

# Michael Szell

## Research Fellow

Centre for Social Sciences  
Hungarian Academy of Sciences  
Tóth Kálmán utca 4  
1097 Budapest, Hungary

Tel: +36 1 224-6700/249  
Email: [michael.szell@gmail.com](mailto:michael.szell@gmail.com)  
<http://michael.szell.net>

## Education

Ph.D. (Dr.rer.nat.) in Physics, *summa cum laude*, University of Vienna, Mar 2012  
M.Sc. (Dipl.-Ing.) in Technical Mathematics, Vienna University of Technology, Oct 2007

## Positions held

### *Current positions*

External fellow, Complexity Science Hub Vienna  
since Apr 2017

Research fellow, Centre for Social Sciences, Hungarian Academy of Sciences  
since Sep 2016

Visiting research fellow, Center for Network Science, Central European University  
since Oct 2016

Visiting researcher, Center for Complex Network Research, Northeastern University  
since Sep 2016

Founder and manager of Bayer & Szell OG  
since Sep 2006

Developer and administrator of the Massive Multiplayer Online Game *Pardus*, [www.pardus.at](http://www.pardus.at)  
since Jul 2004

### *Past positions*

Researcher in residence, moovel lab, moovel Group GmbH  
Sep 2016 – Dec 2016

Postdoctoral research associate, Center for Complex Network Research, Northeastern University  
Jul 2014 – Sep 2016

Postdoctoral research fellow, Senseable City Laboratory, Massachusetts Institute of Technology  
Apr 2012 – Jul 2014

Research assistant, Section for Science of Complex Systems, Medical University of Vienna  
Jan 2009 – Dec 2011

## Research interests

Quantifying human behavior and social networks, in particular online and in cities  
Urban sustainability and human mobility  
Data visualization, Data science, Complex systems

## Skills

Programming: Python, MATLAB, PHP, SQL, HTML/CSS, MongoDB

Data mining, Database management, Web scraping, Online game development

Languages: English, German, Hungarian, (Italian)

## Publications

\* denotes corresponding authorship

### *Peer-reviewed publications*

- S. Grauwin, M. Szell, S. Sobolevsky, P. Hövel, F. Simini, M. Vanhoof, Z. Smoreda, A.-L. Barabási, C. Ratti  
Identifying the structural discontinuities of human interactions, *Scientific Reports* 7, 46677 (2017)
- R. Tachet, O. Sagarra, P. Santi, G. Resta, M. Szell, S. Strogatz, C. Ratti  
Scaling law of urban ride sharing, *Scientific Reports* 7, 42868 (2017)
- M. Nyhan, S. Sobolevsky, C. Kang, P. Robinson, A. Corti, M. Szell, D. Streets, Z. Lu, R. Britter, S.R.H. Barrett, C. Ratti  
Predicting vehicular emissions in high spatial resolution using pervasively measured transportation data and microscopic emissions model, *Atmospheric Environment* 140, 352–363 (2016)
- R. Sinatra, P. Deville, M. Szell, D. Wang, A.-L. Barabási  
A century of physics, *Nature Physics* 11, 791–796 (2015)
- O. Sagarra, M. Szell, P. Santi, A. Diaz-Guilera, C. Ratti  
Supersampling and network reconstruction of urban mobility, *PLOS ONE* 10(8), e0134508 (2015)
- O. Mryglod, B. Fuchs, M. Szell, Y. Holovatch, S. Thurner  
Interevent time distributions of human multi-level activity in a virtual world, *Physica A* 419, 681–690 (2014)
- P. Santi, G. Resta, M. Szell\*, S. Sobolevsky, S. Strogatz, C. Ratti  
Quantifying the benefits of vehicle pooling with shareability networks, *Proceedings of the National Academy of Sciences* 110(37), 13290–13294 (2014)
- M. Szell\*, S. Grauwin, C. Ratti  
Contraction of online response to major events, *PLOS ONE* 9(2), e89052, (2014)
- R. Sinatra, M. Szell\*  
Entropy and the predictability of online life, *Entropy* 16(1), 543–556 (2014)
- S. Sobolevsky, M. Szell, R. Campari, T. Couronné, Z. Smoreda, C. Ratti  
Delineating geographical regions with networks of human interactions in an extensive set of countries, *PLOS ONE* 8(12), e81707 (2013)
- S. Thurner, P. Klimek, M. Szell, G. Duftschmid, G. Endel, A. Kautzky-Willer, D. Kasper  
Quantification of excess-risk for diabetes when born in times of hunger, in an entire population of a nation, across a century, *Proceedings of the National Academy of Sciences* 110, 4703–4707 (2013)
- M. Szell, S. Thurner  
How women organize social networks different than men, *Scientific Reports* 3, 1214 (2013)
- M. Szell, R. Sinatra, G. Petri, S. Thurner, V. Latora  
Understanding mobility in a social petri dish, *Scientific Reports* 2, 457 (2012)
- M. Szell\*, S. Thurner\*  
Social dynamics in a large-scale online game, *Advances in Complex Systems* 15, 1250064 (2012)
- S. Thurner, M. Szell, R. Sinatra  
Emergence of good conduct, scaling and Zipf laws in human behavioral sequences in an online world, *PLOS ONE* 7, e29796 (2012)

