

Hello Earth!

A grounded introduction to Matlab

Frederik J Simons

Christopher Harig

Adam C. Maloof

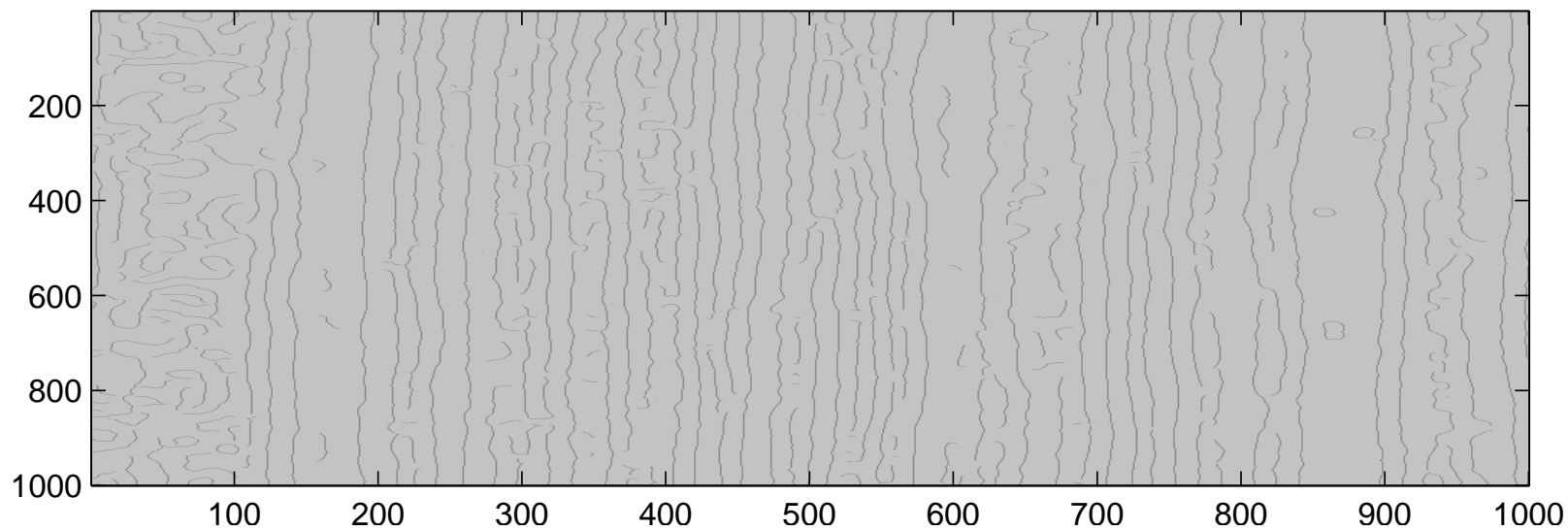
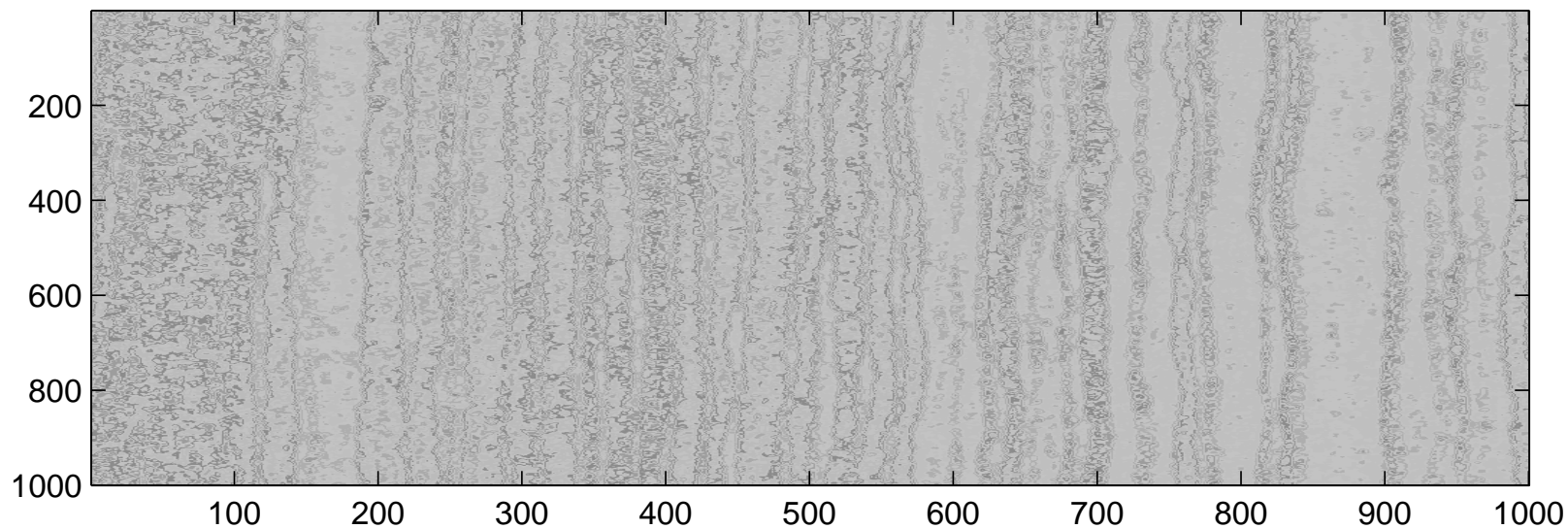
Princeton University



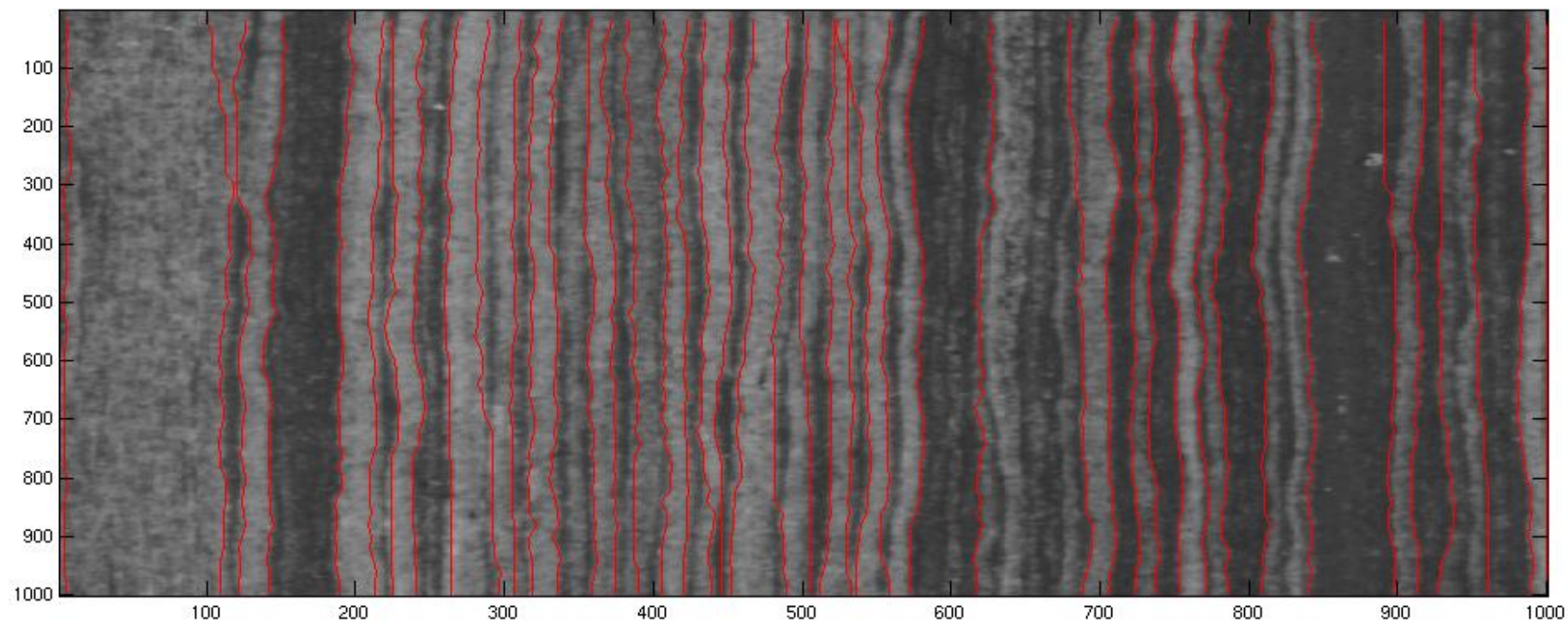
(Enter teacher)



Something canny *Matlab* can do



Something cunning *you* can do



1. help

1. help

2. lookfor

1. `help`

2. `lookfor`

3. `type`

1. help

2. lookfor

3. type

4. who, whos

1. help

2. lookfor

3. type

4. who, whos

6. diary

7. plot

7. `plot`

8. `xlabel, ylabel, title`

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11. `hold on, hold off`

7. `plot`

8. `xlabel, ylabel, title`

11. `hold on, hold off`

13. `sprintf`

7. `plot`

8. `xlabel, ylabel, title`

11. `hold on, hold off`

13. `sprintf`

14. `print`

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8. `xlabel, ylabel, title`

11. `hold on, hold off`

13. `sprintf`

14. `print`

15. `load, imread`

Name	Function	Example
imread	Reads an image file	<code>ix=imread('filename');</code>
fullfile	Constructs a valid path name	<code>ff=fullfile('dirn','fname');</code>
size	Queries the size of a variable	<code>s=size(ix);</code>
plot	Plots (x, y) values on a graph	<code>x=[1 2 3]; y=[10 20 30]; plot(x,y,'o')</code>
xlabel	Uses a quoted string for an x -axis label	<code>xlabel('elevation [m]')</code>
ylabel	Uses a quoted string for a y -axis label	<code>xlabel('roughness')</code>
hold on	Keeps current axes for next time you plot anything	<code>x=[1 2 pi]; y=[10 20 30]; plot(x,y,'bo'); hold on; plot(10*x,3*y,'rs')</code>
linspace	Makes an array of N evenly spaced values between a and b	<code>x=linspace(-3,3,100)</code>
reshape	Changes the dimensions of an array x to a rows and b columns	<code>x=linspace(-3,3,100); xr=reshape(x,20,5)</code>
hist	Makes a histogram (and plots it)	<code>x=linspace(-3,3,10); hist(x)</code>
bar		
axis xy		
axis ij		

