

Group DELTA

Anuraag Vankayala

Tim John

## Group DELTA

# Anuraag Vankayala

# Tim John

|           |      |        |       |
|-----------|------|--------|-------|
| test.cpp  | 74%  | 2672KB | 2.6MB |
| 00:00 ETA |      |        |       |
| test.cpp  | 95%  | 3448KB | 2.4MB |
| 00:00 ETA |      |        |       |
| test.cpp  | 100% | 3689KB | 1.8MB |

```

Mon Nov 18 02:27:38 PST 2013
$SINK CHECK ABOVE TIME
A
n/p2/scene.h
n/p2/m2_final.txt
n/p2/in_01.png
n/p2/soln_brightened.png
n/p2/in_02.png
n/p2/in_03.png
n/p2/soln_scene2.png
n/p2/soln_scene3.png
n/p2/soln_inverted.png
n/p2/rbgapixel.c
n/p2/soln_scene4.png
n/p2/soln_scene0.png
n/p2/soln_scene1.png
n/p2/soln_scene2.png
n/p2/soln_scene3.png
n/p2/soln_scene4.png
n/p2/soln_scene5.png
n/p2/soln_scene6.png
n/p2/testimage.cpp
n/p2/png.c
n/p2/png.h
n/p2/image.h
n/p2/image_extra_credit.txt
n/p2/png.h
n/p2/soln_scene.png
n/p2/makefile
n/p2/soln_scene.png
n/p2/m2_grayscale.txt
n/p2/testimage.cpp
Checked out revision 47951.

real    @m11.583s
user    @m0.572s
sys @m0.388s
Mon Nov 18 02:27:38 PST 2013

```

- Data Collection

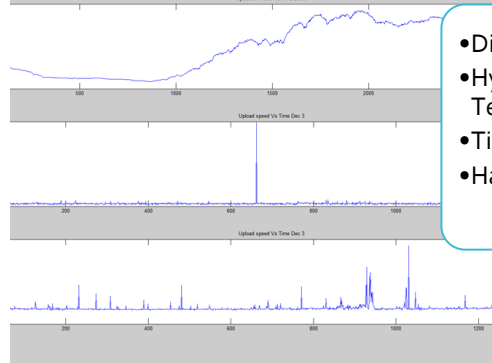
```
1 - looktime = 10; %Look
2 - looktime = datenum(2013,12,10,00,00,00); %For Lab , format YYYYMMDDHHSS
3 - str = 'Dec 10'; %For Lab %
4 - index = 31747; %For UL and DL ODD NUMBER ONLY%
5 - i=14;
```

```

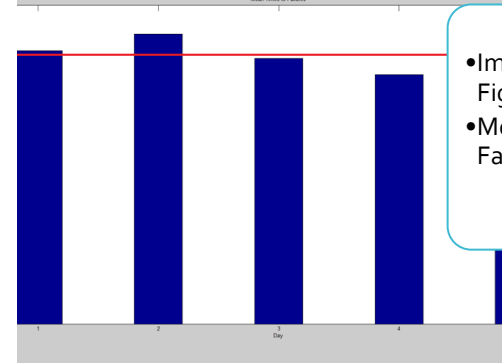
3  dummevent=0; %DUMMEVENT
4  looktime = datenum(2013,12,10,00,00,00); %For Lab , format YYYYMMDDSS
5  i=1; %i: For Lab x
6  index = 31747; %For UL and DL ODD NUMBER ONLY
7  i=141;
8  start1=i; Input only if you want to find x
9  Lab_start0;
10 Lab_terminate;
11 Lab_foundtime0;
12 DL_start0;
13 UL_start0;
14 DL_PST120;
15 UL_PST120;
16 DL_end0;
17 UL_end0;
18 PST12 = looktime + 2/24; %DL and UL's
19 endtime = lookme + 1; %DL and UL's
20 while i<588266
21     j=str2double(day(i));
22     if j<1000000;
23         Lab_start1;
24         break;
25     end
26     i=i+1;
27 end
28
29 while i<588266
30     j=str2double(day(i));
31     if j<1000000;
32         Lab_terminate1;
33         break;
34     end
35     i=i+1;
36 end
37
38 for i=start1:141:Lab_terminate
39     strtemp = strcat(' ',Time(i));
40     dume = datenum(strtemp);
41     if (looktime - dume < 1/1440)
42         Lab_foundtime1;
43         break
44     end
45     strtemp='null';
46     end
47 end

