Michael T. Gastner

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Professional Profile

Applied mathematician and data scientist specializing in data visualization, cartography, network analysis, and mathematical modeling. Originator of the go-cart.io project, which simplifies cartogram generation to make it more accessible and user-friendly. Internationally experienced educator at the undergraduate and postgraduate level. Vice-Chair of the International Cartographic Association's Commission on Map Projections. Regular contributor to peer-reviewed journals, with a contract from CRC Press to author the textbook "Data Visualization with R, RStudio, and the Tidyverse."

Academic Positions

Current Since Jan 2023	Singapore Institute of Technology: Associate Professor *Information and Communications Technology*
	The Singapore Institute of Technology is a key university in Singapore that adopts an integrated applied learning and research approach to contribute to the economy and society. My research is supported by a competitive grant from the Singapore Ministry of Education, where I serve as the Principal Investigator, with total funding of nearly S$650,000. I also supervise projects in the Integrated Work Study Programme and final-year projects.
Dec 2022 – Jul 2015	Yale-NUS College (Singapore): Assistant Professor *Mathematical, Computational and Statistical Sciences*
	Yale-NUS was a selective liberal arts and sciences college. I supervised undergraduate research culminating in "Capstone Projects" in the students' senior year. Many projects resulted in peer-reviewed publications co-authored with students, earning me the Yale-NUS College Annual Research Recognition Award. I also taught and designed modules for the "Common Curriculum" and the Data Science program.
Jun 2015 – Nov 2013	Hungarian Academy of Sciences (Budapest): Marie Curie Fellow *Institute of Technical Physics and Materials Science*
	Independent research in statistical physics, network analysis and game theory. This fellowship was supported by the European Commission (€184,000).
Oct 2013 – Sep 2012	University of Bristol (UK): Lecturer *Department of Engineering Mathematics*
	Independent research in applied mathematics. Lecturer for undergraduate and postgraduate courses. My research was supported by the grant "Building Global Engagements in Research" (£3,440).
Aug 2012 – Dec 2009	Imperial College (London): Junior Research Fellow *Mathematics Department*
	Independent research in complexity and network science. Lecturer for postgraduate courses. The fellowship (£122,000) was awarded by Imperial College after a worldwide search for early-career researchers and a rigorous three-stage review process.

Academic Positions (continued)

Nov 2009 – May 2008	Carl von Ossietzky Universität, Oldenburg (Germany): Research Fellow *Institute for Chemistry and Biology of the Marine Environment* Mathematical modeling of bioinvasion mediated by the network of cargo ships, supported by a Computational Science Fellowship from the Volkswagen Foundation (€ 201,000).
May 2008 – Oct 2005	Santa Fe Institute (USA): Postdoctoral Fellow Independent research in complex systems and interdisciplinary science. The fellowship provided $12,000 for research expenses in addition to the salary.

Qualifications

Aug 2005 – Sep 2000	University of Michigan (USA): Ph.D. *Physics Department* | Adviser: Prof. M. E. J. Newman Thesis: "Spatial Distributions—Density-Equalizing Maps, Facility Location, and Two-Dimensional Networks." Supported by Max Kade Foundation Scholarship and Rackham Dissertation Grant.
Jul 2000 – Oct 1997	Albert-Ludwigs-Universität Freiburg (Germany): Vordiplom *Physics Department* Average mark: 1.0 (best possible mark on a scale from 1.0 to 6.0)

Selected Publications

Cartogram Legends and Grid Lines	K. L. T. Fung, S. T. Perrault, and **M. T. Gastner** (2024) "Effectiveness of Area-to-Value Legends and Grid Lines in Contiguous Area Cartograms" *IEEE Trans. Vis. Comput. Graph.* 30(8):4631–4647 DOI: 10.1109/TVCG.2023.3275925 We experimentally evaluated whether legends and grid lines enhance the interpretability of cartograms, where the area of each map region is proportional to an associated numeric data value (e.g., population or gross domestic product) while maintaining geographic connectivity. Legends and grid lines were found to improve task completion rates but did not significantly enhance accuracy and slowed response times. Selectable legends with grid lines reduced variability in area estimates and were rated the most effective by participants.
Interactive Cartograms	I. K. Duncan, S. Tingsheng, S. T. Perrault, and **M. T. Gastner** (2021) "Task-Based Effectiveness of Interactive Contiguous Area Cartograms" *IEEE Trans. Vis. Comput. Graph.* 27(3):2136–2152 DOI: 10.1109/TVCG.2020.3041745 Cartograms are often criticized for being difficult to interpret due to their distorted appearance. We conducted an experiment to assess whether cartograms become more legible when accompanied by interactive animations, linked brushing, and infotips. Our findings suggest that interactivity has the potential to make cartograms accessible even to readers unfamiliar with interactive computer graphics or lacking prior experience with maps.
Fast Cartogram Algorithm	**M. T. Gastner**, V. Seguy, and P. More (2018) "Fast Flow-Based Algorithm for Creating Density-Equalizing Map Projections" *Proc. Natl. Acad. Sci. U.S.A.* 115(10):E2156–E2164 DOI: 10.1073/pnas.1712674115 Density-equalizing map projections are a powerful tool for creating contiguous cartograms. Prior to this publication, calculating these projections was generally cumbersome and slow. Here we describe and benchmark a new algorithm that computes cartograms in seconds by solving parallelizable equations of motion inspired by fluid dynamics.

