The use of GIS Story Maps in Oceanography

Maritime Informatics & Robotics Summer School

Dr **Varvara Antoniou**
Faculty of Geology and Geoenvironment
National and Kapodistrian University of Athens, Greece
vantoniou@geol.uoa.gr

Contents

01

GIS
Story Maps
Oceanography

02

Examples
Practical tips

03

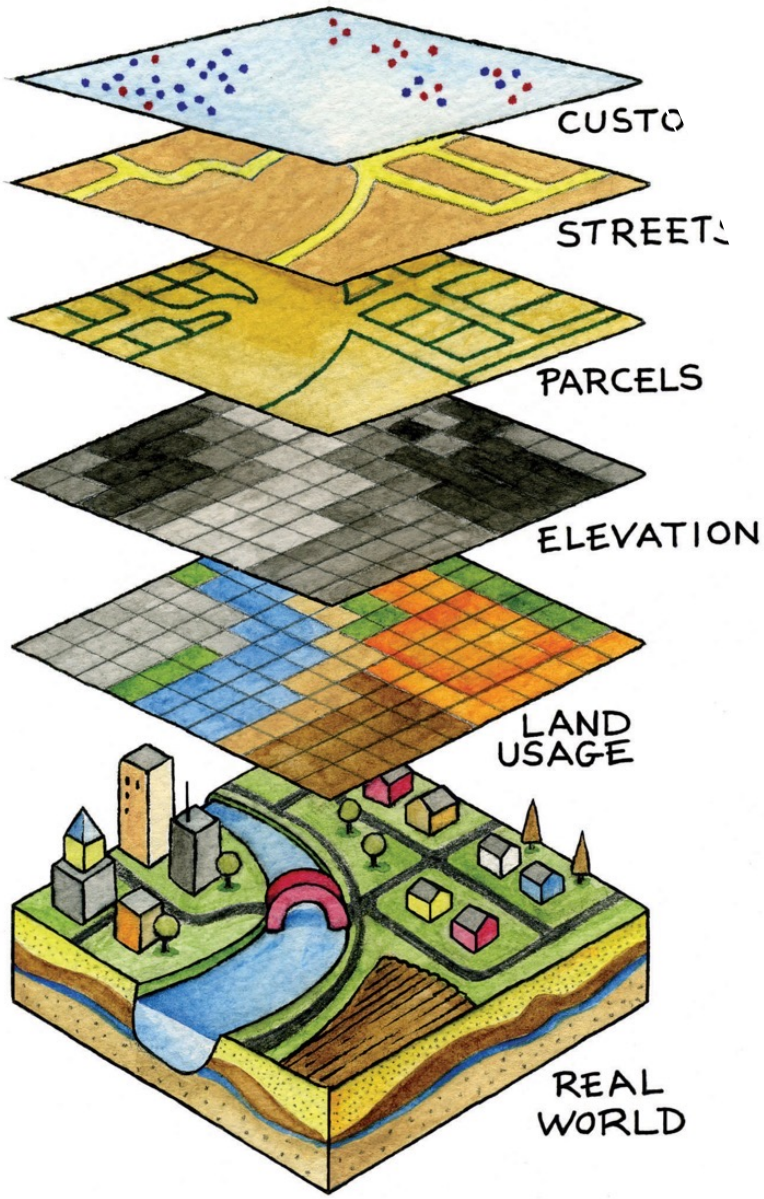
A case study

Contents

01
GIS
Story Maps
Oceanography

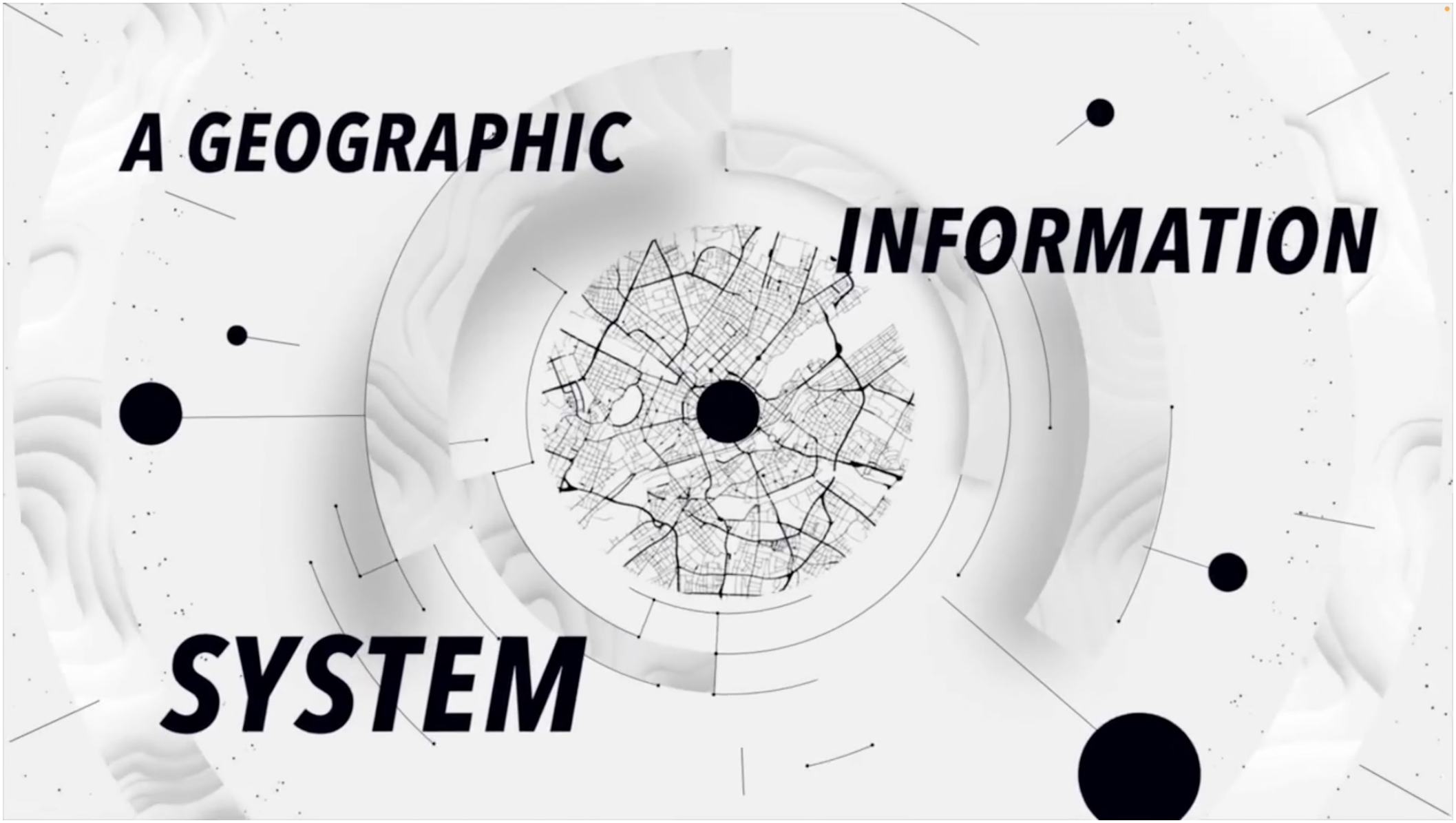
02
Examples
Practical tips

03
A case study



GIS: Geographic Information System

GIS is a technology that is used to **create, manage, analyze, and map all types of data.**



https://mediaspace.esri.com/media/t/1_9gsx27x2

History of GIS

.....
Maps are used for exploration, strategy, and planning.

