

Lu X, PhD

College of Information System & Management
National University of Defense Technology
410073, Changsha, China

Flowminder Foundation
<http://www.flowminder.org>

Tel: +86 186 2756 1577

E-mail: xin.lu@flowminder.org

Homepage: <http://www.homexinlu.com/>

Updated: July 2, 2017

Research Fields Big Data, complex networks, statistics, epidemiology, mobile phone data, human behaviours, disaster response.

Current Position

Sep, 2012 – present, co-founder, chief analyst and system developer at Flowminder Foundation.

Jan, 2014 – present, postdoc at Department of Public Health Sciences, Karolinska Institutet, Stockholm.

Jan, 2015 – present, associate professor at College of Information System & Management, National University of Defense Technology, Changsha.

EDUCATION & WORK EXPERIENCE

Feb, 2013 – Dec, 2014, lecturer at College of Information System & Management, National University of Defense Technology, Changsha.

Mar, 2013 – May, 2013, researcher at the Institute For Future Studies in Stockholm, full time.

Jan, 2009– Feb, 2013, assistant researcher at the Department of Sociology, Stockholm, 40%.

Jan, 2010– Mar, 2013, assistant researcher at the Department of Public Health Sciences, Karolinska Institutet, Stockholm, 20%.

Dec, 2009 – Feb, 2013, PhD from Department of Public Health Sciences, Karolinska Institute, Stockholm

Sep, 2006 – Dec, 2008, Master & PhD Candidate at College of Information System & Management, National University of Defense Technology, Changsha.

Aug, 2002 – Jun, 2006, Bsc from Sichuan University, Chengdu.

REPRESENTATIVE PUBLICATIONS

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.

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

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.

Lu X. Linked Ego Networks: Improving Estimate Reliability and Validity with Respondent-driven Sampling. *Social Networks*, 2013, 35: 669-685.

Lu X, Wetter E, Bharti N, et al. Approaching the Limit of Predictability in Human Mobility. *Scientific Reports*, 2013, 3, 2923.

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.

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.

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

PEER-REVIEWED PAPERS

- [1] Chen S & **Lu X***. (2017). An Immunization Strategy for Hidden Populations. *Scientific Reports*, 7(1), 3268.
- [2] Mou J, Liu C, Chen S, Huang G, & **Lu X***. (2017). Temporal Characteristics of the Chinese Aviation Network and their Effects on the Spread of Infectious Diseases. *Scientific Reports*, 7(1), 1275.
- [3] Steele JE, et al. (2017). Mapping poverty using mobile phone and satellite data. *Journal of the Royal Society Interface*, 14(127).
- [4] Zhao Y, Li M, **Lu X**, et al. (2017). Optimal layout design of obstacles for panic evacuation using differential evolution. *Physica A: Statistical Mechanics and its Applications*, 465, 175-194.
- [5] Fan C, Liu Z, **Lu X**, et al. (2017). An efficient link prediction index for complex military organization. *Physica A: Statistical Mechanics and its Applications*, 469, 572-587.
- [6] **Lu X**, et al. (2016). 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.
- [7] **Lu X**, et al. (2016). Detecting climate adaptation with mobile network data in Bangladesh: anomalies in communication, mobility and consumption patterns during cyclone Mahasen. *Climatic Change*, p. 1-15.
- [8] Tan S-Y, Wu J, Lü L, Li M-J, **Lu X** (2016) Efficient network disintegration under incomplete information: the comic effect of link prediction. *Sci. Rep.* 6: 22916.
- [9] Wilson R, et al. (2016). 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.
- [10] Strömdahl S*, **Lu X***, Bengtsson L, Liljeros F, Thorson A (2015) Implementation of Web-Based Respondent Driven Sampling among Men Who Have Sex with Men in Sweden. *PLoS ONE* 10: e0138599.
- [11] Bharti N, **Lu X**, Bengtsson L, Wetter E, & Tatem AJ (2015) Remotely measuring populations during a crisis by overlaying two data sources. *International Health* 7(2):90-98.
- [12] Cheng Q, **Lu X**, Liu Z, & Huang J (2015) Mining research trends with anomaly detection models: the case of social computing research. *Scientometrics*:1-17.
- [13] Bengtsson L, et al. (2015) Using Mobile Phone Data to Predict the Spatial Spread of Cholera. *Sci. Rep.* 5.

