Hyejin Youn

CONTACT INFORMATION

Media Lab
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ACADEMIC POSITIONS

Santa Fe Institute, Santa Fe, NM, USA
Research Fellow — Aug 2013 – current
Postdoctral Fellow — Jan 2011 – Aug 2013
Graduate Fellow — Sep 2009 – Dec 2010

Massachusetts Institute of Technology , Cambridge, MA, USA
Media Lab Visiting Scientist — Oct 2016 – current

Royal Society for Arts, London, UK
RSA Fellow — Mar 2017 – current

Harvard University , Cambridge, MA, USA
John F. Kennedy School of Government Visiting Fellow — Apr 2017 – current

University of Oxford, Oxford, UK
Senior Research Fellow at the Mathematical Institute — Sep 2013 – Sep 2016
James Martin Fellow at Oxford Martin School — Dec 2013 – current

EDUCATION

Ph. D. Physics, KAIST (Daejeon, South Korea), February 2011
Thesis topic: Quantifying Collective Dynamics and Emergent Behaviors in Complex Systems
Advisor: Hawoong Jeong
M. S. Physics, KAIST (Daejeon, South Korea), February 2006
Exchange program at Royal Institute of Technology, Sweden, 2003–2004
B. S. Physics, KAIST (Daejeon, South Korea), February 2003

RESEARCH INTERESTS

Innovation and technological change
Urban scaling and dynamics (economic diversity, energy consumption, human mobility)
Historical and computational linguistics (language universality, linguistic cognitive space)
Transportation network (traffic in decentralized system)
Network theory (topology and dynamics)

GRANT AND CONSULTING

PI, "Understanding Technological Change from the Map of Capabilities."
joint with Aaron Clauset (University of Colorado at Boulder)
National Science Foundation SciSIP,
EAGER (USA), No. SMA-1312294, $152,500 — 2013 – 2017

Consultant, Merck KGaA, Germany — Sep 2015

Co-PI, "Understanding Urban Energy Consumption in UK"
REU mentor for Kevin Carlson under the NSF Grant No. 1005075 — 2011 – 2011

PI, "Quantifying Complex Systems",
National Research Foundation (Korea) ca. $10,000 — 2009 – 2010

PUBLICATIONS

Peer-reviewed

Minjin Lee, Hugo Barbosa, Hyejin Youn, Gourab Ghoshal, Petter Holme, *Urban socioeconomic patterns revealed through morphology of travel routes*, *arXiv:1701.02973* under review.

Hyejin Youn, Sutton, Eric Smith, Bill Croft, Jon Wilkins, Tanmoy Bhattacharya, Ian Maddieson, Cris Moore "On universal structure of human lexical semantics", *Proc. Natl. Acad. Sci USA* **113** (7) 1766–1771.

Daniel Kim, Dan Cerigo, Hawoong Jeong, Hyejin Youn, “Technological novelty profile and invention’s future impact”, *EPJ Data Science* 2016 **5**:8.

Hyejin Youn, José Lobo, Deborah Strumsky, Horacio Samaniego, Geoffrey B. West, Luís M. A. Bettencourt “Scaling and universality in urban economic diversification”, *J. R. Soc. Interface* **13**:20150937.

Marcus Hamilton, José Lobo, Eric Rupley, Hyejin Youn, and Geoffrey B. West “The ecological and evolutionary energetics of hunter-gatherer residential mobility”, *Evolutionary Anthropology* **25** 124–132.

Hyejin Youn, José Lobo, Luís M.A. Bettencourt, Debora Strumsky “Invention as a combinatorial process: Evidence from U.S. Patents”, *J. R. Soc. Interface* **12** 20150272.

Elsa Arcaute, Erez Hatna, Peter Ferguson, Hyejin Youn, Anders Johansson, and Michael Batty, “Constructing cities, deconstructing scaling laws”, *J. R. Soc. Interface* **12** 20140745.

Vsevolod Salnikov, Daniel Schien, Hyejin Youn, Renaud Lambiotte, and Michal Gastner “The geography and carbon footprint of mobile phone use in Cote d’Ivoire”, *EPJ Data Science* **3** 3.

Luís Bettencourt, Horacio Samaniego, Hyejin Youn “Professional diversity and the productivity of cities”, *Scientific Reports* **4** 5393.

Andres Gomez-Lievano, Hyejin Youn, Luís M. A. Bettencourt “The Statistics of Urban Scaling and Their Connection to Zipf’s Law” *PLoS ONE* **7(7)** e40393.

Hyejin Youn, Michael T. Gastner, Hawoong Jeong, “Inefficiency in Networks with Multiple Sources and Sinks”, *Complex ‘2009* (USST, Shanghai, China, Feb. 23-25).

Hyejin Youn, Michael T. Gastner, Hawoong Jeong, “The Price of Anarchy in Transportation Networks: Efficiency and Optimality Control”, *Phys. Rev. Lett.* **101** 128701.

