Introduction: AutoCarto 2020—WhereNext

On behalf of the Cartography and Geographic Information Society, I want to welcome you to AutoCarto 2020, offered this 18th day of November—GIS Day! My name is Aileen Buckley, and I'm honored to be the conference chair for AutoCarto 2020.

AutoCarto 2020 is endorsed by the International Cartographic Association (ICA). CaGIS makes every effort to ensure that AutoCarto is offered in the years when the biennial ICA's International Cartographic Conference (ICC) does not meet. This way, cartographic researchers and geoscientists from around the world have a venue in which to meet every year. Since the ICC met last year, AutoCarto is being held this year.

The theme of AutoCarto 2020, WhereNext, was conceived by Dr. May Yuan, AutoCarto 2020 program chair. Her vision was to promote communication and collaboration that challenged the ideas of *where* and *next* in terms of meaning, communication, visualization, and reasoning. And she wanted to position the sharing of ideas within the context of a new technological age that's characterized by advancements such as automation, the robotic revolution, and artificial intelligence.

May's vision, which she first articulated last year as we began planning the conference, has turned out to be somewhat prophetic, as is evident in a recent article in the *National Geographic* magazine, which came out only two months ago. This article explores a world in which robots perform the tasks that humans would—and AI makes the decisions that humans would.

National Geographic*, September 2020*
https://www.nationalgeographic.com/magazine/2020/09/the-robot-revolution-has-arrived-feature/

AI now is broadly used in a wide variety of activities, from screening job applicants to assisting with food production and—perhaps more relevant to geography—supporting smart cities in a whole range of areas, such as security, traffic, public safety, and governance.

In the past, automation may have been primarily about efficiency and productivity. But—in a world faced with a global pandemic—automation, robots, and AI may become essential for our health and

safety. People may have to overcome their distaste for the idea that machines can replace humans. Robots are helping to ensure that people are safer and healthier by reducing contact, monitoring social distance, and even eliminating the need to go out altogether.

For example, at my alma mater, Oregon State University, "delivery robots [are] bringing food orders to students, staff, and faculty across the university's more than 500-acre campus and beyond in the ultimate form of contactless delivery service."

Suddenly, replacing people with robots may not just be safer and more practical—we may find it becoming essential. And that's not only to do the actual work that humans do, but also to provide social support, as with *socially assistive* or *telepresence* robots, which are being used to replace direct person-to-person contact. For example, these robots can allow users to check on elderly relatives, share experiences with distant friends, or verify that an item is available in a store before visiting. The use of telepresence robots may help reduce feelings of loneliness by providing much-needed social interactions during physical isolation. And socially assistive robots can help people cope with the negative consequences of social distancing by motivating them to maintain physical activity and proper nutrition.

Back at Oregon State University, researchers are testing the power of artificial intelligence, using deep learning algorithms to capture geographic features from satellite images and learn a "sense of place" like humans. This information is then used to develop what's called a "city style," which can be transferred to other places, like an imaginary city. However, it can also be used to falsify geospatial data or generate fake data.

Imaginary City

It is difficult to quantify geographic features with a certain character or pattern, especially taking spatial variability and heterogeneity into account. Landscape exhibits various patterns and processes in different scales. However, it seems that CycleGAN is able to extract some general features from spatial distribution of city structures.

Corvallis with a transferred style

To examine whether it is possible for CycleGAN to extract city styles and transfer the potentially learned style to other place, Corvallis is used as a sample for generating satellite images. View the real Corvallis Here.