Selected Publications (continued)

<table>
<tr><td>Network
Analysis</td><td>P. Kaluza, A. Kölzsch, M. T. Gastner, and B. Blasius
The Complex Network of Global Cargo Ship Movements
J. Royal Soc. Interface 7(48):1093–1103 (2010)
DOI: 10.1098/rsif.2009.0495

The global network of merchant ships plays a crucial role in human mobility, the exchange of goods, and the spread of invasive species. Using data on cargo ship itineraries from 2007, we constructed and analyzed the network of links between ports.</td></tr>
</table>

Teaching Experience

Data Analysis and Visualization and *Information Visualization*
Yale-NUS College (2016–2022), Singapore Institute of Technology (2023–2024)

This course teaches computer programming for data analysis and visualization, adopting a grammar-of-graphics approach. Beginning with the fundamentals of the R programming language, students learn to write their own programs using the ggplot2 package. Hands-on instruction emphasizes optimizing programming efficiency with the RStudio integrated development environment and the Tidyverse suite of R packages. Real-world data sets are used to demonstrate techniques for extracting information and presenting it effectively (e.g., as networks or geographic maps). My teaching materials are scheduled for publication as a textbook by CRC Press in 2025.

Introduction to Data Science
Yale-NUS College (2022)

This course introduces foundational methods in data science, combining mathematical, statistical, and computational approaches to analyze and model real-world phenomena. Students gain hands-on experience with R, RStudio, and R Markdown while exploring topics such as exploratory data analysis, hypothesis testing, regression techniques (linear, logistic, Poisson, stepwise, and Lasso), clustering, decision trees, Naive Bayes classifiers, association rules, principal component analysis, and text analysis. The course emphasizes practical application and critical thinking to develop data-driven insights.

Quantitative Reasoning
Yale-NUS College (2016–2021)

This "Common Curriculum" course aims to develop students' skills in logical and statistical reasoning, enabling them to become critical and informed readers of quantitative data. Students learn to critique and question empirical claims, support them with logical arguments, and address real-life problems by gathering and visually representing quantitative data. The course employs team-based learning pedagogy, fostering an environment where students with diverse talents and backgrounds can learn together and from one another.

Stochastic Processes and Models
Yale-NUS College (2016–2017)

This course introduces students to the mathematics underlying common models of stochastic processes, including Markov chains, Poisson processes, renewal processes, and queuing theory. Students learn to prove key mathematical results and apply these concepts to real-world problems.

Evolutionary Game Theory
Eötvös Loránd University, Budapest (2014)

In this course, students learn fundamental concepts of evolutionary game theory, including payoff matrices, pure and mixed strategies, and various notions of equilibria and their stability.

Engineering Mathematics
University of Bristol (2013)

This two-semester course aims to ensure that all students entering the Faculty of Engineering achieve a common standard in mathematics. It covers the foundational mathematics essential for professional engineering. Topics include algebra, analysis, calculus, differential equations, probability, and statistics.

Teaching Experience (continued)

Networks: Theory and Applications
Imperial College London (2011)

This course introduces the mathematical theory of networks with applications in social networks, the Internet, transportation, and biology. Topics include graph theory, algorithms, and mathematical models of networks, with a particular focus on random graph models. The course aims to develop the mathematics of network-driven processes (e.g., traffic flows, epidemiology, and web search engines) and to apply the theory to real data.

I have also taught the following courses.

- *Data Engineering and Visualization*, Singapore Institute of Technology (2024–2025)
- *Data Structures*, Singapore Institute of Technology (2023–2025)
- *Monte Carlo Simulations in Science and Statistics*, Yale-NUS College (2017)
- *Statistical Computing*, Yale-NUS College (2016)
- *Statistical Programming*, Yale-NUS College (2015)
- *Network Flow Algorithms*, University of Bristol (2012)
- *PhD school "Networks and Medical Imaging"*, University of Namur, Belgium (2012)
- *Stochastic Spatial Models in Ecology*, Imperial College London (2012)
- *Mathematics I for Civil Engineers*, Imperial College London (2012)
- *Networks Winter School*, University of Warwick (2011)
- *Biological Modelling*, Universität Oldenburg, Germany (2008)
- *Graduate Workshop in Social Science*, Santa Fe Institute, USA (2006)
- Graduate Student Instructor, University of Michigan (2001–2003)
    - *Introductory Mechanics and Sound Laboratory*
    - *Introductory Electricity and Light Laboratory*
    - *Elementary Laboratory II (Electricity and Magnetism)*