Addressing:

rows, columns, dimensions, range

Addressing:

rows, columns, dimensions, range

17. `size`

Addressing:

rows, columns, dimensions, range

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18. `transpose`

Addressing:

rows, columns, dimensions, range

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19. `colon`

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Logic:

logical, character, string, double

Addressing:

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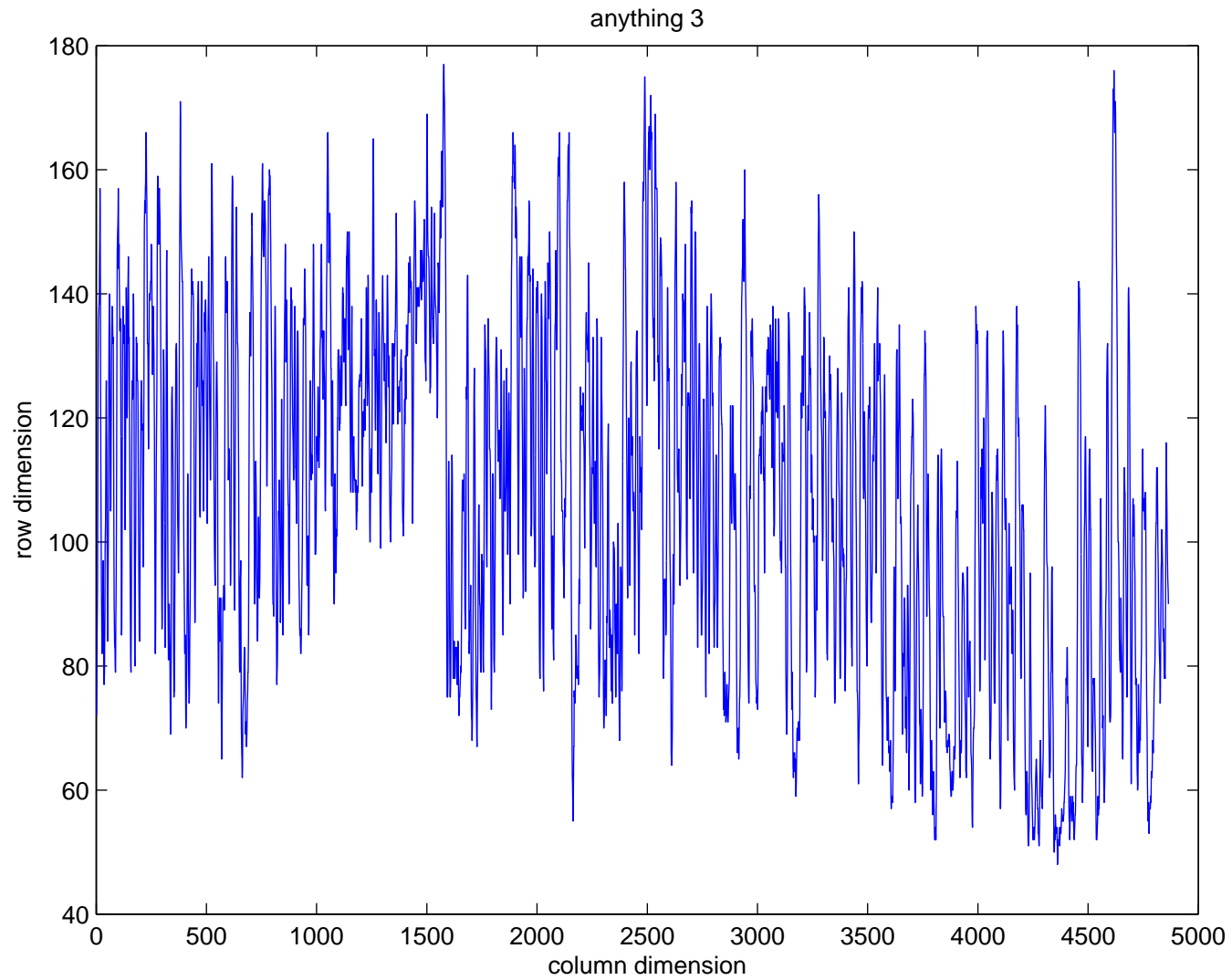
19. `colon`

20. `linspace`

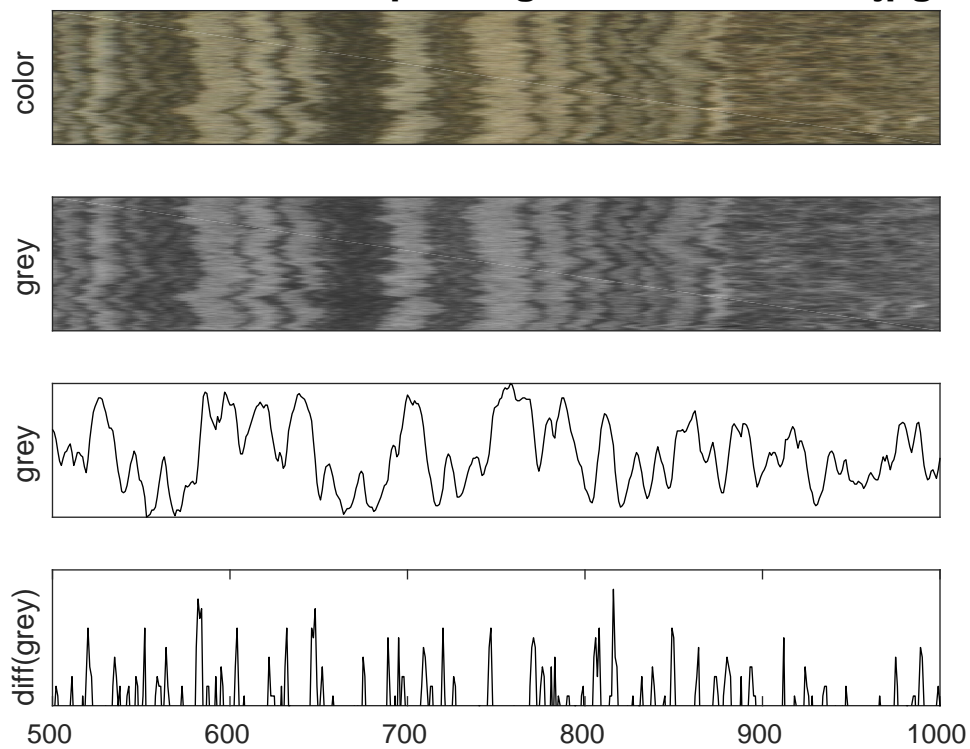
Logic:

