

## **Computing in Context: Intelligence and Security Informatics**

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**Module Name:** Data Visualization in Security Informatics

**Scope:** This module will help the students learn how to create visualizations for security informatics using modern web technologies.

### **Learning Objectives**

- Learn about online graphics formats
- Create simple CSS based graphics
- Understand the advantages of Scalable Vector Graphics
- Learn to access external data sources for populating your visualizations
- Adding Interactivity to your data
- Animating your visualizations

### **Computing concepts and skills involved**

- Data structure
- Graphics & visualization
- Knowledge representation and information
- Database and data modeling
- Programming

### **Level of effort required**

- In-class: Four 2-hour classes
- Out of class: Watch video tutorials each week (30 minutes each)
- Individual out of class exercises (1 hourgoogle)

## Relationship with other modules

- These modules would work well with other modules from this poster such as the Cybercrime Investigation Database.
- The data for these visualizations could come from other modules
- Integration would help tie this and other modules together

## Pre-requisite knowledge

- Basic computer skills
- Understand how to put an HTML page together
- Understand how to use basic Cascading Style Sheets (CSS)
- Understand how to include a script on a page

## Body of knowledge (outline)/Exercises

### Session 1

#### Understanding Online Formats

Learning how to put together a basic web page and the different graphic formats they can contain. Learn about the SVG Graphic format, how it's built around an XML structure and why they are perfect for cross platform and mobile graphics. Plus learn to build their first visualization using a local data source and CSS based graphics.

- Introduction to web graphics
- Installing the D3 Library
- Adding D3 into an HTML document
- Modifying the DOM using D3
- Creating basic graphics with CSS
- Creating a bar graphic
- Adding text elements
- Controlling color in graphics

### **Exercise -- Build a bar chart using CSS Graphics and the D3 Library**

In this exercise, students will create their first D3 graphics library graphic and learn how to download and install the D3 library and use it to create a simple bar chart graphic using CSS and a static data source.

## **Session 2**

### **Creating SVG Graphs**

In this session, the students will learn how to work first with static data and explore how they can use the data to build a complex bar chart graphic using the D3 library and the SVG format. We'll explore fundamental components of the D3 library .

- Organizing your data
- Creating an SVG Graphic
- Adding axis
- Creating a Legend
- Parsing external data
- Creating a D3 scale
- Working with D3 ranges
- Using chaining to make complex graphics

### **Exercise – External data source**

In this exercise, students will create a more advanced visualization that uses an external data source first from a file then export from an excel spreadsheet as a CSV file and then by reading data from an eternal source.

## Session 3

### Exploring Graph Types

In this session, the students will learn how to work first with data imported from external source and work with different types of D3 visualizations.

- Understanding D3 Visualization modules
- Using Trees
- Showing clusters
- Using Pie charts
- Using Stack Graphics

#### Exercise – External data source

In this exercise, students will create a more advanced visualization that explores the use of different types of visualization options the library provides.

## Session 4

### Adding Interactivity

In this final session, students will learn how to add more interactivity and respond to events like click and drag to enhance their visualizations.

- Adding Physics (Force, gravity and charge)
- Creating Links between elements
- Adding Data Points
- Controlling graphics with mouse input
- Adding text to data links
- Modifying graphics on mouseOver and mouseOut
- Making your graphics draggable
- Dealing with Time

#### Exercise – Build and Drag and Drop visualization

In this exercise, students will put what they learned to the test and create a draggable force driven layout using an external data source.

## Resources Required

- Basic Excel experience
- Online access for videos
- Access to a Text Editor & browser
- Suggested Books
  - Data Visualization with d3.js by Swizec Teller Packt Publishing
  - Data Visualization with D3.js Cookbook by Nick Qi Zhu Packt Publishing

## Additional Useful Links

- <http://d3js.org/>
- <http://www.codecademy.com/courses/web-beginner-en-kcP9b/0/1>
- <https://www.dashingd3js.com/table-of-contents>
- <http://youtube.com/planetoftheweb>