Hyejin Youn, Fabian Roth, Matthew Silver, Marie-Helene Cloutier, Peter Ittzes, and Hawoong Jeong, “Price of Anarchy on Boston Road Network”, *J. Korean Phys. Soc.* **48** 217

Book
43 Visions for complexity *World Scientific* January, 2017
Edited by: Stefan Thurner (ISBN: 9789813206847)

In Review
Morgan R. Frank, Lijun Sun, Manuel Cebrian, HyeJin Youn, Iyad Rahwan, *Small cities face greater impact from automation*, *in review* .

Tanmoy Bhattacharya et al, *Studying language evolution in the age of Big Data*, *in review* .

Luís M. A. Bettencourt, Jose Lobo, Geoffrey B. West, Hyejin Youn “The Hypothesis of Urban Scaling: formalization, implications, and challenges”, arXiv: 1301.5919 [physics.soc-ph] *in review*

Paula Sabloff, Stefan Thurner, Hyejin Youn, and Rudolf Hanel, “Demographics and Democracy: A Network Analysis of Mongolians’ Political Cognition” *in review*

In Preparation
Hyunuk Kim, Marcus J. Hamilton, Woo-Sung Jung, Hyejin Youn, “The structure of mythologies and the humanexpansion out of Africa”

Hyejin Youn, “urban physics”, *EPJB* invited review paper

Hyejin Youn, Panjun Kim, Seungwoo Son, Hawoong Jeong, “Effective Population Density and Its Applications”, *in preparation*

Luís Bettencourt, Hyejin Youn, Anna Khasanova, Geoffrey B. West, “Citier: Bigger, Denser, Greener”, *in preparation*

Daniel Kim, Young-Ho Eom, and Hyejin Youn, “Quantifying the Stream of Technological Innovation” *in preparation*

Hyejin Youn, “Paradox of Taxation”, *in preparation*

TALKS

Keynote, and Colloquium

Urban physics: scaling in physics, biology, society and beyond
Indiana University Bloomington, Indiana, USA — Apr 17, 2017

Scaling in urban systems,
Land & Housing Institute, Korea — Jun 3, 2016

Combinational inventions as nature of innovation,
Merck KGaA, Darmstadt, Germany — Sep 23, 2015

The nature of invention,
The Future of Fund Management, London, UK — Mar 10, 2015

Invention as a combinatorial process of technological change
DISC (Daegu Gyeongbuk International Social Network Conference), Daegu, Korea — Dec 11, 2014

Invited Talks

Diversification in urban economy
Updating the Production Function for the Algorithmic Economy, Menlo Park, CA — Feb 28, 2017

Innovation and urbanisation
International Workshop: Frontiers of Physics, Pohang, Korea — Dec 12, 2016

Scaling and universality in urban economic diversification
Cities as complex systems symposium (VW-Foundation), Hanover, Germany — July 13, 2016

Big Data in social physics
Grand open conference, Complexity Science HUB, Vienna, Austria — May 23, 2016

Physics in urban systems: scaling, Zipf’s law, fractality and beyond
City Analytics: Future Cities Catapult,
Urban Innovation Centre, London, UK — Sep 10, 2015

Understanding Innovation by Mapping Technology Space,
Complex Networks Network Seminar,
King’s College, University of Cambridge, UK — Feb 17, 2015

Invention as a Combinatorial Process,
the 4^{th} International Symposia: Green, Smart, Development & Vision,
Seoul National University, Korea — Dec 22, 2014

Recipes and Inventions as Combinatorial Process,
Computational Gastronomy–Food in the Age of Data
Kavli Royal Society International Centre, UK — Sep 29, 2014

Cities: Emergence of Order, Erice International Seminars on Planetary Emergencies,
47th sessions, Energy, Cities, and the Control of Complex Systems Workshop,
the Ettore Majorana Centre, Erice, Italy — May 12, 2014

Understanding technological change as dynamics in ecosystem,
seminar of Center for International Development, Harvard University, USA — Apr 2014

Cities as Complex Systems: Universal Structure of Urban Economic Diversity,
Quantitative & Applied Spatial Economic Research Lab. ,
UCL, London, UK — Mar 2014

Towards the Scientific Theory of Cities, Measuring Up Cities,
the Long Finance Symposium, the Museum of London, UK — Jan 2014

Cities as Emergence of Order,
London Mathematical Laboratory, UK — Dec 2013

Panel discussion in Women in Physics Session,
XXV IUPAP International Conference on Statistical Physics, Seoul, Korea — Jul 2013

The Hidden Structure in Urban Economic Complexity,
International Workshop on Social Computing, Seoul, Korea — Jul 2013

Cities: Emergence of Order, *seminar* at Los Alamos National Lab, US — Sep 2012

MEDIA COVERAGES

Nature "Languages have common structure," *Nature* **530**, 133, 2016
The Economist:
"The process of invention: Now and then," April 25, 2015
"Queuing conundrums," September 13, 2008
Nature Physics "Innovation Slowdown," Mark Buchanan, *Nature Physics* **11**, 2, 2015
MIT Technology Review: "Data Mining 200 Years of Patent Office Records To Reveal The Nature of Invention," June 16, 2014
Smart Planet: "How will our cities grow?" July 27, 2011
NEXT CITY: Science of Cities: "When it comes to making money, Big Data reveals cities have a pattern" Jan 29, 2016
National Geographic: "Do languages 'think' alike?" Feb, 2016
QUARTZ: "Scientists say the ways humans describe nature transcends culture and geography" Feb 2016
Scientific American: "Detours by Design" January, 2009
Others: Gizmodo, Phys.org, News and Tribune, Ars technica, SpringerOpen, National Geography, Mathematical Institute at the University of Oxford, News in Santa Fe Institute, Highlights in PNAS.