```

## Building Data Structures



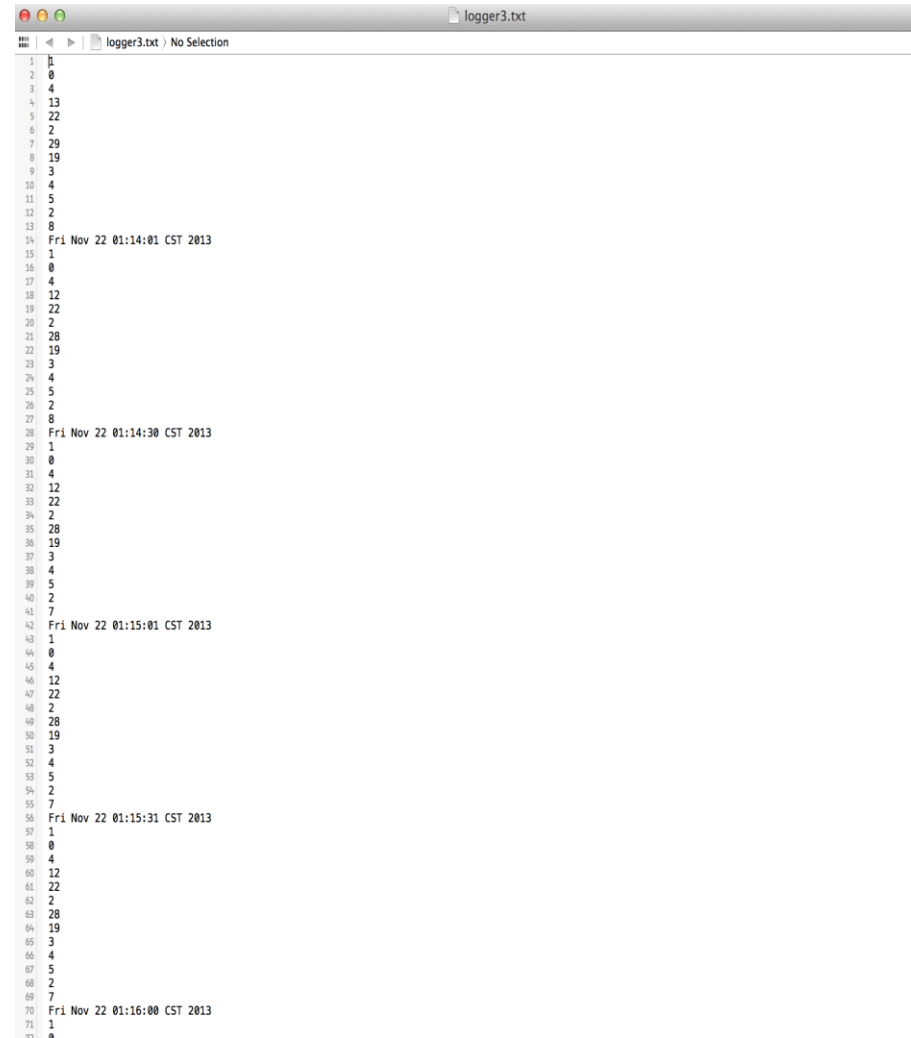
- Distributions
- Hypothesis Testing
- Timeseries
- Hazard Rates



- Important Figures
- Mean Time to Failure

# Data Collection(i)

A direct sample of our RAW data



```
1 1
2 0
3 4
4 13
5 22
6 2
7 29
8 19
9 3
10 4
11 5
12 2
13 8
14 Fri Nov 22 01:14:01 CST 2013
15 1
16 0
17 4
18 12
19 22
20 2
21 28
22 19
23 3
24 4
25 5
26 2
27 8
28 Fri Nov 22 01:14:30 CST 2013
29 1
30 0
31 4
32 12
33 22
34 2
35 28
36 19
37 3
38 4
39 5
40 2
41 7
42 Fri Nov 22 01:15:01 CST 2013
43 1
44 0
45 4
46 12
47 22
48 2
49 28
50 19
51 3
52 4
53 5
54 2
55 7
56 Fri Nov 22 01:15:31 CST 2013
57 1
58 0
59 4
60 12
61 22
62 2
63 28
64 19
65 3
66 4
67 5
68 2
69 7
70 Fri Nov 22 01:16:00 CST 2013
71 1
```