View Here »

https://chunxxu.github.io/fakegeo/IC.html

Deepfakes use a form of <u>deep</u> learning to <u>fake</u> images, thus leading to a new threat—doctored images of the earth itself. With an emerging technique called "generative adversarial networks," computers are tricked into seeing objects—in landscapes or satellite images—that aren't there. This is deeply concerning as more open-source images are generated and increasingly used—for example, to route self-driving vehicles or help run smart cities, as I mentioned earlier. I believe geographic information scientists and cartographers are uniquely positioned to watchdog these types of deceptions.
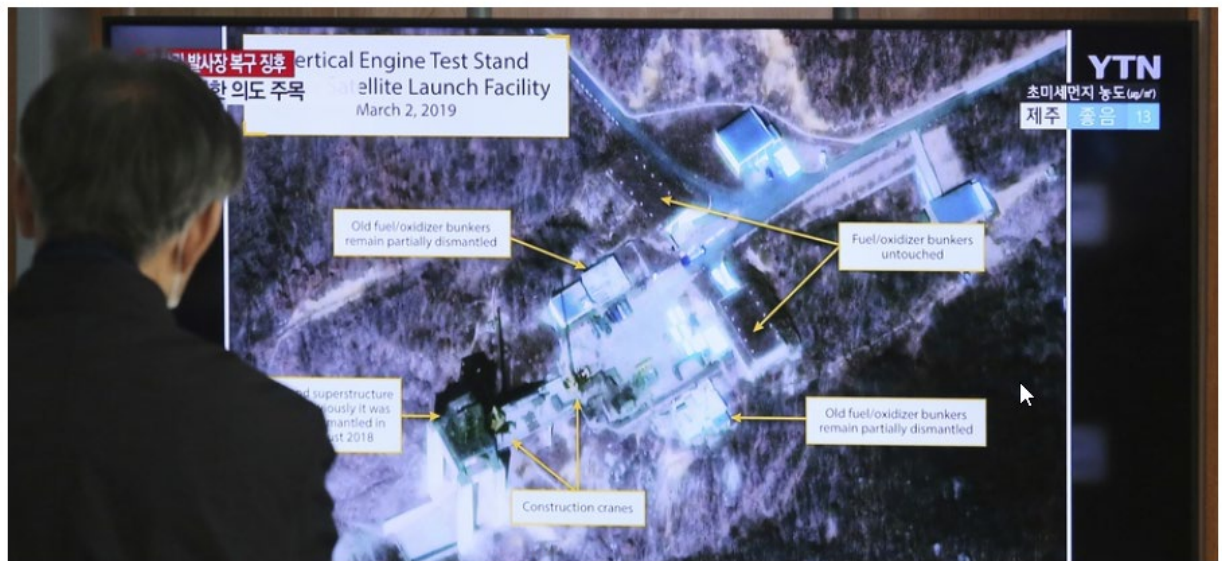
A man watches a TV screen showing an image of the Sohae Satellite Launching Station in Tongchang-ri, North Korea, during a news program at the Seoul Railway Station in Seoul, South Korea, Wednesday, March 6, 2019. AP / AHN YOUNG-JOON

SCIENCE & TECH

The Newest AI-Enabled Weapon: 'Deep-Faking' Photos of the Earth

Step 1: Use AI to make undetectable changes to outdoor photos. Step 2: release them into the open-source world and enjoy the chaos.

https://www.defenseone.com/technology/2019/03/next-phase-ai-deep-faking-whole-world-and-china-ahead/155944

The myriad uses—and misuses—of automation, the robotic revolution, and artificial intelligence frame new thoughts in the discussion of *where* and *next*, especially as automation, the robotic revolution, and artificial intelligence challenge both theoretical and practical aspects of some of the most important foundational geographic concepts—scale, place, distance, interaction, change, movement, and others.

This is why it is important that we have a forum in which to share our ideas—that is the intent of AutoCarto 2020.

