SHAW OLUWAGBOUNMI PRECIOUS

STUDENT ID: ST20182956

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TASK 1

Review on different techniques used for geospatial analysis and social media information analysis

a. ArcGIS

ArcGIS is a geographic data framework created and maintained by Environmental Systems Research Institute (ESRI) for dealing with maps and geographic data. It is a tool set that

Functionality of ArcGIS

Some of the functions available in the ArcGIS software include:

- Data formats and managements
- Scripting and automation
- Visualization and mapping
- Share and collaborate
- Explore and analyse data

Applications of ArcGIS

ArcGIS can be applied in various industries and areas such as:

- Assessment and tax: produces land use maps for appraisers and planners.

- Architecture, Engineering, and Construction (AEC): monitors the condition of roads and bridges and produces planning maps for natural disasters.
- Public safety: study crime patterns to intelligently utilize its personnel and to monitor the effectiveness of neighbourhood watch programs.
- Utilities: produces maps of bicycle paths for commuters.

Strengths of ArcGIS

- Provides guides such as teaching and learning materials.
- More options available for geodata.

Limitations of ArcGIS

- Paid license
- Only available on Windows and Linux operating systems
- Long processing time

b. Google Map

Google map has long been the industry standard for map integration used by Bolt, Uber, Allianz, and many other large and smaller businesses.

Functionality of Google Map

- Street view: a feature of Google maps which gives a 360˚extensive level of street view of various locations.
- Indoor maps: enables the users to navigate within buildings like airports, universities, train stations and other public spaces.
- Time-lapse: allows users to view the changes that has occurred to the earth in the last 37 years.

Applications of Google Map

Google map can be used in many ways like:

- Plan routes
- Start navigation with current bus and train data
- Information about locations, opening hours and menus
- Define addresses for example home address or workplace

Strengths of Google Map

- Multi-language support. GMP currently supports over 80 languages.

- Instantly recognizable. Most smartphone and computer users are familiar with the interface of Google Maps, which is likely to create a sense of inherent trust when interacting with the version built into your app.
- Excellent global and local data quality. Over the years of its existence, Google Maps has conquered an unprecedented area with its mapping services and collected unfathomable volumes of information on the local level.

Limitations of Google Map

- Few options for customization. Although the new custom styles are being rolled out as beta, Google Maps API currently supports limited options for creating a unique look for your integrated maps.
- Not an open-source API. We could try and guess whether it's because Google requires no help from the developers' community, or the corporation is holding on to the right to implement certain features without external consent, but that's the way things are.

c. Facebook

Facebook is a website which allows users, who sign-up for free profiles, to connect with friends, work colleagues or people they don't know, online. It allows users to share pictures, music, videos, and articles, as well as their own thoughts and opinions with however many people they like.

Functionality of Facebook

Here are so features of Facebook:

- Embed in posts: this generates the link of articles, videos or pictures posted from a. website.
- Messenger: this is another chat platform separate from Facebook itself dedicated to just sending messages and viewing stories.
- Like button: this enables the users to show appreciation or approval of other users' post.

Applications of Facebook

- It is used as a marketing tool for businesses
- It is used to enhance computer literacy as well as help student advance their communication and writing skills.

Strengths of Facebook

- It is free
- Friendly user interface
- Helps its users maintain social relationships, find long lost friends and identify products or services they like.

Limitations of Facebook

- Targeted marketing: Facebook uses information on users' profile to target them with advertisements.
- Lack of privacy: mutuals or friends of users can tag them to a post they don't like.
- Identity theft: because users post pictures and videos of themselves, it is very easy for a fraud to impersonate them.
- Malware and viruses: users can post a link and unsuspecting users click on them, their devices are infected with malware or viruses and could lead to phishing attack.

d. GeoPandas

GeoPandas is an open source project to make working with geospatial data in python easier.

Functionality of GeoPandas

- PyGeo: it is a vectorised geometry function available in C and Python libraries. It helps in speeding up the geospatial processes.
- Geopy: it easy for Python developers to locate the coordinates of addresses, cities, countries, and landmarks across the globe using third-party geocoders and other data sources.
- Geocoder: Geocoder is a simple and consistent geocoding library that provides a street address that is readable for both the user and locals.

Applications of GeoPandas

- Project data into map representations
- Helps in analysing geospatial data to make or give recommendations.

TASK 2

TRANSPORTATION INDUSTRY

The use of GIS in transportation is widespread. The major areas of applications include highway maintenance, traffic modelling, accident analysis, and route planning.

- **Highway management:** The most important objective of using GIS is visualization achieved through maps. With visualization of real-time data, transport planners can easily identify potential issues that can be addressed more efficiently and economically than with the prevailing methods. Through detailed GIS maps, this information can be easily conveyed to decision-makers and the public.

- **Traffic modelling**: GIS data can model road networks around the world as polylines with attributes. The resulting model representation could also provide important road features for traffic simulations, including smoothly connected ramps, highways, overpasses, legal merge zones, and intersections.
- **Accident analysis:** GIS delivers powerful spatial analytics, allowing the authorities to discover patterns and gain intelligence to better understand travel behaviours and perform accident analysis. GIS significantly helps in accident analysis and leads to a reduction in the number of accidents on roads as well.
- **Route planning:** GIS-based systems quickly provide and analyse essential economic, demographic and cost estimates for planning new routes. It helps in analysing existing routes, collecting data and informing the riders of change to routes.

EDUCATION SECTOR

It can be used efficiently in several levels of informal and formal education. The use occurs in all levels including primary, secondary grades, and continues to university courses. Here are the applications of GIS in education:

- **Emphasize concepts:** Instructors are emphasizing teaching with GIS at the elementary and secondary levels. It is used to teach skills and concepts in geography, earth science, mathematics courses, history, biological science, and chemistry.
- **Enhance learning ability:** Students have benefited from GIS in several ways. The use of GIS helps to enhance learning ability. Learners can think critically when solving problems and analysing data.
- **Research tool:** Institutions of higher education including universities and colleges use GIS as a fundamental tool. It researches in disciplines such as demography, geography, and geology.
- **Map literacy:** GIS enhances map literacy. Students learn to change situational knowledge to visual pictures. They can visualize spatial patterns and engage in inquiry.

PUBLIC SAFETY

The current scenario is encouraging with policing agencies worldwide actively imbibing GIS in their functioning with the intent of achieving higher public safety and quicker response. Here are examples of how GIS helps to ensure public safety:

- **Smart policing:** Spatial analysis is giving geographical context to real world incidents and helping police officials to create geographical profiling of offenders. GIS tools by providing hot spot generation, zonation, navigation and mobile location identification are enabling the Intelligence community to be smarter, faster and hit right at the spot at the right time.
- **Workforce management:** GIS aids the law enforcement authorities manage their workforce better. GIS helps them in planning field visits for general supervision, crime

investigation visits, route optimization, route tracking of the concerned officers, work scheduling, police vehicle tracking, real-time tracking of the location of the force, attendance management, Human Resource Management, asset management, reporting etc.

- **Prison and parole management:** GIS helps in prison and parole management by helping in identifying areas prone to inmate violence in institutional settings, assigning probation and parole officers by geographic location, directing probationers and parolees to services and treatment centres, making site selection decisions for the placement of new facilities within a community etc. **GIS** also makes inmate information such as booking photos, current charges, demographic data, gang affiliation, and corrections history just a click away. It serves as a valuable tool for analysis and investigation for prison authorities.

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