1854
Physician John Snow maps cholera cases (spatial analysis)

1960
Geographic computer science emerges

1963
Tomlinson becomes the ”father of GIS”

1969
Environmental Systems Research Institute (ESRI) is founded

1972
Landsat satellites launches – Remote sensing begins

1978
First GPS satellite (Navstar I) by US

1982
ARC/INFO is released

1986
First in-car navigation by Etak

1991
GIS goes mainstream

2001
1 million GIS users. GIS marketplace is estimated at $7 bil.

2004
Web 2.0
GIS moves also to the web

2005
Google Maps
Google Earth

2006
Cloud computing
Amazon Web Services released

2007
First iPhone launches the smartphone industry

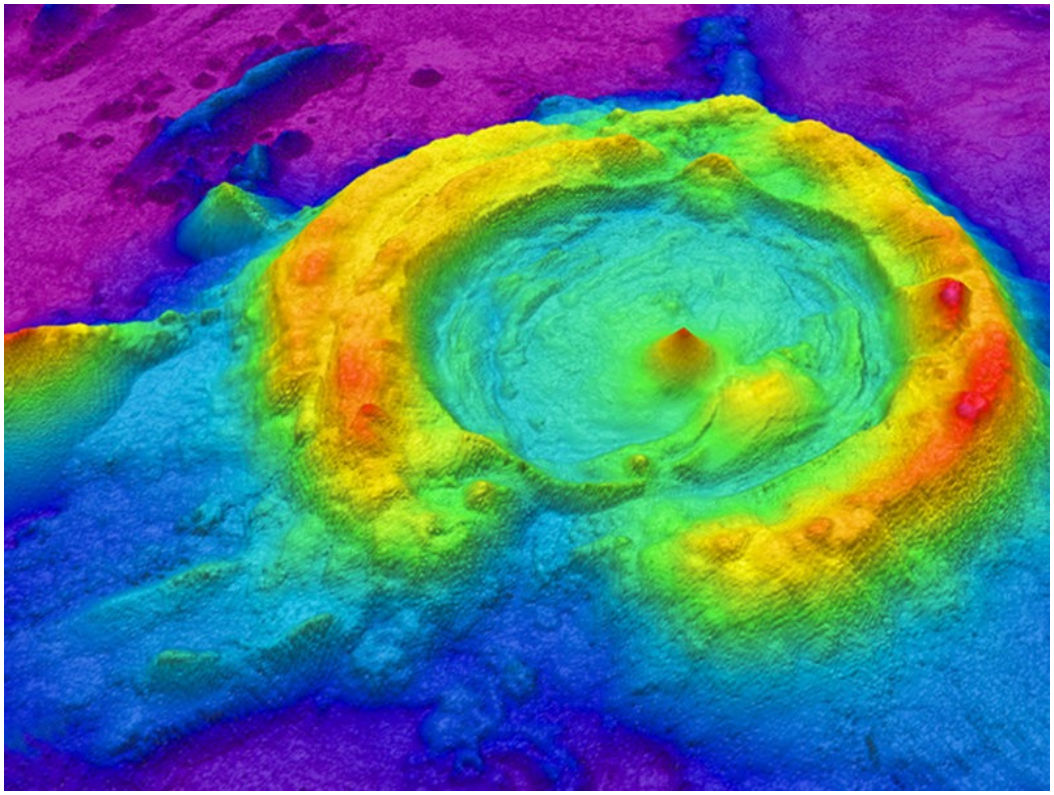
2012
ArcGIS Online (ESRI) is released (first cloud-based)

2018
AI in GIS (GeoAI)

2020
GIS supports COVID-19 response

Today
GIS is everywhere

How does GIS work?



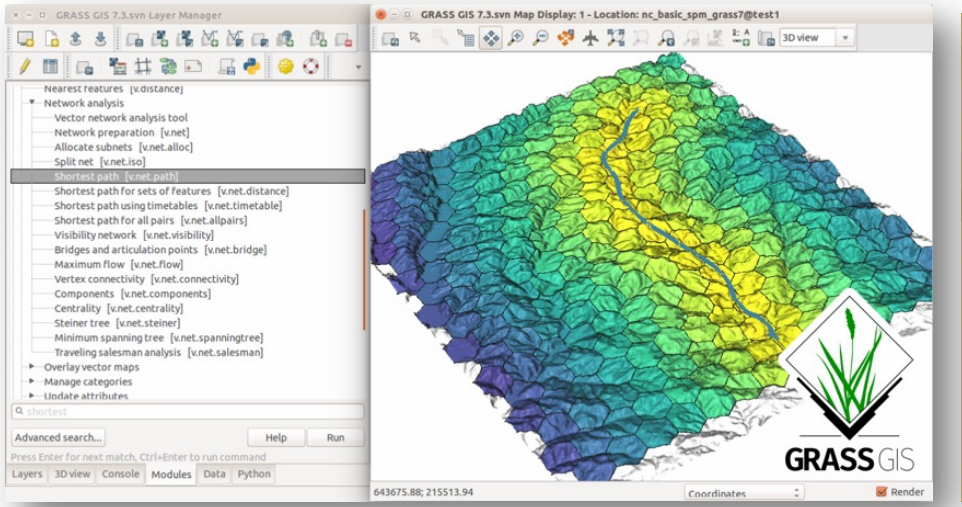
Map of a huge caldera in the NE Lau Basin, created from multibeam data processed with GIS software. Image courtesy of NOAA.

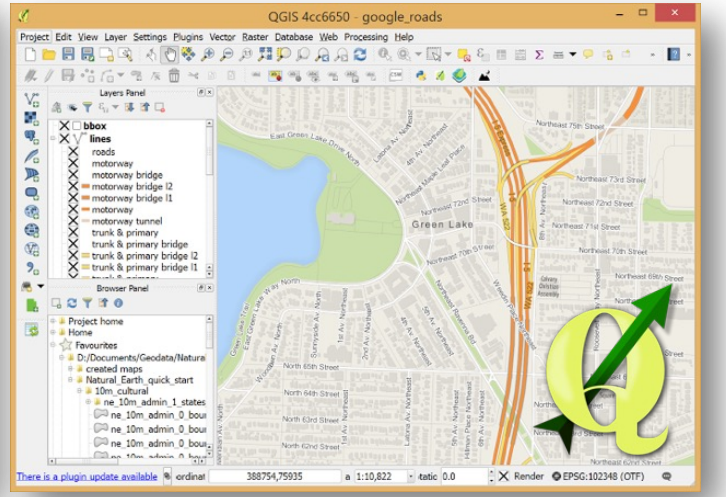
Building a GIS requires a **computer with specialized software and spatial data**. Two of the most commonly used forms of data in GIS are vector-based and rasters:

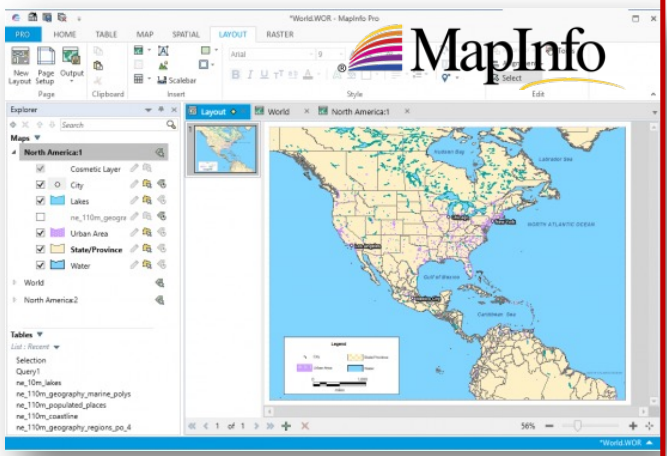
- **Vector data** use X and Y coordinates to define the locations of points, lines, and polygons (or areas). **Points** can be representative of the locations of cities, **lines** may represent rivers and roads, and an example of a **polygon** would be the boundary of a national park.
- Bathymetric datasets, which include information about the depths and shapes of underwater terrain, can be **raster files**. Rasters are datasets comprised of **pixels** (also known as cells) that have unique assigned values.