Researchers from around the world responded to May's call for contributions to AutoCarto 2020. For this year's conference, you have access to 40 papers by 121 authors from 14 different countries, thus constituting a truly international program. There are 7 workshops by 16 organizers from 6 countries. And you can watch four visionary keynote speeches from four different perspectives—international, government, industry, and academia.
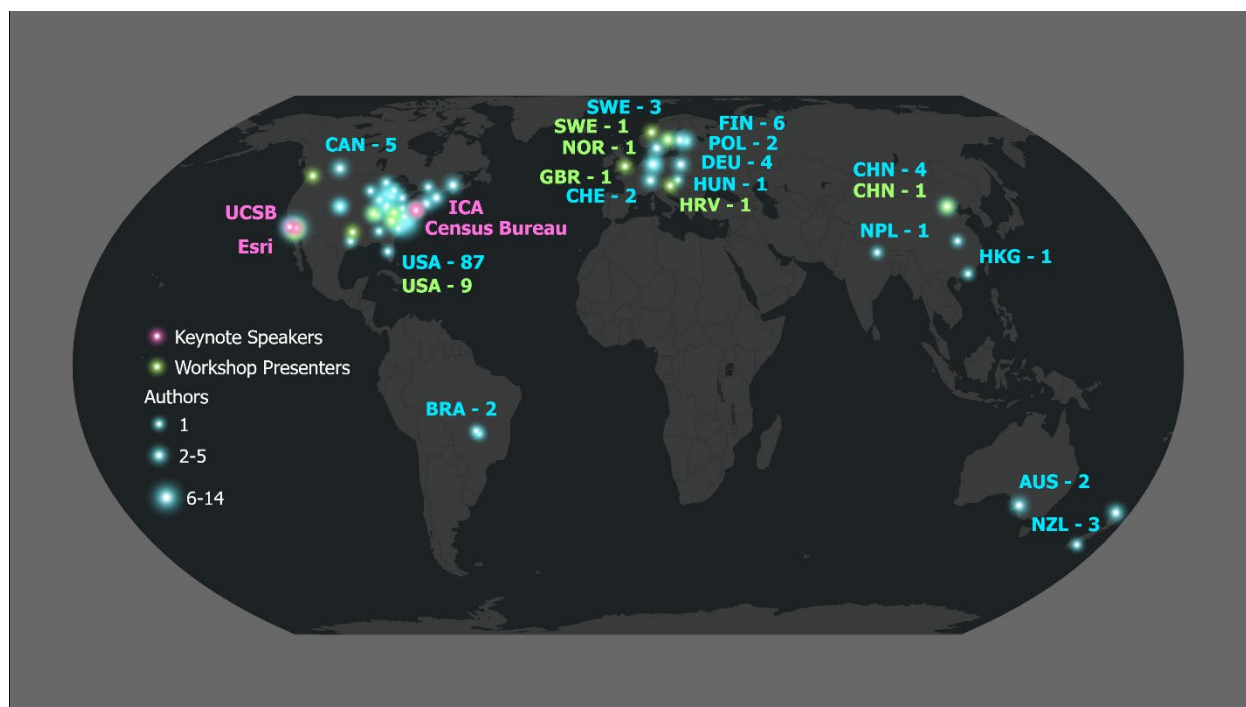
To give you a taste of this year's content, I want to briefly touch on some of the inspiring and insightful thoughts of our keynote speakers. The first is Tim Trainor, president of the International Cartographic Association, or ICA. Presidents of the ICA have traditionally graced the stage of AutoCarto to welcome its audience and to provide some insight and direction from the international organization.

In his talk, Tim speaks about the association's work to address global challenges through involvement in three important international initiatives:

- The United Nations Sustainable Development Goals (SDGs)
- The Integrated Geospatial Information Framework (IGIF)
- The Global Statistical Geospatial Framework (GSGF)

He explains how the ICA provides a platform for engagement to advance areas of research in support of these initiatives though public media, publications, and conferences.

Deirdre Dalpiaz Bishop, chief of the Geography Division of the US Census Bureau, speaks to the theme of WhereNext in relation to geospatial data innovation. She reflects on the accomplishments that have led to finalization of all 2020 Census data-collection operations. She speaks about the necessity of building and maintaining geographic partnerships to help achieve the bureau's completeness and consistency requirements while collecting massive amounts of data at a very local scale. She explains a unique use of satellite imagery to validate the bureau's data about societal geography. And she describes the bureau's requirements to publicly share its progress throughout the data collection process.