-
- [14] Buckee CO, Tatem AJ, Wetter E, **Lu X**, & Bengtsson L (2014) Society: Protect privacy of mobile data. *Nature* 514(7520):35-35.
- [15] **Lu X** & Brelsford C (2014) Network Structure and Community Evolution on Twitter: Human Behavior Change in Response to the 2011 Japanese Earthquake and Tsunami. *Sci. Rep.* 4.
- [16] Bengtsson L, **Lu X**, Liljeros F, Thanh HH, & Thorson A (2014) Strong propensity for HIV transmission among men who have sex with men in Vietnam: behavioural data and sexual network modelling. *BMJ Open* 4(1).
- [17] Wesolowski A, *et al.* (2014) Flowminder Foundation West Africa human mobility models: Version 1.0. *www.flowminder.org*.
- [18] Stein ML, *et al.* (2014) Online Respondent-Driven Sampling for Studying Contact Patterns Relevant for the Spread of Close-Contact Pathogens: A Pilot Study in Thailand. *PLoS ONE* 9(1):e85256.
- [19] Stein ML, *et al.* (2014) Comparison of Contact Patterns Relevant for Transmission of Respiratory Pathogens in Thailand and the Netherlands Using Respondent-Driven Sampling. *PLoS ONE* 9(11):e113711.
- [20] Wesolowski A, *et al.* (2014) Commentary: Containing the Ebola outbreak—the potential and challenge of mobile network data. *PLOS Currents Outbreaks*.
- [21] **Lu X**, Wetter E, Bharti N, Tatem AJ, & Bengtsson L (2013) Approaching the Limit of Predictability in Human Mobility. *Sci. Rep.* 3.
- [22] **Lu X**, Malmros J, Liljeros F, & Britton T (2013) Respondent-driven sampling on directed networks. 292-322.
- [23] **Lu X** (2013) Linked Ego Networks: Improving estimate reliability and validity with respondent-driven sampling. *Social Networks* 35(4):669-685.
- [24] **Lu X** (2013) Respondent-driven sampling: theory, limitations & improvements. PhD (Karolinska Institutet, Stockholm, Sweden).
- [25] Yan W, *et al.* (2013) ISS-An Electronic Syndromic Surveillance System for Infectious Disease in Rural China. *PLoS ONE* 8(4):e62749.
- [26] **Lu X**, Bengtsson L, & Holme P (2012) Predictability of population displacement after the 2010 Haiti earthquake. *Proceedings of the National Academy of Sciences* 109(29):11576-11581.
- [27] **Lu X**, *et al.* (2012) The sensitivity of respondent-driven sampling. *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 175(1):191-216.
- [28] Bengtsson L, *et al.* (2012) Implementation of Web-Based Respondent-Driven Sampling among Men Who Have Sex with Men in Vietnam. *PLoS ONE* 7(11):e49417.
- [29] Duenas M, Ivanov O, **Lu X**, & Wood I (2012) Robustness in a space of complex networks.
- [30] **Lu X** & Camitz M (2011) Finding the shortest paths by node combination. *Applied Mathematics and Computation* 217(13):6401-6408.
- [31] Bengtsson L, **Lu X**, Thorson A, Garfield R, & von Schreeb J (2011) Improved Response to Disasters and Outbreaks by Tracking Population Movements with Mobile Phone Network Data: A Post-Earthquake Geospatial Study in Haiti. *PLoS Med* 8(8):e1001083.
- [32] Bengtsson L, **Lu X**, Garfield R, Thorson A, & Von Schreeb J (2010) Saint-Marc Cholera Outbreak: Analyses of ongoing population movements from the Saint-Marc area, Haiti. *Saint-Marc Cholera Outbreak: Analyses of ongoing population movements from the Saint-Marc area, Haiti*, (Sweden. Karolinska Institute. Center for Disaster Medicine; United States. Columbia University. Schools of Nursing and Public Health).
- [33] Bengtsson L, **Lu X**, Garfield R, Thorson A, & Von Schreeb J (2010) Internal Population Displacement in Haiti:

Preliminary analyses of movement patterns of Digicel mobile phones: 1 December 2009 to 18 June 2010. *Internal Population Displacement in Haiti: Preliminary analyses of movement patterns of Digicel mobile phones: 1 December 2009 to 18 June 2010*, (Sweden. Karolinska Institute. Center for Disaster Medicine; United States. Columbia University. Schools of Nursing and Public Health).

- [34] Bengtsson L, **Lu X**, Garfield R, Thorson A, & von Schreeb J (2010) Internal population displacement in Haiti: preliminary analyses of movement patterns of Digicel mobile phones: 1 January to 11 March 2010. Columbia University, Karolinski Institutet; 2010. *Karolinska Institute and Columbia University*.
- [35] LI Jun, **Lu X**, TAN Yuejin. *Spatial-Based Modeling of Tactical Communication Networks*, **Systems Engineering and Electronics**, 2010, 32(7): 1456-1461.
- [36] **Lu X**, Yong Li, Hongzhong Deng, Yuejin Tan. *A New Algorithm for Shortest Paths Based On Node Combination*. **Journal of Chinese Computer Systems**, 2009, 30(4): 695-700.
- [37] **Lu X**, Hongzhong Deng, Yong Li, Jun Wu, Yuejin Tan. *Modeling and Simulation Analysis on Growth and Catastrophe of *Microtus Fortis* in DongTing Lake Area*. **Journal of System Simulation**, v 20, n 23, Dec 5, 2008: 6575-6579.
- [38] Huang Zehan, Tan Yuejin, **Lu X**. *Research on Paths Optimization in Network Using Delay-Capacity Conversion Method*. **Journal of Industrial Engineering/Engineering Management**, 2009(03): 111-114.
- [39] Yuejin Tan, **Lu X**, Jun Wu, Hongzhong Deng. *On The Invulnerability Research of Complex Networks*. **Systems Engineering- Theory & Practice**, 2008, 28 (Suppl): 116-120.
- [40] Hongzhong Deng, Jun Wu, Yong Li, **Lu X**, Yuejin Tan. *The Influencing Study of Complex Network's Topologic Structure on System's Invulnerability*. **Systems Engineering and Electronics**, 2008(12).
- [41] Yuejin Tan, **Lu X**, Jun Wu, Hongzhong Deng. *Main Scientific Problems for the Invulnerability Research of Complex Networks*. Proceedings of the **15th Chinese System Engineering Society Conference**, Jiangxi, Oct 1 2008.
- [42] Yuejin Tan, **Lu X**. *Review on the Invulnerability of Complex Networks and Its Military Application*. The 3rd **Workshop on "Complexity and Informationization of Warfare"**, National Defense University, May 2008.
- [43] **Lu X**, Hongzhong Deng, Yong LI, Jun WU, Yuejin TAN. *An Improved SIS Model with Random Remote Infection on Complex Networks*. Proceedings of the **3rd Chinese Conference on Complex Network**, Shanghai, 2007, 12.

Published by:

Complex networks: Theory and Practice [M], Hong Kong: System Science Press Shanghai (Hong Kong), first edition, Jun 2008. ISBN 978-988-17255-1-6:245-251.