Awards and Fellowships

Yale-NUS College Annual Research Recognition Award (2021)
Awarded for faculty-student collaboration, jointly with student recipients Ian K. Duncan and S. Tingsheng (S\$ 5000 research grant + S\$500 prize for each recipient)

FP7 Marie Curie Fellowship (2013–2015)
Competitive intra-European fellowship (total support: €184,000)

Imperial College Junior Research Fellowship (2009–2012)
Independent fellowship that aims to select world-class early-career researchers through a rigorous three-stage review process in open competition (total support: £122,000)

Computational Science Fellowship of the German Volkswagen Foundation (2009)
Independent fellowship that supports junior researchers in theoretical and computer-based disciplines, selected by an international review panel (total support: €201,000)

Postdoctoral Fellowship, Santa Fe Institute (2005–2008)
Highly competitive fellowship that aims to "prepare fellows to be leaders in transdisciplinary science" (salary + \$12,000 research expenses)

Wirt and Mary Cornwell Prize (2004)
Awarded to Ph.D. students who "demonstrated greatest intellectual curiosity, given most promise of original study and creative work" (\$10,000 cash award)

Awards and Fellowships (continued)

Max Kade Foundation Scholarship (2000–2001)
Competitive fellowship to promote German-US educational exchange (tuition fees + monthly stipend)

Research Grants

Yale-NUS Special Pockets Research Grant (2022)
"Connecting metadata to cartograms displayed on internet-enabled devices" (S$1500)

Singapore Ministry of Education Academic Research Fund Tier 2 (2022–2025)
"Designing mobile-friendly cartograms for visualising geospatial data" (S$649,480)

Yale-NUS Special Pockets Research Grant (2021)
"Automatic label placement in computer-generated cartograms" (S$1,500)

Yale-NUS Special Pockets Research Grant (2021)
"Topological colouring algorithm for cartograms" (S$1,500)

Yale-NUS Special Pockets Research Grant (2020)
"Implementing topology-aware cartogram software" (S$1,500)

Singapore Ministry of Education Academic Research Fund Tier 1 (2019–2022)
"Developing the web application go-cart.io for generating cartograms" (S$86,811)

Yale-NUS Research Cluster Seminar Grant (2016)
S$19,600 support for workshops and conferences

Yale-NUS Startup Grant (2016–2020)
S$60,000 for research on networks and cartography

Building Global Engagements in Research (2012–2013)
Competitively awarded internal responsive mode funding at the University of Bristol (£3,440)

Rackham Dissertation Grant (2005)
Awarded by the University of Michigan for exceptionally promising Ph.D. dissertation projects (tuition fees + monthly stipend)

Invited Positions

Dec 2018 – Oct 2018	Hungarian Academy of Sciences (Budapest): Visiting Senior Research Fellow *Center for Social Sciences, RECENS research group*
May 2008 – Jan 2008	University of New Mexico (USA): Visiting Postdoctoral Researcher *Department of Computer Science*

Seminars, Conference Presentations and Workshops

Keynote Speeches

Sep 2022	*Teaching Data Visualization to Undergraduate Students* 18th International Conference on Geoinformation and Cartography, Selce, Croatia
Dec 2018	*A Fast Flow-Based Algorithm for Creating Density-Equalizing Map Projections* 3rd Asia-Pacific Conference on Complex Systems Design and Management, Singapore

Other Invited Talks since 2018

Sep 2024	*Data-Centric Analytical Capacity with AI* Singapore Cooperation Programme, Ministry of Foreign Affairs
Nov 2023	*Cartograms for Geography Education* Workshop, Ministry of Education, Singapore
Jun 2023	*Area Cartograms of Singapore* Official Speaker at the Launch of the Data Arcade Tournament 2023, organised by GovTech Singapore
Dec 2022	*Accelerating the Calculation of Optimally Smooth Pycnophylactic Interpolations* Seminar, Workshop on Optimization in the Big Data Era, Institute for Mathematical Sciences, Singapore
Nov 2022	*Remapping Data: Visualizing Geospatial Statistics Using Cartograms* Seminar, Applied and Computational Mathematics, University of Wisconsin, Madison
Jul 2022	*Cartograms: Geographic Maps Reimagined* Seminar, Infocomm Technology, Singapore Institute of Technology
Jun 2021	*Cartograms for Spatiotemporal Visualization* Workshop on Data Science and Curation: Spatial Data Science, Indian Statistical Institute, Bengaluru
Jun 2021	*Cartograms: the Past, the Present and the Future* Colloquium, Institute for Geography, University of Augsburg, Germany
Oct 2020	*Conveying Geospatial Information with Contiguous Area Cartograms* Seminar, Biology Department, Hong Kong Baptist University
Mar 2020	*Cartograms: Geographic Maps Reimagined* Seminar, Computer Science Department, University of Iceland, Reykjavik
Feb 2020	*Bringing Cartograms to the Masses* Complexity Community Sharing Session, Nanyang Technological University, Singapore
Jan 2020	*Contiguous Area Cartograms* Seminar, Geography Department, University of Zurich, Switzerland
Oct 2019	*Contiguous Area Cartograms for Data Visualization and Analysis* Satellite meeting: Extracting and analysing networks from spatio-temporal data, Conference on Complex Systems, Singapore

