CDS DS 594
Lec 1

Why DV

1. Topics
    a. Project Management
    b. Know Your Audience
    c. SQL
    d. Data Prep
    e. Data Viz Technologies
    f. Exploratory Analysis
    g. Chart Types
    h. Use of Color
    i. Preattentive Attributes
    j. Labels
    k. Layout Design
    l. Interactive Dashboards
    m. Diversity, Equity and Inclusion
    n. Project Discovery
2. Projects
    a. A Better City
    b. Boston Climate Action Network
    c. Instituto Brasil
    d. Center for Economic Democracy
    e. SW DC Council
    f. BU Institutional Research
    g. Urban League of E. Massachusetts
    h. WBUR
    i. BU Center for Innovation in Social Science
3. Why Data Visualization?
    a. More effective than text
    b. Convey large amounts of information more quickly
    c. Visual metaphors are a universal language
    d. Communicate across any language or technical experience
    e. Increases knowledge of analyst and audience
    f. Facilitates mental processing, analysis and retention
    g. Better collaboration
    h. Communicate to larger audiences
    i. Faster time to consensus

4. Data Visualization Importance

| 2 | 1 | **7** | 5 | 5 | **7** | 1 |
|---|---|---|---|---|---|---|
| 8 | 3 | 4 | 2 | 2 | **7** | 1 |
| 5 | 4 | 0 | **7** | 6 | 6 | 6 |
| 9 | 3 | 4 | 5 | 9 | **7** | 8 |
| 6 | 8 | 9 | 3 | 2 | 8 | 9 |
| 4 | 2 | 6 | 8 | 1 | 9 | 8 |
| 5 | 9 | 0 | 3 | 4 | 9 | 2 |

a.
    i.    How many sevens?

Η θερμοκρασία ανεβαίνει

온도가 올라가고 있어요

Izinga lokushisa liyenyuka

b.
    i.    What do these texts mean?

| Extract | Extract |
|---|---|
| Month of Date | Sales Amount |
| October 2021 | 127,439,619.58 |
| November 2021 | 162,914,347.85 |
| December 2021 | 235,953,659.31 |
| January 2022 | 173,276,299.70 |
| February 2022 | 146,804,608.63 |
| March 2022 | 182,359,606.63 |
| April 2022 | 155,791,060.31 |
| May 2022 | 158,749,238.46 |
| June 2022 | 207,612,893.21 |
| July 2022 | 148,030,297.59 |
| August 2022 | 226,950,917.60 |
| September 2022 | 201,474,606.07 |
| October 2022 | 204,402,645.08 |
| November 2022 | 223,798,697.70 |
| December 2022 | 266,536,862.49 |
| January 2023 | 173,971,552.71 |
| February 2023 | 147,330,360.22 |
| March 2023 | 182,727,328.78 |
| April 2023 | 156,301,485.29 |
| May 2023 | 159,148,164.01 |
| June 2023 | 207,988,130.97 |
| July 2023 | 148,681,966.93 |
| August 2023 | 227,529,789.31 |
| September 2023 | 202,060,444.27 |

c.                                      vs
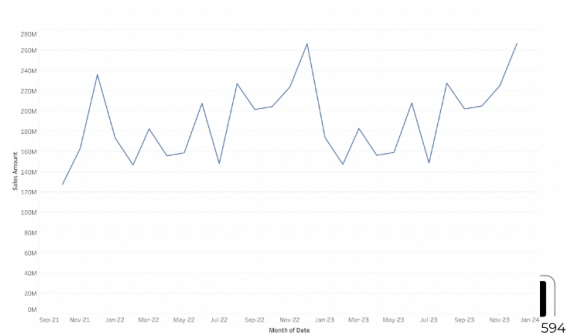


i.      What is the monthly sales trend?