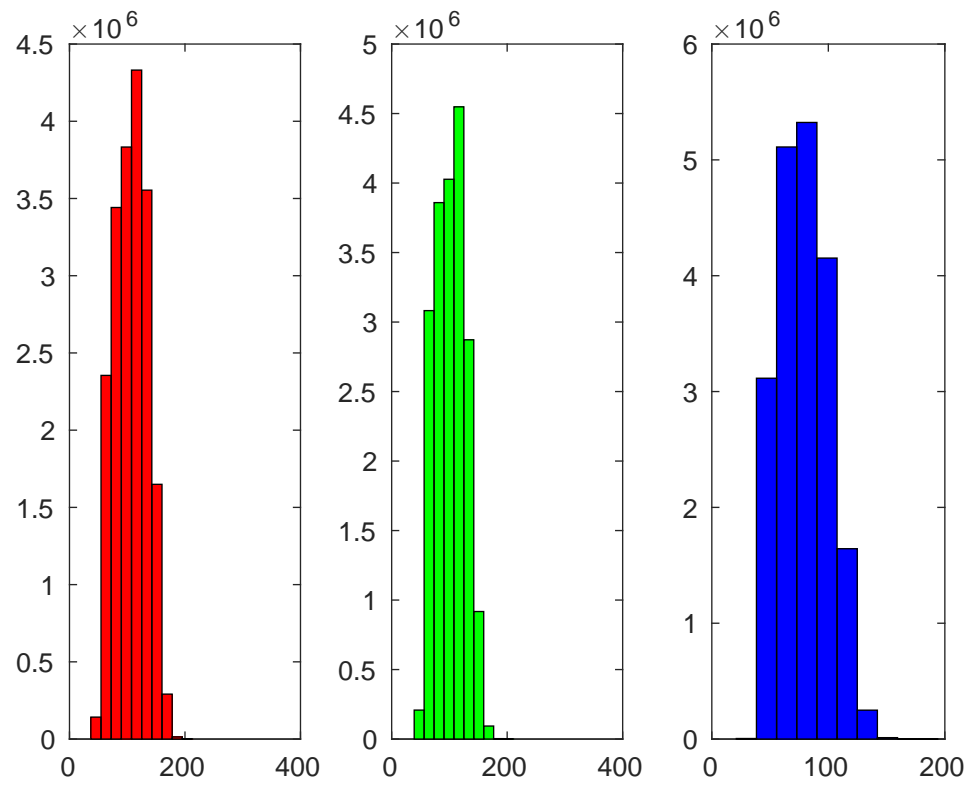
logical, character, string, double

21. `<`, `>`, `==`, `~`, `&`, `|`



I, Frederik Simons, am plotting H1W-18.35-test2.jpg



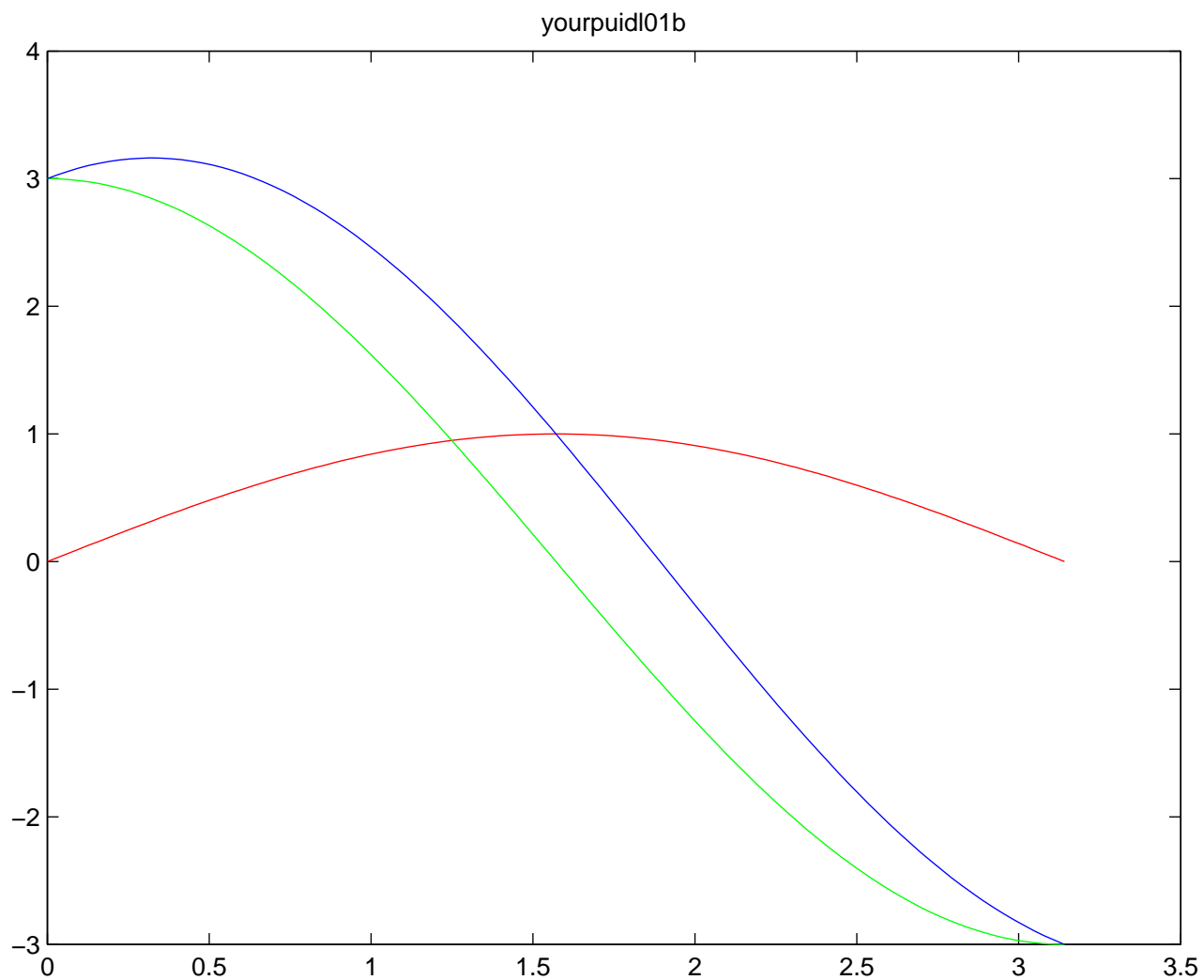


Navigate to Course Materials, Software Installation and Templates.

1. Install Matlab as per the instructions.
2. Start Matlab: you will be making a Very Simple Plot.
3. Create ("edit") a new code (*.m) file called "lab01b.m" and in it, type the following few instructions, or some slight variations thereof, according to your taste (i.e. vary the numbers):

```
x=linspace(0,pi,100);  
A=1; B=3; f1=0; f2=0;  
y1=A*sin(x+f1); y2=B*cos(x+f2); y3=y1+y2;  
figure (1)  
plot(x,y1,'r'); hold on; plot(x,y2,'g'); plot(x,y3,'b')  
title('yournetid101b')  
hold off; axis tight  
print('-dpdf','yournetid101b')
```

4. Save this file, see that you can find it again.
 5. In step 3, "yournetid" is once again your Princeton netid of course.
 6. Now "run" or "execute" this "script" and make sure that something pops up on your screen - and that a PDF gets made!
 7. Find the PDF that you just made ('yournetid101b.pdf').
That is your second Assignment! Upload it to Blackboard by the deadline.
-



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Documentation/Help/Date

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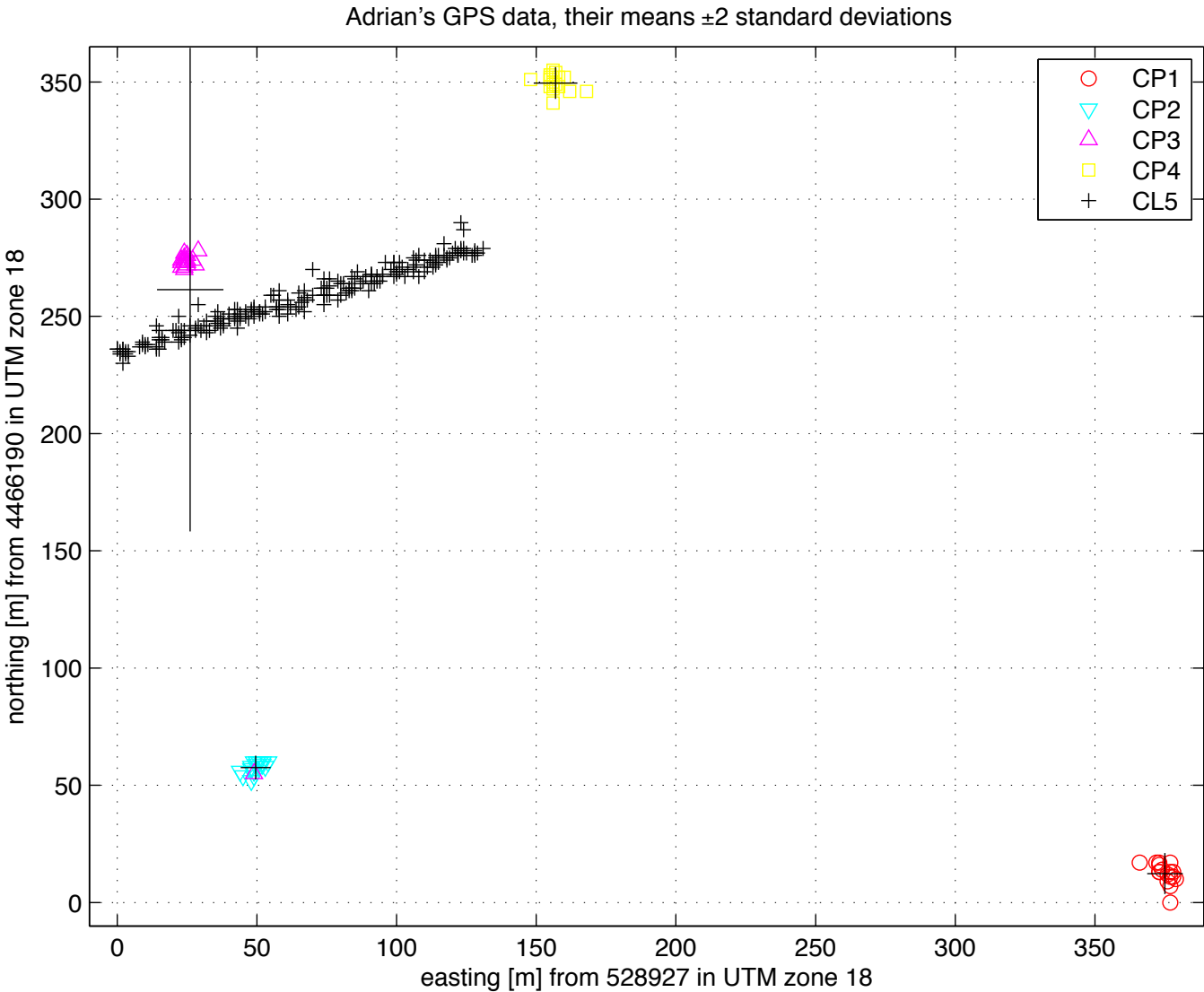
Input/Output

