2016/2/2 Lecture/Videos

- Semiconductor Technology at TSMA, March 26, 2011, 8:02 min, https://www.youtube.com/watch?v=4Q_n4vdyZzc
- LSI Storage, 12:14 min, https://www.youtube.com/user/lsistorage
- Ch 3. Discrete Random Variables and Probability Distribution

Refs: Discrete Random Variables and Probability Distribution

- STAT 200 Elementary Statistics, Penn State – Eberly College of Science, https://onlinecourses.science.psu.edu/stat200/node/35
- Random Variables, http://www.stat.yale.edu/Courses/1997-98/101/ranvar.htm
- Discrete Random Variables, Gary Simon, 2006, http://people.stern.nyu.edu/wgreene/Statistics/DiscreteRandomVariablesCollection.pdf
- Discrete Random Variable, Math 461, http://www.math.uiuc.edu/~hildebr/461/discrete1.pdf
- Discrete Random Variables, video, https://www.youtube.com/watch?v=9ycJNH0F3OM

2-8 Random Variables, pp. 57-58

Random Variable

- A random variable is a function that assigns a real number to each outcome in the sample space of a random experiment.
- A random variable is denoted by an uppercase letter X. After the experiment is conducted, the measurement value of the random variable is denoted by a lowercase letter such as x = a measurement value.

An Example, Discrete Random Variables, video, https://www.youtube.com/watch?v=9ycJNH0F3OM

In the sample space, there are 3 blue balls and 5 red balls.

- Let X be the random variable that equals to the = no of blue balls selected
- Choose 3 ball at random
    - x = 0, 1, 2, 3 (no blue ball, 1 blue balls, 2 blue balls, 3 blue balls)

Formulate the following Table

x	P(X = x)
0	P(X =0) = ((3C0)*(5C3)/((8C3) = 10/56 ≈0.199
1	P(X =1) = ((3C1)*(5C2)/((8C3) = 30/56 ≈0.536
2	P(X =2) = ((3C2)*(5C1)/((8C3) = 15/56 ≈0.268
3	P(X =3) = ((3C3)*(5C0)/((8C3) = 1/56 ≈0.0179
Total	1

Find the probability distribution of X:

P(X = 0) = (3C0) (5C3)/(8C3) = 10/56

3C0 = $C_r^n = \binom{n}{r} = \frac{n!}{r!(n-r)!} = \frac{3!}{0!(3-0)!} = 1$

5C3 = $C_r^n = \binom{n}{r} = \frac{n!}{r!(n-r)!} = \frac{5!}{3!(5-3)!} = \frac{5!}{3!2!} = \frac{120}{6x2} = 10$

8C3 = $C_r^n = \binom{n}{r} = \frac{n!}{r!(n-r)!} = \frac{8!}{3!(8-3)!} = \frac{8!}{3!5!} = \frac{8*7*6*5*4*3*2*1}{(3*2*1)(5*4*3*2*1)} = 56$

Also P(X =0) + P(X=1) + P(X=2) + P(X=3) = 1

Find the mean:

$$\mu = E[X] = \sum_x x \cdot P(X = x) = 0 * \frac{10}{56} + 1 * \frac{30}{56} + 2 * \frac{15}{56} + 3 * \frac{1}{56} = \frac{63}{56} = 1.125$$

Expected one ball will be blue, and two balls will be red.

Find variance σ^2:

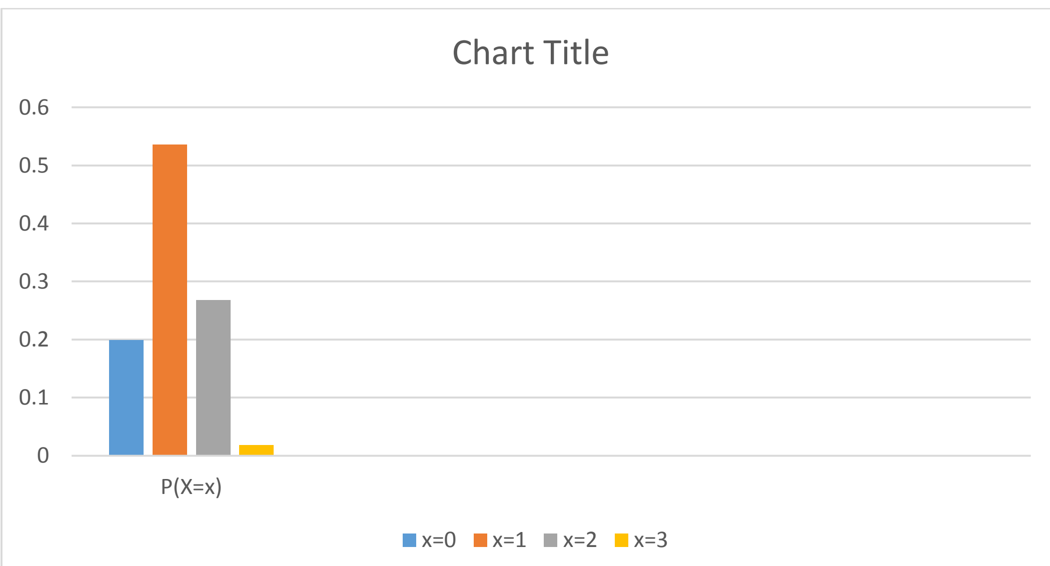
$$\sigma^2 = V[X] = \sum_x (x - \mu)^2 \cdot P(X = x)$$

$$\sigma^2 = (0 - \frac{63}{56})^2 \cdot \frac{10}{56} + \left(1 - \frac{63}{56}\right)^2 \cdot \frac{30}{56} + \left(2 - \frac{63}{56}\right)^2 \cdot \frac{15}{56} + \left(3 - \frac{63}{56}\right)^2 \cdot \frac{1}{56} = 225/448 \approx 0.502$$

Find the standard deviation σ:

$$\sigma = \sqrt{\frac{225}{448}} \approx 0.709$$

Graphical Visualization (Histogram – Insert, Add a Chart):
Y-axis (probability values: 0.199, 0.536, 0.268, 0.0179)
X-axis (x values: 0, 1, 2, 3)



Mean is μ at: x = 1.125, (one blue ball, two red balls)

Semiconductor Technology/Foundry Plant Tours Videos

- Semiconductor Technology at TSMA, March 26, 2011, 8:02 min, https://www.youtube.com/watch?v=4Q_n4vdyZzc
- How a CPU is Made, Feb. 4, 2013, 10: 5 min, https://www.youtube.com/watch?v=qm67wbB5GmI
- Intel Factory Tour – 32 nm Manufacturing Techniques (from silicon wafers to computer chips), Nov. 13, 2010, 6: 20 min, https://www.youtube.com/watch?v=SeGqCl3YAaQ

IT 507 – Hw 4 Assignment, 2016/2/2

- SPC Methods for Semiconductor Manufacturing, 1999, http://www-mtl.mit.edu/researchgroups/Metrology/PAPERS/stats.pdf
- Real-Time Process Monitoring and Statistical Process Control for an Automated Casting Facility, BS Mechanical Engineering Report, Daniel Lettiere, 2012, https://www.wpi.edu/Pubs/E-project/Available/E-project-053112-163739/unrestricted/Lettiere_MQP_SYS-SYS7_Final_Report.pdf

Quality Strategy,

Quality Handbook

- STMicroelectronics, http://www.st.com/web/en/resource/quality_and_reliability/quality_report/qualification_report/ST-Quality-Handbook-V1-1.pdf?sc=quality-handbook
- Seiko Epson Semiconductor Product – Quality Assurance Guidebook, http://global.epson.com/products/semicon/technology/pdf/assurance_handbook.pdf

IEOR 103 - Methods for Manufacturing Improvement, Prof. Robert C. Leachman, U.C. Berkeley, Aug. 2015, http://ieor.berkeley.edu/~ieor130/130%20intro_2015.pdf

- Process control
- Yield analysis
- Equipment efficiency
- On-time delivery
- Speed (AKA cycle time)

Six-Sigma

- Achieving Six Sigma quality in medical device manufacturing by use of Design of Experiments and statistical process control, by Per Vase, Pharmaceutical Engineering, March /April 2007, vol. 27, no.2, http://www.nnepharmaplan.com/insights/expert-articles/achieving-six-sigma-quality-in-medical-device-manufacturing-by-use-of-design-of-experiments-and-statistical-process-control/

RAID

- LSI Storage, 12:14 min, https://www.youtube.com/user/lsistorage
- RAID and Storage Solutions, Jun 17, 2014, 19:43 min, https://www.youtube.com/watch?v=1h9sHu6jGmY