Seminars, Conference Presentations and Workshops (continued)

Sep 2019	*Network Analysis with R* Workshop on Complex Networks and Persistent Homology, National University of Malaysia, Bangi
Oct 2018	*Consensus Time in a Voter Model with Concealed and Publicly Expressed Opinions* Seminar, "Lendület" Research Center for Educational and Network Studies (RECENS), Hungarian Academy of Sciences, Budapest
Oct 2018	*Voter Model with Concealed and Publicly Expressed Opinions* Complexity and Networks Group, Imperial College London, UK
Jan 2018	*A Fast Flow-Based Algorithm for Creating Density-Equalizing Map Projections* Complexity Community Sharing Session, Nanyang Technological University, Singapore

Contributed Conference Talks since 2018

Oct 2024	*Effectiveness of Area-to-Value Legends and Grid Lines in Contiguous Area Cartograms* IEEE VIS, virtual conference
Sep 2024	*Designing Mobile-Optimized Cartograms* EuroCarto, Vienna, Austria
Sep 2024	*Effectiveness of Large-Language Models in Recognizing Spatially Intensive Statistical Data* International Conference on Geoinformation and Cartography, Zagreb, Croatia
Jun 2024	*Power-Law Tailed Weight Distributions in Connectome Graphs* Network Neuroscience 2024, Québec City, Canada
Sep 2023	*Topology-Aware Line Densification for Reprojected Curves on Maps* International Conference on Geoinformation and Cartography, Zadar, Croatia
Aug 2023	*Topology-Aware Algorithm for Constructing Cartograms from Density-Equalising Map Projections* International Congress on Industrial and Applied Mathematics, Tokyo, Japan
Jun 2022	*Motivating Good Practices for the Creation of Contiguous Area Cartograms* International Conference on Cartography and GIS, Nessebar, Bulgaria
Dec 2021	*Balancing Shape Distortions and Contiguity in Cartograms* International Cartographic Conference, Florence, Italy
Oct 2021	*Task-Based Effectiveness of Interactive Contiguous Area Cartograms* IEEE VIS, virtual conference
Sep 2020	*Beyond Fortune 500: Women in a Global Network of Directors* NetSci, Rome, Italy
Dec 2019	*Mean Consensus Time of the Voter Model on Networks Partitioned into Two Cliques of Arbitrary Sizes* Complex Networks, Lisbon, Portugal
Oct 2019	*Mean Consensus Time of the Voter Model on Networks with Two Cliques* Conference on Complex Systems, Singapore

Seminars, Conference Presentations and Workshops (continued)

Jul 2019 | *go-cart.io: A Web Application for Generating Contiguous Cartograms*
International Cartographic Conference, Tokyo, Japan

Sep 2018 | *A Voter Model with Concealed and Publicly Expressed Opinions*
Conference on Complex Systems, Thessaloniki, Greece

Jul 2018 | *Implementing a Fast Flow-Based Algorithm for Creating Cartograms*
Data Science, Statistics and Visualization, Vienna, Austria

Selected Media Coverage

About My Work on Cartograms

Sage Perspectives (7 May 2021)
Everybody is talking about vaccines, but who on earth gets them?
https://tinyurl.com/talkingAboutVaccines

Latest @ Yale-NUS (16 Apr 2021)
Faculty-student research collaboration tackles inequality in vaccine distribution
https://www.yale-nus.edu.sg/newsroom/faculty-student-research-collaboration-tackles-inequality-in-vaccine-distribution/

Der Spiegel (4 Apr 2021)
So haben Sie die Welt noch nicht gesehen
https://www.spiegel.de/ausland/die-erde-in-karten-so-haben-sie-die-welt-noch-nicht-gesehen-a-4b03cf99-672c-41f1-a846-1cee641215dd

Latest @ Yale-NUS (4 Apr 2018)
Yale-NUS faculty member and student collaborate on cartographic research
https://www.yale-nus.edu.sg/newsroom/4-april-2018-yale-nus-faculty-member-and-student-collaborate-on-cartographic-research/

Nature (15 Feb 2006)
A popular perspective
https://doi.org/10.1038/439800a

The Guardian (16 Nov 2004)
The altered states
https://www.theguardian.com/world/2004/nov/16/uselections2004.comment

Washington Post (13 Nov 2004)
Election map makers, exercising some latitude
https://www.washingtonpost.com/wp-dyn/articles/A46719-2004Nov12.html

CNN (12 Nov 2004)
Paula Zahn now
http://edition.cnn.com/TRANSCRIPTS/0411/12/pzn.01.html

About My Work on Opinion Formation

GNT, Brazilian television (17 Mar 2021)
Saia Justa
https://michaelgastner.com/videos/VT_HIPOCRISIA_GNT.mp4

