灾害救援

### 现工作单位

2015/1 - 至今, 国防科技大学, 信息系统与管理学院, 副教授

2012/9- 至今, 国际非盈利组织 Flowminder 基金会创建者, 首席分析师

### 教育工作经历

2013/7 - 2014/12, 国防科技大学, 信息系统与管理学院, 讲师

2013/3 - 2013/5, 斯德哥尔摩未来学院, 研究员

2009/1 - 2013/2, 斯德哥尔摩大学社会学系, 助理研究员, 40%工作时间

2010/1 - 2013/2, 卡罗林斯卡学院公共卫生系, 助理研究员, 20%工作时间

2009/1 - 2013/2, 瑞典卡罗林斯卡学院, 公共卫生管理, 博士, 导师: Fredrik Liljeros

2006/9 - 2008/12, 国防科学技术大学, 管理科学与工程, 硕博连读, 导师: 谭跃进

2002/9 - 2006/6, 四川大学, 管理科学, 学士, 导师: 贺昌政

### 代表著作

Lu X, Wrathall DJ, Sundsøy PR, Nadiruzzaman M, Wetter E, Iqbal A, et al. Unveiling hidden migration and mobility patterns in climate stressed regions: A longitudinal study of six million anonymous mobile phone users in Bangladesh. **Global Environmental Change** 2016,38:1-7. IF5.09 (一区)

Buckee C O, Tatem A, Wetter E, Lu X, and Bengtsson L. *Society: Protect Privacy of Mobile Data*. **Nature**, 514, 7520 (2014): 35-35. IF41.46 (一区)

Lu X, Brelsford C. *Network Structure and Community Evolution on Twitter: Human Behavior in Response to The 2011 Japanese Earthquake and Tsunami*. **Scientific Reports**, 2014, 4, 6773. IF5.58 (Nature 子刊)

Lu X. *Linked Ego Networks: Improving Estimate Reliability and Validity with Respondent-driven Sampling*. **Social Networks**, 2013, 35: 669-685. IF3.38 (SSCI, 社会网络研究顶刊)

Lu, X Wetter, E, Bharti, N, et al. *Approaching the Limit of Predictability in Human Mobility*. **Scientific Reports**, 2013, 3,

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2923. IF5.58 (Nature 子刊)

Lu X, Bengtsson L, Holme P. *Predictability of population displacement after the 2010 Haiti earthquake*. **Proceedings of the National Academy of Sciences**, 2012, 109 (29), 11576-11581. IF9.67 (一区)

Lu X, Bengtsson L, Britton T, Camitz M, Kim BJ, Thorson A, Liljeros F. *The Sensitivity of Respondent-driven Sampling Method*. **Journal of the Royal Statistical Society: Series A (Statistics in Society)**, 2012, 175: 191-216. IF1.64 (一区)

Bengtsson L, Lu X, Garfield R, Thorson A, Schreeb J V. *Improved Response to Disasters and Outbreaks: Tracking Population Movements with Mobile Phone Network Data in Haiti*. **PLOS Medicine**, 2011; 8 (8): e1001083 IF14.43 (一区)