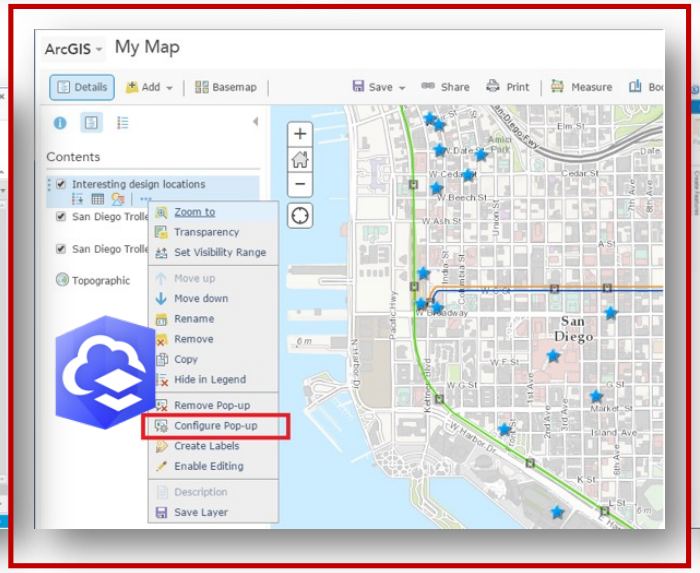
Tools are then used to analyze spatial location and organize layers of information into visualizations using digital map overlays. Users can use the software to integrate and analyze relationships among all types of data inputted into the GIS.