| Summary 9 rows 2 fie... | |
| --- | --- |
| Cat | Val |
| A | 98 |
| B | 7 |
| C | 15 |
| D | 99 |
| E | 58 |
| F | 75 |
| G | 28 |
| H | 21 |
| I | 33 |
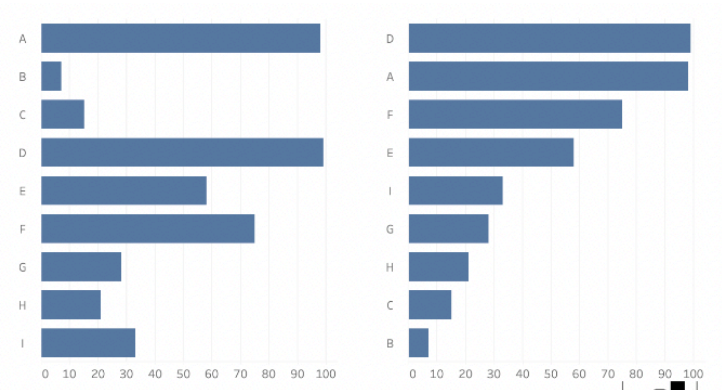
d.      VS

    i.      What is the top category?



| Product Line | Store Type | Avg. Sales Amount |
| --- | --- | --- |
| Pantry | Super market | 8,775.26 |
| Meat & Seafood | Super market | 3,901.84 |
| Grocery | Super market | 12,957.63 |
| Frozen | Super market | 20,899.39 |
| Fresh Produce | Super market | 5,457.50 |
| Deli | Super market | 3,969.09 |
| Dairy & Eggs | Super market | 16,495.41 |
| Breakfast & Cereal | Super market | 16,363.71 |
| Beverage | Super market | 11,695.62 |
| Bakery & Bread | Super market | 10,532.03 |
| Pantry | Hyper market | 7,802.65 |
| Meat & Seafood | Hyper market | 4,218.06 |
| Grocery | Hyper market | 12,181.12 |
| Frozen | Hyper market | 19,626.41 |
| Fresh Produce | Hyper market | 6,031.48 |
| Deli | Hyper market | 5,273.25 |
| Dairy & Eggs | Hyper market | 17,893.55 |
| Breakfast & Cereal | Hyper market | 19,306.63 |
| Beverage | Hyper market | 10,350.29 |
| Bakery & Bread | Hyper market | 12,170.85 |
| Pantry | Grocery store | 7,034.64 |
| Meat & Seafood | Grocery store | 2,681.51 |
| Grocery | Grocery store | 8,766.78 |
| Frozen | Grocery store | 14,488.07 |
| Fresh Produce | Grocery store | 3,690.94 |

| Product Line | Convenience store | Department store | Grocery store | Hyper market | Super market |
| --- | --- | --- | --- | --- | --- |
| Bakery & Bread | $2,879 | $15,297 | $7,396 | $12,171 | $10,532 |
| Beverage | $3,102 | $12,060 | $7,545 | $10,350 | $11,696 |
| Breakfast & Cereal | $4,518 | $26,850 | $9,395 | $19,307 | $16,364 |
| Dairy & Eggs | $5,791 | $23,288 | $12,931 | $17,894 | $16,495 |
| Deli | $1,429 | $6,340 | $3,585 | $5,273 | $3,969 |
| Fresh Produce | $1,657 | $7,143 | $3,691 | $6,031 | $5,457 |
| Frozen | $6,356 | $23,012 | $14,488 | $19,626 | $20,899 |
| Grocery | $3,937 | $17,594 | $8,767 | $12,181 | $12,958 |
| Meat & Seafood | $1,186 | $6,366 | $2,682 | $4,218 | $3,902 |
| Pantry | $3,467 | $10,402 | $7,035 | $7,803 | $8,775 |

e.      VS

    i.      What product and store type has the highest average monthly sales?

