# **Geospatial Data Science considering COVID-19**

George Percivall, CTO/Chief Engineer

The world's leading and comprehensive community of experts making location information:







# What is OGC?

A Global consortium representing over 500 industry, government, research and academic member organizations:

A hub for thought leadership and innovation for all things related to location

A neutral and trusted forum for tackling interoperability issues within and across communities

A consensus-based open standards organization for location information

## **Location Powers: Data Science Summit**

Explosive availability of data about nearly every aspect of human activity along with revolutionary advances in computing technologies

- Shift from data-scarce to data-rich environment comes from mobile devices, remote sensing and the Internet of Things
- Innovations in cloud computing and big data provides methods to perform data analytics at exceedingly large scale and speed
- Nearly all of this data has components of location and time

Location Powers



Hosted by Google, Nov 13&14, 2019

Data Science – source NIST

## **Geospatial Data Science**

"The art and craft of people leveraging technology to create value out of data"

- Andy Brooks, Chief Data Scientist - Location Powers Data Science Summit



X 2995

QC A

# Geospatial Data Science considering COVID-19 OGC

- Telling a data science story
  - Accurate use of maps
- Pandemic outbreak and spread
  - Traditional Models vs. Machine Learning
- Contract tracing
  - Location vs. proximity
- Data Ethics



## **Telling Stories with Maps**

#### Accurately telling stories and conveying experiences about location data



Source: Kenneth Field <u>mapping/mapping-coronavirus-responsibly/</u>

X 2995

OGC

# Traditional Algorithms vs. Machine Learning OGC



Graphic Source: <u>https://towardsdatascience.com/what-is-machine-learning-and-deep-learning-47fe6718adec</u>



## **Predictive Models**

X 2995

OGC

HU CL4

- Disease outbreak models
  - Predictions based on current situation
  - Used to judge possible actions
     Health promotion messages, #FlattenTheCurve
- Models depend on
  - Biology of disease
  - Social sciences for behavior
  - Statistics to analyze data
  - Geospatial-temporal proximity and movement



JHU website powered by GIS from Esri



White House projections – March 31

QC

# **Traditional Model prediction of COVID-19**



## Static Code

- Network model of population dynamics
- Bayesian statistics to infer transmission rate
- Data
  - Reported Infections
  - Human mobility data at coarse level
    - Little identifiable information in the datasets
- Results
  - Predictions of Exposed and infected populations

X 2995

**YF(C**)

## **AI Prediction of COVID-19**

OGC



### Data

- News and official health-care reports
- Mentions of high-priority diseases, such as coronavirus
- Air-travel data

X 2995

- AI algorithm
  - Natural-language processing (NLP) after training

Early AI predictions of COVID-19 by HealthMap, Blue Dot, Metabiota

https://www.technologyreview.com/2020/03/12/905352/ai-could-help-with-the-next-pandemicbut-not-with-this-one/ https://www.brookings.edu/research/a-guide-to-healthy-skepticism-of-artificial-intelligence-and-coronavirus/

## **Contact Tracing**

HU CL4

#### **Location-Based**

- High-accuracy location tracking, like opt-in LBS apps
- Compare trajectories of individuals to determine nearness



www.tracetogether.gov.sg/ www.nytimes.com israel-coronavirus-cellphone-tracking.html thelbma.com/research/covid-19-allaving-privacy-in-favour-of-protection/

### **Proximity-Based**

- Bluetooth messages exchanged between phones
- Contact with infected individuals determined by proximity



X 2995

ContactTracing-BluetoothSpecification.pdf by Google and Apple Washingtonpost.com/technology/2020/04/10/apple-google-tracking-coronavirus/ <u>MIT The-PACT-protocol-specification-ver-0.1.pdf</u> EPFL Decentralized Privacy-Preserving Proximity Tracing

QC

## **Geospatial Data Science Ethics**

## Ethics of Data

- Collection and access to large datasets
- Re-identification of individuals, e.g., based on location

## Ethics of Algorithms

 Increasing complexity and autonomy of algorithms; Understandability and bias

## Ethics of Practices

- Responsible innovation, R&D, usage foster innovation and protect rights
- Secondary use integration of data sets
- Unintended use

X 2995

4583

᠂ᢄᢞᢧᡐ᠂

**)**GC

# **Data Ethics for COVID-19**

#### • Ethics of Data

- Proximity protocols require less personal location information than location-based tracking apps
- Centralized vs. decentralized databases of proximity contacts (PEPP-PT vs DP-3T)

#### Ethics of Algorithms

- Artificial Intelligence only helpful when applied judiciously by interdisciplinary team
- Public "social distancing scoreboard" uses location to evaluate stay-at-home orders

#### Ethics of Practices

- Telecom carriers have given data to authorities to combat the pandemic; public uncertain
- Billions of geographic data points available from apps installed on mobile phones with user's permission to track their location

"COVID-19 pandemic ushering in a new era of digital surveillance and rewiring the world's sensibilities about data privacy." - WSJ

https://www.wsj.com/articles/coronavirus-paves-way-for-new-age-of-digital-surveillance-11586963028

X 2995

https://www.pewresearch.org/fact-tank/2020/04/16/most-americans-dont-think-cellphone-tracking-will-help-limit-covid-19-are-divided-on-whether-its-acceptable/ https://www.williamsmullen.com/news/legal-risks-sharing-geolocation-data-government-agencies

# Responsible Development of Digital Contact

OGC



Project MUSE - Digital Contact Tracing for Pandemic Response: Ethics and Governance Guidance https://muse.jhu.edu/book/75831

## **Emergent Trend Clusters – June 2020**

Responding to COVID-19	<b>W3C</b> <sup>®</sup> <b>OGC</b> <sup>®</sup> Making location count. Spatial Data on the Web	New Space Exploitation
روْصَيْ روْصَيْ Connected and Autonomous Vehicles	Al and Machine Learning	Geo IT Ethics
Cloud Native and Edge Computing	Geospatial Data Science	السmersive Geo: AR XR
Urban Digital Twin	<b>پنې</b> Open API Management	Model Interoperability

X 2995

00

0 3974 OGC **George Percivall** 0 2763 [5H] 24.67 - 87 A4 0 4583 X 2995

# **Thank You!**

#### Community

500+ International Members
110+ Member Meetings
60+ Alliance and Liaison partners
50+ Standards Working Groups
45+ Domain Working Groups
25+ Years of Not for Profit Work
10+ Regional and Country Forums

#### Innovation

120+ Innovation Initiatives380+ Technical reportsQuarterly Tech Trends monitoring

#### **Standards**

X 2995

65+ Adopted Standards 300+ products with 1000+ certified implementations 1,700,000+ Operational Data Sets Using OGC Standards

Contact info@ogc.org to schedule a meeting for an in-depth discussion with OGC staff and join our community today!

ogc.org |16

0 4583

## Best wishes to GISMO for next 30 years!

## GISMO NYC Geospatial Information Systems and Mapping Organization



HU CL4 -1

OGC