Summary of Matlab Statistics Commands and References
for MSE 301
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I. Discrete Distributions

http://www.mathworks.com/help/stats/discrete-distributions.html

MatLab contains intrinsic functions describing all discrete PDFs studied in this course except the multivariate hypergeometric.

- Uniform Distribution (Discrete)
- Binomial Distribution
- Multinomial Distribution
- Hypergeometric Distribution
- Negative Binomial Distribution
- Geometric Distribution
- Poisson Distribution

II. Continuous Distributions

http://www.mathworks.com/help/stats/continuous-distributions.html

MatLab contains intrinsic functions describing all continuous PDFs studied in this course and many more.

- Uniform Distribution (Continuous)
- Normal Distribution
- Gamma Distribution
- Exponential Distribution
- Chi-Squared Distribution
- t Distribution
- F Distribution

III. Calculating the value of the PDF

http://www.mathworks.com/help/stats/pdf.html

MatLab contains intrinsic functions for calculating values of PDFs. For discrete PDFs, these values are probabilities. For continuous PDFs, these are values of the integrand.

To calculate the value of PDF, one can use the pdf function.

```
Y = pdf(name,X,A)
Y = pdf(name,X,A,B)
Y = pdf(name,X,A,B,C)
```

where x is the random variable and A, B and C are parameters.
The values of the name of the pdf and the parameters are provided in the table below.

PDF Table for MatLab

name	Distribution	Input Parameter A	Input Parameter B	Input Parameter C
'unid' or 'Discrete Uniform'	Uniform Distribution (Discrete)	N: maximum observable value	—	—
'bino' or 'Binomial'	Binomial Distribution	n: number of trials	p: probability of success for each trial	—
'hyge' or'Hypergeometric'	Hypergeometric Distribution	M: size of the population	K: number of items with the desired characteristic in the population	n: number of samples drawn
'nbin' or 'Negative Binomial'	Negative Binomial Distribution	r: number of successes	p: probability of success in a single trial	—
'geo' or 'Geometric'	Geometric Distribution	p: probability parameter	—	—
'poiss' or 'Poisson'	Poisson Distribution	λ: mean	—	—
'unif' or 'Uniform'	Uniform Distribution (Continuous)	a: lower endpoint (minimum)	b: upper endpoint (maximum)	—
'norm' or 'Normal'	Normal Distribution	μ: mean	σ: standard deviation	—
'gam' or 'Gamma'	Gamma Distribution	a: shape parameter	b: scale parameter	—
‘exp’ or ‘Exponential’	Exponential Distribution	μ: mean	—	—
'chi2' or 'Chisquare'	Chi-Square Distribution	v: degrees of freedom	—	—
't' or 'T'	Student's t Distribution	v: degrees of freedom	—	—
'f' or 'F'	F Distribution	$v1$: numerator degrees of freedom	$v2$: denominator degrees of freedom	—

examples

```
>> f = pdf('Normal',-2,0,1)

f = 0.053990966513188

>> p = pdf('Poisson',4,5)

p = 0.175467369767851
```

IV. Calculating the value of the Cumulative PDF

http://www.mathworks.com/help/stats/cdf.html

MatLab contains intrinsic functions for calculating values of PDFs. For discrete PDFs, these values are probabilities. For continuous PDFs, these are values of the integrand.

To calculate the value of PDF, one can use the pdf function.

```
y = cdf('name',x,A)
y = cdf('name',x,A,B)
y = cdf('name',x,A,B,C)
```

Examples

(a) Normal distribution - $P(z < 1.43; \mu = 5, \sigma = 3)$

```
>> p = cdf('Normal',1.43,5,3)

p = 0.117023196023109
```

(b) Normal distribution - $P(z > 1.43; \mu = 5, \sigma = 3)$

```
>> p = 1 - cdf('Normal',1.43,5,3)

p =  0.882976803976891
```

(c) Normal distribution - $P(4.5 < z < 6.5; \mu = 5, \sigma = 3)$

```
>> p = cdf('Normal',6.5,5,3) - cdf('Normal',4.5,5,3)

p = 0.257646293884917
```

(d) Binomial distribution - $P(x \le 2; n = 5, p = 0.3)$

```
>> p = cdf('Binomial',2,5,0.3)

p = 0.836920000000000
```

(e) Binomial distribution - $P(x \ge 2; n = 5, p = 0.3)$

```
>> p = 1 - cdf('Binomial',1,5,0.3)

p = 0.471780000000000
```

(f) Binomial distribution - $P(1 \le x \le 2; n = 5, p = 0.3)$

```
>> p = cdf('Binomial',2,5,0.3) - cdf('Binomial',0,5,0.3)

p = 0.668850000000000
```

V. Inverse Problem – given p, find z (or x)

http://www.mathworks.com/help/stats/icdf.html

MatLab contains intrinsic functions for calculating values random variables corresponding to given cumulative probabilities for various PDFs. This is the "given z, find p" problem.

```
Y = icdf(name,X,A)
Y = icdf(name,X,A,B)
Y = icdf(name,X,A,B,C)
```

(a) Normal distribution - $P(z < Z; \mu = 5, \sigma = 3) = 0.05$, find Z

```
>> z = icdf('Normal',0.05,5,3)

z = 0.065439119145582
```

(b) Normal distribution - $P(z > Z; \mu = 5, \sigma = 3) = 0.05$

Use the probability 1 – 0.05 = 0.95 for greater than

```
>> z = icdf('Normal',0.95,5,3)

z = 9.934560880854416
```

VI. Confidence Intervals

forthcoming

VII. Other notes

Some distributions are more common than others and have specific functions named after them. For example, for the normal distribution, there are two ways to calculate the cumulative PDF,

```
>> p = cdf('Normal',1.43,5,3)

>> p = normcdf(1.43,5,3)
```

However, as near as I could tell, these specific functions don't exist for all PDFs or all cumulative PDFs and there are no special functions for the inverse cumulative PDF funciton (icdf).