M. Szell, S. Thurner  
Measuring social dynamics in a massive multiplayer online game, *Social Networks* 32, 313–329 (2010)

M. Szell, R. Lambiotte, S. Thurner  
Multirelational organization of large-scale social networks in an online world, *Proceedings of the National Academy of Sciences* 107, 13636–13641 (2010)

### Other publications

Y. Holovatch, O. Mryglod, M. Szell, S. Thurner  
Analyses of a virtual world, *Math Meets Myth*, Springer, Eds.: R. Kenna, M. Maccarron, P. Maccarron (2016, in print)

M. Szell\*, R. Sinatra  
Research funding goes to rich clubs, *Proceedings of the National Academy of Sciences* 112(48), 14749–14750 (2015)

M. Szell\*, P. Santi, C. Ratti  
Trip sharing in the era of self-driving cars, *Autonomous Vehicles Conference*, New York University (2015)

P. Santi, G. Resta, M. Szell\*, S. Sobolevsky, S. Strogatz, C. Ratti  
Reply to Lopez et al.: Sustainable implementation of taxi sharing requires understanding systemic effects, *Proceedings of the National Academy of Sciences* 111(51), E5489 (2014)

M. Szell\*, B. Groß  
Hubcab – Exploring the Benefits of Shared Taxi Services, *Decoding the City*, De Gruyter, Eds.: D. Offenhuber, C. Ratti (2014)

M. Szell  
Connecting Paradigms, *Science* 343(6147), 970–971 (2014)

M. Szell\*, B. Groß  
Hubcab – Taxi-Fahrgemeinschaften, digital erkundet, *Stadt entschlüsseln*, Bauwelt Fundamente 150, Birkhäuser, Eds.: D. Offenhuber, C. Ratti (2013)

S. Thurner, P. Klimek, M. Szell, G. Duftschnid, G. Endel, A. Kautzky-Willer, D. Kasper  
Reply to Klitz and Niklasson: Can viral infections explain the cross-sectional Austrian diabetes data?, *Proceedings of the National Academy of Sciences* 110, E2751 (2013)

M. Szell  
Statistical physics approaches to large-scale socio-economic networks, *Dissertation*, University of Vienna (2011)

S. Thurner, M. Szell (Eds.)  
Book of abstracts ECCS'11 Vienna, *European Conference on Complex Systems 2011*, Löcker (2011)

M. Szell, G. Petri, K. Zhao, D. Levin  
Human mobility in an online world, *Santa Fe Summer School 2010 Project Paper* (2010)

M. Szell  
Finite Differenzen Verfahren zur numerischen Lawinensimulation, *Diploma thesis*, Vienna University of Technology (2007)

M. Szell, F. Judex  
Petri Net Modelling of Different Strategies in ARGESIM Comparison C4 “Dining Philosophers” with HPSim, *Simulation News Europe* 17, 1 (2007)

## Data visualization projects

*What the Street!?*, June 2017, [whatthetstreet.moovellab.com](http://whatthetstreet.moovellab.com)

An online platform for intuitive and playful exploration of wasted mobility space in cities, of uneven distribution of space between different modes of transportation, and of how, in future scenarios of widespread shared and autonomous vehicles, massive areas of parking spaces could be regained for the public.

