Crime Analysis of Publicly Documented Information Using Geostatistics
Outline

• Geospatial Intelligence
• Open Sources data collection
• Geo-spatial statistics and modeling within ArcGIS
• Predicting potential illicit operations – student projects
• Analytics results with ESRI’s Story Maps

Questions
Analytical process is a problem solving model to help one maximize the ability at planning and direction, collecting, collating, analyzing and now, reporting and disseminating your recommendations.

Ron Wulf, Analytic Methodologist (SIAC, CPC November 2014)
Image source David McClocklin IALEIA
Geospatial intelligence is the exploitation and analysis of imagery, imagery intelligence, and geospatial information.

4 components: technology, data, workflows, and products are modeled using HUMINT, SIGINT, MASINT and OSINT

Open Source Intelligence is the collection & analysis of information that is gathered from public, or open sources to answer classified, unclassified, or proprietary intelligence.

Law enforcement OSINT users include Scotland Yard; INTERPOL, NYPD, Los Angeles County Sheriff's Department and Royal Canadian Mounted Police.
Comparative Analysis & geostatistical methodology as predecessors of Machine Learning (ML) & Artificial Intelligence (AI)

College students used analytics to predict next marijuana gro-ops

"Everything is related to everything else, but near things are more related than distant things."

(Tobler’s first law of geography)
OSINT data collection
- Media
- Government Data
- Academia
- Commercial Data
- Grey literature

Geo-spatial statistics & data modeling
ArcGIS 10.0 with Geospatial Analyst
interpolation methods:
- Inverse Distance Weight (IDW)
- Hotspot analysis (HAS)
- Kriging

Niagara College student project (2013)

Analysis of Publicly Documented Criminal Activities Utilizing Geo-Spatial Statistics

IACA Training Conference 2013
Fort Lauderdale, Florida

Liliana Selimovic, MEcon, GISP

Download to see step by step https://bit.ly/2m8TvN1
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Comparative analysis using 3 techniques – Kriging depicted areas of high prediction.
Study area for analysis of publicly documented marijuana busts:
- Hamilton Police Service
- Niagara Regional Police Service
- Ottawa Police Service
- Waterloo Regional Police
Modeling procedure:

Proprietary & Open Source software:
- ArcGIS 10
- Google technology (Google Drive, Google Fusion, Google Earth & Google Map)
- QGIS
Ordinary Kriging yielded correct results for 2 agencies
We prepare students for real life scenario!!!

Issues with the project that we would like to improve:
- ESRI Educational licensing
- Open source software not reliable
- Not all students could participate
- Neither results or open source software can be used in work environment
Google Earth Pro storytelling with maps using Tour Builder

The pioneers in the Intelligence community were telling their stories with ArcGIS for long time
SSgt Alain Gagnon, RCMP

Story Maps with ArcGIS – The Criminal case that shook Canada 2015

SSgt Alain Gagnon, RCMP
ESRI made reporting easy for Everyone - 2018


A user experience for place-based narratives

The Story Map Tour™ app template is ideal when you want to present a linear, place-based narrative featuring images or videos. Each “story point” in the narrative is geo-located. Your users have the option of clicking sequentially through the narrative, or they can browse by interacting with the map or using the thumbnail carousel.
How we would possibly know all of this?
Kriging with ArcMap?

Important is to know where to find it!
Kriging with ArcGIS Pro?

Little bit different

How Kriging works

Available with Spatial Analyst license.
Available with 3D Analyst license.

Kriging is an advanced geostatistical procedure that generates an estimated surface from a scattered set of points with z-values. Unlike other interpolation methods in the Interpolation toolset, to use the Kriging tool effectively involves an interactive investigation of the spatial behavior of the phenomenon represented by the z-values before you select the best estimation method for generating the output surface.

What is kriging?
ArcGIS Online

OSINT utilization

Is this new buzzword?

Machine Learning ???

What do we mean by Machine Learning?

Machine Learning (ML) refers to a set of data-driven algorithms and techniques that automate the prediction, classification, and clustering of data. Machine learning can play a critical role in spatial problem solving in a wide range of application areas, from image classification to spatial pattern detection to multivariate prediction.

In addition to traditional Machine Learning techniques, ArcGIS also has a subset of ML techniques that are inherently spatial. These spatial methods that incorporate some notion of geography directly into their computation can lead to deeper understanding. The spatial component often takes the form of some measure of shape, density, contiguity, spatial distribution, or proximity. Both traditional and inherently spatial machine learning can play...
THANK YOU!

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Sessions of note…

**Tuesday**

- Crime Analysis Tools: An Introduction
- Public Safety Address Data Management Using GIS
- ArcGIS Geostatistical Analyst: An Introduction
- ArcGIS Online: Best Practices for High Demand Layers
- Geollect Maritime Risk Modelling to Improve Safety and Speed of Transits
- GeoAI Deep Dive: Implementing Machine Learning Solutions with ArcGIS

**Wednesday**

- Advanced Crime Analysis Using Dynamic Data Sources
- Kriging: An Introduction to Concepts and Applications
- Empirical Bayesian Kriging and EBK Regression Prediction in ArcGIS
- Examples of Geostatistics in Practice
- Spatial Analysis: The Road Ahead

**Thursday**

- Stories Behind Our Stories
- Apply Spatial Analysis Techniques to Make Better Decision
- Deploying Law Enforcement Maps and Apps for Local Government
- Applied Spatial Analytics for Defense and Intelligence
- Machine Learning in ArcGIS

Finally something to take a look