Computation/Algorithm

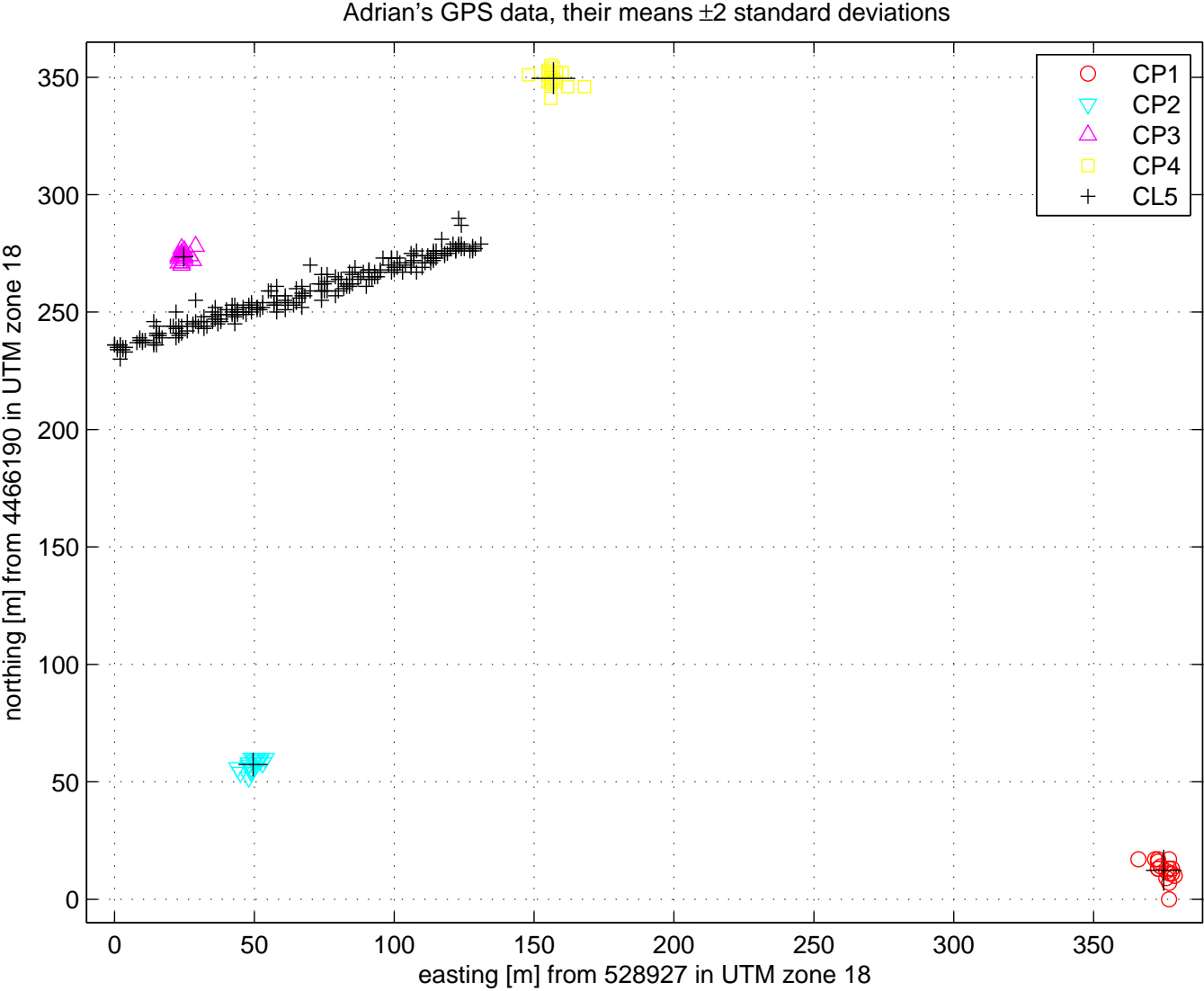
Figures/Embellishment

Variable Output

Homework 2 — Data collection



Homework 2 — Data curation



Homework 3 — Data analysis

- 6 **Hypothesis** . Shorter dune wavelengths appear on steeper slopes because winds are not able to travel far
7 before touching the ground and depositing sediment; higher dune amplitudes occur on steeper slopes because
8 the distance of the slope to the boundary layer decreases at a quicker rate, resulting in higher velocity sediment-
9 carrying winds that can carry and deposit more sediment.

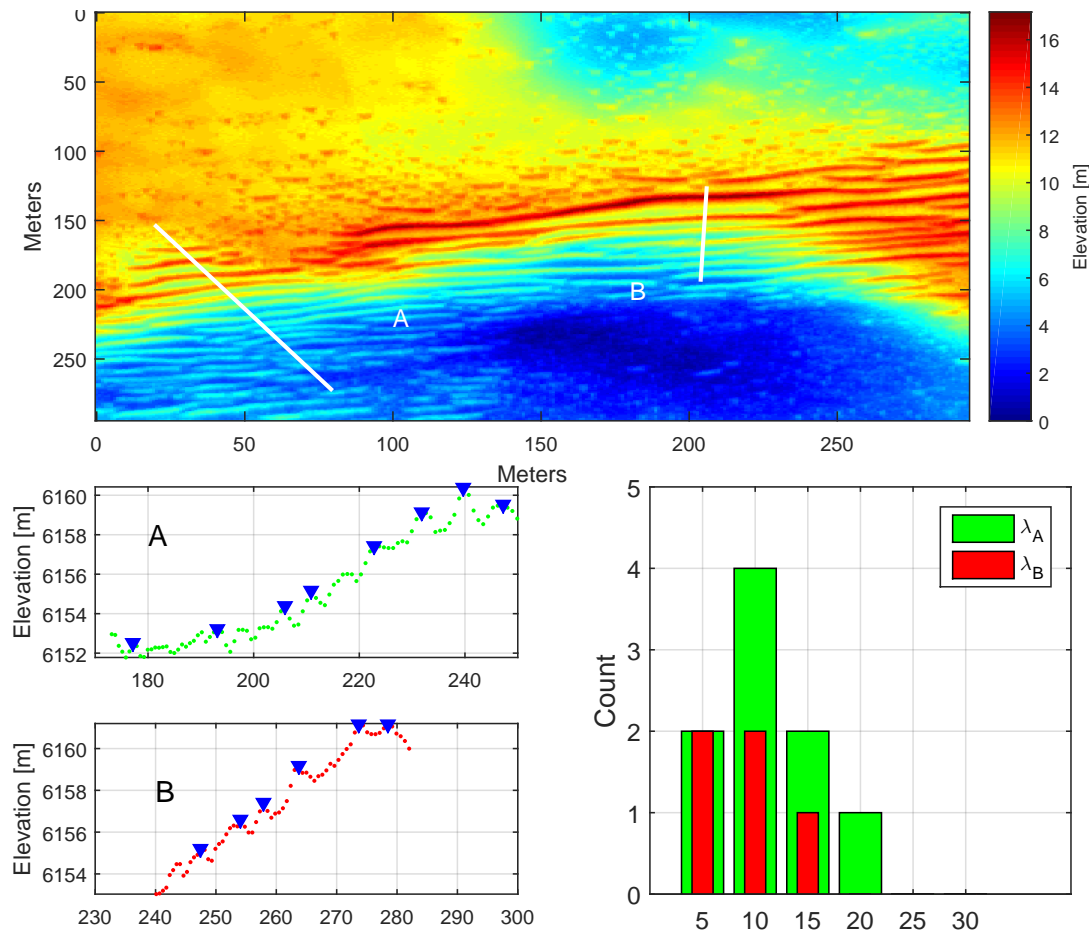


Figure 1: Transect A crosses 8 transverse dune peaks and transect B crosses 6 dune peaks . Transect B follows a steeper slope than transect A. The average dune wavelength found along transect B was 7.54m; along transect A the average dune wavelength was 12.47m. The average dune amplitudes (not shown in figure) were 1.02m for transect B and 0.82m for transect A. Image was downloaded from < http://www.uahirise.org/dtm/dtm.php?ID=ESP032814_670 >

Homework 3 — Data analysis

- 4 **Hypothesis.** As the elevation of the dunes in Iaxartes Tholus increases, the dunes increase in size (wavelength and amplitude), possibly due to a more abundant sand supply.
- 5