*HubCab*, Mar 2014, [www.hubcab.org](http://www.hubcab.org)

An interactive visualization that invites you to explore the ways in which over 170 million taxi trips connect the City of New York in a given year. This interface provides a unique insight into the inner workings of the city from the previously invisible perspective of the taxi system with a never before seen granularity.

*Tweet Bursts*, Feb 2014, [senseable.mit.edu/tweetbursts](http://senseable.mit.edu/tweetbursts)

Visual exploration of our collective excitement towards major events: The more excited we are, and the more intense the flurry of messages in the collective, the shorter our messages become.

## Talks

### *Invited talks*

*Northwestern University*, Evanston, USA, Jul 2017

Quantifying sharing benefits and injustice in urban transportation

*Senseable City Lab, MIT*, Cambridge, USA, Jun 2017

Exploring the arrogance of space with *What the Street!?*

*Quantifying success* satellite at *NetSci 2017*, Indianapolis, USA, Jun 2017

The success of teams and interdisciplinary research

Talk at Center for Network Science, Central European University, Budapest, Hungary, May 2017

Understanding social networks and collective behavior in online and urban environments

*Physics of Flexible Mobility* symposium at *DPG Spring Meeting*, Dresden, Germany, Mar 2017

Mobility in shareability networks

*moovel meetup* at *moovel Group GmbH*, Stuttgart, Germany, Sep 2016

The science of trip-sharing

Seminar at "Lendület" Research Center for Educational and Network Studies (RECENS), Budapest, Hungary, Jan 2016

Conflict and cooperation in large social networks

*Autonomous Vehicles* Conference at New York University, New York, USA, May 2015

Trip-sharing in the age of self-driving cars

*Understanding Complexity* Conference, Vienna, Austria, Feb 2015

Understanding Human Society with a Social Petri Dish

*Zurich meets New York* Festival at New York Academy of Science, New York, USA, May 2014

Using virtual worlds to explore behavior of people

*Social Network Analysis* Colloquium at ETH Zürich, Switzerland, Feb 2014

The Social Petri Dish and New Perspectives in Social Network Analysis

*Urban Beers* Meetup, Barcelona, Spain, Sep 2013

Taxi pooling in New York City: a network-based approach to optimize shared mobility

*FuturICT Workshop* at MIT Medial Lab, Cambridge, Feb 2013

Online games as platforms for measuring socio-economic behavior

*Macro Connections* Seminar at Harvard University, Cambridge, USA, Oct 2011

Understanding collective socio-economic behavior in an online world

Talk at Barabasilab, Northeastern University, Boston, USA, Oct 2011  
 Structure and dynamics of multi-relational, socio-economic networks in an online world

*Games Technology Workshop* at ETH Zürich, Switzerland, Mar 2011  
 Browser-based MMOGs: Technology and use as research tools

Interdisciplinary Seminar *Modeling Complex Socio-Economic Systems and Crises* at ETH Zürich, Switzerland, Feb 2011  
 Social Networks in Multiplayer Online Games

Invited talk at ETH Zürich, Switzerland, Feb 2011  
 Massive Multiplayer Online Games as Socio-economic Labs

*IIASA Xevents Workshop*, Laxenburg, Austria, Mar 2010  
 Extreme events in a large-scale, virtual human society

Invited talk at University of Catania, Italy, Oct 2009  
 Measuring the evolution of socio-economical structure in an online game

Invited lecture at the Department of Education and Human Development, University of Vienna, Austria, Jun 2008  
 Pardus – Funktion und Aufbau eines Browser-Spiels

*ARGESIM Simulation Workshop*, Siena, Italy, Sep 2007  
 Finite Differenzen Verfahren zur numerischen Lawinensimulation  
 Pardus – Funktion und Aufbau eines Browser-Spiels

*Workshop for avalanche dynamics* at the Austrian service for Torrent and Avalanche Control, Schwaz, Austria, Oct 2007  
 Finite Differenzen Verfahren zur numerischen Lawinensimulation

### Contributed talks

*Urban Systems and Network Science* satellite at *NetSci 2017*, Indianapolis, USA, Jun 2017  
 Interactive, animated exploration of urban mobility spaces through the online platform “What the Street!?”