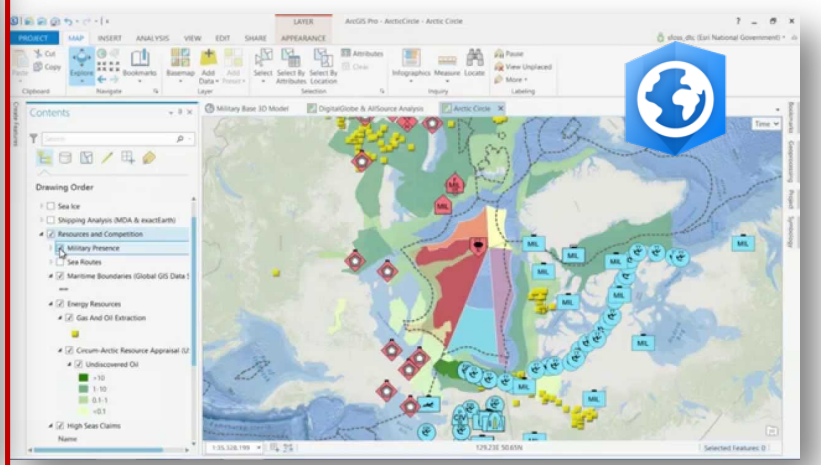
GIS software







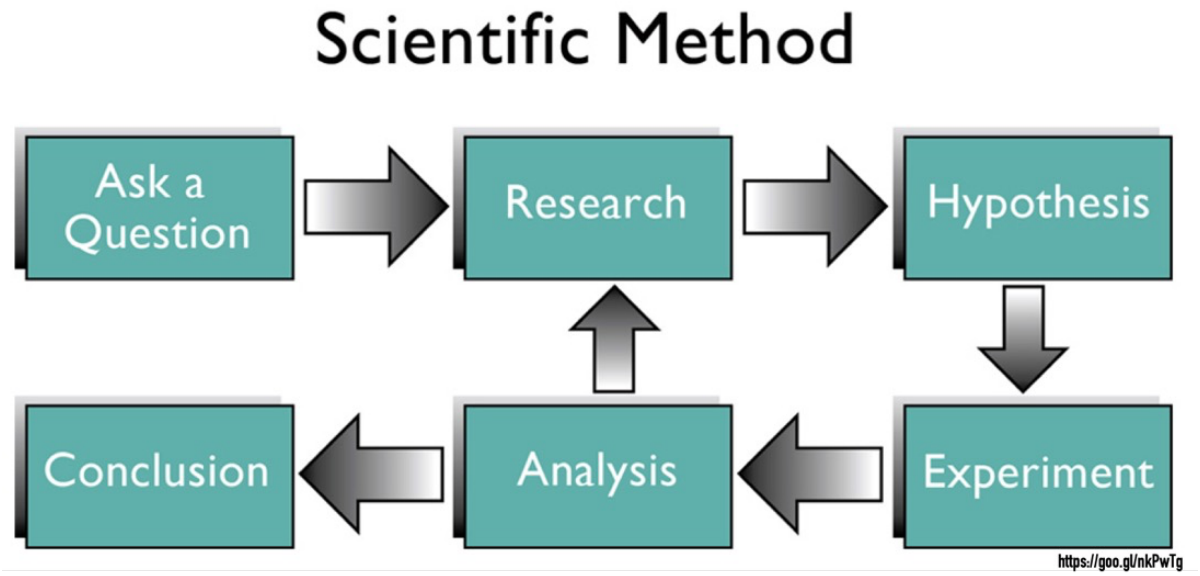




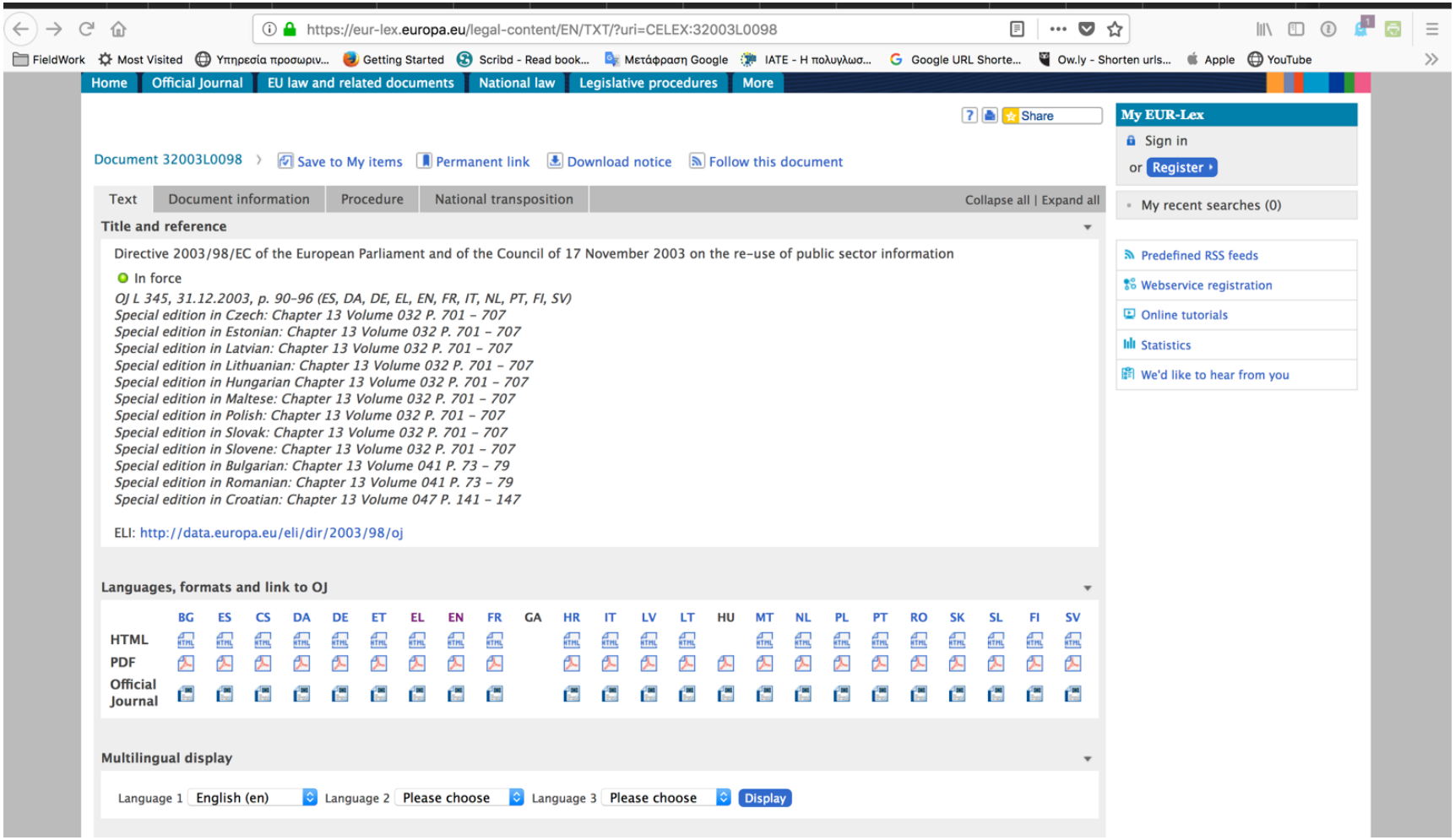
Disseminate Scientific Information

Disseminate Scientific Information

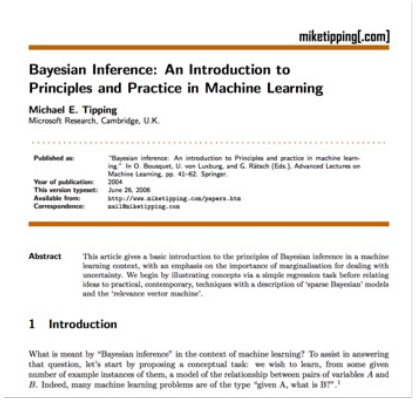
the act of spreading something, especially information, widely, information that has been conducted in the manner of science or according to results of investigation by science, practicing or using thorough or systematic methods



According to the European Union, Directive **2003/98/EC** of the European Parliament and of the Council of 17 November 2003 on the **re-use** of public sector information



Scientific Reports



miketipping[.com]

Bayesian Inference: An Introduction to Principles and Practice in Machine Learning

Michael E. Tipping
Microsoft Research, Cambridge, U.K.

Published as: "Bayesian inference: An introduction to Principles and practice in machine learning." In O. Bousquet, U. von Luxburg, and G. Rätsch (Eds.), Advanced Lectures on Machine Learning, pp. 41–62. Springer.
Year of publication: 2004
This version typeset: June 26, 2006
Available from: http://www.miketipping.com/papers.htm
Correspondence: mail@miketipping.com

Abstract This article gives a basic introduction to the principles of Bayesian inference in a machine learning context, with an emphasis on the importance of marginalisation for dealing with uncertainty. We begin by illustrating concepts via a simple regression task before relating ideas to practical, contemporary, techniques with a description of 'sparse Bayesian' models and the 'relevance vector machine'.

1 Introduction

What is meant by "Bayesian inference" in the context of machine learning? To assist in answering that question, let's start by proposing a conceptual task: we wish to learn, from some given number of example instances of them, a model of the relationship between pairs of variables A and B. Indeed, many machine learning problems are of the type "given A, what is B?".[1]

https://goo.gl/eEt25e

Articles

Global warming – a solution

Swami Dayananda Saraswati

THE Himalayan glaciers have been the perennial source of water for the rivers such as Ganga, Yamuna, Brahmaputra and Sindhu. Now the disturbing news is that the glaciers are receding due to global warming. This problem of global warming is not limited to India and it will cause irreparable damage to more than one way if it is not addressed. One will find it difficult to believe the contention of some ecologists that the river Ganga would cease to be perennial in six to forty years of time, that the other rivers of Himalayan origin would suffer the same fate.

As a human being I have a controlled relationship to the Mother Earth. Global warming testifies how indifferent and careless we have been in discharging our caste taking responsibilities. Now that we see the seriousness of this problem we need to take corrigendum and remedy measures. A report by the United Nations in the year 2004 reveals the surprising fact that "raising animals for food generates more greenhouse gases than all the cars and trucks in the world combined." Tons of billions of animals farmed for food release gases such as methane, nitrous oxide and carbon-dioxide. Methane is a greenhouse gas. Animals such as cows and sheep, being ruminant, emit huge amount of methane due to flatulence and burping. "The released methane", the report says, "has 23 times the global warming potential of CO_2." It is very alarming to note that the livestock industry alone is responsible for 37% of human induced methane emissions. To make room for these animals to graze, virgin forests are cleared. The livestock industry also needs vast stretches of land to raise mono crops to feed the animals. The CO_2 that the trees and plants store escapes back into the air when they are destroyed.

Growing fodder for farmed animals implies heavy use of synthetic fertilizers produced with fossil fuels. While this process emits a huge amount of CO_2, fertilizer itself releases nitrous oxide (N_2O) — a green house gas that is 296 times more potent than CO_2. Alarming though these facts are! we do not need to be pessimistic. In spite of all this world ever have to do is to avoid meat eating. In the absence of demand for meat there is no more need for breeding millions of animals for daily slaughter. The reversal of global warming is a certainty.

The most lofty cannot do anything if the change is from the individuals. A single individual by simply not consuming meat prevents the equivalent of 1.5 tons CO_2 emissions in a year. This is more than the one ton of CO_2 emissions prevented by switching from a large sedan to a small car. One needs to have an honest commitment to save the mother earth who has been relentlessly patient and magnanimous since she began bearing life. There are a number of reasons for one to be a vegetarian. People given to meat eating think that a pure vegetarian diet is optional. But now they have no choice if they are alive to what is happening to this life-bearing planet. There is no justification whatsoever for one to continue to be a non-vegetarian knowing the devastating consequences of global warming.

Promotion of vegetarianism does not require any legislation from the State. It does require a change of heart on the part of meat eating individuals anywhere on this planet. I cannot appeal to the tigers and wolves. They are programmed to be what they are. Being endowed with free will only a human being can make a difference by exercising responsibly his or her choice.

