

**Massachusetts Institute of Technology  
Department of Urban Studies and Planning**



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**11.204: Planning, Communication & Digital Media  
Fall 2004**

**Lab 4:  
Using ArcGIS to Visualize Population Density**

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**Assigned: Rec. 5**  
**Due: Rec. 6 at 5PM**

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**I. Scenario**

This lab exercise is designed to help you learn more about ESRI's ArcGIS (ArcMap), while enhancing your understanding of Central Square. So, you should not only keep an eye toward the functions packaged in ArcGIS, but also think about the data you are manipulating and visualizing as you move through the exercise.

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**II. Directions**

**A. Introducing ArcGIS**

Based on the the information presented during the recitation, answer the following three questions.

1. List two GIS software vendors and products in addition to **ESRI's ArcGIS package**;
  2. Give an example for each **geographic feature**: point, line and polygon;
  3. Think of two **attributes** of each feature you listed above.
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**B. ArcGIS interface and elements**

1. Launch **ArcMap** and examine the interface. [[Help](#)]
  2. Open a **ArcMap file** "Startup.mxd" at the MIT Server. [[Help](#)]
  3. Examine the **data frame** "Cambridge." How many **layers** are there in the data frame?
  4. Open and examine the **attribute table** for the layer "Camtract.shp." [[Help](#)]
  5. Exit ArcMap. [[Help](#)]
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**C. Create your own map document**

1. Restart ArcMap and Create a new document. [[Help](#)]
  2. Add a data layer from the MIT Server into the data frame. [[Help](#)]
  3. Add three more data layers. The first is a **Point Feature**, the second is a **Line Feature**, and the third is a **Polygon Feature**. [[Help](#)]
  4. Turn all the layers on, make sure they are displayed in a sequence from top to bottom in this order: Cambookstore, MassMBTAline, Camtract and CamBorder. Make the Cambookstore layer active. Consider the difference between **Existence, Visibility and Activeness**. Instructors would discuss them in the recitation. [[Help](#)]
  5. Play with **Pan/Zoom In/Out/Full Extent/Layer/Selected/Previous**. [[Help](#)]
  6. Use the **"i" tool** (linking information to location) to find out and examine the area of the census tract where MIT resides. [[Help](#)]
  7. Now, we need to setup the properties for the data frame. Change the data frame properties as follows, [[Help](#)]
    - Name: Type in "Cambridge Overview"
    - Display Units: Choose "Miles"
  8. Next, set up the layer properties. Change the name for each layer according to their contents. [[Help](#)]
  9. Save the map document to "H:\private\11.204\lab4\johndoe.mxd." Replace "johndoe" with your username. [[Help](#)]
  10. Great, we have built our first ArcGIS map document file! However, it needs improvement.
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## D. Symbolization & classification

1. Open the map document file "H:\private\11.204\lab4\johndoe.mxd" if you closed it. We want to refine the symbols for this map document.
  2. Make the layer "Cambridge Book Stores" active and change the symbol for book stores to a red triangle with size of 12. [[Help](#)]
  3. Change the symbol for "Cambridge Border" layer as follows. [[Help](#)]
    - Fill pattern: Hollow
    - Outline width: 3
    - Outline Color: Black
  4. Change the symbol for "MBTA Subway Line" layer. Hint: Use the LINE field in determining the symbology. [[Help](#)]
    - Legend Type: Categories -> Unique Values
    - Style: Railroad line (Depending on your preference, in the help the double line is shown.)
    - Size: 2
    - Color: According to the line name (i.e. Green for Green line, Red for Red Line, etc.)
  5. Change "Cambridge Census Tract" layer to show the population density for each tract. [[Help](#)]
    - Legend Type: Quantities -> Graduated Color
    - Value: POPUDENSE (population density: person per acre)
    - Classification Type: **Quantile**
    - Number of classes: 5
    - Color Ramps: 

There are other classification types. We will cover more details in later lab exercises.
  6. The map looks better. Save your map document.
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## E. Layout/export