Shifting perspectives from government to private industry, Clint Brown, director of product engineering at Esri, talks about this new age of cloud-based and elastic computing in which maps are dynamic and multiscale, mashed up, and not only interactive but also reactive. He points out that the features on the maps are linked directly to the data and that the data has been integrated from many different sources. He also highlights the importance of sharing, using as examples the 1.5 million ArcGIS StoryMaps stories that have been created in the last 5 years and the 35 million items that have been added to ArcGIS

Online in the last 10 years. These items include not only the geographic data that we have come expect to find online but also maps, models, and apps.

I especially like how Clint has summarized *mapping* in this new age in which we find ourselves. As he says, "All of our information is being brought together and integrated in interactive maps built for specific audiences so that everyone gets the map for their mission, purpose, or work. . . . GIS and maps are becoming relevant for everyday citizens."

Moving on to an academic viewpoint, Keith Clarke, renowned professor of geography at the University of California in Santa Barbara, describes a recently completed project that explores the current state of and future prospects for cartographic research in the US. He identifies five overarching thematic topics that led the authors to reflect on the accomplishments and shortfalls of the past and to contemplate the possibilities and challenges for the future.

Before I go any further, I want to take a quick look backwards, because the AutoCarto of today truly does stand on the shoulders of giants. AutoCarto first convened in 1974, about 15 years after the advent of automated cartography. It was dubbed the International Conference on Automation in Cartography, and its intent was to bring together "people interested in automation in cartography" such as government researchers—mostly cartographers—from a multitude of government agencies; academic cartographers; and researchers from private industry.

At that time, automation was being considered in terms of the following:

- Attaining speed and accuracy
- Lowering the cost of mapping
- Easing the revision process
- Facilitating data digitization

Despite a 15-year gestation period, the technology was still nascent, and a one-solution-fits-all development strategy left some—such as Dean Edson, the first AutoCarto presiding conference chair—to lament the lack of low-cost, individualized approaches that would meet the demands of what he rightly predicted would be unprecedented numbers of potential users.

A quick review of the past conferences reveals the importance of these early gatherings. AutoCarto was the only event to bring together people working in automated cartography and, incidentally, the early development of GIS. And evidently, there were a lot of people working in these arenas who <u>did</u> want to meet with others, hear about their work, and share their own. For example, the AutoCarto archives, available on the CaGIS website, have a record of 870 participants at the fourth AutoCarto conference, in 1979, and nearly all the early giants of GIS were in attendance. Compare this gathering to the first Esri User Conference, which was held three years later in 1981 with 16 users!

No. in Series	Name	Year	Location	Conference Chair	Number of People		Notes
1	Auto-Carto 1	1974	Reston, Virginia	Dean T. Edson	288	registrants	
2	Auto-Carto 2	1975	Reston, Virginia	Robert T. Aangeenbrug	567	participants	
3	Auto-Carto 3	1978	San Francisco, California	James E. Chamberlain	54	speakers	
4	Auto-Carto 4	1979	Reston, Virginia	Robert T. Aangeenbrug	181	authors	870 participants
5	Auto-Carto 5	1982	Crystal City, Virginia	Jack Foreman	125	authors	
6	Auto-Carto 6	1983	Ottawa/Hull, Canada	D.R.F. Taylor	76	presentations	
8	Auto-Carto 7	1985	Washington, District of Columbia	Steven J. Vogel/Jack Foreman	178	presentations	
9	Auto-Carto London	1986	London, England	Michael Blakemore	115	presentations	
10	Auto-Carto 8	1987	Baltimore, Maryland	Nicholas. R. Chrisman	86	presentations	133 authors
11	Auto-Carto 9	1989	Baltimore, Maryland	Eric Anderson	104	presentations	142 authors
12	Auto-Carto 10	1991	Baltimore, Maryland	David M. Mark/Denis White	27	papers	39 full papers submitted
13	Auto-Carto 11	1993	Minneapolis, Minnesota	Robert B. McMaster/Marc P. Armstrong	43	papers	70+ abstracts
14	Auto-Carto 12	1995	Charlotte, North Carolina	Donna J. Peuquet	39	papers	60+ extended abstracts
15	Auto-Carto 13	1997	Seattle, Washington	Nicholas Chrisman	45	papers	69 authors
16	AutoCarto 2005	2005	Las Vegas, Nevada	Lynn Usery / Eric Anderson	34	presentations	80 authors
17	AutoCarto 2006	2006	Vancouver, Washington	Lynn Usery	40	presentations	94 authors
18	AutoCarto 2008*	2008	Shepherdstown, West Virginia	Keith Clarke	32	presentations	65 authors
19	AutoCarto 2010*	2010	Orlando, Florida	Lynn Usery			
20	AutoCarto 2012*	2012	Columbus, Ohio	Sarah Battersby	62	presentations	168 authors
21	AutoCarto 2014*	2014	Pittsburgh, Pennsylvania	Dan Cole	65	presentations	137 authors
22	AutoCarto 2016	2016	Albuquerque, New Mexico	Scott Freundschuh	31	presentations	72 authors
23	AutoCarto 2018*	2018	Madison, Wisconsin	Scott Freundschuh	41	presentations	116 authors
24	AutoCarto 2020	2020	Online	Aileen Buckley	40	papers	121 authors, 4 keynotes
25	AutoCarto 2022			Thomas Pingel			
	* Also in the CaGIS journal						