The threatening inundation from the melting icebergs in the North Pole is avoidable and the perennial flow of the holy Ganga and Yamuna would continue if only there is a change of heart on the part of every meat eater. If it is too much for one to switch to be a total vegetarian one needs to give up at least red-meat eating. This is the only option one has.

https://goo.gl/uCW1xs

Conferences

https://goo.gl/LNXGz6

Media/WEB

https://goo.gl/h9Zvhg

Journals

https://goo.gl/YQoJT9

Maps/Apps

https://tinyurl.com/ymrkfbdf

Challenges in Communicating Information regarding Ocean Environment

1. Complexity of Ocean Systems

- Interdisciplinary Nature
- Dynamic Systems

2. Limited Accessibility

- Data Collection Barriers
- Technical Language

3. Visualizing the Invisible

- Hidden Nature of Oceans

4. Public Awareness and Perception

- Disconnect with Daily Life
- Misinformation

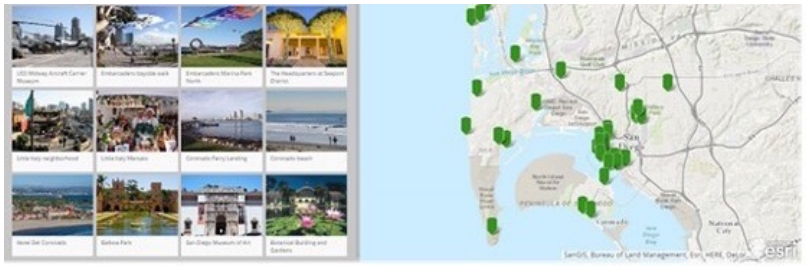
5. Communication Medium Challenges

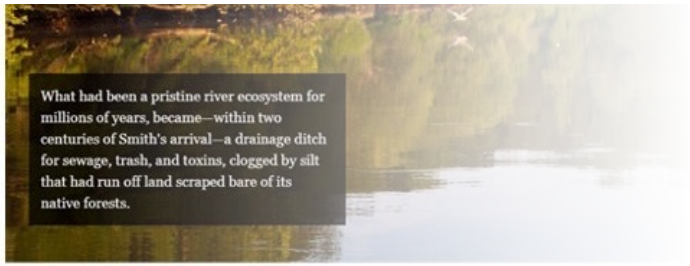
- Overreliance on Data
- Language and Cultural Barriers

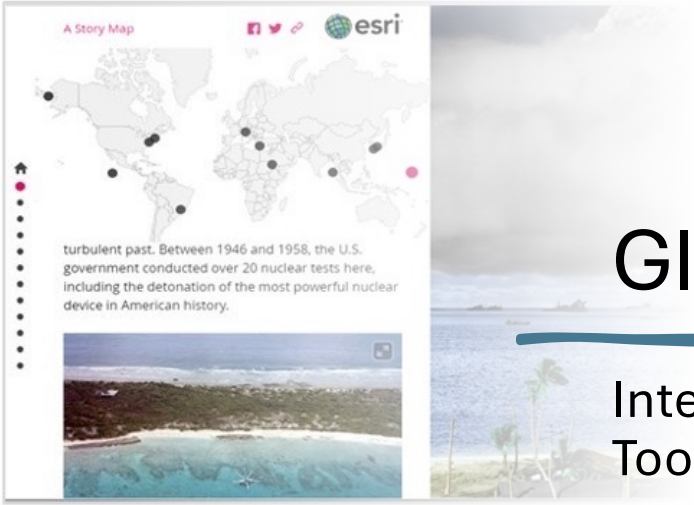
6. Policy and Advocacy Issues

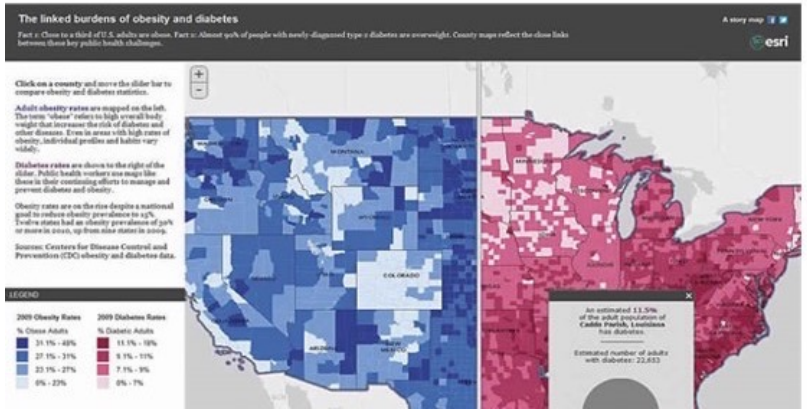
- Polarization
- Funding Constraints

- Use storytelling and visualization
- Focus on relatability
- Promote education









GIS Story Maps

Interactive Storytelling Tools by integrating geographic information with a narrative to engage viewers effectively