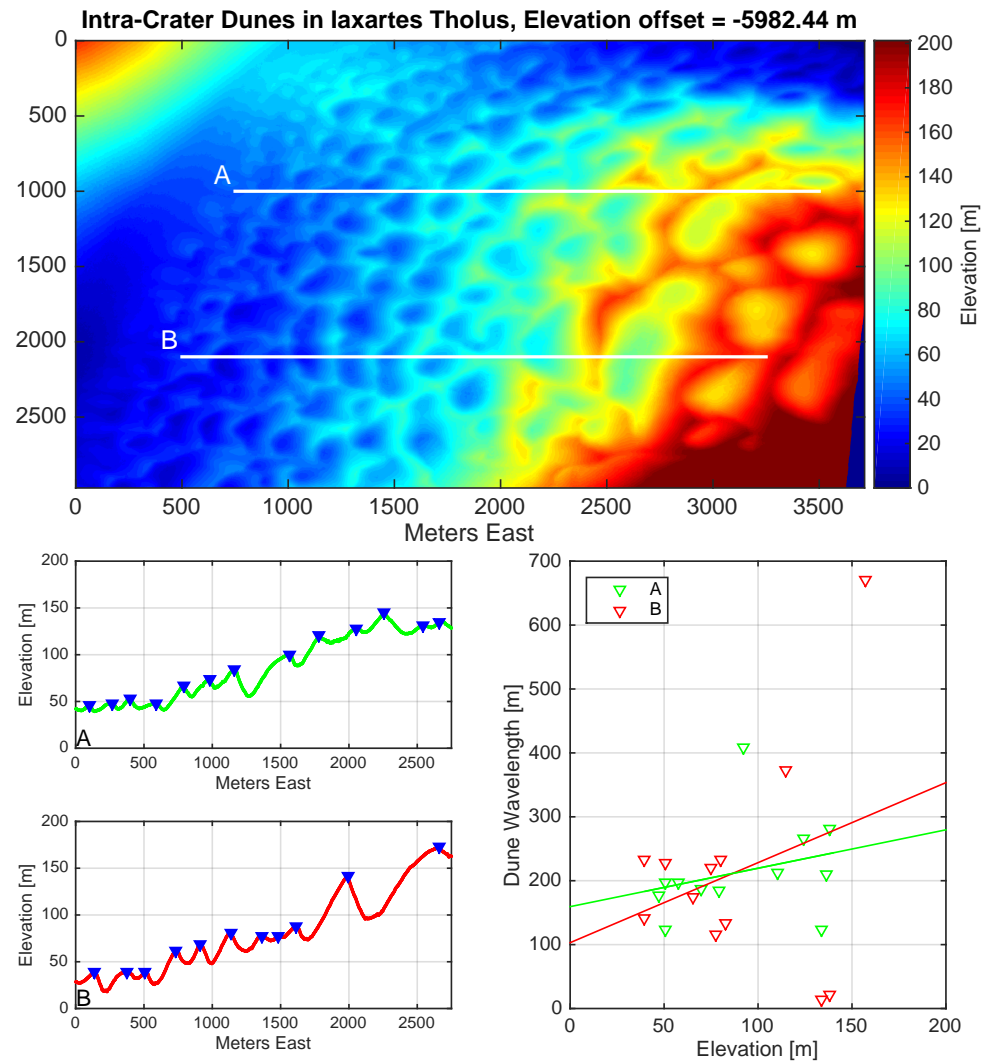


Figure 1: Intra-crater dunes in Iaxartes Tholus vary with elevation. Transect lines show increasing wavelength and amplitude as the elevation increases. Digital elevation model came from http://www.uahirise.org/dtm/dtm.php?ID=ESP_018938_2520.

Homework 3 — Data analysis

- 4 **Hypothesis.** Based on the geometry in figure 1, the transected dunes are Barchan dunes.

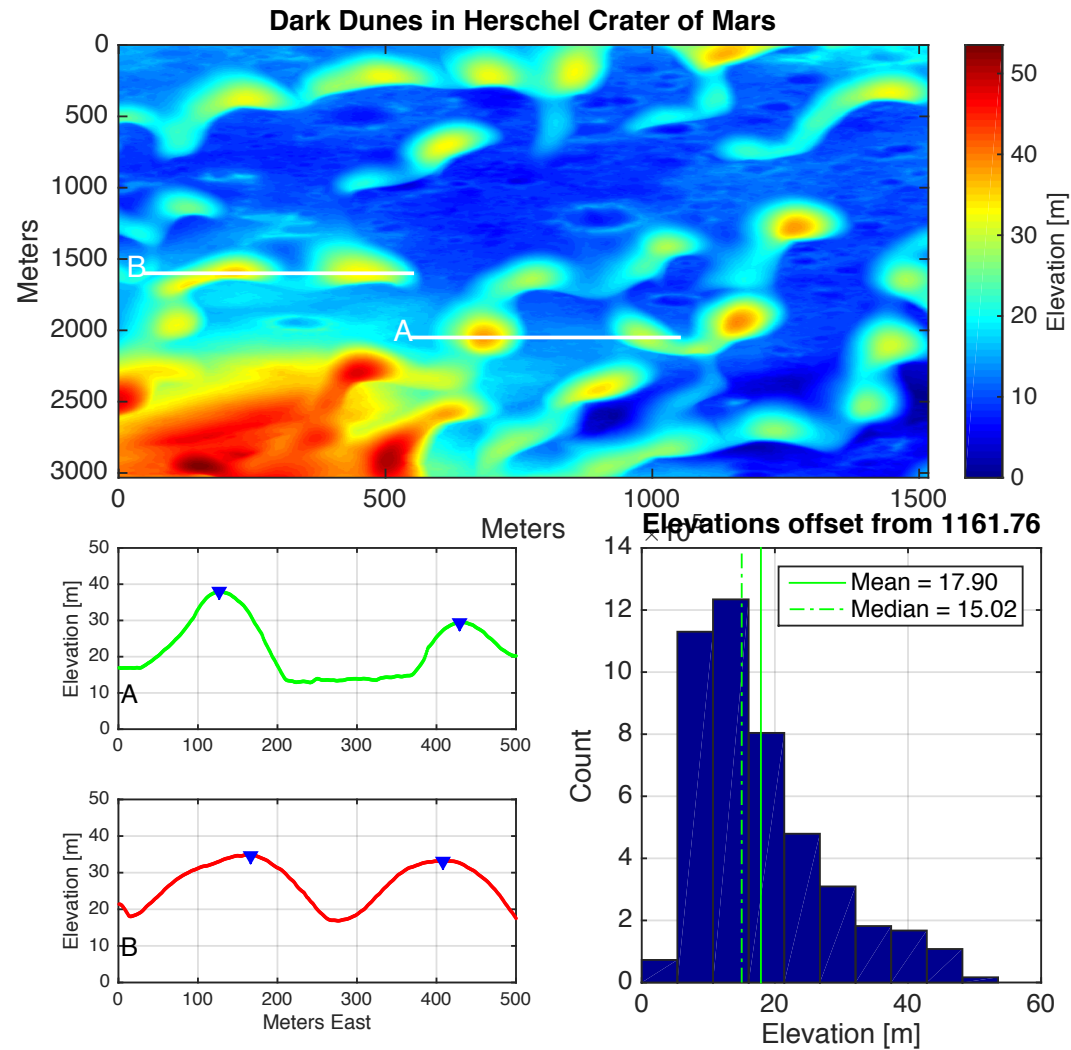
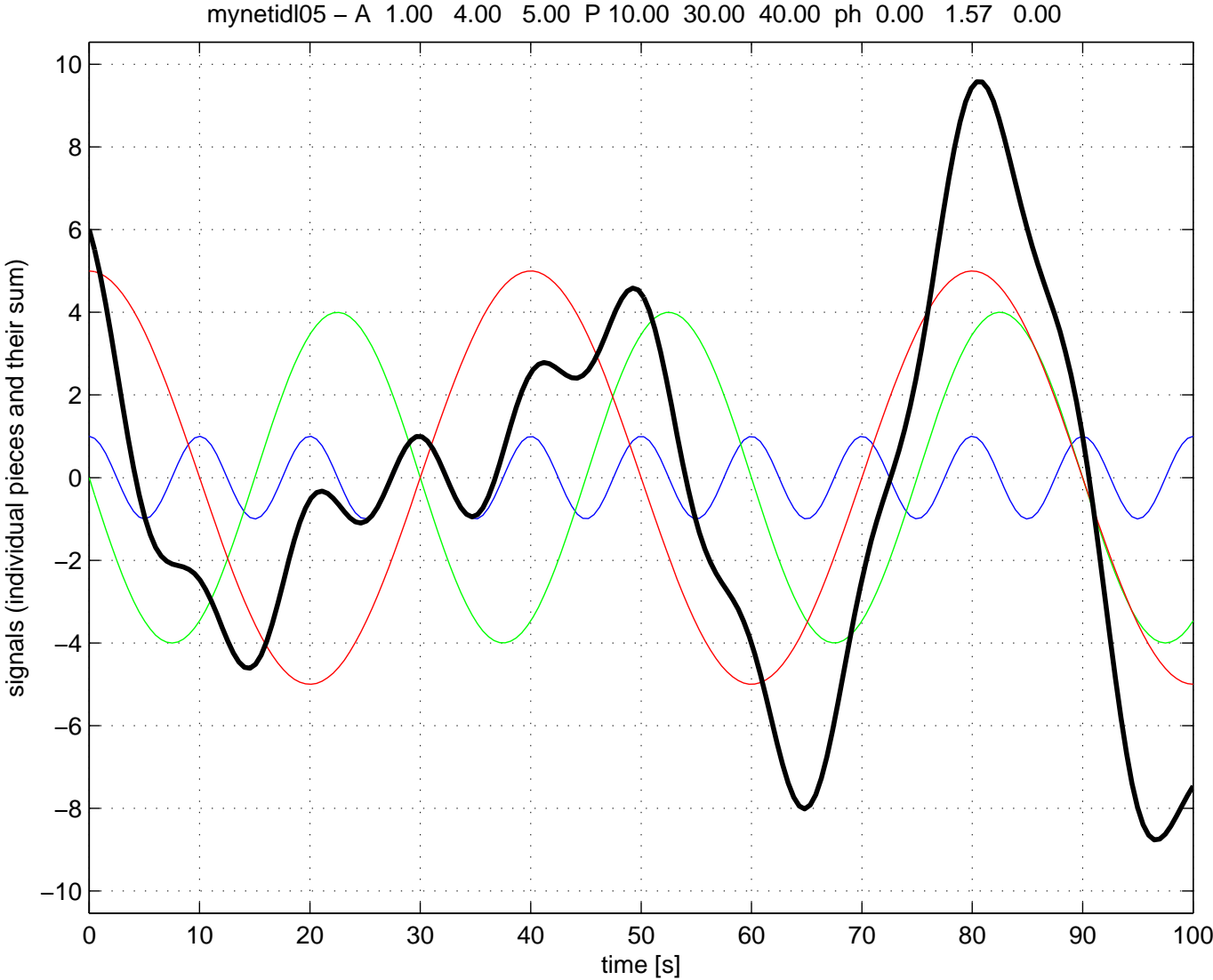
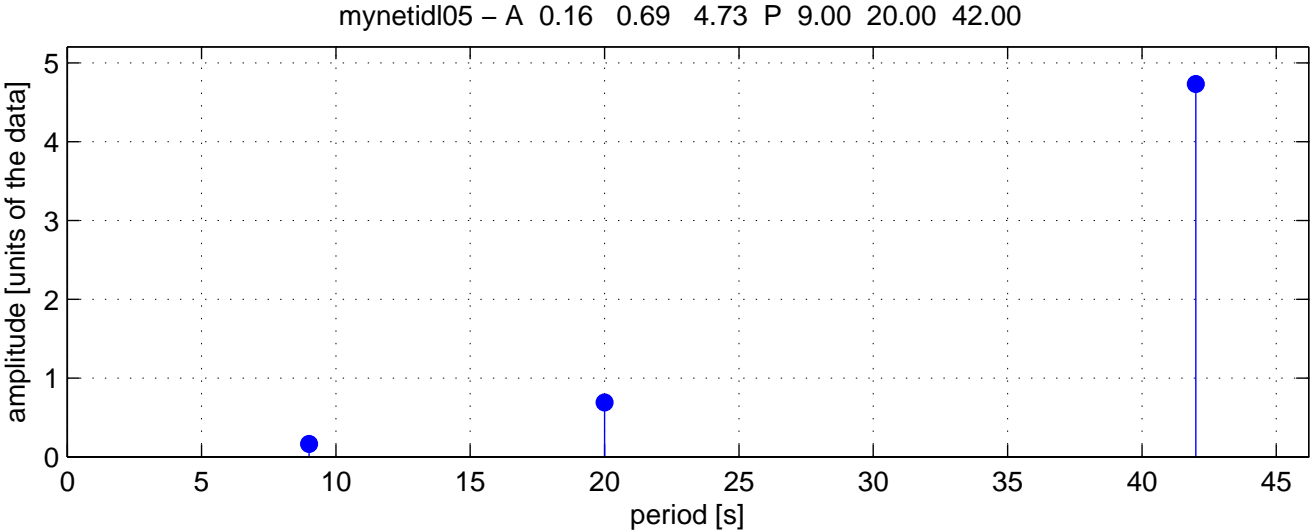
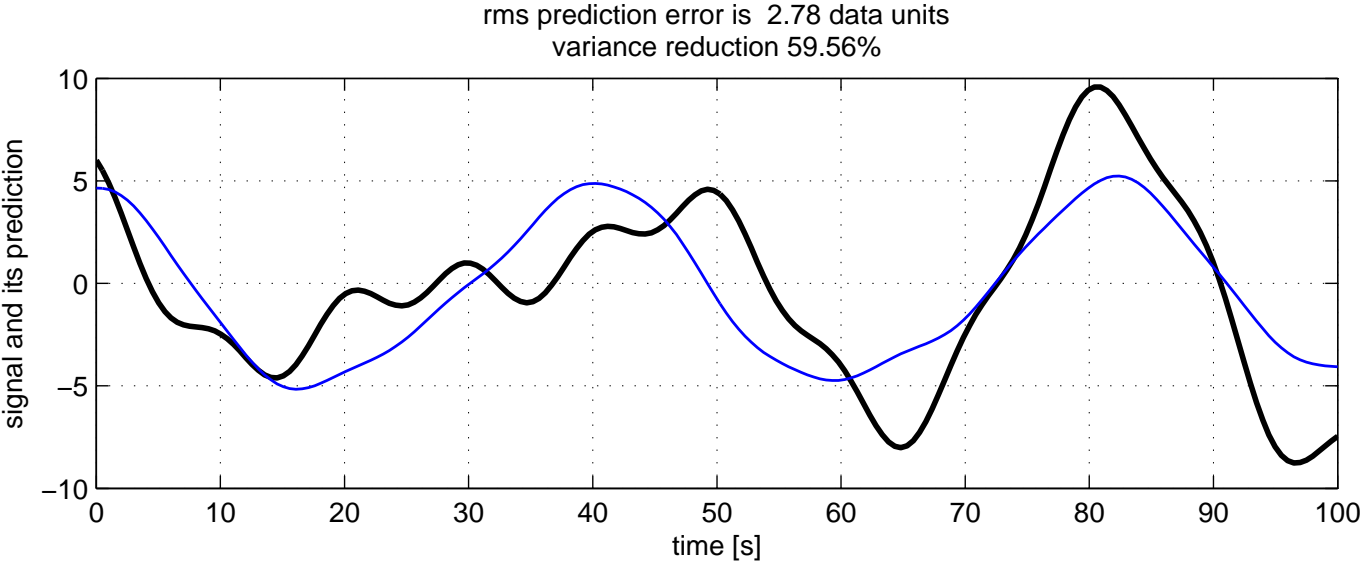