AutoCarto Archives: https://cartogis.org/autocarto/autocarto-archives/

Surprisingly to some, the symposium series was laid to rest in 1997 because, as a previous conference chair told me, the organizers believed they had "solved the problem of automating cartography."

By that time, 13 symposia had been held. But other things were also happening. There were more automated mapping and GIS conferences to choose from, including AM/FM, which began in 1978 and became GIS/LIS in the mid-1990s; and GIScience, which emerged in 2000 from the National Center for Geographic Information and Analysis—12 years after the NCGIA first received its multimillion-dollar funding in 1988. Additionally, in 1997, the Esri User Conference was relocated to the San Diego Convention Center to accommodate the growing number of attendees, which had grown to around 6,300.

Throughout this time period, conferences of the American Congress on Surveying and Mapping, or ACSM, continued to be held. But cartographers began to feel increasingly marginalized at these surveyor-dominated events.

Throughout this time period, conferences of the American Congress on Surveying and Mapping or ACSM continued to be held. Even though CaGIS was the second largest member of ACSM, cartographers began to feel increasingly marginalized at these surveyor-dominated meetings.

Thus, by the early 2000s, there were few opportunities for people working in automated cartography and the closely aligned and rapidly emerging field of geographic visualization to come together aside from the biennial International Cartographic Conference.

