# NetSci-X 2020: Keynote/Invited and Parallel Sessions Talk Schedule

| Room | Theme | Authors | Title |
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| **Keynote/Invited [Monday Jan. 20, 2020 -- 9:10-10:40]** | | | **Chair: Hiroki Sayama, Junichi Yamanoi** |
| **Ibuka Auditorium (1F)** | **Keynote** | Katy Börner | Network Models and Visualizations of Education, Scientific, and Job Market Developments |
| | **Invited** | Joe Labianca | Recognizing the Positive and Negative Ties in a Network |
| **Contributed Session 1 [Monday Jan. 20, 2020 -- 11:10-12:30]** | | | |
| **Ibuka Auditorium (1F)** | **Economic and Financial** | Irena Vodenska, Nima Dehmamy, Alexander Becker, Sergey Buldyrev, Shlomo Havlin, and Gene Stanley | Vulnerability of interconnected financial networks |
| **Chair: Giulio Cimini** | | Takayuki Mizuno, Shohei Doi, and Shuhei Kurizaki | Visualizing indirect influence of China in global shareholding networks |
| | | Kimihiro Nakaga, Koji Eguchi, Takayuki Mizuno, and Atsuhiro Takasu | Embedding and predicting supply-chain networks |
| | | Mayu Furukawa, Tomomi Kito, Junichi Yamanoi, and Hiroki Sayama | An integrated index for product & customer diversification strategies |
| **Meeting Room 1 (3F)** | **Network Structure 1** | Quoc Hoan Tran, Van Tuan Vo, and Yoshihiko Hasegawa | Scale-variant topological portraits of complex networks |
| **Chair: Jean-Gabriel Young** | | Takayuki Hiraoka and Koji Oishi | Genealogical network analysis of social group evolution |
| | | Chihiro Noguchi and Tatsuro Kawamoto | Robustness of spectral clustering for networks with an overlapping community structure |
| | | Vaiva Vasiliauskaite, Tim Evans, and Paul Expert | The hidden treasures of acyclic graphs: diamonds |
| **Meeting Room 2 (3F)** | **Temporal** | Hartmut Lentz, Andreas Koher, James Gleeson, and Philipp Hövel | Epidemic spreading on temporal networks - a contact-based model |
| **Chair: Hiroshi Kori** | | Radosław Michalski, Jaroslaw Jankowski, and Piotr Bródka | Sequential seeding in temporal networks |
| | | Kashin Sugishita, Mason Porter, Mariano Beguerisse-Diaz, and Naoki Masuda | Opinion dynamics in tie-decay networks |
| | | Maddalena Torricelli, Márton Karsai, and Laetitia Gauvin | Event embedding for temporal networks |
| **Meeting Room 3 (3F)** | **Brain** | Hardik Rajpal, Matthew Fredericks, Pedro Mediano, Fernando Rosas, Stefan Brugger, and Henrik Jeldtoft Jensen | Network and other higher order measures in the brain: lessons from a study of schizophrenia |
| **Chair: Carlo Vittorio Cannistraci** | | Makoto Fukushima and Kenji Leibnitz | Simulating packet-based communication on brain structural networks |
| | | Tommaso Gili, Andrea Gabrielli, Guido Caldarelli, Fabrizio Piras, Gianfranco Spalletta, and Rossana Mastrandrea | Functional brain network topology maps the dysfunctional substrate of schizophrenia |
| | | Hao Wang and Linyuan Lü | Higher-order morphorspace in individual myelin-based brain network |
| **Invited [Monday Jan. 20, 2020 -- 14:00-14:30]** | | | **Chair: Guido Caldarelli** |
| **Ibuka Auditorium (1F)** | **Invited** | Misako Takayasu | Modeling of the business transaction network in Japan and its practical applications |
| **Contributed Session 2 [Monday Jan. 20, 2020 -- 14:40-16:00]** | | | |
| **Ibuka Auditorium (1F)** | **Social** | Guido Caldarelli, Rocco De Nicola, Fabio Del Vigna, Marinella Petrocchi, and Fabio Saracco | The role of bot squads in the political propaganda on Twitter |
