**Class 6** – **Statistics and Probability**

ChE310\_Sec1\_F2019 9.10.2019

<http://www.reuelgroup.org/numerical-methods-che-310.html>

**Group Activity:** With your group do the following and submit to Jared Dopp on Slack for credit by 2:25pm.

NOAA equation for calculating wind chill:  
  
   Wind Chill (°F) = 35.74 + 0.6215\*T -  
                              35.75(V0.16) + 0.4275(V0.16),  
            where T = Air Temperature (°F),  
                       V = Wind Speed (mph)

Jan30.xlsx contains temp and velocity data (2019)

* Plot wind chill vs. hour
  + Plot DANGEROUS wind chill temps (<35°F) as red circles
  + Plot the rest as blue points
  + Label axes

**Outline for Class 5 Lecture**

1. Statistics Overview in one picture



* 1. Population
  2. Sample
     1. Generalizable
     2. Reliable
     3. Independent (free of bias)
  3. Once we have good sample, what parameters best describe the population?

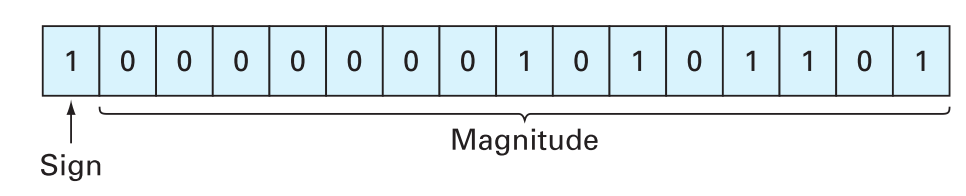
1. Univariate data
   1. Measures of center
      1. Mean (**mean**)
      2. Median (**median**)
      * Example with Bulls1997
   2. Measures of spread
      1. Standard deviation (**std**)
      2. Interquartile range (**iqr**)
      3. Box and whisker plot (**boxplot**)
2. Histograms for visualization (**histogram**)
   * + 2017 class data (c1 = commute time, c2 = # kids)
3. Distributions
   1. There are many shapes ([link](https://www.mathworks.com/help/stats/supported-distributions.html))
   2. Probability density function (**pdf**)
   3. Cumulative density function (**cdf**)
   4. Inverse cumulative density func (**inv**)
   5. Distribution fitter function (**fitdist**)
   6. Plot histogram w/ PDF (**histfit**)
   7. Random number generators (**rnd**)
      * Electronic part lifetime
4. Precision vs. accuracy [pictures]
5. Error definitions
   1. True Error () = (True - Appx)/True
   2. Appx Error () =

(PresentVal - PrevVal) / PresentVal

* 1. Tolerance ()

1. Error Types
   1. Blunders = Gross Errors, Human Error, Machine Malfunction (bugs)
   2. Model Errors
   3. Data Uncertainty (Measurement error)
2. Computer Numbers and Roundoff Error
   1. Base 10 vs. Base 2
      1. Metaphor – 10 vs. 2 fingers





* 1. Floating point representation (pg. 117)
     1. 64 bits: sign (1), exponent (11), significand (mantissa) (52)
     2. Range is huge (2^±1024)
  2. Computer math errors (subtractive cancellation, large computations, adding a large and small number)
  3. Truncation errors

1. Hypothesis Tests and ANOVA (I’ll leave this for you to review! Matlab has a lot of built in functions and examples for these.
   1. ‘null is dull’, default there is no assoc.
   2. Goal is to reject the null hyp with test
      1. Hypothesis tests ([link](https://www.mathworks.com/help/stats/hypothesis-tests-1.html))
      2. ANOVA ([link](https://www.mathworks.com/help/stats/analysis-of-variance-anova-1.html))
2. Debugging in MATLAB and break points