Physics World (12 Dec 2019)
Voter model examines how opinions spread between social networks
https://physicsworld.com/a/voter-model-examines-how-opinions-spread-between-social-networks/

Selected Media Coverage (continued)

Cordis, European Commission (25 Aug 2016)
A game theoretic perspective on network dynamics
https://www.cordis.europa.eu/result/rcn/188386_en.html

About My Work on Transport Networks

Hakai Magazine (23 Sep 2019)
The ballast of colonization
https://www.hakaimagazine.com/ballast-podcast/

ARD, German public television (19 Jun 2014)
Wissen vor Acht
https://web.archive.org/web/20170408183354/http://www.daserste.de/information/wissen-kultur/wissen-vor-acht-natur/sendung/wissen-vor-acht-natur-344.html

ZDF, German public television (3 Jun 2013)
Deutschland von oben 3: Fluss (beginning at minute 38:00)
https://www.zdf.de/dokumentation/terra-x/terra-x-deutsche-gewaesser-von-oben-100.html

Wall Street Journal (7 May 2013)
Roving sea squirts, mussels threaten top Asian ports
https://www.wsj.com/articles/BL-CJB-17670

Der Spiegel (6 May 2013)
Eingeschleppte Arten: Forscher kartieren Wege der Bioinvasoren
https://www.spiegel.de/wissenschaft/natur/eingeschleppte-arten-forscher-kartieren-routen-der-bioninvasoren-a-898178.html#ref=rss

BBC News (5 May 2013)
Scientists map global routes of ship-borne invasive species
https://www.bbc.co.uk/news/science-environment-22397076

Scientific American (1 Feb 2009)
Removing roads and traffic lights speeds urban travel
https://www.scientificamerican.com/article/removing-roads-and-traffic-lights/

The Atlantic (1 Dec 2008)
Share the road
https://www.theatlantic.com/magazine/archive/2008/12/quick-study/307155/

The Economist (11 Sep 2008)
Queuing conundrums
https://www.economist.com/science-and-technology/2008/09/11/queuing-conundrums

Research Supervision

Singapore Institute of Technology (Academic Capstone Theses)

- Teo Wen Yu Carlsen: Automated Deployment for the Web-Based Cartogram Generation Tool go-cart.io (2024)
- Poon Wai Hung: Maintaining the Topological Validity of Cartograms during Morphing Animations (2024)

Research Supervision (continued)

Yale-NUS College (Capstone Theses)

- Yau Yen Ching: Evaluating the Effectiveness of Different Cartogram Designs for Visualising Contiguity (2022)
- Fung Lee Tat Kelvin: Effectiveness of Cartogram Legend and Grid Lines (2021)
- Matthias E. Goh: Topology-Aware Construction of Density-equalising Map Projections (2021)
- Ian K. Duncan: An Evaluation of the Usability of the Web-Based Cartogram Generation Tool go-cart.io (2021)
- Kota Ishida: Two-community Voter Model (2020)
- Shi Tingsheng: go-cart.io—Implementing Good Practices for Generating Contiguous Area Cartograms Online (2020)
- Adam Y. M. Tonks: Reducing Regional Distortions in Flow-based Algorithm Cartograms (2018)
- Evan Asava Aree: A Simulation Model and Web App as a Research and Pedagogical Tool to Understand Succession in Secondary Forests (2018)
- Anna Evtushenko: Networks of Interlocking Directorates, a Global Approach (2017)

Imperial College London (Master of Science Theses)

- Elias Bamis: Constrained Gravity Models for Network Flows (2012)
- Vivien Seguy: Cartograms (2011)
- Ahmed-Amine Homman: Percolation Thresholds on Correlated Lattices and Finite-Size Scaling (2011)

Service to the Research Community

Leadership

- Vice-Chair of the International Cartographic Association's Commission on Map Projections (since 2024)

Peer Reviewing

- Academic Editor: PLOS ONE (since 2022)
- Review Editor: Models in Ecology and Evolution (special section of Frontiers in Ecology and Evolution) (since 2022)
- Book proposal review: CRC Press (Taylor and Francis Group), Bentham Science
- Reviews for journals:

Interdisciplinary:	Chaos, Journal of the Royal Society Interface, Nature Communications, PLOS ONE, Royal Society Open Science, Scientific Reports
Physics:	EPL (Europhysics Letters), Journal of Physics A, Journal of Statistical Physics, Networks and Heterogeneous Media, New Journal of Physics, Physical Review Letters, Physical Review E, Physics Letters A
Computer science:	ACM Transactions on Spatial Algorithms and Systems, Digital, IEEE Transactions on Network Science and Engineering, IEEE Transactions on Visualization and Computer Graphics, IEEE VIS, Information Visualization, Knowledge-Based Systems, Mathematics and Computers in Simulation, PacificVis

Service to the Research Community (continued)