## 学术论文 (英/中)

- [1] Steele, J. E. et al. Mapping poverty using mobile phone and satellite data. *Journal of The Royal Society Interface* 14 (2017).
- [2] Chen, S. & Lu, X\*. An Immunization Strategy for Hidden Populations. *Scientific Reports* 7, 3268 (2017).
- [3] Mou, J., Liu, C., Chen, S., Huang, G. & Lu, X\*. Temporal Characteristics of the Chinese Aviation Network and their Effects on the Spread of Infectious Diseases. *Scientific Reports* 7, 1275 (2017).
- [4] Zhao, Y. et al. Optimal layout design of obstacles for panic evacuation using differential evolution. *Physica A: Statistical Mechanics and its Applications* 465, 175-194 (2017).
- [5] Fan, C., Liu, Z., Lu, X., Xiu, B. & Chen, Q. An efficient link prediction index for complex military organization. *Physica A: Statistical Mechanics and its Applications* 469, 572-587 (2017).
- [6] Zhang, Z.-K. et al. Dynamics of information diffusion and its applications on complex networks. *Physics Reports* 651, 1-34 (2016).
- [7] Wilson R et al. Rapid and Near Real-Time Assessments of Population Displacement Using Mobile Phone Data Following Disasters: The 2015 Nepal Earthquake. *PLOS Currents Disasters* Feb 24 . Edition 1 (2016).
- [8] Tan, S.-Y., Wu, J., Lü, L., Li, M.-J. & Lu, X. Efficient network disintegration under incomplete information: the comic effect of link prediction. *Scientific Reports* 6, 22916 (2016).
- [9] Tan, S. Y., Wu, J., Li, M. J. & Lu, X. Approximating natural connectivity of scale-free networks based on largest eigenvalue. *EPL (Europhysics Letters)* 114, 58002 (2016).
- [10] Ruktanonchai, N. W. et al. Census-derived migration data as a tool for informing malaria elimination policy. *Malaria Journal* 15 (2016).
- [11] Lu, X. et al. Detecting climate adaptation with mobile network data in Bangladesh: anomalies in communication, mobility and consumption patterns during cyclone Mahasen. *Climatic Change* 138, 505-519 (2016).
- [12] Lu, X. et al. Unveiling hidden migration and mobility patterns in climate stressed regions: A longitudinal study of six million anonymous mobile phone users in Bangladesh. *Global Environmental Change* 38, 1-7 (2016).
- [13] Kulane, A., Sematimba, D., Mohamed, L. M., Ali, A. H. & Lu, X. Health in a fragile state: a five-year review of mortality patterns and trends at Somalia's Banadir Hospital. *International Journal of General Medicine* 9, 303 (2016).
- [14] Cheng, Q., Lu, X., Wu, J. T., Liu, Z. & Huang, J. Analysis of heterogeneous dengue transmission in Guangdong in 2014 with multivariate time series model. *Scientific Reports* 6, 33755 (2016).
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- [16] Strömdahl, S., Lu, X., Bengtsson, L., Liljeros, F. & Thorson, A. Implementation of Web-Based Respondent Driven Sampling among Men Who Have Sex with Men in Sweden. *PLoS ONE* 10, e0138599 (2015).

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- [17] Cheng, Q., Lu, X., Liu, Z. & Huang, J. Mining research trends with anomaly detection models: the case of social computing research. *Scientometrics* 103, 453-469 (2015).
- [18] Bharti, N., Lu, X., Bengtsson, L., Wetter, E. & Tatem, A. J. Remotely measuring populations during a crisis by overlaying two data sources. *International Health* 7, 90-98 (2015).
- [19] Bengtsson, L. et al. Using Mobile Phone Data to Predict the Spatial Spread of Cholera. *Sci. Rep.* 5 (2015).
- [20] Wesolowski, A. et al. Commentary: Containing the Ebola outbreak—the potential and challenge of mobile network data. *PLOS Currents Outbreaks* (2014).
- [21] Wesolowski, A. et al. Flowminder Foundation West Africa human mobility models: Version 1.0. [www.flowminder.org](http://www.flowminder.org) (2014).
- [22] Stein, M. L. et al. Online Respondent-Driven Sampling for Studying Contact Patterns Relevant for the Spread of Close-Contact Pathogens: A Pilot Study in Thailand. *PLoS ONE* 9, e85256 (2014).
- [23] Stein, M. L. et al. Comparison of Contact Patterns Relevant for Transmission of Respiratory Pathogens in Thailand and the Netherlands Using Respondent-Driven Sampling. *PLoS ONE* 9, e113711 (2014).
- [24] Lu, X. & Brelsford, C. Network Structure and Community Evolution on Twitter: Human Behavior Change in Response to the 2011 Japanese Earthquake and Tsunami. *Sci. Rep.* 4 (2014).
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- [30] Lu, X., Malmros, J., Liljeros, F. & Britton, T. Respondent-driven Sampling on Directed Networks. *Electronic Journal of Statistics* 7, 292-322 (2013).
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- [33] Linus Bengtsson, Xin Lu, Fredrik Liljeros, Hoang Huy Thanh & Thorson, A. High Sexual Risk Behavior Indicates Explosive HIV Transmission among Men who have Sex with Men in Vietnam. submitted (2013).
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- [45] 吕欣, 李勇, 邓宏钟 & 谭跃进. 基于节点合并的最短路问题新算法. *小型微型计算机系统*, 695-699 (2009).
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- [51] 谭跃进 & 吕欣. in *第三届“战争复杂性与信息化战争模拟”研讨会*.
- [52] 吕欣, 邓宏钟, 李勇, 吴俊 & 谭跃进. 洞庭湖区东方田鼠种群生长与灾变过程建模与仿真分析. *系统仿真学报* 20, 6575-6579 (2008).
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- [54] 李勇 et al. 基于级联失效的复杂保障网络抗毁性仿真分析. *计算机应用研究* 25, 3451-3454 (2008).
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- [58] 吕欣, 邓宏钟, 李勇, 吴俊 & 谭跃进. in *第三届全国复杂网络学术会议*. (eds 陈关荣 & 许晓鸣) 245-251 (上海系统科学出版社 (香港)).
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- [60] 邓宏钟, 吴俊, 李勇 & 吕欣. C4ISR 系统结构的网络分析. *火力与指挥控制* 录用 (2007).
- [61] 吕欣 & 古副文. 高考分数与大学成绩相关性实证分析. *教育情报参考* 9, 16-17 (2005).