1. Change to **Layout** view, and add a final touch to your map according to the following requirements. [[Help](#)]
  2. Give the map a meaningful title
  3. Add the author's name and the date
  4. Add the data source as  
Data Sources: US Bureau of the Census, 2000; MBTA
  5. Add north arrow, legend, and scale
  6. Arrange map elements (north arrow, legend, scale, and title) on the page, creating a logical presentation (look at the work from last year for ideas)
  7. Export the final map into "H:\private\11.204\lab4\johndoe\_lab4.jpg", replace "johndoe" with your username. Save the map document file. [[Help](#)]
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## F. Creating a web page

1. Using the JPEG file you saved in your folder, prepare a web page that contains the information described in the "Materials to submit" section below.
    - Make sure that a copy of the JPEG file is in your www folder, and that copy must be embedded in the web page. If you embed your private copy of the JPEG file in your web page, no one other than you can browse that page (i.e. we can't give you a grade!).
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## III. Things to ponder

- If you had to create a presentation using the data from this lab, what argument would you formulate?
  - How would you communicate your position?
  - Would you create a thematic map showing all of Cambridge or would you zoom in to a particular portion of the city?
  - What if you were interested in showing that population density corresponds/does not correspond with the location of book stores?
  - Would you turn off the MBTA Route layer?
  - What would you title your presentation?
  - Would you change the symbol for book stores from a triangle to another symbol?
  - Would you make the symbol larger?
  - Would these changes impact the strength of your argument?
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## IV. Materials to submit

This lab is **due at 5:00pm on October 20th**.

For this exercise, you are asked to submit your answers as a WEB PAGE. Create a web page that contains the following:

1. Answers to Questions 1 through 3 in Section II-A and Question 3 in Section II-B;
2. The map image (.jpg) you exported in Section II-E;
3. Answers to any question in Section III, Things to Ponder. Pick one and describe your thoughts using no more than 3 sentences.

You are to submit an email message with the URL of your web page for this exercise Please address the email message to your TA with '11.204: Lab 4' appearing in the subject line.

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## V. Grading criteria

- All the necessary elements (your name, data source, legend, north arrow, scale etc.) should appear on the map in a logical and pleasing

fashion.

- All map and attribute labels on the layout should be complete names (no abbreviations or codes). For example, no layout should show “camtract.shp” as one of the map layers or “popudense” as the name of an attribute.
- The legend uses appropriately rounded numbers.
- Subway lines are colored according to their name.
- The map is framed to Cambridge, not the whole MBTA system.
- You can “improve” the map in the way you think appropriate. For example, we do not mark off even if you use a different color ramp (it does not have to be green).
- Answers to Questions 1 through 3 should be correct.
- Your answer to a question in Section III, Things to Ponder, should demonstrate your ability to reflect meaningfully on the map you have created (In the future, you will create thematic maps to advance your own arguments).

**Lab 4 is worth a total of 10 percentage points toward your final grade.**

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## VI. To learn more

ArcGIS's predecessor, ArcView, is still favored by many practitioners. If you want to learn how to operate ArcView, in addition to ArcMap, [open this page](#). To learn how you could complete the same tasks using ArcView.

You can learn more about ArcGIS at [ESRI Virtual Campus](#). MIT students can take courses free of charge! For more information, please refer to [this page](#) provided by the GIS lab at MIT.

DUSP also offers advanced courses on GIS. For example, you might consider taking [11.520 : A Workshop on Geographic Information Systems](#) and [11.521: Spatial Database Management and Advanced Geographic Information Systems](#) to learn more about GIS.

There is also [a number of GIS-related courses offered during the IAP](#).

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Created July 2002 by Jinhua Zhao. Updated August 2002 by Lorlene Hoyt. Updated October 2002 by Jinhua Zhao. Updated October 2002 by Lorlene Hoyt. Updated April 2003 by Masa Matsuura. Updated October 2003 by Jinhua Zhao. Updated June 2004 by Masa Matsuura. Updated July 2004 by Lorlene Hoyt.

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