Figure 1: The heat map represents the elevation of sand dunes on Mars, with two transects, A and B, drawn over two specific dunes. The elevation, along with the peaks, of those dunes are then graphed as A and B respectively below the heat map. The histogram is a count of how often certain elevations were measured and the mean and median of those measurements.

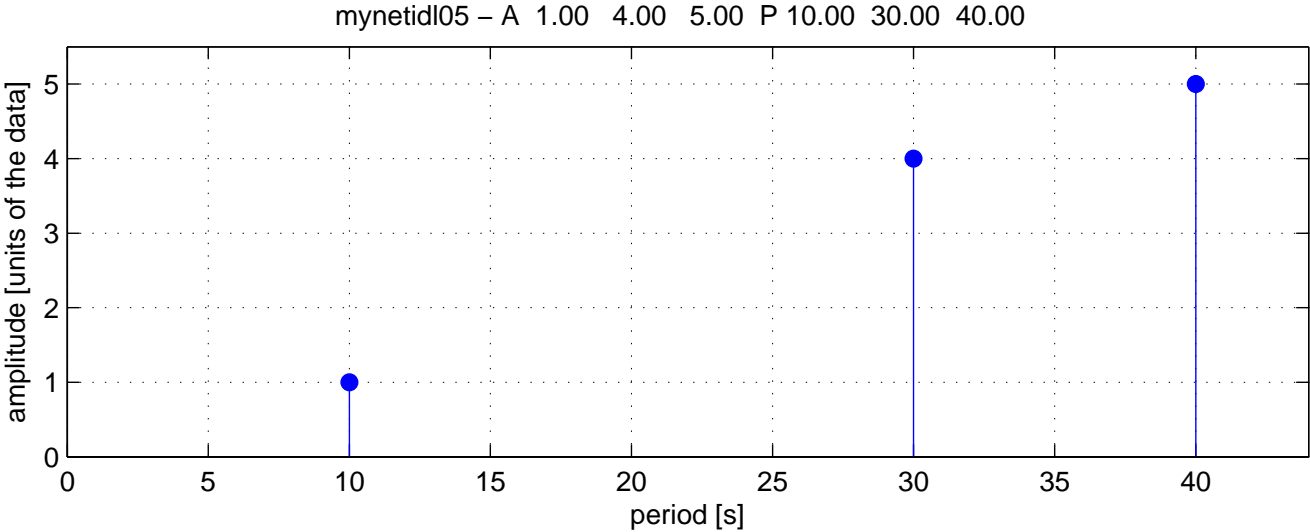
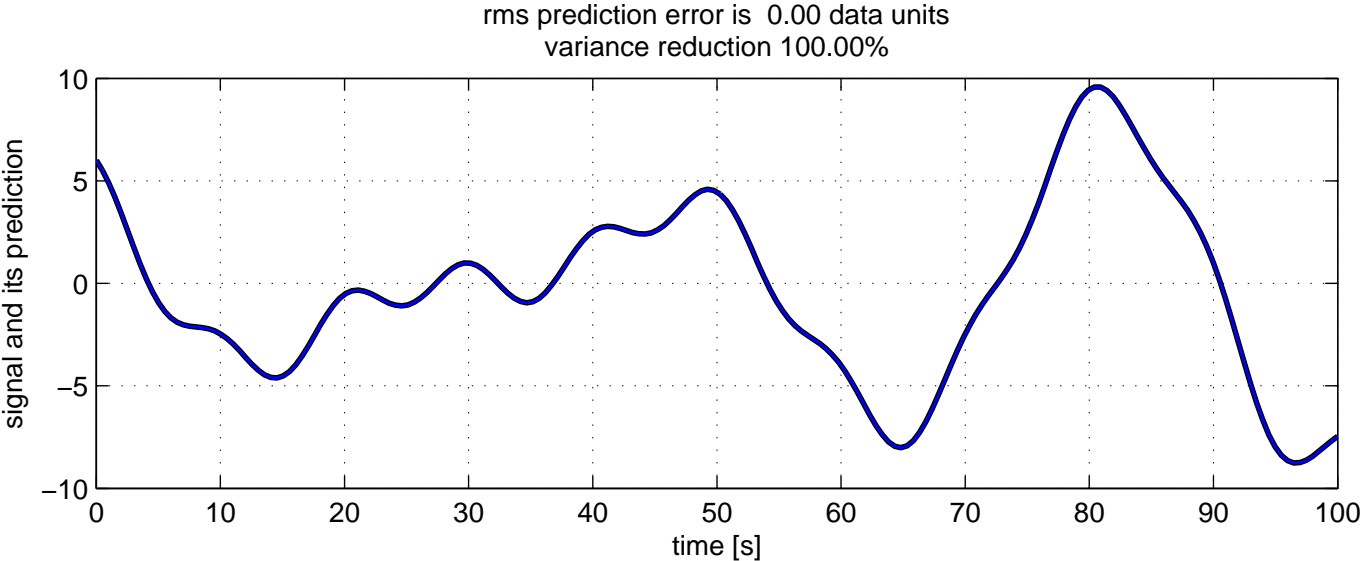
Homework 3 — Data reduction