*CompleNet 2017* Conference, Dubrovnik, Croatia, Mar 2017  
 Shareability networks: Quantifying ride-sharing benefits

*IC2S2 2016* Conference, Evanston, USA, Jun 2016  
 Exploring the anatomy of physics

*CompleNet 2016* Conference, Dijon, France, Mar 2016  
 Quantifying social effects in collaborative work

*ICCSS 2015* Conference, Helsinki, Finland, Jun 2015  
 Understanding effort and success in teams

*NetSci 2015* Conference, Zaragoza, Spain, Jun 2015  
 Quantifying team effort and success

*CompleNet 2015* Conference, New York City, USA, Mar 2015  
 Understanding Team Success

*NetSci 2014* Conference, Berkeley, USA, Jun 2014  
 Higher-order models in human mobility and interactions

*Network Frontier Workshop 2013* at Northwestern University, Evanston, USA, Dec 2013  
 Taxi-pooling in New York City: A network-based approach to social sharing

*Engaging Data 2013* Conference at MIT, Cambridge, USA, Nov 2013  
 Hubcab – Taxi-sharing in New York City: A network-based approach

*ECCS 2013* Conference, Barcelona, Spain, Sep 2013  
 Human spatial organization and the emergence of urban centers

ECCS 2013 Conference, Multiplex Networks 2013, Barcelona, Spain, Sep 2013  
 Multiplex networks in social systems

Urban Code Conference, Cambridge, USA, Nov 2012  
 hubcab – A network-based improved urban taxi service

Ph.D. Defensio at University of Vienna, Austria, Mar 2012  
 Statistical physics approaches to large-scale socio-economic networks

ECCS 2011 Conference, Vienna, Austria, Sep 2011  
 Human mobility on a network

NetSci 2011 Conference, Budapest, Hungary, Jun 2011  
 Multi-relational Socio-economic Networks in a Large-scale Online Community

Net2011 Conference at University Bicocca Milano, Italy, May 2011  
 Multi-relational socio-economic networks in a massive multiplayer online game

INSITE Kickoff-Meeting, Venice, Italy, Apr 2011  
 The artificial world of the Pardus game: First lessons

7th Vienna Central European Seminar in Particle Physics and Quantum Field Theory, Austria, Nov 2010  
 Complex human mobility dynamics on a network

ECCS 2010 Conference, Lisbon, Portugal, Sep 2010  
 Multi-relational social dynamics in a large-scale online game society  
 Trade, Conflict and Sentiments: Multi-relational organization of large-scale social networks

COST workshop *Processes on Networks* at Medical University of Vienna, Austria, Mar 2010  
 Establishment of a large-scale “laboratory” for socio-economic behavior

Workshop *Modelling Science* at Rathenau Institute, Amsterdam, Netherlands, Oct 2009  
 Measuring the evolution of socio-economical structure in an online game

DPG Spring Meeting, Dresden, Germany, Mar 2009  
 Measuring the evolution of socio-economical structure in an online game

## Academic activities

### *Review service*

Nature, Nature Communications, PNAS, Physical Review Letters, Physical Review E, New Journal of Physics, Europhysics Letters, Social Networks, Journal of The Royal Society Interface, Royal Society Open Science, PLOS ONE, Journal of Statistical Mechanics, EPJ Data Science, Condensed Matter Physics, Frontiers, Transportation, Games, ACM Transactions on Knowledge Discovery from Data, IEEE Transactions on Network Science and Engineering, IEEE Transactions on Knowledge and Data Engineering, IEEE Transactions on Signal and Information Processing over Networks, IEEE Transactions on Intelligent Transportation Systems, International Journal of Sustainable Transportation, International Journal of Geographical Information Science, Economics Bulletin, Forum neue Medien Austria, Netherlands Organisation for Scientific Research (NWO)