Interactive Experience Components

Maps Integration

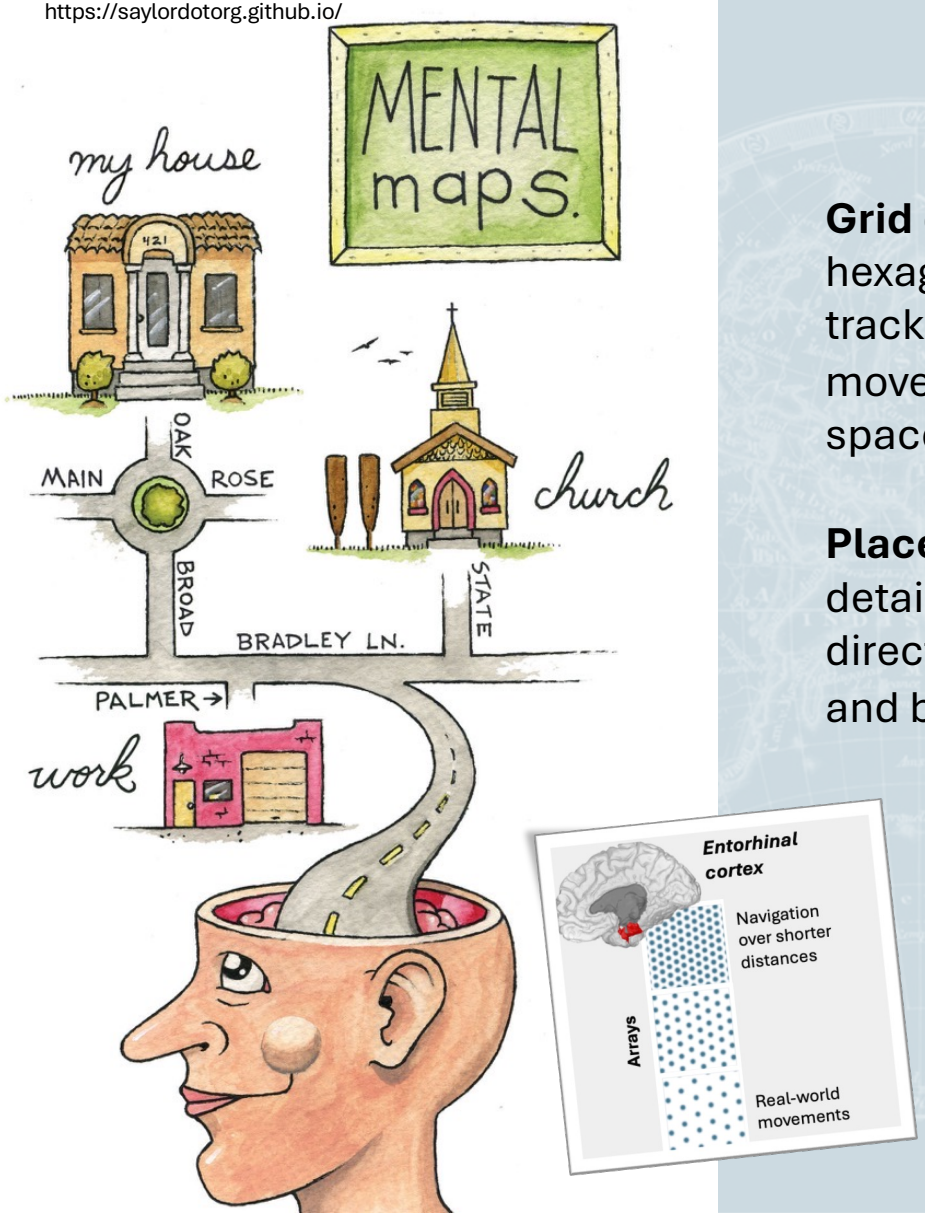
Multimedia Enhancement

Narrative Structure

Maps Integration

Maps are universally appealing and highly effective information providers

https://saylordotorg.github.io/



Grid cells in hexagonal patterns track our movement in space

Place cells store details like direction, speed and boundaries

Multimedia Enhancement

Humans respond dynamically to visual stimuli

A content with visual elements gets...

90%
more views

40%
more likely to be shared

Narrative Structure

neurochemical called Oxytocin

Story

Preaching

Admonition

Account

Narrative

Narration

Register

Fairy tale

Thread

Anecdote

Parable

Myth

Allegory

Memoir

Lesson

Biography

Proclamation

Exhibition

Calendar

History

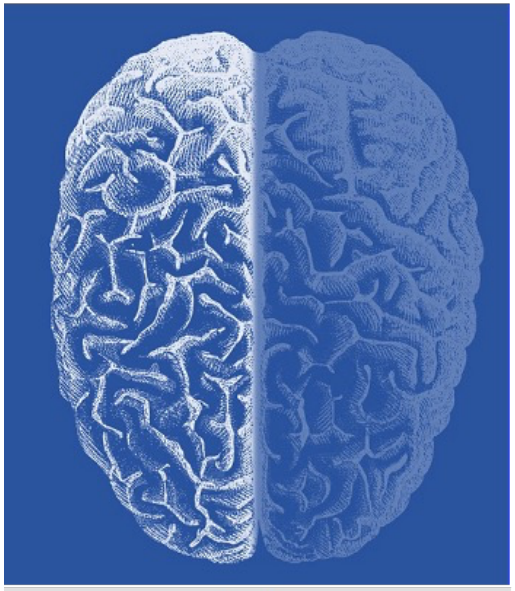
Chronicle

Memorandum

GIS Story Maps

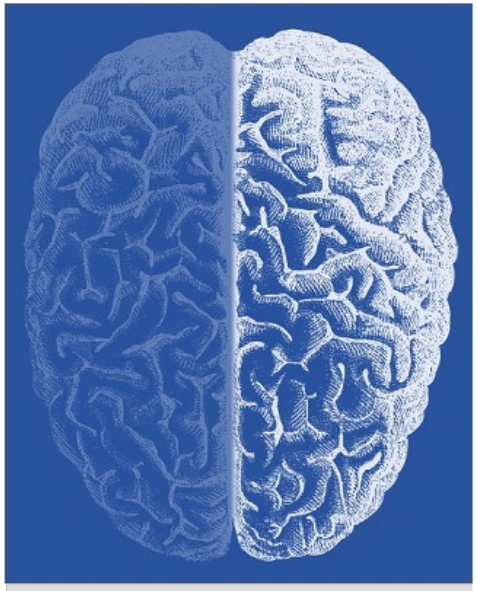
Narrative maps combining text, maps and multimedia content activate both sides of the brain

ESRI: Environmental Science Research Institute



Logic
Analysis
Objectivity

Reacts to maps stimulating rational thinking



Intuition
Thought-Attention
Subjectivity

Reacts to multimedia content and text eliciting emotions

ArcGIS Experience Builder: Another ESRI product, it offers more flexibility than StoryMaps, allowing you to create highly customized web apps with mapping capabilities. https://www.esri.com/en-us/arcgis/products/arcgis-experience-builder/overview

Google Earth Web: Google Earth Web allows you to create stories with maps using the "Projects" feature, where you can add place markers, lines, shapes, and media.

Google My Maps: A simple tool to create custom maps with markers, lines, and shapes. It's less sophisticated than ESRI StoryMaps but useful for quick and simple map-based stories.

Mapbox: A flexible platform for creating custom maps and visualizations. While it doesn't have a dedicated "storytelling" tool, you can combine it with other tools or custom code to create interactive map-based narratives. https://www.mapbox.com/

Knight Lab's StoryMapJS: A free, open-source tool that allows you to create simple, lightweight stories linked to geographic locations. It's great for linear narratives where each slide is associated with a specific location on the map. https://storymap.knightlab.com/

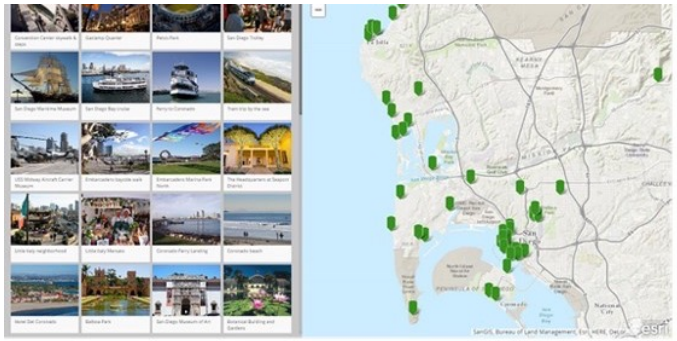
CARTO: CARTO offers tools for spatial data analysis and visualization, which can be used to create interactive maps. While not a dedicated storytelling tool, you can use it to present geospatial data effectively. https://carto.com/

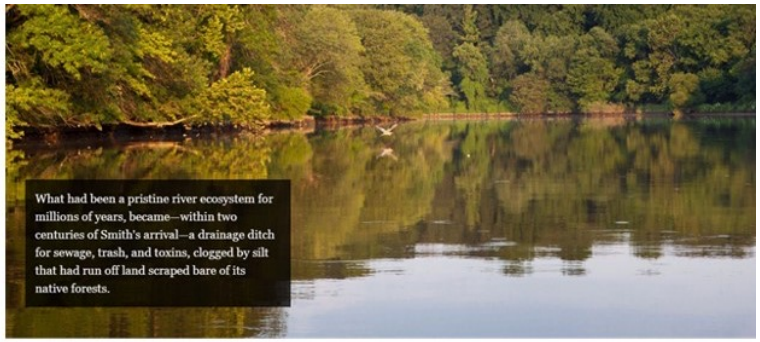
Scribble Maps: An easy-to-use tool for creating custom maps with a variety of annotation and drawing tools. It's a more straightforward option if you're looking for basic mapping combined with narrative elements. https://www.scribblemaps.com/