# Data Collection(ii)

RAW data

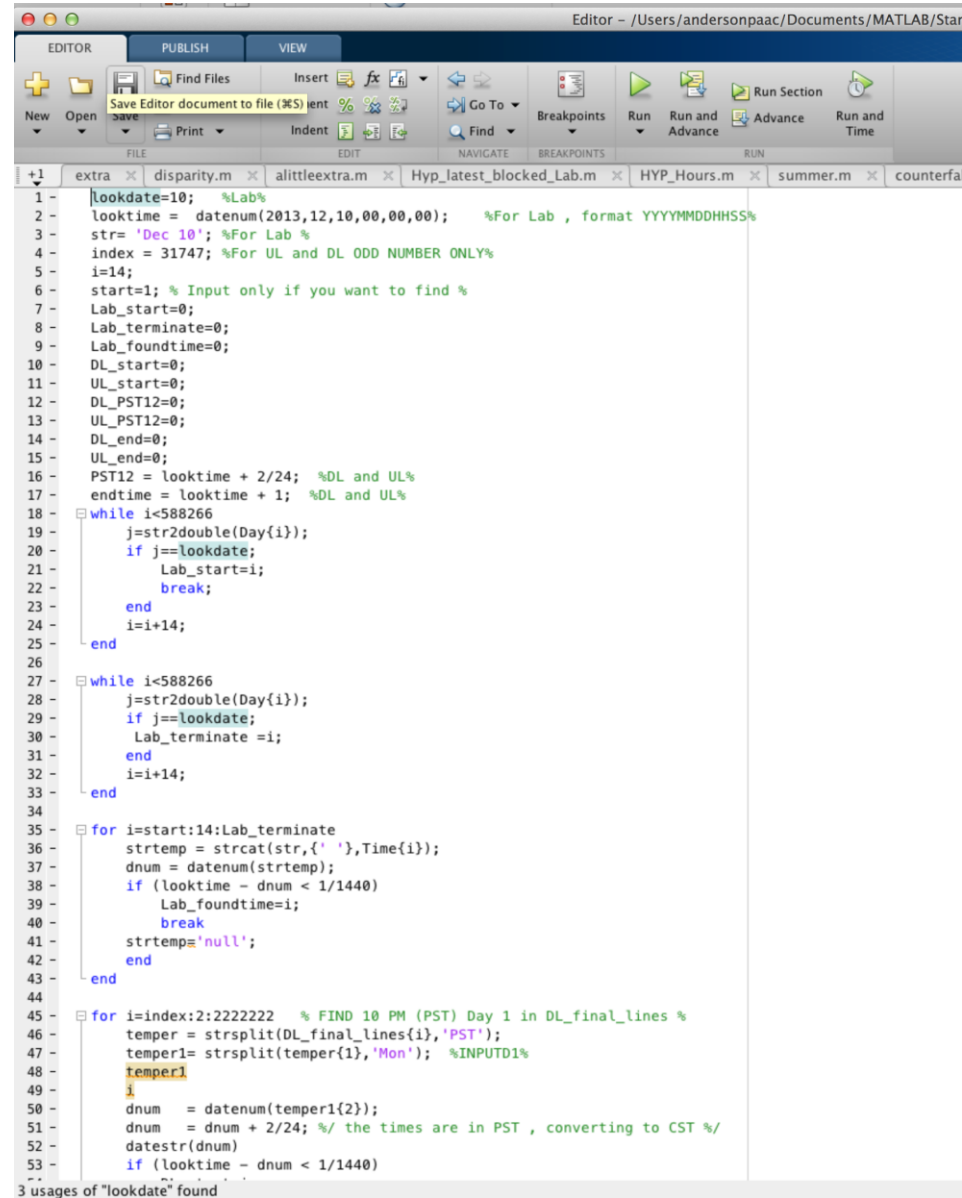
00:02

```
Mon Nov 18 02:27:38 PST 2013
SVN CHECK ABOVE TIME
A   mp2/scene.h
A   mp2/mp2_final.txt
A   mp2/in_01.png
A   mp2/soln_brightened.png
A   mp2/in_02.png
A   mp2/in_03.png
A   mp2/soln_scene2.png
A   mp2/soln_scene3.png
A   mp2/soln_inverted.png
A   mp2/rgbapixel.cpp
A   mp2/soln_scene4.png
A   mp2/soln_scene5.png
A   mp2/soln_scene6.png
A   mp2/soln_flipped.png
A   mp2/soln_scene7.png
A   mp2/rgbapixel.h
A   mp2/image.cpp
A   mp2/soln_scene8.png
A   mp2/testimage.cpp
A   mp2/png.cpp
A   mp2/image.h
A   mp2/mp2_extra_credit.txt
A   mp2/png.h
A   mp2/soln_scene.png
A   mp2/Makefile
A   mp2/scene.cpp
A   mp2/mp2_grade.txt
A   mp2/testscene.cpp
Checked out revision 47951.

real    0m11.183s
user    0m0.572s
sys     0m0.388s
Mon Nov 18 02:28:35 PST 2013
UPLOAD CHECK ABOVE TIME
```

# Data Analysis Approach

Our Secret Recipe



The image shows a MATLAB Editor window with the following details:

- Title Bar:** Editor - /Users/andersonpaac/Documents/MATLAB/Star
- Toolbars:** EDITOR (New, Open, Save, Print, Indent), PUBLISH (Find Files, Insert, %), VIEW (Go To, Find, Breakpoints, Run, Run and Advance, Run Section, Run and Time).
- Tab Bar:** extra, disparity.m, alittleextra.m, Hyp\_latest\_blocked\_Lab.m (active), HYP\_Hours.m, summer.m, counterfa.
- Code:**

```
1 - lookdate=10; %Lab%
2 - looktime = datenum(2013,12,10,00,00,00); %For Lab , format YYYYMMDDHHSS%
3 - str= 'Dec 10'; %For Lab %
4 - index = 31747; %For UL and DL ODD NUMBER ONLY%
5 - i=14;
6 - start=1; % Input only if you want to find %
7 - Lab_start=0;
8 - Lab_terminate=0;
9 - Lab_foundtime=0;
10 - DL_start=0;
11 - UL_start=0;
12 - DL_PST12=0;
13 - UL_PST12=0;
14 - DL_end=0;
15 - UL_end=0;
16 - PST12 = looktime + 2/24; %DL and UL%
17 - endtime = looktime + 1; %DL and UL%
18 - while i<588266
19 -     j=str2double(Day{i});
20 -     if j==lookdate;
21 -         Lab_start=i;
22 -         break;
23 -     end
24 -     i=i+14;
25 - end
26 -
27 - while i<588266
28 -     j=str2double(Day{i});
29 -     if j==lookdate;
30 -         Lab_terminate =i;
31 -         end
32 -         i=i+14;
33 -     end
34 -
35 - for i=start:14:Lab_terminate
36 -     strtemp = strcat(str,' ',Time{i});
37 -     dnum = datenum(strtemp);
38 -     if (looktime - dnum < 1/1440)
39 -         Lab_foundtime=i;
40 -         break
41 -     strtemp='null';
42 - end
43 - end
44 -
45 - for i=index:2:222222 % FIND 10 PM (PST) Day 1 in DL_final_lines %
46 -     temper = strsplit(DL_final_lines{i},'PST');
47 -     temper1= strsplit(temper{1},'Mon'); %INPUTD1%
48 -     temper1
49 -
50 -     dnum = datenum(temper1{2});
51 -     dnum = dnum + 2/24; %/ the times are in PST , converting to CST %/
52 -     datestr(dnum)
53 -     if (looktime - dnum < 1/1440)
```
- Status Bar:** 3 usages of "lookdate" found

