CSOD Course

Geospatial Data Analysis: Tools and Techniques

June 30th, 2020

Course: Data Preparation

Course Description:

Welcome to the Course "Geospatial Data Analysis: Tools and Techniques". This is the 2nd in the CSOD ADVANCED program that seeks to empower young adults with the practical skills for today's Digital economy. These courses are designed to address competency profiles in Digital literacy and Data skills that have become essential for the job markets of today and the future. Participants in this course on "Geospatial Data Analysis", will acquire the essential practical skills that will equip them with foundational data competencies for collecting, working with and visualizing location-based data, and applying these techniques to Interactive Community Mapping.

This course is broken down into 4 (four) modules namely:

1. Understanding the Business value of Geospatial data
2. Geodata and Mapping Concepts
3. Interactive Community Mapping – Tools & Techniques
4. Visualizing Geospatial Data

Purpose of the Course:

In the Digital economy, Data has become a critical and valuable business resource. In particular, there is a lot of economic value in geospatial data i.e. data that contains geographical co-ordinates that can be plotted on a map. As a result of the ubiquity of mobile devices such as smartphones, a lot of today's business data from social media posts to transactional data are collected with location coordinates. This course introduces students to the fundamentals of geospatial data, mapping concepts and applications. Practical techniques are learned to collect, process and visualize geodata using low-cost devices and free tools such as Openstreetmap.

Learning Objectives:

1. Explain the business value of Geospatial Data
2. Understand Mapping concepts
3. Collect Geospatial data using mobile devices
4. Upload and Edit Geospatial data in Openstreetmap
5. Demonstrate techniques for visualizing Geospatial Data
6. Apply the learned techniques to Interactive Community Mapping

Target Audience:

The course is targeted to young adults who have reached the end of high school and/or are beginning to engage in tertiary education, and who have completed the CSOD basic program, or have otherwise acquired digital competencies.

Pedagogical Approach:

Content design employs the following pedagogical strategies, suitable for adult learners and amenable to online delivery using web/mobile devices:

- **Adult Learners**: allow for student agency and autonomy; being goal-oriented; heavily practical content and; structured to leverage the learner's experience as well as the local community;
- **Retrieval learning**: Short, modular content with built-in quizzes and repetitive learner assessment in line with content;
- **Alignment**: Module Content has been organized in a logical sequence with clear linkages and alignment to explicit learning objectives
- **Mastery learning**: Modules strive for a progressive, self-paced, directed learning path that allows students to achieve incremental mastery of concepts before moving on to the next
- **Enhanced attention and focus**: Incorporates text and graphical components to create rich, interactive and a much more responsive learner experience
- **Self-Reflection**: Modules provide guides that encourage the student to reflect on the learned concepts and cognitively apply them to familiar contexts

Time Required:

Estimated time to complete each module ranges from 45 – 90 minutes. Additional learning resources are provided to enable students to explore more information on the topics covered.

Programme/Course Assessment:

The assessment done at the course level is based on both formative and summative assessments, and includes:

1. Progressive in-course Assessment (i.e. questions built-into modules)
    - ~ 5-7 questions per module that help students to test and validate their learning and reinforce the concepts
2. Reflection Questions

- A series of 1 - 2 short answer, open ended questions that encourage the student to reflect on the learned concepts and cognitively apply them to familiar contexts

3. A Quiz administered at the end of each Course

    - More traditional summative tests/evaluations which attempt to draw together and integrate a number of elements across the modules in a course

Module Outlines:

Below is a brief description, a list of learning objectives and topics for each module of this course:

Module 1: Understanding the Business value of Geospatial data

Module Description:

As a result of the ubiquity of mobile devices such as smartphones, a lot of today's business data from social media posts to transactional data are collected with location coordinates This module, "Understanding the Business value of Geospatial data", introduces the concepts of geospatial data (i.e. Geospatial data is data that contains geographical co-ordinates that can be plotted on a map) and GPS devices. Learners gain knowledge and understanding about the increased importance and economic value of geospatial data and its use in various applications and contexts.

Learning Outcomes:

By the end of the module students will be able to:

1. Discuss the prevalence and increasing importance of geospatial data
2. Identify various sources and types of geospatial data
3. Explain the concepts of Global Positioning System (GPS) and different grades of GPS devices
4. Discuss the implications of precision in geospatial data
5. Discuss potential applications and economic value opportunities of geospatial data

Module Topics:

1. Definitions of geospatial data and its increasing business and recreational relevance
2. Various sources and types of geospatial data (mobile, social media, mapping)
3. Global Positioning System (GPS) and GPS devices
4. Applications and economic impact of geospatial data

Module 2: Geospatial data and Mapping Concepts

Module Description:

This module, "Geospatial data and Mapping Concepts", is designed to orient learners in the foundational concepts and principles of maps, mapping and geospatial data. It introduces the learner to the various elements and attributes that go into constructing a digital map.

Learning Outcomes:

By the end of the module students will be able to:

1. Understand mapping as a modelling concept and various types of maps
2. Explain the use of various mapping elements: points, lines, polygons, attributes
3. Be able to Read and Interpret information on Maps
4. Construct a Map using Google Map Editor

Module Topics:

1. Mapping concepts
2. Mapping elements: points, lines, polygons and attributes
3. Reading and interpreting Maps
4. Using Google Map Editor to construct a Map

Module 3: Interactive Community Mapping – Tools & Techniques

Module Description:

This module, "Interactive Community Mapping", is designed to provide learners with knowledge on the tools and techniques for mapping a local community. Mobile devices (smartphone or tablet) are used to collect Geospatial data and attributes which is stored in an online database in a form suited for subsequent mapping or analysis. Students are provided with a practical hands-on introduction to the Openstreetmap platform and can use it for capturing editing field data to produce media-rich community maps

Learning Outcomes:

By the end of this module students will be able to:

1. Explain the concept of interactive mapping community (ICM) and crowdsourcing geospatial data.
2. Discuss applications of ICM in Tourism, Social Development and Business development
3. Collect geospatial data in the field using Mobile devices and mapping fieldpapers
4. Use OpenStreetMap as an effective platform to produce media-rich community map

Module Topics:

1. Interactive mapping community and crowdsourcing geospatial data.
2. ICM applications in Tourism, Social Development and Business development
3. Collecting geospatial data using Mobile devices and mapping fieldpapers
4. Learning to use OpenStreetMap to produce media-rich community maps

Module 4: Visualizing Geospatial Data

Module Description:

The pervasiveness of mobile devices such as Tablets and Smartphones that have GPS capability, and therefore have the ability to capture location data means that many modern Datasets include location information, thus enabling the use of maps for visualization. This module, "Visualizing Geospatial Data", applies data visualization tools and techniques from the Data Visualization course, to display geospatial data on Maps.

Learning Outcomes:

By the end of this module students will be able to:

1. Understand the value of visualizing geospatial data using Maps
2. Familiarize with various methods for geocoding (adding location data) to existing datasets
3. Apply different techniques for visualizing geospatial data
4. Design dashboards with geospatial data content

Module Topics:

1. Visualizing geospatial data using Maps
2. Geocoding non-geospatial Data
3. Techniques for visualizing geospatial data
4. Dashboard Design with geospatial data

Conclusion:

This course consists of 4 modules which, when done successfully, ensures the young adult learners are equipped with the practical valuable knowledge and skills for today's Digital economy. This course introduces students to the fundamentals of geospatial data, mapping concepts and applications. Practical techniques are learned to collect, process and visualize geodata using low-cost devices and free tools such as Openstreetmap. Additionally, students will acquire knowledge about the economic value and business applications of geospatial data.