| Month | Store | Products | Sales |
|---|---|---|---|
| March 2022 | Grocery Wichita 2 | 74 | 534,720.33 |
| February 2022 | Grocery Wichita 2 | 53 | 314,781.30 |
| January 2022 | Grocery Wichita 2 | 59 | 780,680.51 |
| December 2021 | Grocery Wichita 2 | 66 | 659,563.65 |
| November 2021 | Grocery Wichita 2 | 56 | 341,253.15 |
| October 2021 | Grocery Wichita 2 | 52 | 387,464.88 |
| December 2023 | Grocery Wichita | 74 | 901,107.88 |
| November 2023 | Grocery Wichita | 60 | 819,593.31 |
| October 2023 | Grocery Wichita | 70 | 507,657.26 |
| September 2023 | Grocery Wichita | 69 | 761,436.68 |
| August 2023 | Grocery Wichita | 83 | 729,816.22 |
| July 2023 | Grocery Wichita | 65 | 499,097.76 |
| June 2023 | Grocery Wichita | 65 | 506,057.61 |
| May 2023 | Grocery Wichita | 55 | 482,564.27 |
| April 2023 | Grocery Wichita | 65 | 686,898.54 |
| March 2023 | Grocery Wichita | 74 | 678,679.13 |
| February 2023 | Grocery Wichita | 65 | 393,019.02 |
| January 2023 | Grocery Wichita | 53 | 497,426.62 |
| December 2022 | Grocery Wichita | 74 | 889,170.15 |
| November 2022 | Grocery Wichita | 60 | 809,818.98 |
| October 2022 | Grocery Wichita | 70 | 508,113.61 |
| September 2022 | Grocery Wichita | 69 | 766,593.28 |
| August 2022 | Grocery Wichita | 83 | 724,389.63 |
| July 2022 | Grocery Wichita | 65 | 491,107.22 |
| June 2022 | Grocery Wichita | 65 | 489,045.23 |
| May 2022 | Grocery Wichita | 55 | 486,378.01 |
| April 2022 | Grocery Wichita | 65 | 684,027.89 |
| March 2022 | Grocery Wichita | 74 | 706,583.93 |
| February 2022 | Grocery Wichita | 65 | 393,846.79 |
| January 2022 | Grocery Wichita | 53 | 492,322.27 |
| December 2021 | Grocery Wichita | 67 | 700,129.11 |
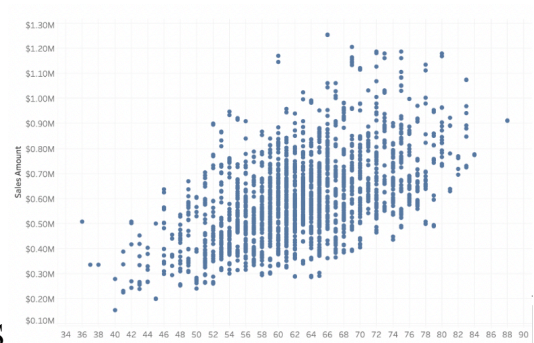
f.  VS

    i.    Is there a relationship between the number of products offered and sales?



| Store | Sales |
|---|---|
| Stop & Shop Olathe | 13,946.54 |
| Stop & Shop Olathe | 1,029.67 |
| Stop & Shop Lowell | 1,029.67 |
| Stop & Shop Lansing | 1,086.88 |
| Stop & Shop Sterling Heights | 1,058.27 |
| Stop & Shop Warren | 1,029.67 |
| Stop & Shop Warren | 1,115.48 |
| Stop & Shop Rochester | 1,172.68 |
| Stop & Shop Kansas City 2 | 1,037.97 |
| Stop & Shop Columbia | 1,029.67 |
| Stop & Shop Columbia | 1,115.48 |
| Stop & Shop Independence | 1,086.88 |
| Stop & Shop High Point | 1,115.48 |
| Stop & Shop Dayton | 9,653.18 |
| Stop & Shop Norman | 9,928.98 |
| Stop & Shop Norman | 11,308.00 |
| Stop & Shop Columbia 2 | 1,063.28 |
| Stop & Shop Norman | 2,193.11 |
| Stop & Shop Norman | 15,026.63 |
| Stop & Shop Norman | 15,444.04 |
| Stop & Shop Broken Arrow | 5,739.41 |
| Stop & Shop Norman | 5,437.34 |
| Stop & Shop Norman | 12,033.45 |
| Stop & Shop Broken Arrow | 8,247.20 |
| Stop & Shop Norman | 7,596.10 |
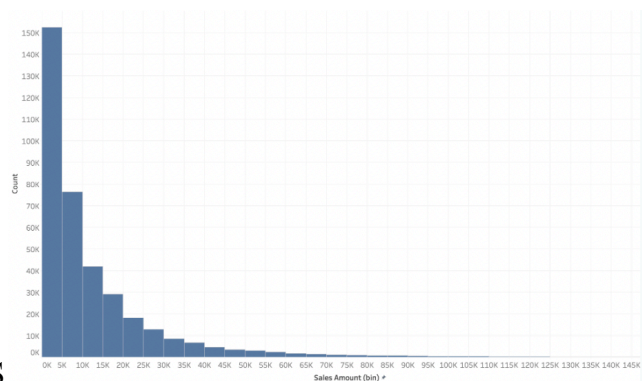
g.  VS