Consequently, in 2005, when I was president of CaGIS, the society seceded from the ACSM and became independently incorporated. We resurrected the AutoCarto symposium in recognition that cartography and GIScience continue to evolve and that researchers are continually presented with new challenges. We also undertook the challenge of digitizing and placing online the entire archive of AutoCarto. This project was completed three years later, in 2008, coincident with the 18th AutoCarto conference. Of course, the papers from AutoCarto 2020 will be added to this archive. As of 2018, another eight conferences had been held, continuing to bring together researchers from around the world to share their work with other professionals in cartography and GIScience.
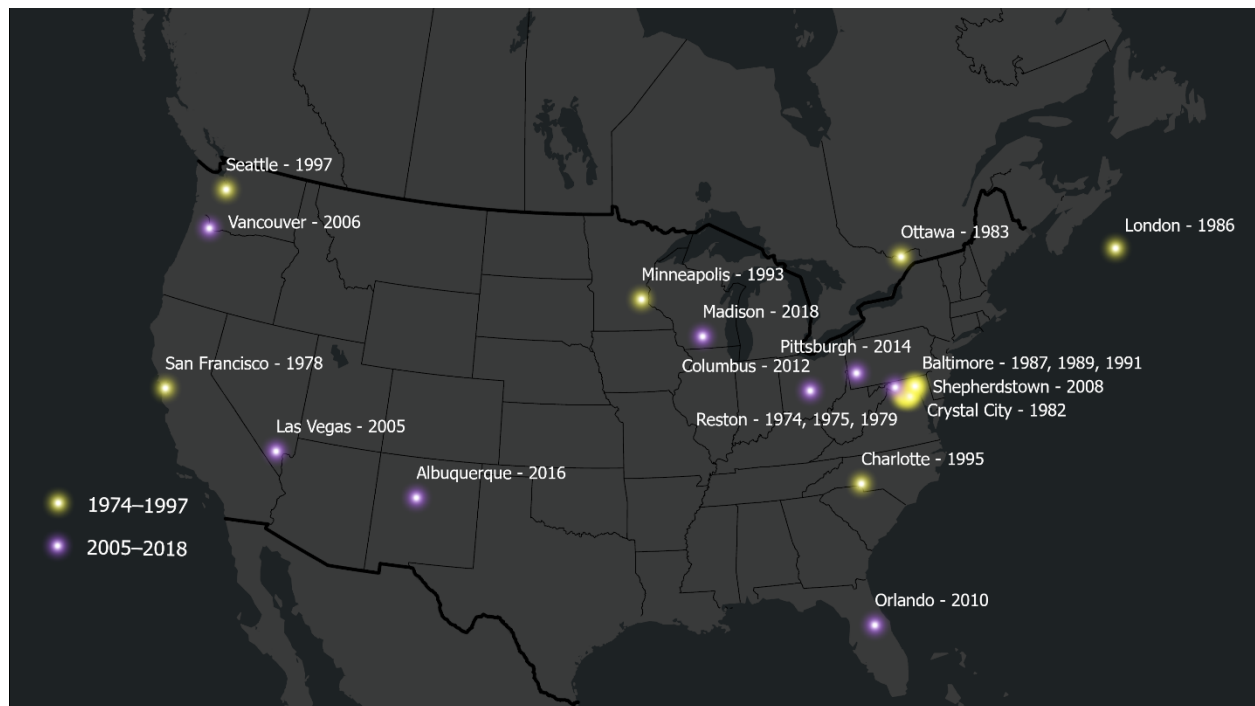
This brings us to AutoCarto 2020, which—unlike all previous conferences—is being offered completely online. Prompted by the global pandemic, CaGIS made the decision to offer this year's content in an open-access format, by delivering it online and free of cost for all. Just as the format of the conference has changed, so too has the conference's intent over the years—shifting from automation in cartography to activities, advancements, and challenges at the interface of cartography and GIScience.

While there are some vast differences between the AutoCarto events of old and those of today, some things still hold true, such as this observation by the chair of Auto-Carto 1, Dean Edson: "Things are going on in the field of cartography that were unthought of just a few years ago." And his hope was that after that first meeting concluded, they would have a better idea of what the future might hold. We, too, hope for that as an outcome of AutoCarto 2020.

Aileen Buckley

AutoCarto 2020 Conference Chair

Acknowledgements

As with many conferences, AutoCarto was organized entirely though the volunteer efforts of many dedicated people who spent countless hours grinding out the details. This was, of course, complicated by the pandemic, which caused us not only to reschedule the event—adding six months to the planning period—but also to completely rethink its presentation. The organizing committee of 17 met nearly weekly for 18 months—there are few who I feel so indebted to for such tireless efforts and continuous enthusiasm. Under the vigilant eye of program chair May Yuan, the program committee of 35 people from around the globe worked to ensure that this conference's offerings met the high standards that May had set. And a much-deserved shout-out goes to the CaGIS webmaster, Thomas Pingel, for his unflagging efforts to bring this conference to you online. We also thank our sponsors—Esri, the US Census Bureau, and the University of Redlands—for their support. And finally, we acknowledge the Cartography and Geographic Information Society, which has been dedicated to offering you this conference for the past 46 years!