| **Chair: Irena Vodenska** | | Amirhossein Farzam, Parham Moradi, Zahra Padar, Mahdi Sarikhani, and Kosar Karimipour | Collective identity and social bots in Farsi Twitter |

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| | | Jia-Rong Xie, Gang Yan, Jiachen Sun, Xiao Ma, and Yanqing Hu | Unexpectedly high capacity and extremely unbalanced discursive power of social media networks to spread information |
| | | Diego Fregolent Mendes de Oliveira and Kevin S. Chan | Competition and spreading of low and high quality information in online social networks |
| **Meeting Room 1 (3F)** | **Network Structure 2** | Ignacio Morer, Alessio Cardillo, Albert Diaz-Guilera, Luce Prignano, and Sergi Lozano | Comparing spatial networks: a 'one size fits all' efficiency-driven approach |
| **Chair: Takayuki Hiraoka** | | Michael Wilsher, Carl P. Dettmann and A.J. Ganesh | Connectivity of 1-dimensional Soft Random Geometric Graphs |
| | | Serafino Matteo, Giulio Cimini, Amos Maritan, Samir Suweis, Jayanth Banavar, and Guido Caldarelli | Scale-free networks revealed from finite-size scaling |
| | | Pim van der Hoorn, Dmitri Krioukov, Gabor Lippner, and Will Cunningham | Ollivier curvature in random geometric graphs on Riemannian manifolds |
| **Meeting Room 2 (3F)** | **Synchrony and Dynamics** | Ilja Rausch, Yara Khaluf, and Pieter Simoens | Network motifs and collective decision-making |
| **Chair: Yohsuke Murase** | | Young Sul Cho | Concurrent formation of nearly synchronous clusters in each intertwined cluster set with parameter mismatches |
| | | Per Sebastian Skardal and Alex Arenas | Higher-order interactions in complex networks of phase oscillators promote abrupt synchronization switching |
| | | Hiroshi Kori | Noise stability and persistence of synchrony in a power grid model |
| **Meeting Room 3 (3F)** | **Biological and Chemical** | Boris Podobnik, Dean Korosak, Masa Skelin Klemen, Andraz Stozer, Jurij Dolensek, Marjan Slak Rupnik, Plamen Ch. Ivanov, Petter Holme, and Marko Jusup | B-cells operate collectively to help maintain glucose homeostasis |
| **Chair: Tommaso Gili** | | Alessandro Muscoloni, Ilyes Abdelhamid, and Carlo Vittorio Cannistraci | Local-community network automata modelling based on length-three-paths for prediction of complex network structures in protein interactomes and food webs |
| | | Takashi Okada, Je-Chiang Tsai, and Atsushi Mochizuki | Origin of adaptation and modularity in chemical reaction networks |
| | | Wilmer Leal, Eugenio Llanos, Andrés Bernal, Guillermo Restrepo, Duc Luu, Juergen Jost, and Peter F. Stadler | Exploring the hypergraph structure underlying the chemical space |
| **Keynote/Invited [Tuesday Jan. 21, 2020 -- 9:00-10:30]** | | | **Chair: Jesus Gómez-Gardeñes** |
| **Ibuka Auditorium (1F)** | **Keynote** | Meeyoung Cha | |
| | **Invited** | Petter Holme | The big science of small networks |
| **Contributed Session 3 [Tuesday Jan. 21, 2020 -- 11:00-12:20]** | | | |
| **Ibuka Auditorium (1F)** | **Urban** | Riccardo Gallotti, Giulia Bertagnolli, and Manlio De Domenico | Disentangling activity-aware human flows reveals the hidden functional organization of urban systems |
| **Chair: Gourab Ghoshal** | | Mark He, Shankar Bhamidi, Joey Glasser and Nikhil Kaza | Intertemporal community detection in bikeshare networks |
| | | Andrew Elliott, Stephen Law, and Luis Ospina-Forero | Characterising road networks through subgraph graphlet analysis |