    i.    How are monthly per-store sales distributed?

h. How big is BU?

i.

17,590 ▼ -3.5% from 2021

BU Undergraduates fall 2022

| Store | Total ... | Total Sal... | Latitude ... | Longitud... |
|---|---|---|---|---|
| Super Yonkers | $ 1,427,893 | +$ 226,701 | 40.9312 | -73.8987 |
| Stop & Shop Worcester | $ 220,949 | +$ 27,549 | 42.2626 | -71.8023 |
| Grocery Worcester | $ 936,348 | -$ 10,654 | 42.2626 | -71.8023 |
| Super Winston-Salem | $ 1,248,852 | -$ 64,130 | 36.0999 | -80.2442 |
| Stop & Shop Wilmington | $ 379,581 | +$ 58,309 | 34.2257 | -77.9447 |
| Grocery Wichita 2 | $ 699,359 | -$ 131,960 | 37.6922 | -97.3375 |
| Grocery Wichita | $ 901,108 | +$ 81,515 | 37.6922 | -97.3375 |
| Stop & Shop Westminster | $ 229,286 | +$ 79,234 | 39.8366 | -105.0372 |
| Stop & Shop West Valley City | $ 455,040 | +$ 162,464 | 40.6916 | -112.0011 |
| Stop & Shop West Palm Beach | $ 365,250 | +$ 60,829 | 26.7153 | -80.0534 |
| Stop & Shop West Jordan 2 | $ 393,261 | +$ 152,755 | 40.6097 | -111.9391 |
| Stop & Shop West Jordan | $ 274,164 | -$ 6,087 | 40.6097 | -111.9391 |
| Stop & Shop Waterbury | $ 454,693 | +$ 255,044 | 41.5581 | -73.0515 |
| Stop & Shop Washington | $ 483,653 | +$ 32,668 | 38.8951 | -77.0364 |
| Hyper Washington | $ 1,249,752 | +$ 530,090 | 38.8951 | -77.0364 |
| Stop & Shop Warren | $ 479,275 | +$ 225,365 | 42.4904 | -83.0130 |
| Stop & Shop Waco | $ 515,795 | +$ 129,726 | 31.5493 | -97.1467 |
| Stop & Shop Visalia | $ 472,955 | +$ 283,093 | 36.3302 | -119.2921 |
| Hyper Virginia Beach | $ 1,556,177 | +$ 618,222 | 36.8529 | -75.9780 |
| Stop & Shop Victorville | $ 406,750 | +$ 121,862 | 34.5361 | -117.2912 |

i. VS
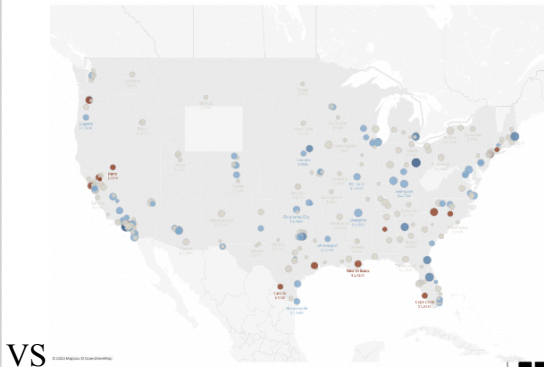
i. Where are sales happening the most?