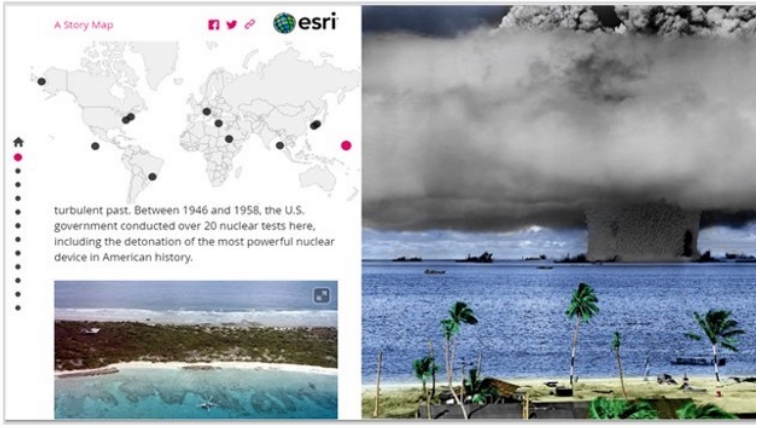
Mapme: A user-friendly platform for building interactive maps with rich media, including videos, images, and text. It's often used for creating storytelling maps for events, tourism, and real estate. https://mapme.com/

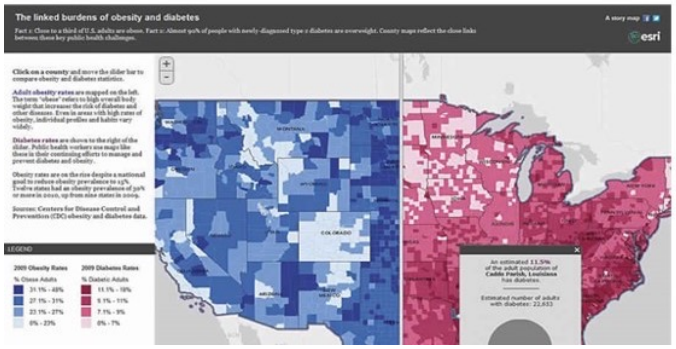
Story Maps

- Informing the public
- Presentation of a topic (instead of power point)
- Personal narratives
- Online guide
- Online Atlas List
- Connecting app
- Presentation of a group
- Book of fairy tales
- Web page
- Collection of crowd data
- Portfolio of projects
- Instructions
- Educational material
- Resume
- Report









Contents

01

GIS
Story Maps
Oceanography

02

Examples
Practical tips

03

A case study

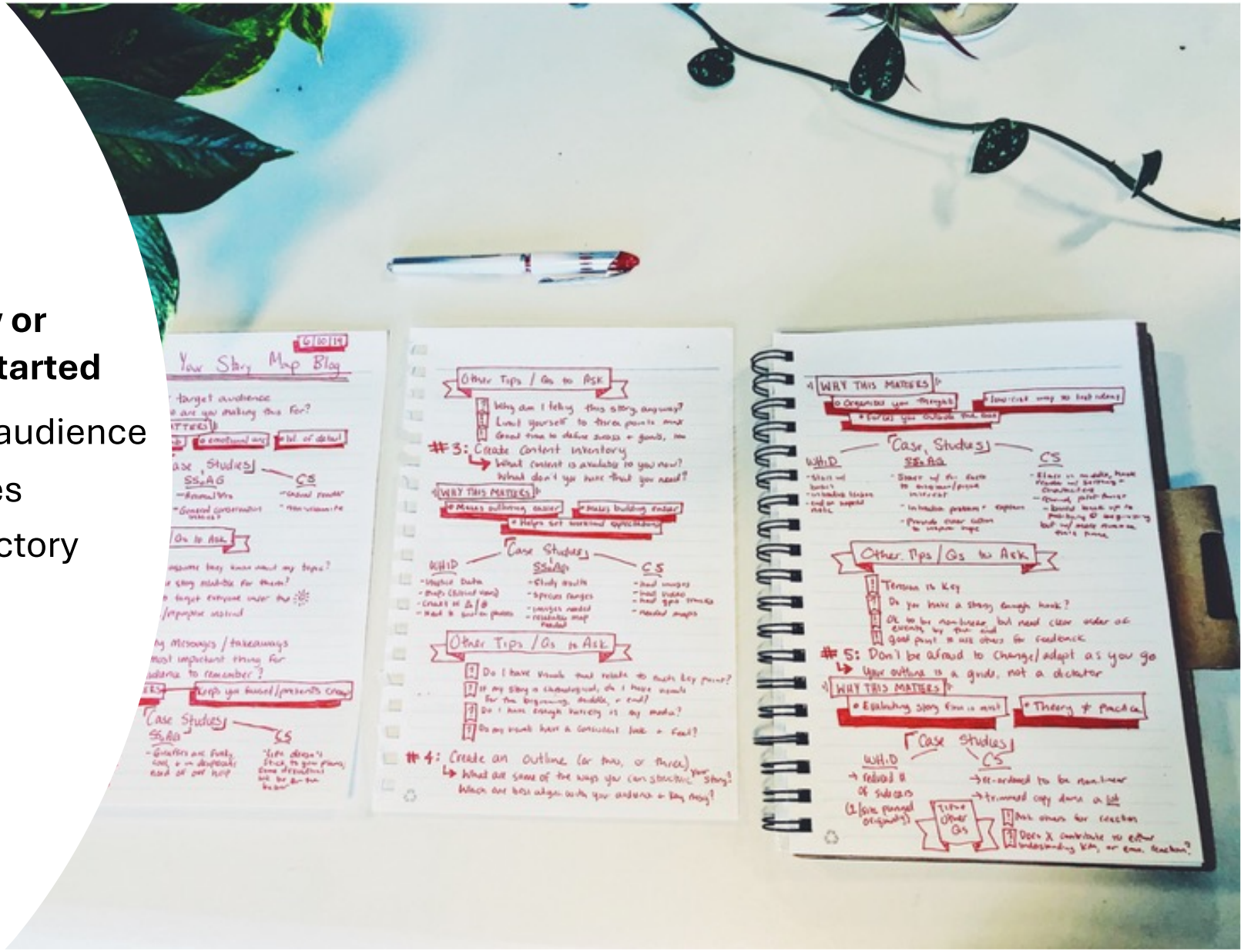
Edison Robots and Plotting Maps

Use your Edison Robot v 2.0 as a map plotter - using code (EdSketch)

Tom Baker

What you need to know or decide before getting started

- Identifying the target audience
- Defining key messages
- Create a content directory
- Structure design (outline/skeleton)



"People have forgotten how to tell a story. Stories don't have a middle or an end any more. They usually have a beginning that never stops beginning"

Steven Spielberg

- **Start** your narrative with something that **grabs the attention of your target audience** (photo/video and headline).
- **Keep your audience's attention by introducing a 'tension'** to the narrative, e.g. the gap created between what is (e.g. a recent discovery) and what could be (e.g. the erosion of the site/monument due to climate change or its preservation for future generations to enjoy). Readers want this tension to be resolved and will remain engrossed in the narrative as long as they feel like they are making progress toward closing this gap.
- Always **finish** the narration with an **action**, provide the audience the ability to do something for the subject presented (eg. a donation, a read more button, etc.)
- Once you've come up with an outline, **run it with someone who is part of your target audience**. If you find that it's not getting the messages you want across, it's easier to make adjustments at this stage than after you've filled out all the content available to you in the web application