| | | Sakil Chowdhury, Laurent Hébert-Dufresne, and Jeff Frolik | Effective implementation of energy aware polarization diversity for iot networks using eigenvector centrality |
| **Meeting Room 1 (3F)** | **Network Models and Percolation** | Ivan Voitalov, Pim van der Hoorn, and Dmitri Krioukov | Weighted hypersoft configuration model with power-law degree and strength distributions |
| **Chair: Xiaoke Xu** | | Andrea Gabrielli, Rossana Mastrandrea, Guido Caldarelli, and Giulio Cimini | Grand canonical ensemble of weighted networks |

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| | | John Ring, Jean-Gabriel Young, and Laurent Hébert-Dufresne | Connected graphs with a given degree sequence: efficient sampling, correlations, community detection and robustness |
| | | Jung-Ho Kim and Kwang-Il Goh | K-selective percolation on complex networks |
| **Meeting Room 2 (3F)** | **Dynamics 1** | Takuma Narizuka and Yoshihiro Yamazaki | Burstiness for adjacency relationships in a Vicsek model |
| **Chair: Oriol Artime** | | Huijuan Wang, Cunquan Qu, and Wioletta Ruszel | Self-avoiding pruning random walk on signed network |
| | | Sungmin Lee, Kyu-Min Lee, and Kwang-Il Goh | Emergent complexity in dynamics on signed networks |
| | | Guilherme Ferraz de Arruda, Giovanni Petri, and Yamir Moreno | Social contagion models on hypergraphs |
| **Meeting Room 3 (3F)** | **Epidemic** | Li Pi, Ceire Costelloe, and Paul Expert | Exploring carbapenem resistant enterobacteriaceae infections in imperial college healthcare trust: a network analysis using individual patient movement data |
| **Chair: Marko Jusup** | | Daniela Perrotta, Enrique Frias-Martinez, Miguel Luengo-Oroz, Daniela Paolotti, Michele Tizzoni, and Alessandro Vespignani | Harnessing cell phone traces to model the spread of Zika in Colombia |
| | | S. Jalil Kazemitabar and Arash A. Amini | Approximate identification of the optimal epidemic source in complex networks |
| | | Minjae Jo, Bukyoung Jhun, and Byungnam Kahng | Hybrid phase transition of simplicial SIS model in scale-free uniform hypergraph |
| **Invited [Tuesday Jan. 21, 2020 -- 13:50-14:50]** | | | **Chair: Naoki Masuda** |
| **Ibuka Auditorium (1F)** | **Invited** | Shlomo Havlin | Some applications of network science |
| | **Invited** | Byungnam Kahng | Hybrid phase transitions in complex systems |
| **Contributed Session 4 [Tuesday Jan. 21, 2020 -- 15:20-16:40]** | | | |
| **Ibuka Auditorium (1F)** | **Innovation** | Michael Park and Russell Funk | A first look at the relationship between the network of lobbying and innovation in high-tech industries |
| **Chair: Sang Hoon Lee** | | Nagi Moriya, Tomomi Kito, and Junichi Yamanoi | Patent opposition network: adversarial interactions of companies and trend of innovation |
| | | Andrea Zaccaria, Lorenzo Napolitano, Emanuele Pugliese, and Luciano Pietronero | Firms' complexity: technological coherence, performance, and forecasting |
| | | Dion O'Neale, Steven Turnbull, and Kirsten Locke | Using network science to understand student pathways in and through STEM education |
| **Meeting Room 1 (3F)** | **Inference** | Nima Dehmamy, Albert-László Barabási, and Rose Yu | Learning network structure using graph convolutional networks |
| **Chair: Laurent Hébert-Dufresne** | | Jean-Gabriel Young, George T. Cantwell, and M. E. J. Newman | Efficient and fully bayesian inference of complex networks from noisy data |
| | | Fang Zhou, Manuel Mariani, and Linyuan Lü | Inferring individual influence and susceptibility in social networks from multiple cascade data |