| category | Event | From | duration |
|----------|-------|------|----------|
| school | Stanford | 1994 | Null |
| school | BU | 1991 | Null |
| school | BU | 1991 | Null |
| school | WPI | 1990 | Null |
| school | WPI | 1990 | Null |
| school | CHS | 1986 | Null |
| school | CHS | 1986 | Null |
| school | McCarthy J... | 1984 | Null |
| school | McCarthy J... | 1984 | Null |
| school | 6th grade ... | 1984 | Null |
| school | 6th grade ... | 1984 | Null |
| school | art | 1982 | Null |
| school | art | 1982 | Null |
| school | South Row | 1978 | Null |
| school | South Row | 1978 | Null |
| home | Acton | 2013 | 10 |
| home | Waltham | 2002 | 11 |
| home | Somerville | 1999 | 3 |
| home | Chestnut Hill | 1998 | 1 |
| home | Oak Square | 1996 | 2 |
| home | Cleveland ... | 1995 | 1 |
| home | CA | 1994 | 1 |
| home | Boston | 1991 | 3 |
| home | Newfound ... | 1984 | 16 |
| home | Chelmsford | 1972 | 19 |
| job | Astreya | 2020 | 3 |
| job | Tableau | 2015 | 0 |
| job | RelayIQ | 2015 | 5 |
| job | Fresenius | 2015 | 4 |
| job | Soundbite | 2012 | 3 |
| job | TUG | 2011 | 8 |
| job | Apofacy | 2010 | 2 |
| job | VFA | 2006 | 6 |
| job | CRICO | 1995 | 11 |
| job | Urban Out... | 1993 | Null |
| job | BU Housing | 1993 | 1 |

j. VS
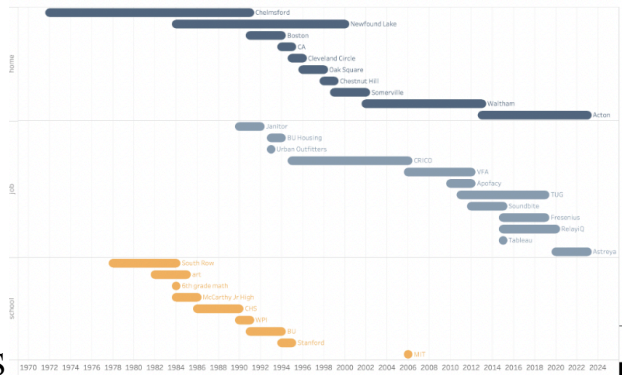
    i.     What have I done with my life?



| | A | B | C | D |
|---|---|---|---|---|
| 1 | lead_id | timestamp | status | category |
| 2 | 110040 | 6/21/23 6:47 AM | Lead Created | Lead Created |
| 3 | 110040 | 6/21/23 2:23 PM | RPC_CLIENT_INTERESTED | Lead Disposition |
| 4 | 110040 | 6/27/23 8:52 AM | RPC_CLIENT_INTERESTED | Lead Disposition |
| 5 | 110040 | 6/27/23 8:54 AM | Appointment Booked | Appointment Booked |
| 6 | 110040 | 6/27/23 2:11 PM | Session Started | Session Started |
| 7 | 110040 | 6/27/23 2:57 PM | Financial cnsl only | Session Disposition |
| 8 | 185697 | 1/1/23 10:27 AM | Lead Created | Lead Created |
| 9 | 185697 | 1/3/23 2:05 PM | Client Created | Client Created |
| 10 | 185698 | 1/1/23 11:15 AM | Lead Created | Lead Created |
| 11 | 185698 | 2/2/23 3:37 PM | Client Created | Client Created |
| 12 | 185698 | 2/2/23 3:46 PM | Appointment Booked | Appointment Booked |
| 13 | 185698 | 2/2/23 3:46 PM | Session Started | Session Started |
| 14 | 185698 | 2/2/23 5:28 PM | Financial cnsl only | Session Disposition |
| 15 | 185712 | 1/2/23 9:27 AM | Lead Created | Lead Created |
| 16 | 185738 | 1/3/23 8:27 AM | Lead Created | Lead Created |
| 17 | 185738 | 1/3/23 8:30 AM | Client Created | Client Created |
| 18 | 185738 | 1/3/23 10:59 AM | RPC_CLIENT_INTERESTED | Lead Disposition |
| 19 | 185738 | 1/4/23 7:27 AM | NON_RPC | Lead Disposition |
| 20 | 185738 | 1/4/23 2:21 PM | NON_RPC | Lead Disposition |
| 21 | 185738 | 1/5/23 7:35 AM | NON_RPC | Lead Disposition |
| 22 | 185738 | 1/5/23 12:36 PM | NON_RPC | Lead Disposition |
| 23 | 185738 | 1/6/23 7:49 AM | NON_RPC | Lead Disposition |
| 24 | 185738 | 2/3/23 1:40 PM | NON_RPC | Lead Disposition |