## 大会报告、论文

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- [62] Lu X, Wetter E, Nita Bharti, Andy Tatem, Bengtsson L. *Approaching the Limits of Predictability in Human Mobility*. Third conference on the Analysis of Mobile Phone Datasets and Networks, MIT (Media Lab), Cambridge, MA. (NetMob2013) Presentation.
- [63] Nita Bharti, Lu X, Bengtsson L, Wetter E, Andy Tatem. *Rapid Assessment of Population Movements in Crises : The Potential and Limitations of Using Nighttime Satellite Imagery and Mobile Phone Data*. Third conference on the Analysis of Mobile Phone Datasets and Networks, MIT (Media Lab), Cambridge, MA. (NetMob2013) Poster.
- [64] Lu X, Bengtsson L, Petter Holme. *Mobility and Predictability of Population Movements after the Haiti 2010 Earthquake*. Second conference on the Analysis of Mobile Phone Datasets and Networks, MIT (Media Lab), Cambridge, MA. (NetMob2011) Presentation.
- <http://www.inma.ucl.ac.be/~blondel/netmob/netmob2011-program.pdf>
- [65] Lisa Brouwers, Andrzej Jarynowski, Fredrik Liljeros, Lu X. *Contact networks and the spread of MRSA in hospitals*. Deutsche Physikalische Gesellschaft, Germany. (DPG2010, March) Presentation.
- [http://www.dpg-physik.de/dpg/gliederung/fv/soe/2010\\_soe.pdf](http://www.dpg-physik.de/dpg/gliederung/fv/soe/2010_soe.pdf)
- [66] Lu X, Diego Rybski, Fredrik Liljeros. *About scaling in the growth of clubs and communities*. Deutsche Physikalische Gesellschaft, Germany. (DPG2010, March) Presentation.
- [http://www.dpg-physik.de/dpg/gliederung/fv/soe/2010\\_soe.pdf](http://www.dpg-physik.de/dpg/gliederung/fv/soe/2010_soe.pdf)
- [67] Lu X, Bengtsson L, Tom Britton, Martin Camitz, Beom Jun Kim, Anna Thorson, Fredrik Liljeros. *Evaluating efficiency of Respondent driven sampling on a gay men web community*, Net SCI 2009, Italy. (Poster)
- <http://pilastro.phys.uniroma1.it/netsci/Programme.htm>

## 公开研究报告

With Bengtsson L, Richard Garfield, Anna Thorson, Johan von Schreeb. "Preliminary analyses of movement patterns of Digicel mobile phones: 1 December 2009 to 19 December 2010." Karolinska Institute, Columbia University, 2011.

With Bengtsson L, Richard Garfield, Anna Thorson, Johan von Schreeb. "Saint-Marc Cholera Outbreak: Analyses of ongoing population movements from the Saint-Marc area, Haiti." Karolinska Institute, Columbia University, 2010.