# Data Analysis Approach

## Hypothesis Testing

```
HYP_Hours_12_09=zeros(4);
sum1=0;
sum0=0;

for i=1:1:24
    HYP_Hours_12_09(1,i)=i;
end

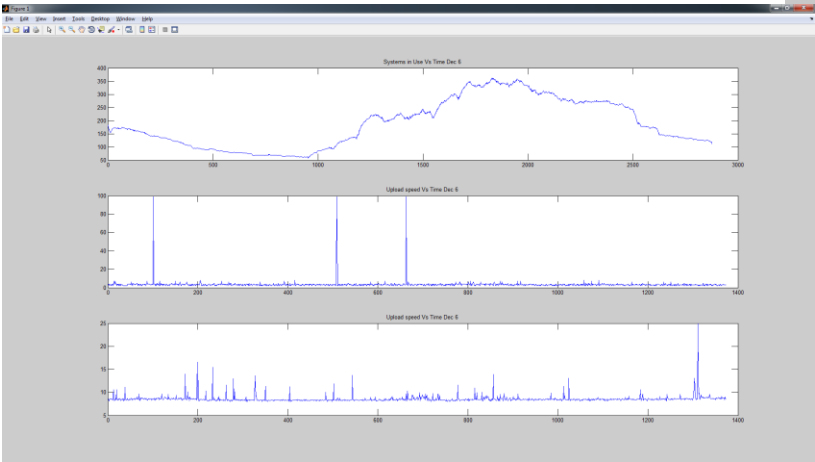
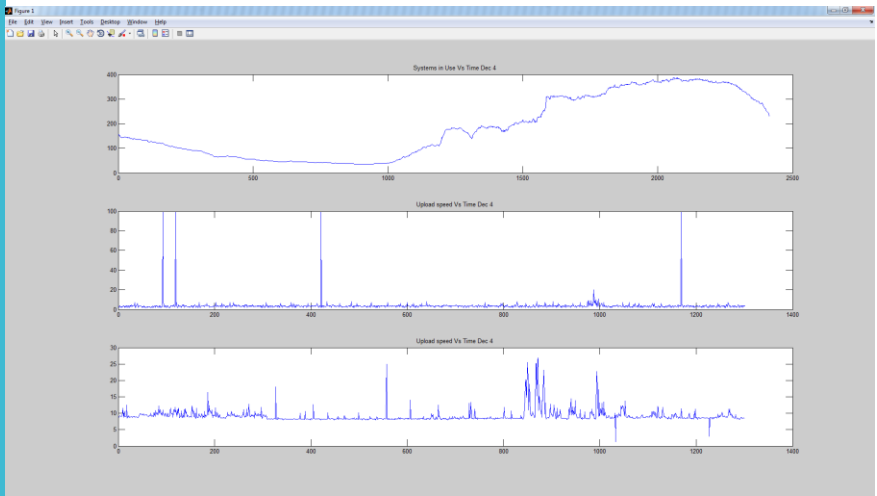
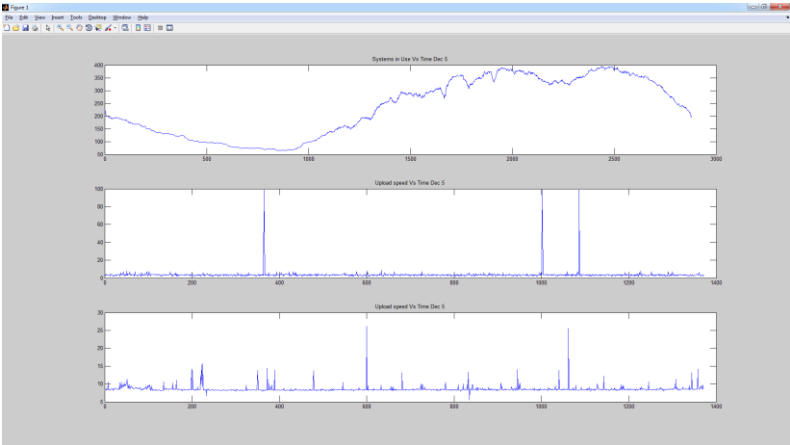
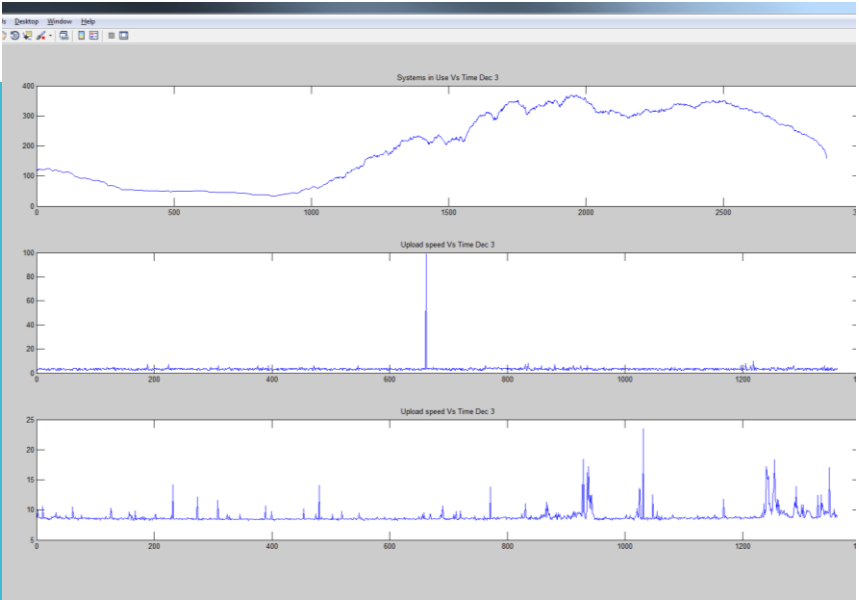
dnum_start= datenum(2013,12,07,00,00,00); % INPUT DATE %
for i=1:1:24
    HYP_Hours_12_09(4,i)=dnum_start;
    dnum_start = dnum_start + 1/24;
end

buildDL=zeros(1);
sizeof=size(DL_ASC_12_09);
sizeme=sizeof(2);
for i=1:1:sizeme
    buildDL(i)=DL_ASC_12_09(2,i);
end

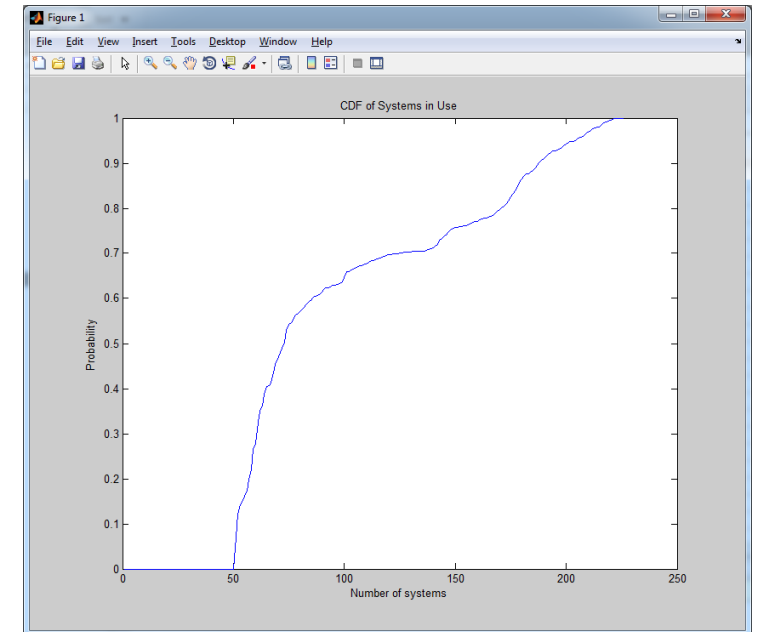