- [44] Changzheng He, **Lu X**. *A Comparative Study on GMDH and PLS of Solving Multicollinearity*. **Statistics and Decision (Theoretical Edition)**, 2007(16): 4-6.
- [45] **Lu X**, Fuwen Gu. *Analysis of Relevance between the Scores of NMET and the Performance of the College's Study*. **Educational Information Reference**, 2005 (9): 16-17.

This paper is also embodied by

Literature of Chinese Modern Educational Studies [M], Guangmin Daily Press, Beijing.

And also published on the webpage of Chinese Education and Research Network (CERN):

<http://www.edu.cn/20050810/3146307.shtml>.

- [46] Yong Li, Jun Wu, Hongzhong Deng, **Lu X**, Bin Liu, Yuejin Tan. *Invulnerability Simulation Analysis of Complex*

Logistics Networks with Different Loads. Proceedings of the 3rd **Chinese Conference on Complex Network**, Shanghai, 2007, 12.

- [47] Hongzhong Deng, Jun Wu, Yong Li, **Lu X**, Bin Liu, Yuejin Tan. *The Simulation Study of Complex Dynamic Network's Invulnerability*. Proceedings of the 3rd **Chinese Conference on Complex Network**, Shanghai, 2007, 12.
- [48] Yong Li, Hongzhong Deng, Jun Wu, **Lu X**, Bin Liu, Yuejin Tan. *Invulnerability Simulation Analysis of Complex Logistics Networks Based on Cascading Failure*. **Application Research of Computers**, 2008, 25(11): 3451-3454.

Conference Presentation, Posters and Abstracts

- [49] **Lu X**, Erik Wetter, Nita Bharti, Andy Tatem, Linus Bengtsson. *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.
- [50] Nita Bharti, **Lu X**, Linus Bengtsson, Erik Wetter, 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.
- [51] **Lu X**, Linus Bengtsson, 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>
- [52] 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
- [53] **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
- [54] **Lu X**, Linus Bengtsson, 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>

Public Research Reports

With Linus Bengtsson, 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 Linus Bengtsson, 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 Linus Bengtsson, 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 Linus Bengtsson, 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.

The above reports are available at: <http://www.reliefweb.int/taxonomy/term/3385>

Activities (Conferences and Summershools)

Workshop on Data-driven Research in Operations Innovation, invited talk, Shanghai, 2017

China-Canada International Conference on Disease Modelling, invited talk, Shanghai, 2017

Network Conference of Young Scientists, keynote, Hefei, 2017

The 18th Chinese Annual conference of Management Science, keynote, Xi'an, 2016

Conference on System Science, keynote, Yantai, 2016

Conference on Big Data Analysis and Complex Social Systems Modeling, invited talk, Changsha, 2016

IEEE International Conference on Data Science in Cyberspace (IEEE DSC 2016), invited talk, Changsha, 2016

Board meeting for the review of “Major Research Plan: Big Data-driven Management and Decision“, NSFC, 2015, 11, Beijing, China.

Annual meeting workshop for young scholars in the field of Micro-management and policy research, NSFC, 2015, 10, Shanghai, China. (keynote)

The Chinese Scholars Association for Management Science and Engineering (**CSAMSE**), 2015, 7, Shenyang, China. (keynote)

HFMD and EV-A71 vaccination Workshop, 2015, 1, China CDC. (invited talk)

NETSCI 15, International Workshop and Conference on Complex Networks and their Applications, 2015, 1, Rio de Janeiro, Brazil. (oral presentation)

International Workshop on Meta-synthesis and Complex Systems (**MCS**), 2014, 12, Beijing, China. (invited talk)

The 9th National Congress of Systems Engineering Society of China and the 18th Annual Meeting, 2014, 10, Hefei, China. (invited talk)

Proceedings of the 10th Chinese Conference on Complex Network (**CCCN14**), Changsha, 2014,10, China. (oral presentation)

Proceedings of the 1st CCF Conference on BIG DATA (**CCF BIG DATA13**), Beijing, 2013, 12, China. (keynote)

Proceedings of the 9th Chinese Conference on Complex Network (**CCCN13**), Hangzhou, 2013, 9, China.