PROFESSIONAL SERVICE

Workshops (Organizer or co-organizer)

Frontiers of Physics: Push the Envelope of Statistical Physics
APCTP Headquater, Pohang, Korea
organised with W. Jung, S. Son, J. Jo — Dec 12-14, 2016

Building an integrated framework for innovation, organiztions, and society
Caucus session at Academy of Management (AOM), Anaheim, CA, USA
organised with K. Kim — Aug 8, 2016

Networks and technology evolution,
Satellite Workshop at NetSci16, Seoul, Korea
organised with J. McNerney, I. Rahwan, and C. Hidalgo — May 30, 2016

Technological change,
the satellite meeting at the Conference of Complex System (CCS'15)
Arizona State University, USA
organised with J. Alstott, B. Yan, F. Lafond, G. Triulzi — Sep 30, 2015

Theory and practice of innovation: Different perspectives under the same name
University of Oxford, UK
organised with L. Bloom (Oxford) and G. Zanello (Oxford) — Feb 27, 2015

Program Committees

The 3rd International Conference on Computational Social Science (IC2S2 2017)
Cologne, Germany — Jul 10-13, 2017

Conference on Complex Systems (CCS'17)
Cancun, Mexico — Sep 19-23, 2017

International School and Conference on Network Science (NetSci-17)
Indianapolis, Indiana — June 19-23, 2017

The 11th International AAAI Conference on Web and Social Media (ICWSM-17)
Montreal, Canada — May 15-18, 2017

The 10th International AAAI Conference on Web and Social Media (ICWSM-16)
Cologne, Germany — May 17-20, 2016

The 9th International AAAI Conference on Web and Social Media (ICWSM-15)
University of Oxford, UK — May 26-29, 2015

Institutional Committees

University of Oxford, Postdoc Fellow Search Committee — 2015
University of Oxford, Research Fellow Search Committee — 2014
University of Oxford, Research Fellow Search Committee — 2013

EDITORIAL WORK

Review Editor, *Big Data*, special section of *Frontiers in ICT*

REFEREE WORKS

Funding Agencies: U.S. National Science Foundation (NSF)
General: Science, PNAS, Scientific Reports, PLOS One, Journal of the Royal Society Interface
Physics: Physical Review Letter, Physical Review E, Physical A, European Physical Journal B, European Physical Letter, JSTAT
Network Science: Journal of Complex Networks
Economics: GECON 2015
Computer Science: ICWSM-15, ICWSM-16

TEACHING & ADVISING & FUNDING

Funding Ross Richardson (Postdoc), University of Oxford 2015 – 2016

Advising

Hyunuk Kim (Visiting Fellow of Santa Fe Institute), Postech	2016 – current
Inho Hong (Visiting Fellow of Santa Fe Institute), Postech	2016 – current
Minjin Lee (Graduate in Energy Science), SKKU	2016 – current
Alex McCormick (Undergraduate in Physics), University of Oxford	2015 – 2016
Daniel Burkhardt Cerigo (Undergraduate in Physics), University of Oxford	2015 – 2016
Daniel Kim (Graduate Fellow of Santa Fe Institute), KAIST	2013 – 2016
Kelvin Carlson (NSF-REU), Indiana University	2011

Tutoring

Network Analysis of UK Patent Data, University of Oxford	2016
Physics and Urban Scaling, University of Oxford	2014

Lecture

Guest lecture for econometrics, School of Future Strategy, KAIST	June 2016
Guest lecture for scalable cooperation, MIT	Mar 2016
Lecture for high school students at Hertford College, University of Oxford	Oct 2015
Lecture for undergraduate students, the Department of Mathematics and Statistics the University of New Mexico	July 2012

Teaching Assistant

Statistical Mechanics, KAIST (best teaching award in the department)	2005
Thermodynamics, KAIST	2005
General Physics II, KAIST	2004
General Physics I, KAIST	2004

OTHER HONORS & AWARDS

D4D (Data for Development) Challenge from Orange (Mobile phone data in Ivory Coast)	2012
Congress Fellowship of XVI International Congress on Mathematical Physics	2009
The Best prize of CYRAM Social Network Analysis competition	2008
Springer Prize for the Best Presentation at APPC10 (The 10th Asia Pacific Physics Conference)	2007
Distinguished Teaching Award, Dept. of Physics	2007
The Best Student of the Year 2001, Dept. of Physics	2001

REFERENCES

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