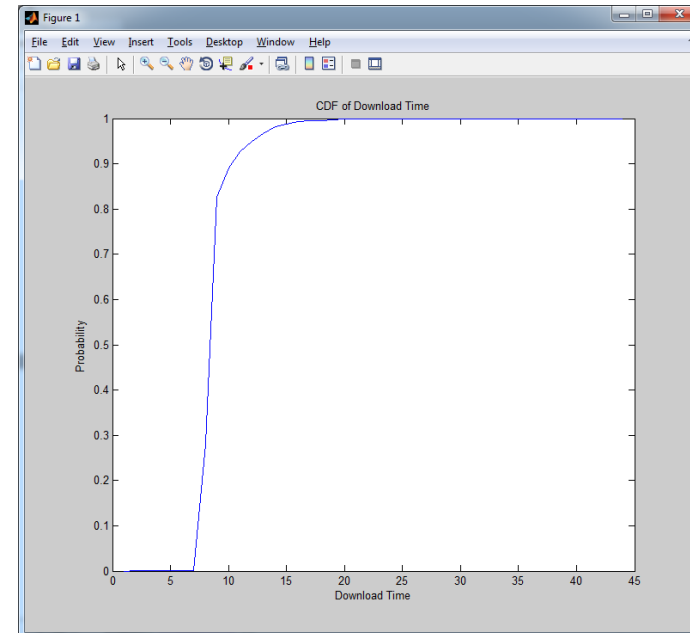
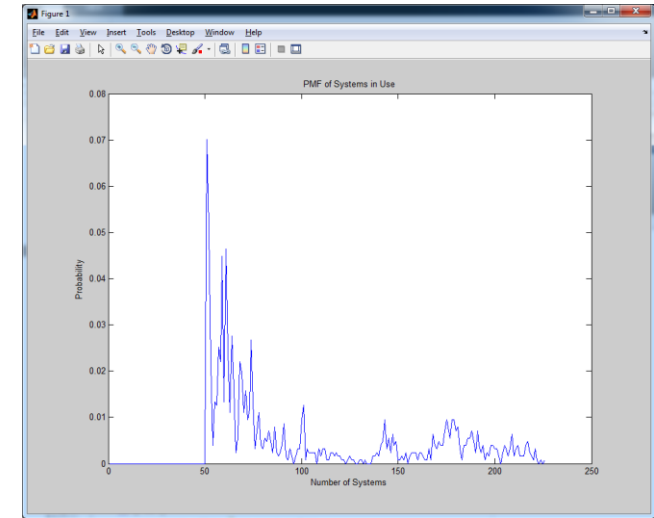
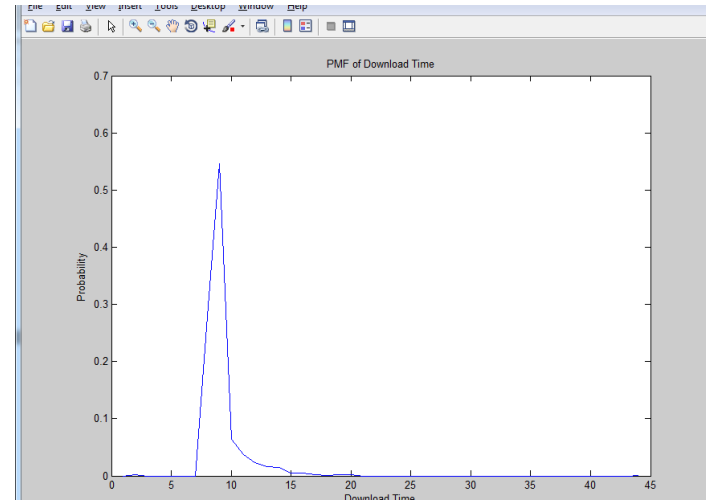
buildUL=zeros(1);
sizeof=size(UL_ASC_12_09);
sizeme=sizeof(2);
for i=1:1:sizeme
    buildUL(i)=UL_ASC_12_09(2,i);
end

j=1;
index=1;
tempend=58;
i=1;
while i<sizeme
    while ((i < tempend) && (i<sizeme))
        if(golden_alarms(i)==1)
            sum1=sum1+1;
        else
            sum0=sum0+1;
        end
        i=i+1;
    end
    sum1
    sum0
    HYP_Hours_12_09(2,j)=sum0;
    HYP_Hours_12_09(3,j)=sum1;
    j=j+1;
    i=tempend;
    tempend=tempend+58;
    sum1=0;
    sum0=0;
end
```