Complex Systems Summer School, June 2nd – 30rd, 2012, **Santa Fe Institute**, New Mexico, US.

Workshop: Network modeling - Methods and applications in biology, medicine and sociology, May 7th – 8th, 2012, **The Norwegian Academy of Science and Letters**, Oslo, Norway.

Organizer of **workshop on Respondent-driven Sampling**, Stockholm, December 7th, 2011, Sweden.

3rd International Conference of Crisis Mappers (**ICCM 2011**), Geneva, November 14th -15th, 2011, Switzerland.

Conference on **Applications of Network Theory**, Stockholm, April 7th -9th, 2011, Sweden.

Summer school In: **International School on Multidisciplinary Approaches to Economic and Social Complex Systems**, Siena, June 27 – July 3, 2010, Italy.

DPG 2010, Deutsche Physikalische Gesellschaft, Regensburg, March 21st - 26th, 2010, Germany.

NETSCI 09, International Workshop and Conference on Complex Networks and their Applications, ISTITUTO VENETO SCIENZE LETTERE ED ARTI, June 29 - July 3, 2009, Italy.

SCHOLARSHIP & HONORS

- 2017 Outstanding Young Scientist of Hunan Province, Hunan, China
- 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
- 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

SKILLS Skilled in C, C#, SQL database, Matlab and ArcGIS; Experienced in analysing large datasets (Millions→Billion); Chinese (native) and English (fluent);

PROJECTS

Jan, 2016-

PI for Nature Science Foundation Excellent Young Scientists fund no. 71522014 “Big data mining and emergency management”

- In collaboration with China CDC, Karolinska Institutet and Flowminder foundation.

Jan, 2014-

Co-applicant for VR grant funded by Swedish Research Council “Using mobile phone data from 25 million subscribers in four low- and middle-income countries to support elimination child deaths, malnutrition and poverty”

- In collaboration with Karolinska Institutet, Flowminder foundation, Southampton University, MIT and Harvard.

Jan, 2014-

PI for Nature Science Foundation no. 71301165 “Mobile Communication and Online Social Media Based Study of Human Dynamics under Large-Scale Emergencies”

- In collaboration with China CDC, Karolinska Institutet and Flowminder foundation.

Dec, 2013- present

PI for pre-research project “Data Mining and Visualization of Time Series Data from Online Social Networks”

- In collaboration with National University of Defense Technology.

Mar, 2010- present

Major researcher in using mobile phone data from Haiti tracking population movements during earthquake and outbreak of cholera

- In collaboration with Columbia University and United Nations Population Fund (UNFPA).

Jan, 2010- Dec, 2012

EU project ISSC: An integrated surveillance system for infectious disease in rural China.

- Designing/selecting surveillance models and integrating models with the system.
- In collaboration with Karolinska Institute, Heidelberg University, Huazhong University of Science & Technology, and Fudan University.

Jan, 2009 – Dec, 2012

Researcher at Department of Sociology, Stockholm University

Jan, 2009– Jun, 2009

Research preparation course in medical epidemiology, Karolinska Institutet

Dec, 2006–2008

The Eleventh Five-year Advanced Research Project entitled “*Evaluate Reliability of Complex Logistical Network*”, National University of Defense Technology

-
- designing and optimizing algorithms for the simulation of complex logistic network's invulnerability

Sep, 2007–present

National Natural Science Foundation Project entitled "*Invulnerability in Complex Logistic Network*",
National University of Defense Technology

- developing software with C#
- writing research reports

Jun, 2007–present

Project for the Foundation for Innovation Research of National University of Defense Technology entitled
"*Application Research of Complex Networks' Dynamics*"

- in full charge of the project (independently)

Teaching (selected)

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)

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)

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)

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

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

Managerial Statistics (36 hrs, mpa)

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

Statistic Practice with SPSS (18 hrs, mpa)

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