With Bengtsson L, Richard Garfield, Anna Thorson, Johan von Schreeb. "Internal population displacement in Haiti: preliminary analyses of movement patterns of Digicel mobile phones: 1 January to 11 March 2010." Karolinska Institute, Columbia University, 2010.

With Bengtsson L, Richard Garfield, Anna Thorson, Johan von Schreeb. "Internal Population displacement in Haiti - Preliminary analyses of movement patterns of Digicel mobile phones: 1 December 2009 to 18 June 2010." Karolinska Institute, Columbia University, 2010.

上述报告可免费在该网址下载: <http://www.reliefweb.int/taxonomy/term/3385>

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## 学术活动

1. Workshop on Data-driven Research in Operations Innovation, 特邀报告, 上海, 2017
2. China-Canada International Conference on Disease Modelling, 特邀报告, 上海, 2017
3. 网络科学青年论坛, 特邀报告, 合肥, 2017
4. 第 18 届中国管理科学学术年会, 特邀报告, 西安, 2016
5. 系统科学学术研讨会, 特邀报告, 烟台, 2016
6. 大数据分析 with 复杂社会系统建模学术会议, 特邀报告, 国防科学技术大学, 长沙, 2016
7. IEEE International Conference on Data Science in Cyberspace (IEEE DSC 2016), 专题报告, Changsha, 2016
8. 国家自然科学基金委重大研究计划“大数据驱动的管理与决策研究”会评专家, 北京, 2015
9. 国家自然科学基金委员会管理科学部“宏观管理与政策学科公共管理领域 2014 年度青年基金获得者检查交流会”, 大会报告, 上海, 2015。
10. 华人学者管理科学与工程协会国际年会(CSAMSE 2015), 特邀报告, 沈阳, 2015
11. NetSCI-X2015 (全球复杂网络大会), 专题报告, 里约热内卢, 2015
12. 综合集成与复杂系统国际研讨会, 特邀报告, 北京, 2014
13. 中国系统工程学会第 18 届学术年会, 专题报告, 合肥, 2014
14. 全国复杂网络学术会议, 专题报告, 长沙, 2014
15. 明道大会, 特邀报告, 上海, 2014
16. TCL 集团技术创新大会, 特邀报告, 惠州, 2014
17. 中国计算机学会第一届大数据学术会议, 特邀报告, 北京, 2013
18. 第 9 届全国复杂网络大会 (CCCN13), 杭州, 2013 年 9 月
19. 圣塔菲研究所复杂系统暑期学校, 圣塔菲, 美国新墨西哥州, 2012 年
20. SGIP12 (Stockholm Gang Intervention and Prevention Project), 特邀报告, 斯德哥尔摩, 瑞典, 2012 年
21. Workshop: Network modeling - Methods and applications in biology, medicine and sociology, 奥斯陆, 挪威, 2012 年
22. NetMob2011 (世界移动数据会议), 特邀报告, 波士顿, 美国, 2011 年
23. Respondent-driven Sampling 研究论坛, 组织及主持, 斯德哥尔摩, 瑞典, 2011 年
24. 3rd International Conference of Crisis Mappers (ICCM 2011), 日内瓦, 瑞士, 2011 年
25. Conference on Applications of Network Theory, 斯德哥尔摩, 瑞典, 2011 年
26. International School on Multidisciplinary Approaches to Economic and Social Complex Systems, 锡耶纳, 意大利, 2010 年
27. DPG 2010, Deutsche Physikalische Gesellschaft, 雷根斯堡, 德国, 2010 年
28. NetSCI 09 (全球复杂网络大会), 威尼斯, 意大利, 2009 年

## 获奖情况

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|-----------|--|
| 2017      | 湖湘青年英才, 湖南省科技厅, 2017, 中国   |
| 2016      | Flowminder awarded "Glomo - Global Mobile Awards" for the work of "Mobile in Emergency or Humanitarian Situations" 2016, Barcelona |
| 2015      | The National Science Fund for Excellent Young Scholars, NSFC, China  |
| 2014      | The Best Work for Visualization Competition in CCCN 2014, China  |
| 2013      | Flowminder research listed MIT Technology Review "2013 Breakthrough Technologies"  |
| 2009-2012 | Scholarship of Chinese Scholarship Council, China  |