# Results of Data Timeseries



# Distributions



# Hypothesis Testing

## Vs. Hour of the Day

| N= | 1         | 2         | 3         | 4         | 5         | 6         | 7         | 8         | 9          | 10         | 11         | 12         |
|----|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|
| H0 | 0.045611  | 0.0481928 | 0.045611  | 0.0473322 | 0.0481928 | 0.0464716 | 0.0481928 | 0.0490534 | 0.0464716  | 0.04905336 | 0.04991394 | 0.04388985 |
| H1 | 0.0201005 | 0.0100503 | 0.0251256 | 0.0150754 | 0.0100503 | 0.0201005 | 0.0100503 | 0.0050251 | 0.0201005  | 0.00502513 | 0          | 0.03517588 |
| N= | 13        | 14        | 15        | 16        | 17        | 18        | 19        | 20        | 21         | 22         | 23         | 24         |
| H0 | 0.0473322 | 0.0481928 | 0.0404475 | 0.0301205 | 0.0361446 | 0.0430293 | 0.0464716 | 0.0481928 | 0.04819277 | 0.01462995 | 0.0232358  | 0.00516351 |
| H1 | 0.0150754 | 0.0100503 | 0.0552764 | 0.1155779 | 0.080402  | 0.040201  | 0.0201005 | 0.0100503 | 0.01005025 | 0.20603015 | 0.15577889 | 0.10552764 |

## Vs. A given lab count

| N= | 34        | 35        | 36        | 37        | 38        | 39        | 40        | 41        | 42         | 43         | ...        |
|----|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|
| H0 | 0.0068847 | 0.0034423 | 0.0068847 | 0.0154905 | 0.0094664 | 0.0077453 | 0.0025818 | 0.0051635 | 0.00516351 | 0.01549053 | ...        |
| H1 | 0.0050251 | 0         | 0.0050251 | 0         | 0         | 0         | 0         | 0         | 0          | 0.00502513 | ...        |
| N= | ...       | 360       | 361       | 362       | 363       | 364       | 365       | 366       | 367        | 368        | 369        |
| H0 | ...       | 0.0017212 | 0.0017212 | 0         | 0.0025818 | 0.0017212 | 0.0025818 | 0.0025818 | 0          | 0.00258176 | 0.00086059 |
| H1 | ...       | 0.0050251 | 0.0050251 | 0.0050251 | 0         | 0.0050251 | 0.0050251 | 0         | 0          | 0          | 0          |