GIS Story Maps examples

Maritime Informatics and Robotics Summer School

Varvara Antoniou

September 4, 2024

https://arcg.is/1av5zj0

Contents

01
GIS
Story Maps
Oceanography

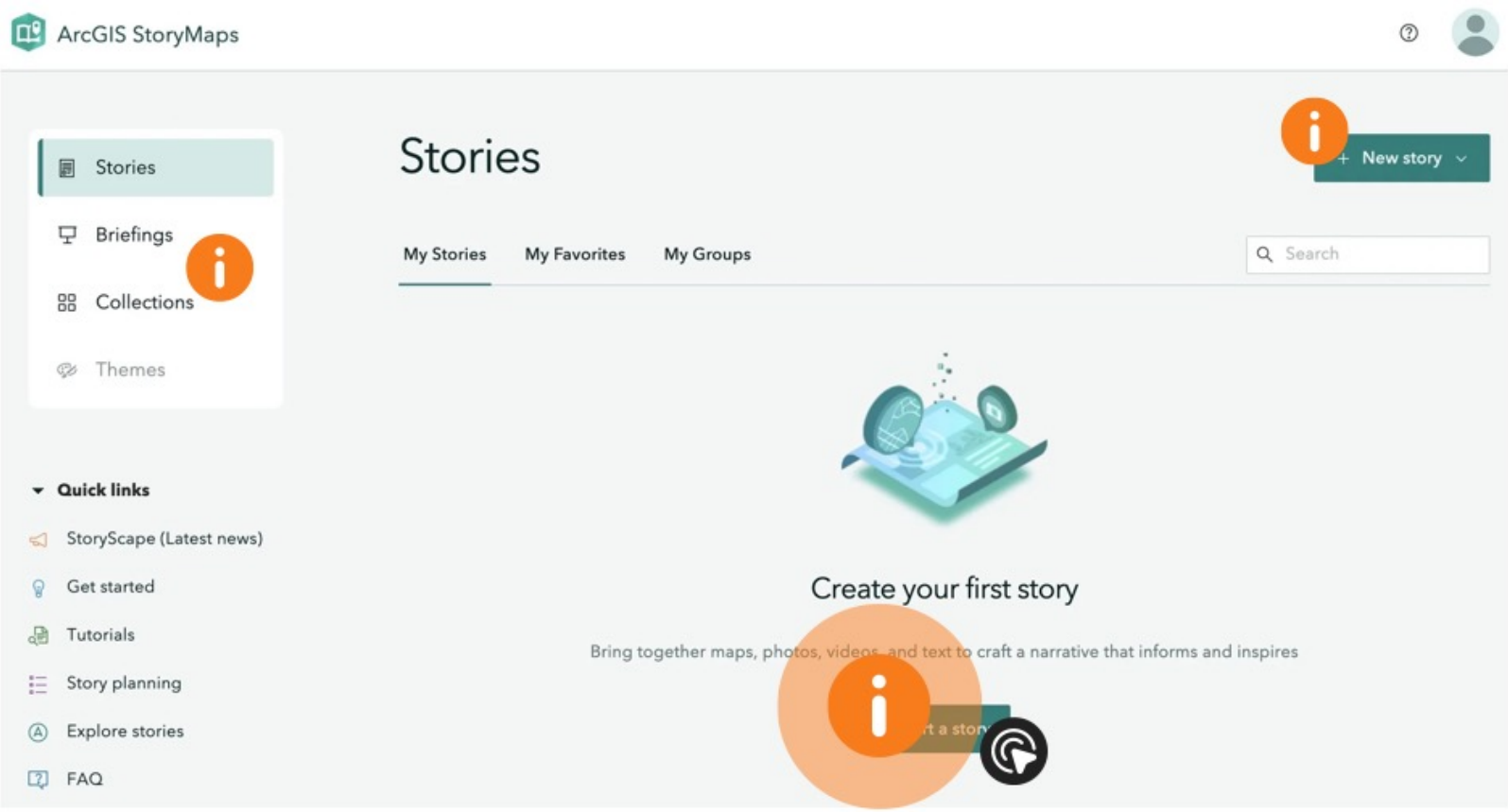
02
Examples
Practical tips

03
A case study

Create public account

https://community.esri.com/t5/arcgis-online-public-account-community/arcgis-online-public-accounts-getting-started/ba-p/1305110

https://storymaps.arcgis.com/


ArcGIS StoryMaps
Stories
Briefings
Collections
Themes
Quick links
StoryScape (Latest news)
Get started
Tutorials
Story planning
Explore stories
FAQ
Stories
New story
My Stories
My Favorites
My Groups
Search
Create your first story
Bring together maps, photos, videos, and text to craft a narrative that informs and inspires

thinglink.

Case Study

https://arcg.is/108GiC

Outline

1. Title
2. *Subtitle*
3. Authors | Date
4. Abstract/Overview
5. Topics
6. Conclusions
7. References
8. Credits
9. Action..

Text
Photos
Videos
Audios
Maps

Task

Present a new robotic system

- Target audience
- Key takeaways
- Content
- Outline

- Publish the StoryMap us **public**
- Send the share link to **vantoniou@geol.uoa.gr**

Contents

01

GIS
Story Maps
Oceanography

02

Examples
Practical tips

03

A case study

The use of GIS Story Maps in Oceanography

Maritime Informatics & Robotics Summer School

Dr **Varvara Antoniou**
Faculty of Geology and Geoenvironment
National and Kapodistrian University of Athens, Greece

vantoniou@geol.uoa.gr

GIS Story Maps examples

GIS Story Maps examples presented https://storymaps.arcgis.com/briefings/1e3349f3b09b4243840645ecdc7d6906

Other examples
Marie Tharp's Seafloor https://storymaps.arcgis.com/stories/232257acdac6409a907abd77b3d83f89
Improving Our Coastal Ocean https://storymaps.arcgis.com/stories/d7c55ba3ea0e4215b624454a3115dae4
GIS for Ocean https://oceans-esrioceans.hub.arcgis.com/pages/storymaps
Treasures of the Deep https://storymaps.arcgis.com/stories/53d486cf7a5a44f5b81171b5457b93f1
An Altered Arctic https://storymaps.arcgis.com/stories/f95048e6731e48478b39b14554fb5e36
ArcGIS StoryMaps for Ocean Science and Conservation https://www.youtube.com/watch?v=iw9K9vtw_ns
Understanding Our Ocean with Water-Column Sonar Data
https://storymaps.arcgis.com/stories/e245977def474bdba60952f30576908f
Ecological Marine Unit explorer https://livingatlas.arcgis.com/emu/#viewpoint=355,11530890,102100,-1071263.193,3814740.591,-237.582&camera=5,31,102100,-1300504.819,1357635.037,3296218.145&query=-10.375,32.625,9&view=3d
Restoring our Ocean https://storymaps.arcgis.com/collections/30b3c5629e0d4b17a5d890cb7f2efa16
Sea Ice Aware https://livingatlas.arcgis.com/sea-ice/

ArcGIS StoryMaps https://storymaps.arcgis.com/
ArcGIS Online https://www.arcgis.com/index.html