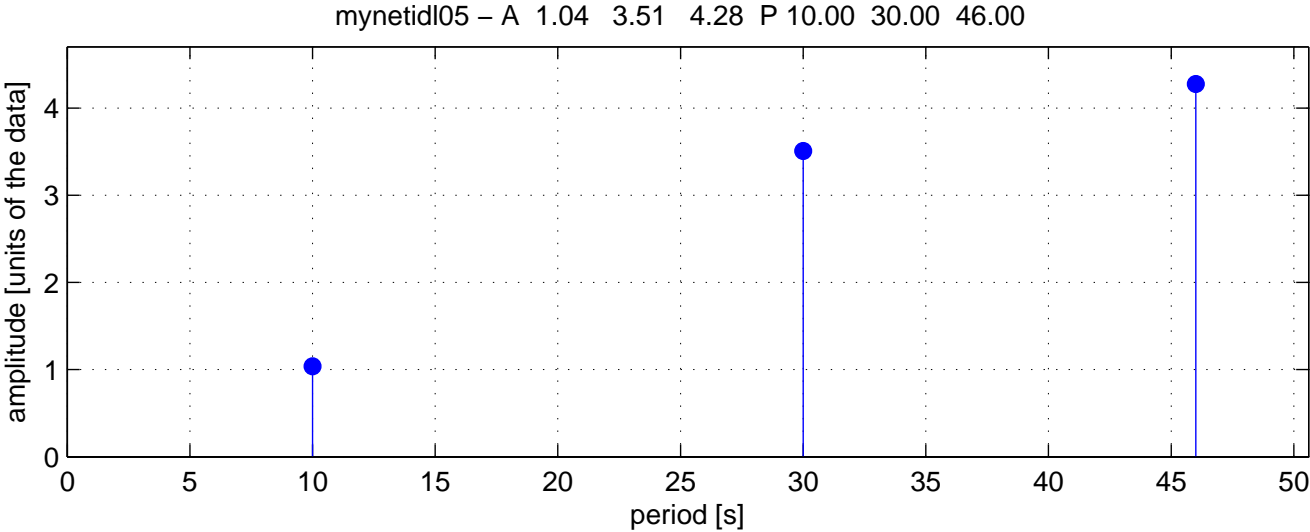
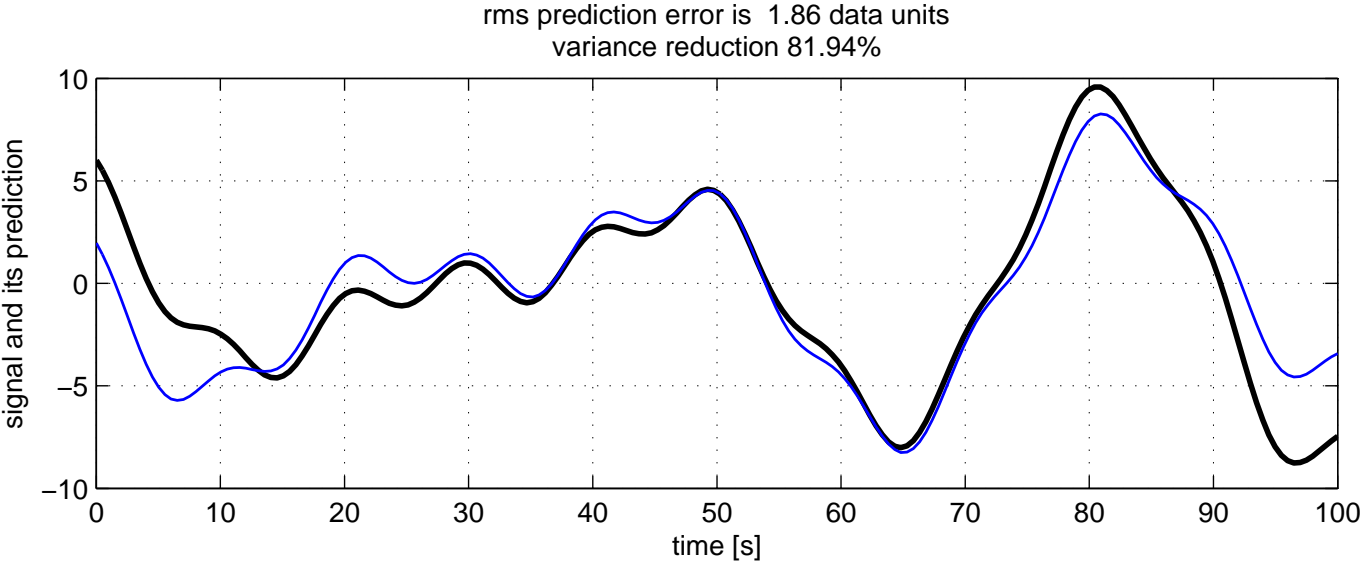
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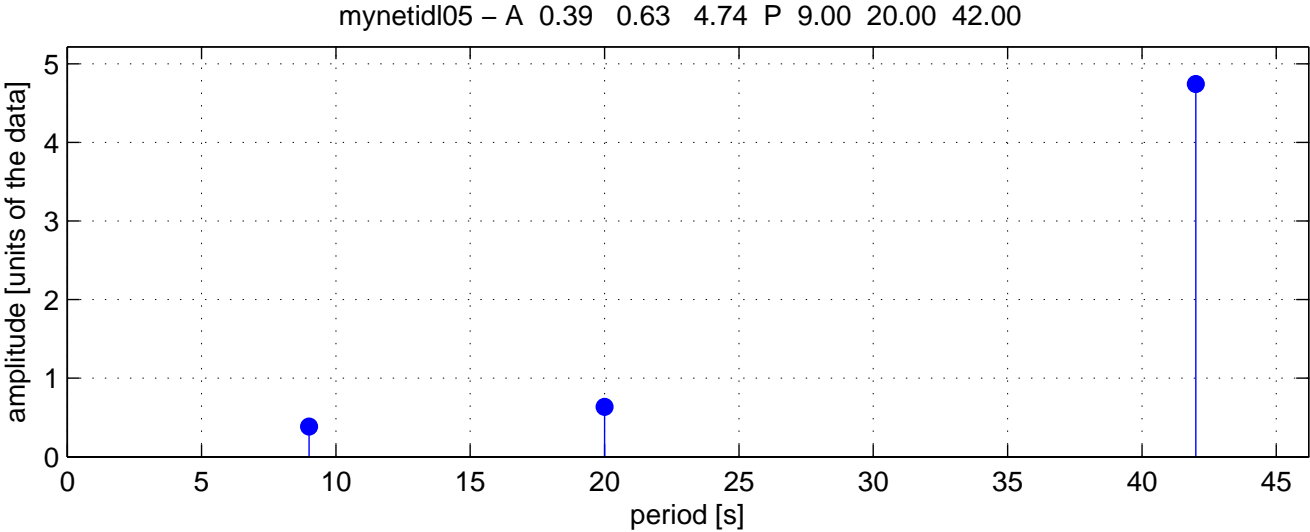
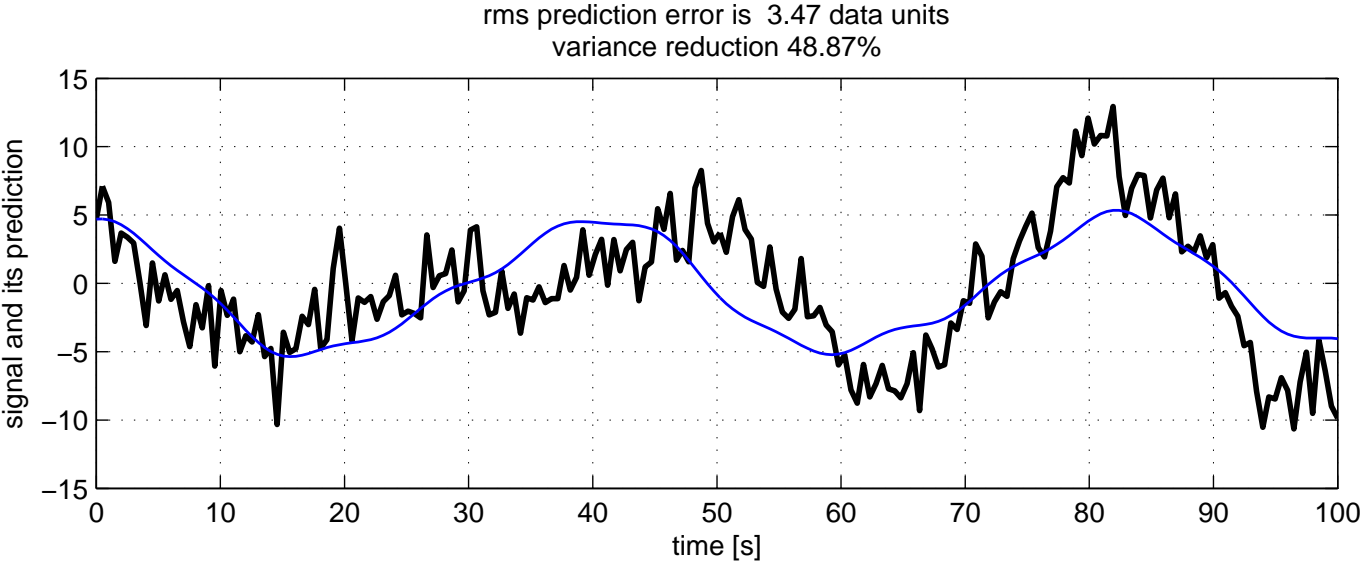
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