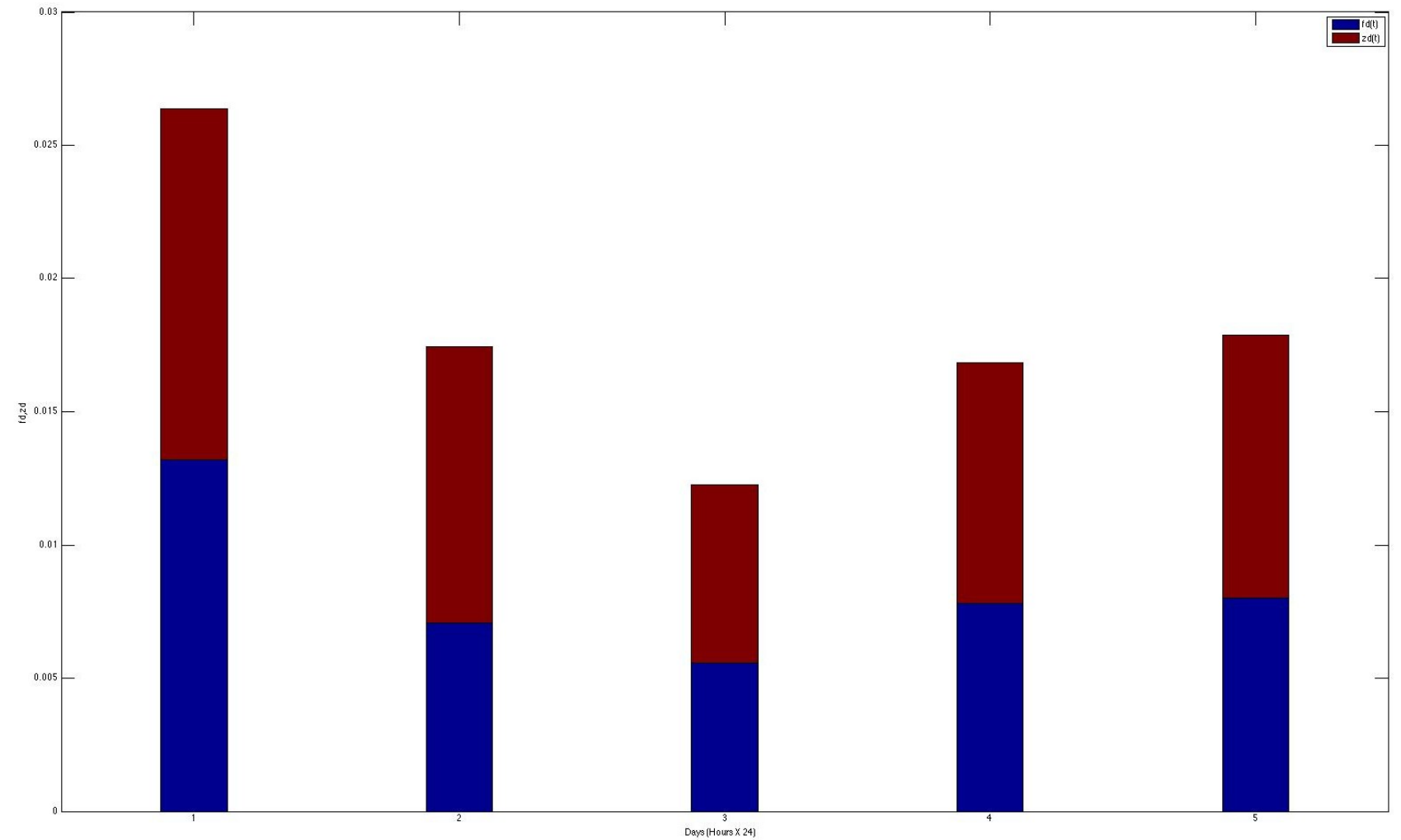
# Hazard Rate Tables

| Hours  | Failures |
|--------|----------|
| 0-24   | 199      |
| 24-48  | 107      |
| 48-72  | 84       |
| 72-96  | 118      |
| 96-120 | 121      |

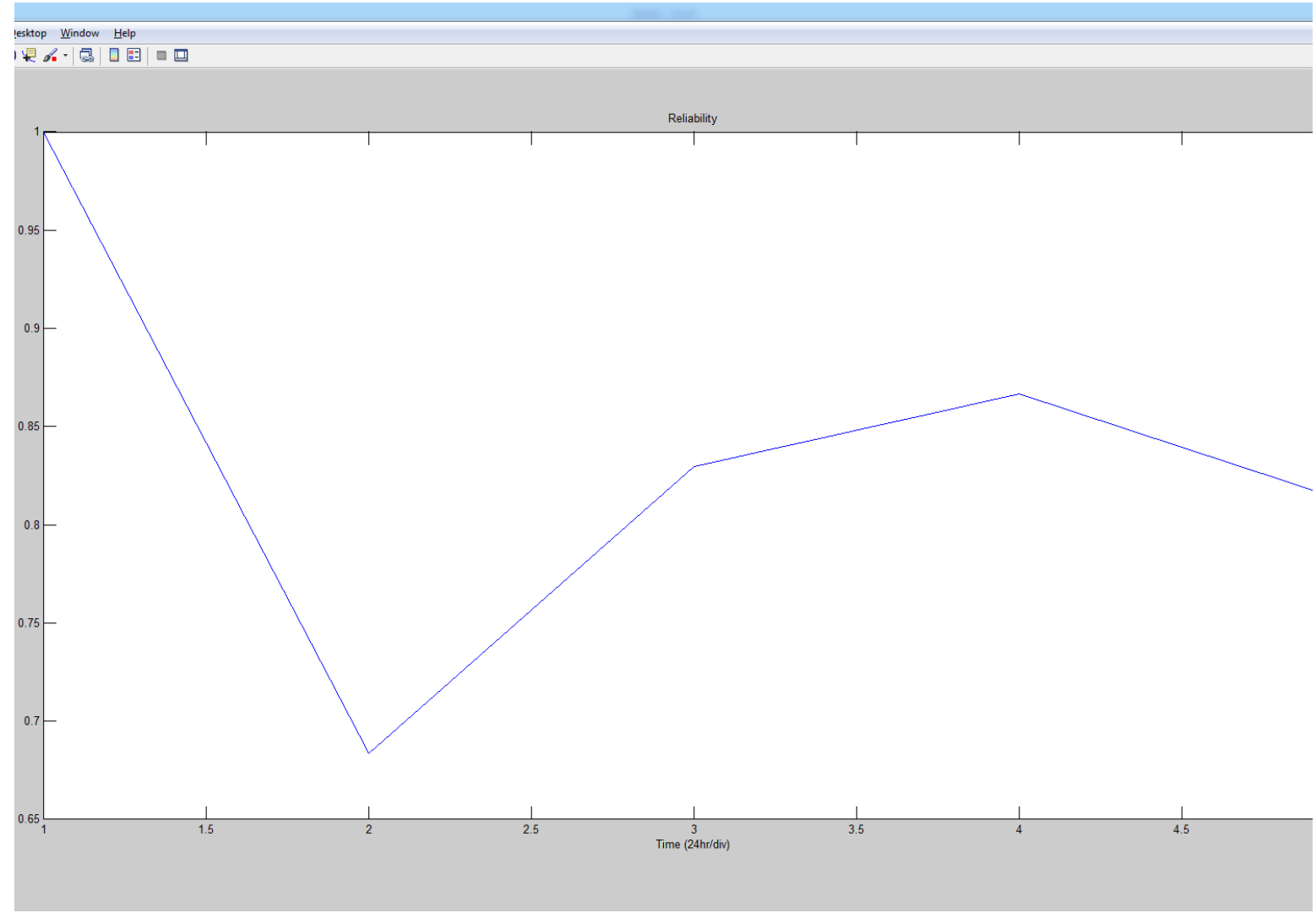
  

| $f_d(t)$                           | $Z_d(t)$                                     |
|------------------------------------|----------------------------------------------|
| $\frac{199}{\text{Tot} \times 24}$ | $\frac{199}{\text{Tot} \times 24}$           |
| $\frac{107}{\text{Tot} \times 24}$ | $\frac{107}{(\text{Tot} - 199) \times 24}$   |
| $\vdots$                           | $\vdots$                                     |
| $\frac{121}{\text{Tot} \times 24}$ | $\frac{121}{(\text{Tot} - \dots) \times 24}$ |