k. VS
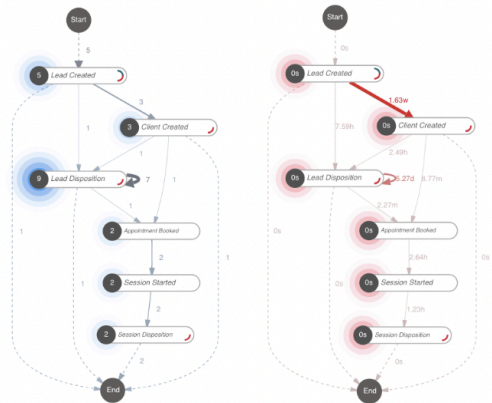
    i.     How good is my sales process?

l. What is an integral?

i.

$$\int_{-4}^{4} x^2 + 10 \, dx$$

(graph of parabola with shaded region between $x = -4$ and $x = 4$, y-axis labeled 0 to 110, x-axis labeled -12 to 12, axis label X)
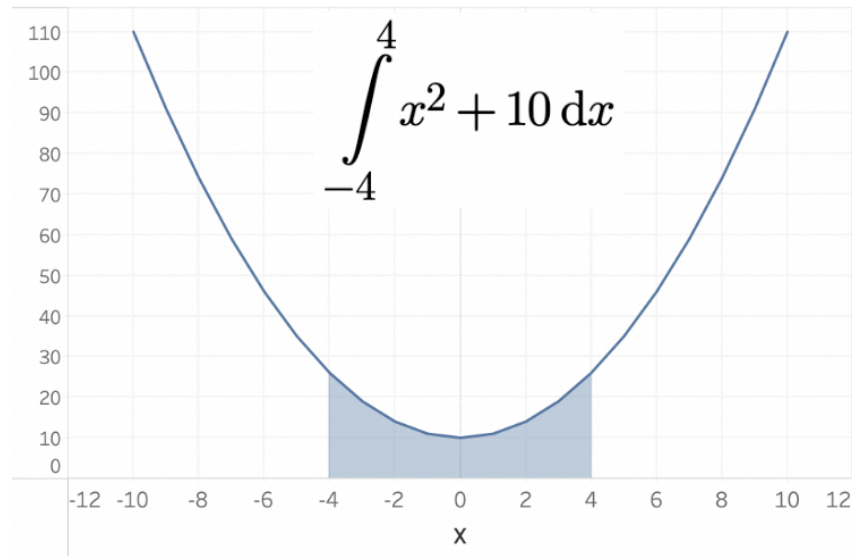
m. How much solar power can I produce?

i.

$$s = 2.04 \cdot \frac{e^{-0.086(i - 51.04)}}{1 + e^{-0.086(i - 51.04)}}$$

(scatter plot with Solar Energy Exported on y-axis ranging 0.0 to 2.0, Angle of Incidence on x-axis ranging 0 to 160)