### *Academic visits*

Northwestern Institute on Complex Systems (NICO), Northwestern University, Evanston, USA, Jul 2017  
 Center for Network Science, Central European University, Budapest, Hungary, Mar – Apr 2016  
 Santa Fe Institute, Santa Fe, USA, Oct 2011  
 Laboratory for Complex Systems, University of Catania, Italy, May – Jun 2011  
 Chair of Sociology, in particular of Modeling and Simulation, ETH Zürich, Switzerland, Feb – Mar 2011  
 Laboratory for Complex Systems, University of Catania, Italy, Sep 2010

COST scientific mission at the Institute of Mathematical Sciences, Imperial College London, UK, Aug – Sep 2010

### *Advanced training*

*Graph Exploitation Symposium* at MIT Endicott House, USA, Aug 2014

*Workshop on Information and Decision in Social Networks* at MIT Media Lab, USA, Nov 2012

*Workshop Computational Social Science* at Harvard University, USA, May 2012

*SFI Complex Systems Summer School 2010* at the Santa Fe Institute, USA, Jun 2010

Summer school *Complex Systems and Social Simulation* at the Central European University, Budapest, Hungary, Jul 2009

Summer school *Steps in Evolution* at the Jacobs University Bremen, Germany, Jun 2009

### *Organization and committees*

Program Committee member of *Complex Networks 2017* in Lyon, France, Nov 2017

Program Committee member of *CCS 2017* in Cancun, Mexico, Sep 2017

Program Committee member of *ENIC'17* in Duisburg, Germany, Jul 2017

Program Committee member of *IC2S2 2017* in Cologne, Germany, Jul 2017

Program Committee member of the *ICWSM-17 11th International Conference on Web and Social Media* in Montreal, Canada, May 2017

Program Committee member of *COMPLEXIS 2017* in Porto, Portugal, Apr 2017

Program Committee member of the Social Networks and Graph Analysis Track of the *WWW2017 26th International World Wide Web Conference* in Perth, Australia, Apr 2017

Program Committee member of *CompleNet 2017* in Dubrovnik, Croatia, Mar 2017

Program Committee member of *Complex Networks 2016* in Milan, Italy, Dec 2016

Program Committee member of the *CCS 2016 Open Science for an Open Society* satellite in Amsterdam, Netherlands, Sep 2016

Program Committee member of the *ICWSM-16 10th International Conference on Web and Social Media* in Cologne, Germany, May 2016

Program Committee member of the *ICDM2016 Workshop on Data mining for the Analysis of Performance and Success (DAPS 2016)* in Cologne, Germany, May 2016

Program Committee member of the *ICWSM-16 10th International Conference on Web and Social Media* in Cologne, Germany, May 2016

Program Committee member of *COMPLEXIS 2016* in Rome, Italy, Apr 2016

Program Committee member of the Social Networks and Graph Analysis Track of the *WWW2016 25th International World Wide Web Conference* in Montreal, Canada, Apr 2016

Program Committee member of the *CompleNet 2016 Workshop on Complex Networks* in Dijon, France, Mar 2016

Program Committee member of the *NetSciX 2016 Conference on Network Science* in Wroclaw, Poland, Jan 2016

Program Committee member of the *ASONAM 2015 DyNo Workshop on Dynamics in Networks* in Paris, France, Aug 2015

Program Committee member of the *ASONAM 2015 Industry-Track* in Paris, France, Aug 2015

Program Committee member of the *IEEE BigData Congress 2015* in New York City, USA, Jun 2015

Main organizer and Program Committee member of the NetSci 2015 Satellite *NetSci Backstage* in Zaragoza, Spain, Jun 2015

Program Committee member of the ICWSM-15 *9th International Conference on Web and Social Media* in Oxford, UK, May 2015

Program Committee member of the CompleNet 2015 *Workshop on Complex Networks* in New York City, USA, Mar 2015

Program Committee member of the NetSciX 2015 *Conference on Network Science* in Rio de Janeiro, Brasil, Jan 2015