| | | Paolo Bertolotti, Ali Jadbabaie, and Fotini Christia | Tests for network cascades via branching processes |
| **Meeting Room 2 (3F)** | **Dynamics 2** | Akira Ishii, Nozomi Okano, Yuki Horio, and Yasuko Kawahata | Opinion dynamics theory including both trust and distrust in human relations |
| **Chair: Huijuan Wang** | | Hiroki Sayama and Junichi Yamanoi | Beyond social fragmentation: coexistence of cultural diversity and structural connectivity is possible with social constituent diversity |
| | | Alberto Aleta and Yamir Moreno | The dynamics of collective social behavior in a crowd controlled game: Twitch plays Pokémon |
| | | Koji Oishi and Kentaro Sakuwa | Evolution of alliance and rivalry networks in international relations |

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| **Meeting Room 3 (3F)** | **Application** | Larry Zhang, Nichol Castro, Trevor Cohen, and Reza Hosseini Ghomi | Probing speech generation via semantic fluency networks in aging populations as a proxy of dementia and Alzheimer's disease |
| **Chair: Daniela Perrotta** | | Shilun Zhang, Matus Medo, Linyuan Lv and Manuel Sebastian Mariani | Anticipators of rising and declining popularity trends in socio-economic systems |
| | | Cailean Osborne, Patrick Gildersleve, and Scott Hale | Navigating historical events through Wikipedia's link structure: a comparative analysis of article networks in 6 language editions |
| | | Sudarshan Kumar, Tiziana Di Matteo, and Anindya Chakrabarti | Distress spillover on complex networks with feedback loops |
| **Keynote/Invited [Wednesday Jan. 22, 2020 -- 9:00-10:30]** | | | **Chair: Tao Jia** |
| **Ibuka Auditorium (1F)** | **Keynote** | Alain Barrat | Temporal contact networks |
| | **Invited** | Linyuan Lü | Vital nodes identification in complex networks |
| **Contributed Session 5 [Wednesday Jan. 22, 2020 -- 11:00-12:20]** | | | |
| **Ibuka Auditorium (1F)** | **Game Theory** | Soya Miyoshi, Marko Jusup, and Petter Holme | Modeling the evolution of vaccine hesitancy |
| **Chair: Sadamori Kojaku** | | Xingru Chen and Fu Feng | Network-based approach to identify bridges and catalysts for persistent cooperation in the iterated prisoner's dilemma |
| | | Jesus Gomez-Gardeñes, Clara Granell, Benjamin Steinegger, and Alex Arenas | Prevalence oscillations triggered by human prophylaxis driven by risk perception |
| | | Alessio Cardillo and Naoki Masuda | Critical mass effect in evolutionary games on networks triggered by zealots |
| **Meeting Room 1 (3F)** | **Multilayer** | Piotr Bródka, Anna Chmiel, Matteo Magnani, and Giancarlo Ragozini | Quantifying layer similarity in multiplex networks |
| **Chair: Maksim Kitsak** | | Michael Danziger and Albert-László Barabási | Recovery coupling of multilayer networks |
| | | Marya Bazzi, Lucas Jeub, Mason Porter, Alex Arenas, and Sam Howison | A framework for the construction of generative models for mesoscale structure in multilayer networks |
| | | Dahae Roh and Kwang-Il Goh | Entropy production in majority-vote model on multiplex networks |
| **Meeting Room 2 (3F)** | **Time Series and Prediction** | Marcin Waniek, Kai Zhou, Yevgeniy Vorobeychik, Esteban Moro, Tomasz Michalak, and Talal Rahwan | How to hide one's relationships from link prediction algorithms |
| **Chair: Teruyoshi Kobayashi** | | Tao Jia, Yijun Ran, and Xiaoke Xu | The upper bound of link prediction by the AUC measure |