Geography:	Applied Geomatics, Cartographic Journal, Cartography and Geographic Information Science, Cartography and Geoinformation, Environment and Planning B, Geo-spatial Information Science, Health and Place, International Journal of Geographical Information Science, ISPRS International Journal of Geo-Information, Journal of Geodesy, Spatial Statistics
Biology:	Ecography, Ecological Modelling, Frontiers in Ecology and Evolution, Insectes Sociaux, International Journal of Health Geographics, Global Ecology and Biogeography, PLOS Computational Biology
Miscellaneous:	Journal of Advanced Transportation, Mathematical Methods in the Applied Sciences

Conference Organisation

- Programme Committee:
  - 13th International Conference on Complex Networks and Their Application (Istanbul, 2024)
  - ACM CCS "CyberSecurity in Healthcare" Workshop (Salt Lake City, 2024)
  - 12th International Conference on Complex Networks and Their Application (Nice, 2023)
  - 18th International Conference on Geoinformation and Cartography (Zagreb, 2022)
  - 11th International Conference on Complex Networks and Their Application (Palermo, 2022)
  - 9th International Conference on Complex Networks and Their Applications (Madrid, 2020)
  - European Conference on Complex Systems (Oxford, 2006)

- Organising Committee: Frontiers in Network Science (Berlin, 2009)
- Chaired Sessions:
  - Conference on Complex Systems (Singapore, 2019)
  - International Cartographic Conference (Tokyo, 2019)

Outreach

- Workshop "Cartograms for Geography Education" at the Singapore Ministry of Education (2023).
- Research supervision of high school student Ananya Shah (Singapore American School, 2021)
- Presentation at Singapore Ministry of National Development: "A Fast Flow-Based Algorithm for Creating Density-Equalizing Map Projections" (2019)
- Expert consultation for research project of secondary-school students (Raffles Institute, Singapore, 2017)

Appendix: Complete Publication List

Peer-Reviewed Journal Articles

C. Rosche, O. Broennimann, A. Novikov, V. Mrázová, G. V. Boiko, J. Danihelka, **M. T. Gastner,** A. Guisan, K. Kožić, M. Lehnert, H. Müller-Schärer, D. U. Nagy, R. Remelgado, M. Ronikier, J. A. Selke, N. M. Shiyan, T. Suchan, A. E. Thoma, P. Zdvořák and P. Mráz
Herbarium Specimens Reveal a Cryptic Invasion of Polyploid *Centaurea stoebe* in Europe
New Phytologist, online ahead of print
DOI: 10.1111/nph.20212

I. K. Duncan and **M. T. Gastner**
Comparative Evaluation of the Web-Based Contiguous Cartogram Generation Tool go-cart.io
PLOS ONE 19(5):e0298192 (2024)
DOI: 10.1371/journal.pone.0298192

K. L. T. Fung, S. T. Perrault and **M. T. Gastner**
Effectiveness of Area-to-Value Legends and Grid Lines in Contiguous Area Cartograms
IEEE Trans. Vis. Comput. Graph. 30(8):4631–4647 (2024)
DOI: 10.1109/TVCG.2023.3275925

M. T. Gastner
Teaching Data Visualisation and Basic Map-Making Skills at a Liberal Arts College
Cartogr. Geoinformation (Kartografija i Geoinformacije) 22(39):43–59 (2023)
DOI: 10.32909/kg.22.39.3

M. T. Gastner, N. Z. Miaji and A. Singhania
Smooth Pycnophylactic Interpolation Produced by Density-Equalising Map Projections
Cartogr. Geoinformation (Kartografija i Geoinformacije) 21(37):60–69 (2022)
DOI: 10.32909/kg.21.37.3

G. Ódor, **M. T. Gastner**, J. Kelling and G. Deco
Modelling on the Very Large-Scale Connectome
J. Phys. Complex. 2(4):045002 (2021)
DOI: 10.1088/2632-072X/ac266c

K. Ishida, B. Oborny and **M. T. Gastner**
Agent-Based Neutral Competition in Two-Community Networks
Phys. Rev. E 104(2):024308 (2021)
DOI: 10.1103/PhysRevE.104.024308

Y. C. Yau and **M. T. Gastner**
Mapping the Inequality of the Global Distribution of Seasonal Influenza Vaccine
Environ. Plan. A 53(6):1249–1252 (2021)
DOI: 10.1177/0308518X21998356

I. K. Duncan, S. Tingsheng, S. T. Perrault and **M. T. Gastner**
Task-Based Effectiveness of Interactive Contiguous Area Cartograms
IEEE Trans. Vis. Comput. Graph. 27(3):2136–2152 (2021)
DOI: 10.1109/TVCG.2020.3041745

Appendix: Complete Publication List (continued)

M. T. Gastner and K. Ishida
Voter Model on Networks Partitioned into Two Cliques of Arbitrary Sizes
J. Phys. A: Math. Theor. 52(50):505701 (2019)
DOI: 10.1088/1751-8121/ab542f

M. T. Gastner, K. Takács, M. Gulyás, Z. Szvetelszky and B. Oborny
The Impact of Hypocrisy on Opinion Formation: A Dynamic Model
PLOS ONE 14(6):e0218729 (2019)
DOI: 10.1371/journal.pone.0218729