Program Committee member of the SocInfo 2014 track EGG 2014 *Exploration on Game and Gamers Workshop* in Barcelona, Spain, Nov 2014

Program Committee member of the SDM 2014 *Workshop on Mining Networks and Graphs: A Big Data Analytic Challenge* in Philadelphia, USA, Apr 2014

Organizer at the conference *Engaging Data 2013* at MIT, Cambridge, USA, Nov 2013

Program Committee member of the SDM'14 workshop *Mining Networks and Graphs: A Big Data Analytics Challenge* Philadelphia, USA, Apr 2014

Program Committee member of the 3PGCIC 2013 *Social Network Applications* track at University of Technology of Compiegne, France, Oct 2013

Program Committee member of the ECCS 2013 *Multiplex Networks 2013* satellite in Barcelona, Spain, Sep 2013

Program Committee member of the BRICS-CCI & CBIC 2013 *Complex Systems Symposium* in Recife, Brazil, Sep 2013

Reviewer of Conference Papers of the CUPUM 2013 *13th International Conference on Computers in Urban Planning and Urban Management* in Utrecht, Netherlands, Jul 2013

Organizer at the conference *Urban Code* at MIT, Cambridge, USA, Nov 2012

Program Committee member of the *Symposium on Social Networks and Social Contagion* at the Westin Arlington Gateway, USA, Nov 2012

Main organizer and Program Committee member of the ECCS'11 Satellite *XNet – Complexity & Networks* at the Medical University of Vienna, Austria, Jan – Sep 2011

Main organizer and Program Committee member of the *European Conference on Complex Systems 2011 (ECCS'11)* at the Medical University of Vienna, Austria, Oct 2010 – Sep 2011

Main organizer of COST MP0801 workshop *Processes on Networks* at the Medical University of Vienna, Austria, Mar 2010

## Teaching

PhD defense examiner at Eötvös Loránd University, Budapest, Hungary, Mar 2017

Supervision of PhD students, master students, interns, at Medical University Vienna and MIT

Seminar chair at seminar *Understanding Big Data*, European Forum Alpbach 2016, Alpbach, Austria, Aug 2016

## External research funding

Premium postdoctoral researcher in the Hungarian Academy of Sciences (MTA) grant *Conflict and Controversy in Large Social Networks*, Sep 2016 – Sep 2019

Key research personnel in the Air Force Office of Scientific Research (AFOSR) grant *The Fundamentals of Predictability of Scientific Success*, with Albert-László Barabási, Alessandro Vespignani, Roberta Sinatra, Feb 2015



Key research personnel in the Austrian Science Fund (FWF) project P23378, *Quantifying socio-economic multiplex networks in a massive multiplayer online game*, with Stefan Thurner, Sep 2011 – Oct 2015  
Although this grant was funded, I did not assume the position due to my move to Boston (MIT) in 2012.

## Travel and other grants

Industry support for organizing NetSci 2015 satellite NetSci Backstage, Jun 2015

Travel and accommodation support to one-month academic visit by ETH Zurich, Feb 2011

Travel grant from Österreichische Forschungsgemeinschaft to ECCS 2010, Sep 2010

Travel grant from the European Cooperation in Science and Technology, Action MP0801 Physics of Competition and Conflicts, to two-month academic visit to Imperial College, Aug-Sep 2010

Full travel and accommodation grant from Santa Fe Institute for three-week SFI Complex Systems Summer School 2010, Jun 2010

## In the media

My research and projects have been featured in, among others:

The New York Times, MIT Technology Review, MIT Frontpage Spotlight, MIT News, Nature News, Science News, National Geographic, The Guardian, Fast Company, The Huffington Post, Forbes, Newsweek, NBC News, The Atlantic, Citylab, Fortune, Yahoo! Finance, New York Magazine, Salon, Physorg, IEEE Spectrum, Quattroruote, Il sole 24 ore, La Stampa, Science Daily, Neue Zürcher Zeitung, 20 Minuten, Austrian National Radio Ö1, Austrian National Radio FM4, ORF Science, Der Standard, Die Presse, Wiener Zeitung, Salzburger Nachrichten, OÖ Nachrichten, Kleine Zeitung

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