| | | Giovanni Petri and Samuel Scarpino | Path entropy identifies predictability horizons |
| | | Michael Small and Debora Correa | Testing networks from time series: when is a network an adequate description of nonlinear dynamics? |
| **Meeting Room 3 (3F)** | **Robustness and Resilience** | Romeil Sandhu and Ji Liu | Maxwell's demon: controlling entropy via discrete Ricci flow over networks |
| **Chair: Zi-ke Zhang** | | Yang Lou, Guanrong Chen, and Lin Wang | Towards optimal robustness of network controllability: an empirical necessary condition on node degrees |
| | | Sergio Faci-Lázaro, Jordi Soriano Fradera, and Jesus Gomez-Gardeñes | Functional resilience of cultured neuronal networks |
| | | Yamir Moreno | Biodiversity and structural stability of multilayer ecological networks |
| **Invited [Wednesday Jan. 22, 2020 -- 13:50-14:20]** | | | **Chair: Alex Arenas** |
| **Ibuka Auditorium (1F)** | **Invited** | Manlio De Domenico | |
| **Contributed Session 6 [Wednesday Jan. 22, 2020 -- 14:30-15:50]** | | | |

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| **Ibuka Auditorium (1F) Success** | Marc Santolini, Leo Blondel, Abhijeet Krishna, Emma Barme, Megan Palmer, and Albert-László Barabási | A large scale analysis of collaboration and innovation in an international science and engineering competition |
| **Chair: Marya Bazzi** | Orsolya Vasarhelyi, Igor Zakhlebin, Stasa Milojevic, and Agnes-Emoke Horvat | Gender diversity in collaboration networks and the online popularity of scientists |
| | Taekho You, Jinseo Park, June-Young Lee, Jinhyuk Yun, and Woo-Sung Jung | Comparing quality of questionable journals in academic ecosystem |
| | Riccardo Gallotti and Manlio De Domenico | Collective effects of individual decisions -- the case of the Nobel prize |
| **Meeting Room 1 (3F) Embedding** | Maksim Kitsak and Dmitri Krioukov | Cross-geometric framework for complementarity-driven networks |
| **Chair: Michael Danziger** | Takeshi Hase and Masanori Shimono | Neural network embedding of real neuronal networks |
| | Olivier Guin, Roland Molontay, and Marcell Nagy | Comparing structural feature-based and graph embedding-based network classification methods |
| | Yanchen Liu, Nima Dehmami, and Albert-László Barabási | Topological characterization of 3D graph embedding landscapes using the graph linking number |
| **Meeting Room 2 (3F) Cascade** | Oriol Artime and Manlio De Domenico | Cascade-based attacks on multilayer networks |
| **Chair: Michael Small** | Tomokatsu Onaga, Fabio Caccioli, and Teruyoshi Kobayashi | Modelling fire sales as heterostate dynamical processes on bipartite networks |
| | Yafei Zhang, Lin Wang, Jonathan Zhu, and Xiaofan Wang | The virality and growth of cascades |
| | Shaunette Ferguson, Sadamori Kojaku, and Teruyoshi Kobayashi | Diurnal dynamics of financial systemic risk |
| **Meeting Room 3 (3F) Community** | Andrew Elliott, Angus Chiu, Marya Bazzi, Gesine Reinert, and Mihai Cucuringu | Core–periphery structure in directed networks |
| **Chair: Alessio Cardillo** | Vaiva Vasiliauskaite and Tim Evans | Making communities show respect for order |
| | Christopher Blöcker and Martin Rosvall | Mapping flow in bipartite networks |
| | Aditya Tandon and Santo Fortunato | Fast consensus clustering in complex networks |
| **Keynote [Wednesday Jan. 22, 2020 -- 16:20-17:20]** | | **Chair: Kwang-Il Goh** |
| **Ibuka Auditorium (1F) Keynote** | Albert-László Barabási | Taming Complexity: From networks to brain control |