M. T. Gastner, B. Oborny and M. Gulyás
Consensus Time in a Voter Model with Concealed and Publicly Expressed Opinions
J. Stat. Mech. Theory Exp. 2018(6):063401 (2018)
DOI: 10.1088/1742-5468/aac14a

M. T. Gastner, V. Seguy and P. More
Fast Flow-Based Algorithm for Creating Density-Equalizing Map Projections
Proc. Natl. Acad. Sci. U.S.A. 115(10):E2156–E2164 (2018)
DOI: 10.1073/pnas.1712674115

M. T. Gastner and G. Ódor
The Topology of Large Open Connectome Networks for the Human Brain
Sci. Rep. 6(6):27249 (2016)
DOI: 10.1038/srep27249

M. T. Gastner
The Ising Chain Constrained to an Even or Odd Number of Positive Spins
J. Stat. Mech. Theory Exp. 2015(3):P03004 (2015)
DOI: 10.1088/1742-5468/2015/03/P03004

M. T. Gastner, N. Markou, G. Pruessner and M. Draief
Opinion Formation Models on a Gradient
PLOS ONE 9(12):e114088 (2014)
DOI: 10.1371/journal.pone.0114088

V. Salnikov, D. Schien, H. Youn, R. Lambiotte and **M. T. Gastner**
The Geography and Carbon Footprint of Mobile Phone Use in Côte d'Ivoire
EPJ Data Sci. 3(1):3 (2014)
DOI: 10.1140/epjds21

H. Seebens, **M. T. Gastner** and B. Blasius
The Risk of Marine Bioinvasion Caused by Global Shipping
Ecol. Lett. 16(6):782–790 (2013)
DOI: 10.1111/ele.12111

M. T. Gastner and B. Oborny
The Geometry of Percolation Fronts in Two-Dimensional Lattices with Spatially Varying
   Densities
New J. Phys. 14(10):103019 (2012)
DOI: 10.1088/1367-2630/14/10/103019

Appendix: Complete Publication List (continued)

M. T. Gastner
Scaling and Entropy in p-Median Facility Location along a Line
Phys. Rev. E 84(3):036112 (2011)
DOI: 10.1103/PhysRevE.84.036112

M. T. Gastner, B. Oborny, A. B. Ryabov and B. Blasius
Changes in the Gradient Percolation Transition Caused by an Allee Effect
Phys. Rev. Lett. 106(12):128103 (2011)
DOI: 10.1103/PhysRevLett.106.128103

P. Kaluza, A. Kölzsch, **M. T. Gastner** and B. Blasius
The Complex Network of Global Cargo Ship Movements
J. Royal Soc. Interface 7(48):1093–1103 (2010)
DOI: 10.1098/rsif.2009.0495

M. T. Gastner, B. Oborny, D. K. Zimmermann and G. Pruessner
Transition from Connected to Fragmented Vegetation across an Environmental Gradient:
    Scaling Laws in Ecotone Geometry
Am. Nat. 174(1):E23–E39 (2009)
DOI: 10.1086/599292

H. Youn, **M. T. Gastner** and H. Jeong
Price of Anarchy in Transportation Networks: Efficiency and Optimality Control
Phys. Rev. Lett. 101(12):128701 (2008)
DOI: 10.1103/PhysRevLett.101.128701

M. T. Gastner and M. E. J. Newman
Optimal Design of Spatial Distribution Networks
Phys. Rev. E 74(1):016117 (2006)
DOI: 10.1103/PhysRevE.74.016117

M. T. Gastner and M. E. J. Newman
The Spatial Structure of Networks
Eur. Phys. J. B 49(2):247–252 (2006)
DOI: 10.1140/epjb/e2006-00046-8

M. T. Gastner and M. E. J. Newman
Shape and Efficiency in Spatial Distribution Networks
J. Stat. Mech. Theory Exp. 2006(1):P01015 (2006)
DOI: 10.1088/1742-5468/2006/01/P01015

M. T. Gastner, C. R. Shalizi and M. E. J. Newman
Maps and Cartograms of the 2004 US Presidential Election Results
Adv. Complex Syst. 8(1):117–123 (2005)
DOI: 10.1142/S0219525905000397

M. T. Gastner and M. E. J. Newman
Diffusion-Based Method for Producing Density-Equalizing Maps
Proc. Natl. Acad. Sci. U.S.A. 101(20):7499–7504 (2004)
DOI: 10.1073/pnas.0400280101

Appendix: Complete Publication List (continued)

Peer-Reviewed Long Conference Papers

W. Yurcik, A. Schick, S. North, **M. T. Gastner,** F. R. de Miranda, R. da Silva Avelino, A. F. de Moraes Batista, G. Pluta and I. Brooks
Monitoring/Mapping of USA Healthcare (All Hospitals)—Magnified Vulnerability Due to Shared IT Infrastructure, Market Concentration, & Geographical Distribution
Proc. 2024 ACM CCS Workshop on Cybersecurity in Healthcare (HealthSec'24), pp. 45–52 (ACM, New York, 2024)
DOI: 10.1145/3689942.3694754