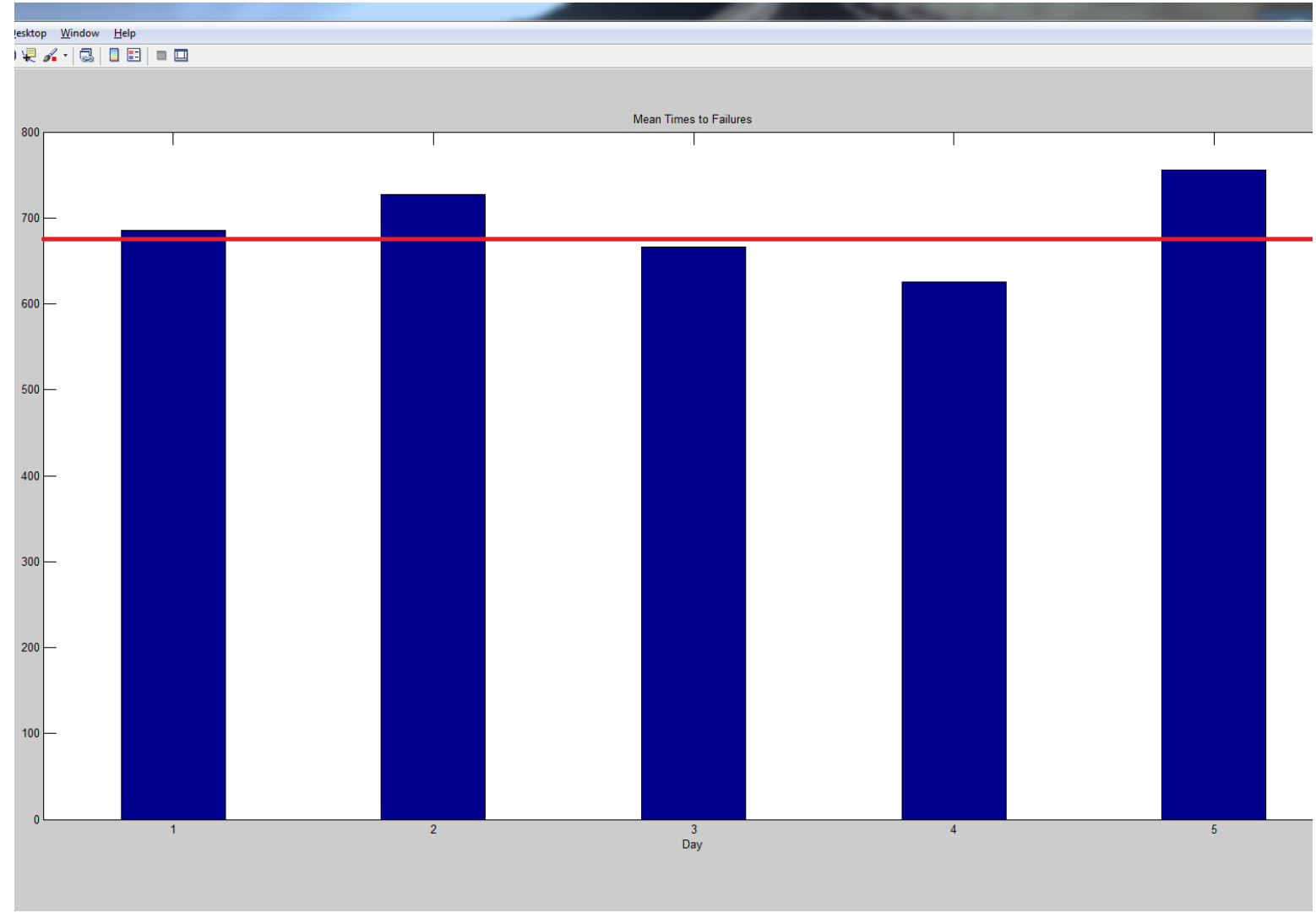
Failure density  
( $f_d(t)$ )  
Hazard  
Rates( $z_d(t)$ )



# Reliability $R(t)$



# Mean Time to Failure



# Inference

- Miss Detection 0.3
- False Alarm 0.2
- Total Error 0.5

- Standard Deviation (DL) 1.81
- Mean (DL) 9.69
- Mean (UL) 7.79
- Standard Deviation (UL) 1.7

## Using MAP Rule => Rains when $N = 1$

- Assume that you know the prior probabilities of raining and not raining:
  - $P(\text{Not Rainy}) = 0.6$ ,  $P(\text{Rainy}) = 0.2$ ,
- Joint Probability Matrix:

|           | <b>N = 0</b> | <b>N = 1</b> | <b>N = 2</b> |
|-----------|--------------|--------------|--------------|
| Not Rainy | <u>0.480</u> | 0.090        | <u>0.030</u> |
| Rainy     | 0.002        | <u>0.018</u> | 0.018        |