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2009-2011 Foundation for Innovation Research of Hunan Province, China  
2009-2011 Foundation for Innovation Research of National University of Defense Technology  
2007-2008 Foundation for Innovation Research of National University of Defense Technology  
2006 Outstanding Graduate of Sichuan Province  
2006 Scholarship of Chinese Academy of Sciences

技能情况 C, C#, 数据库系统, Matlab , ArcGIS; 大数据分析处理 (百万至十亿级数据); 中英文.

## 科研项目

国家优秀青年科学基金“大数据挖掘与应急管理”(71522014), 2016-2018. (项目负责人)

瑞典 Swedish Research Council 基金“Using mobile phone data from 25 million subscribers in four low- and middle-income countries to support elimination child deaths, malnutrition and poverty”( 99546), 在研. (项目共同负责人)

国家自然科学基金“基于移动通信与在线社交媒体数据的大规模突发事件下人类行为动力学研究”(71301165), 在研. (项目负责人)

XX 所预研项目“基于在线社会网络的时间序列数据挖掘技术及可视化方法研究”, 在研. (项目负责人)

欧盟项目“ISSC: An integrated surveillance system for infectious disease in rural China” (241900), 在研. (信号检测预警算法设计)

斯德哥尔摩大学、卡罗林斯卡学院与瑞典皇家工学院合作基金项目“Dynamic of Complex Networks” (P2008-0674), 已完成. (主要研究人员)

卡罗林斯卡学院、斯德哥尔摩大学合作项目“Outbreak of Epidemiology on Real Contacting Networks”, 已完成. (数据处理, 分析)

湖南省优秀研究生创新基金“网络抽样方法-同伴驱动抽样理论与应用研究” (CX2009B019) .已完成. (独立承担)

国防科学技术大学研究生创新基金“复杂网络信息传播动力学及其应用研究” (S070501) .已完成. (独立承担)

国家自然科学基金“复杂负载网络抗毁性研究” (70501032) ,已完成. (算法设计)

国家自然科学基金“不完全信息条件下的复杂网络抗毁性” (70771111) ,已完成. (算法设计、应用研究)

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十一五装备预研项目“复杂\*\*网络可靠性分析与评价技术研究” (513190202) ,已完成. (报告、算法设计、软件编制)

十一五装备预研项目重点基金“网络系统\*\*理论和方法研究”,2008, 已完成. (报告)

## 讲授课程 (部分)

研究生课程《复杂系统理论与方法》

Complex Systems: Theory and Applications (36hrs, master and phd students)

(Covering a range of complexity theory, including adaptive systems, generic algorithm, complex networks etc.

Software use: Gephi)

研究生课程《应用多元统计分》

Applied Multivariate Statistical Analysis (60hrs master and phd students)

(Basic algebra and probability theory, statistic Concepts, correlation, hypothesis testing, linear and non-linear regression, GLM, factor analysis, clustering, spatial data analysis, anomaly detection etc. Software use: SPSS,

Matlab, Gephi, ArcGIS)

高干培训课程《应急管理理论与方法》

Emergency Management (8hrs, training course for officials)

(The theory of emergency management, prevention, mitigation, preparedness, response and recovery, psychological basics on emergency situations, advances in disaster response)

高干培训课程《数据分析基础》

Data Analytic Basics (8 hrs, training course for officials)

(Statistic concepts, descriptive statistics, correlation, hypothesis testing, regression and prediction, data visualization. Software use: Matlab)

MPA 课程《管理统计学》

Managerial Statistics (36 hrs, mpa)

(Statistic concepts, descriptive statistics, correlation, hypothesis testing, regression, factor analysis and case studies. Software use: SPSS)

本科生课程《统计软件及其应用》

Statistic Practice with SPSS (18 hrs, mpa)

(Data preparation, visualization, descriptive statistics, correlation, hypothesis testing, regression, factor analysis. Software use: SPSS)