S. Tingsheng, I. K. Duncan, Y.-N. Chang and **M. T. Gastner**
Motivating Good Practices for the Creation of Contiguous Area Cartograms
in T. Bandrova et al. (Eds.), *8th Int. Conf. Cartogr. GIS*, vol. 1, pp. 589–598 (Bulgarian Cartographic Association, Sofia, 2020)
ISSN: 1314-0604

A. Evtushenko and **M. T. Gastner**
Beyond Fortune 500: Women in a Global Network of Directors
in H. Cherifi et al. (Eds.), *Complex Networks and Their Applications VIII*
Proc. 8th Int. Conf. Complex Networks and Their Applications, vol. 1, pp. 586–598 (Springer, Cham, 2020)
DOI: 10.1007/978-3-030-36683-4_47

M. T. Gastner and C. Ducruet
How Heavy-Tailed Is the Distribution of Global Cargo Ship Traffic?
10th Int. Conf. Signal-Image Technology & Internet-Based Systems, pp. 289–294 (2014)
DOI: 10.1109/SITIS.2014.33

M. T. Gastner
Traffic Flow in a Spatial Network Model
in A. Minai, D. Braha and Y. Bar-Yam (Eds.), *Unifying Themes in Complex Systems*, pp. 315–322 (Springer, Berlin, 2010)
DOI: 10.1007/978-3-540-85081-6_40

H. Youn, **M. T. Gastner** and H. Jeong
Inefficiency in Networks with Multiple Sources and Sinks
in J. Zhou (Ed.), *Complex Sciences*, pp. 334–338 (Springer, Berlin, 2009)
DOI: 10.1007/978-3-642-02466-5_32

M. T. Gastner
Shape and Efficiency in Growing Spatial Distribution Networks
2nd Eur. Conf. Complex Systems, pp. 82 (2006)
https://www.cabdyn.ox.ac.uk/complexity_PDFs/ECCS06/Conference_Proceedings/PDF/p82.pdf

M. T. Gastner and M. E. J. Newman
Density-Equalizing Map Projections: Diffusion-Based Algorithm and Applications
8th Int. Conf. GeoComputation (2005)
http://www.geocomputation.org/2005/

Appendix: Complete Publication List (continued)

Encyclopedia Entry

> **M. T. Gastner**
> Cartogram
> in B. S. Daya Sagar et al. (Eds.), *Encyclopedia of Mathematical Geosciences*
>   (Springer, Cham, 2021)
> DOI: 10.1007/978-3-030-26050-7_55-1

Peer-Reviewed Book Chapter

> **M. T. Gastner** and C. Ducruet
> The Distribution Functions of Vessel Calls and Port Connectivity in the Global Cargo
>   Ship Network
> in C. Ducruet (Ed.), *Maritime Networks: Spatial Structures and Time Dynamics*,
>   pp. 289–294 (Routledge, London, 2015)
> DOI: 10.4324/9781315692852

Peer-Reviewed Abstracts

> A. Tharatipyakul, S. T. Perrault, C.-C. Feng and **M. T. Gastner**
> Designing Mobile-Optimized Cartograms
> *Abstr. Int. Cartogr. Assoc.* 7:169 (2024)
> DOI: https://doi.org/10.5194/ica-abs-7-169-2024

> **M. T. Gastner**, S. T. Perrault and C.-C. Feng
> Balancing Shape Distortions and Contiguity in Cartograms
> *Abstr. Int. Cartogr. Assoc.* 3:87 (2021)
> DOI: 10.5194/ica-abs-3-87-2021

> **M. T. Gastner** and K. Ishida
> Mean Consensus Time of the Voter Model on Networks Partitioned into Two Cliques of
>   Arbitrary Sizes
> in H. Cherifi et al. (Eds.), *Complex Networks 2019*, pp. 46–48 (Int. Conf. Complex
>   Networks and Their Applications, Lisbon, 2019)
> ISBN: 978-2-9557050-3-2

> S. Tingsheng, I. K. Duncan and **M. T. Gastner**
> go-cart.io: A Web Application for Generating Contiguous Cartograms
> *Abstr. Int. Cartogr. Assoc.* 1:333 (2019)
> DOI: 10.5194/ica-abs-1-333-2019

Technical Report

> **M. T. Gastner**
> *Network Formation, Statistical Physics and Social Dynamics*
> Technical report, CORDIS (European Commission), published online on 17 Feb 2016
> https://cordis.europa.eu/docs/results/327/327325/final1-final_report.pdf

Appendix: Complete Publication List (continued)

Ph.D. Thesis

M. T. Gastner
Spatial Distributions: Density-Equalizing Map Projections, Facility Location, and Two-Dimensional Networks
Ph.D. dissertation, Univ. Michigan (Ann Arbor, 2005)
https://deepblue.lib.umich.edu/handle/2027.42/125368