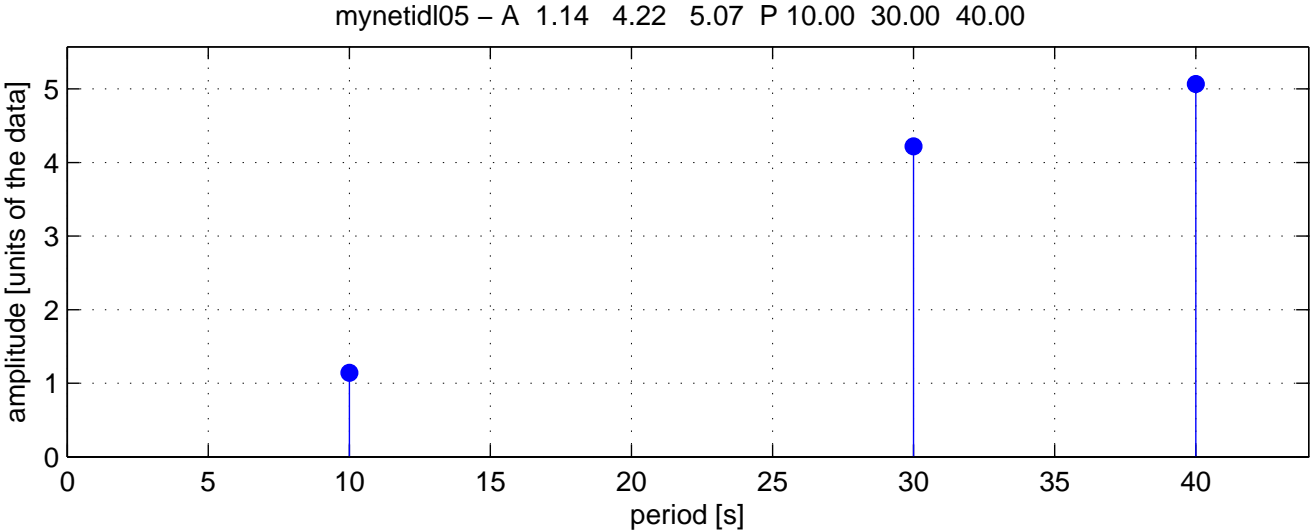
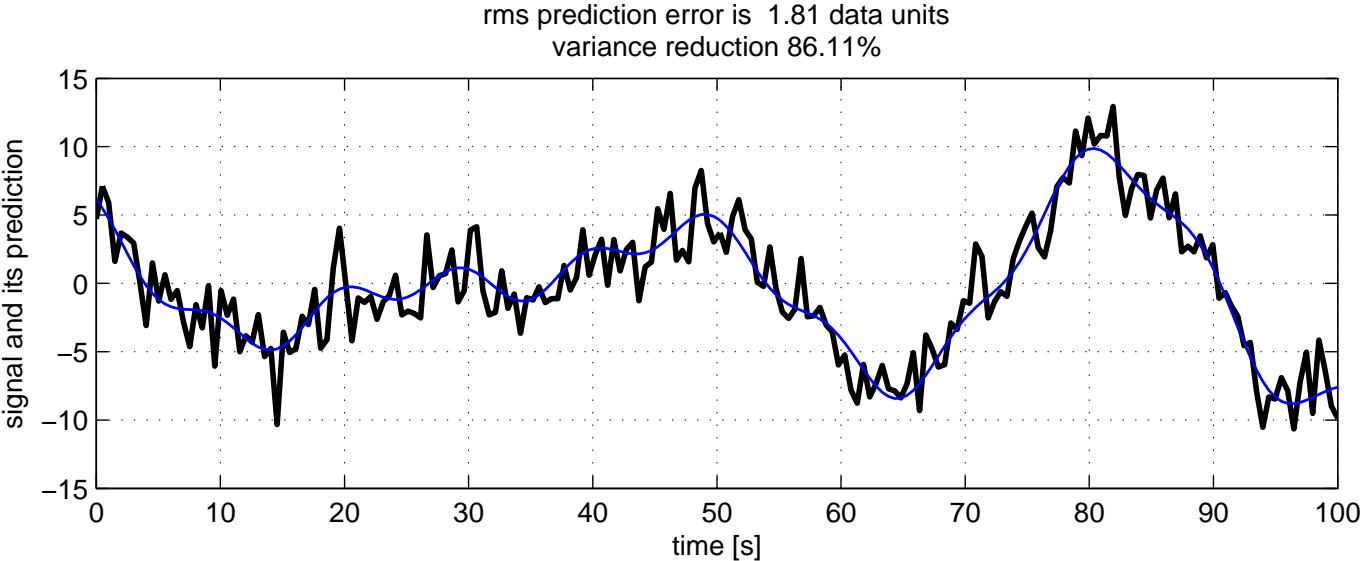
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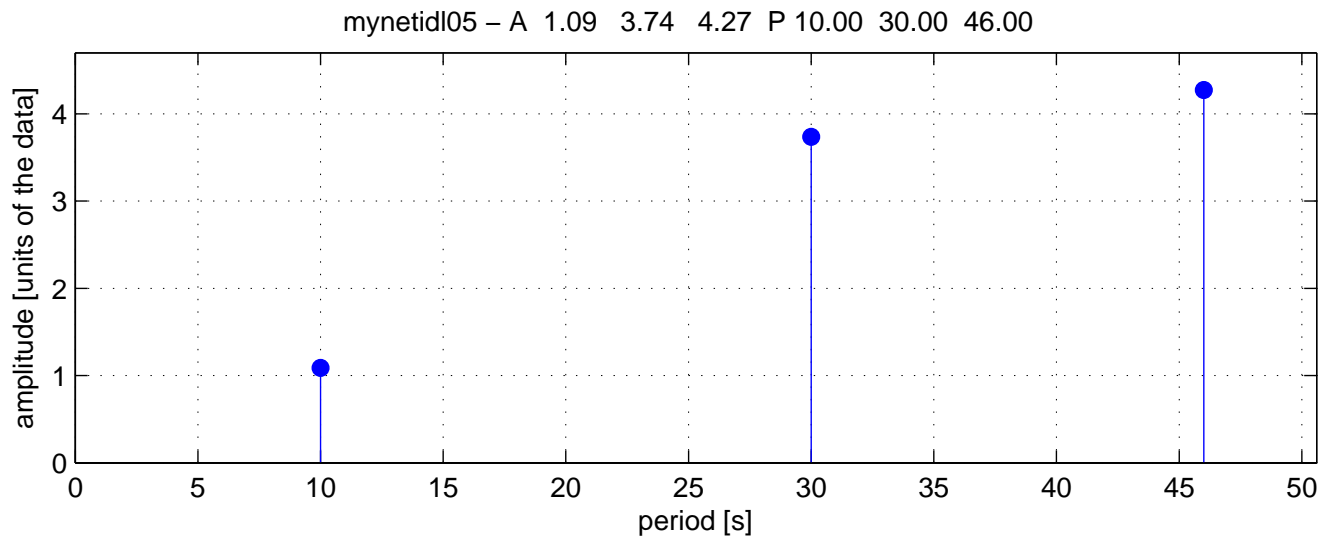
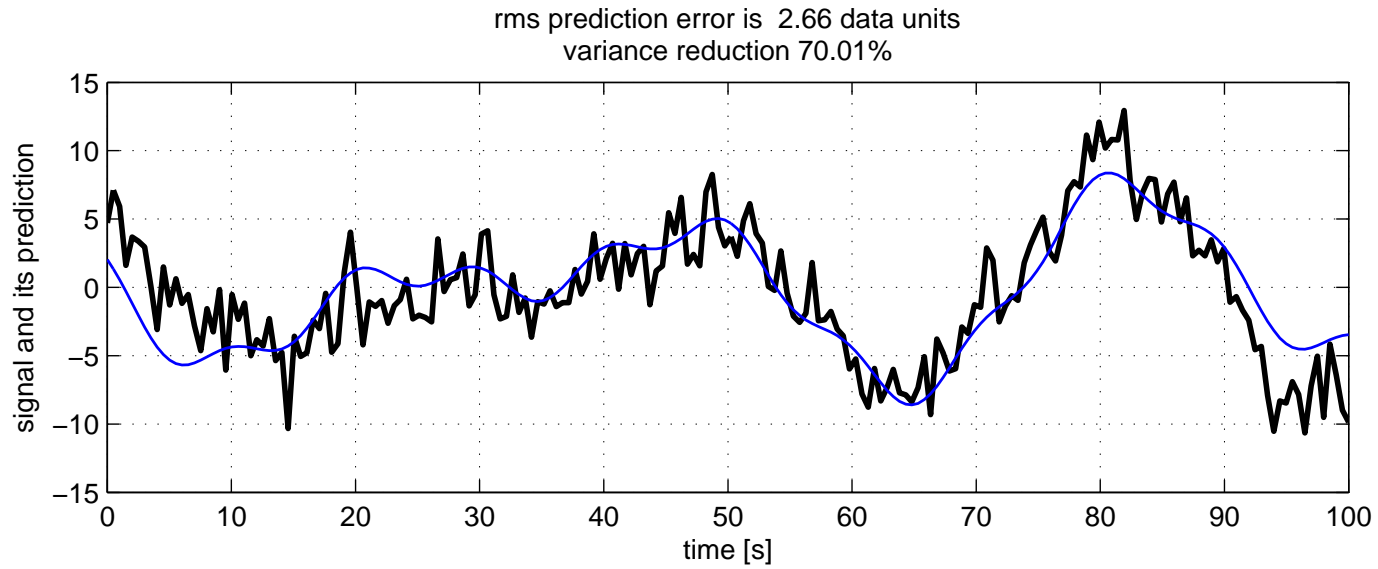
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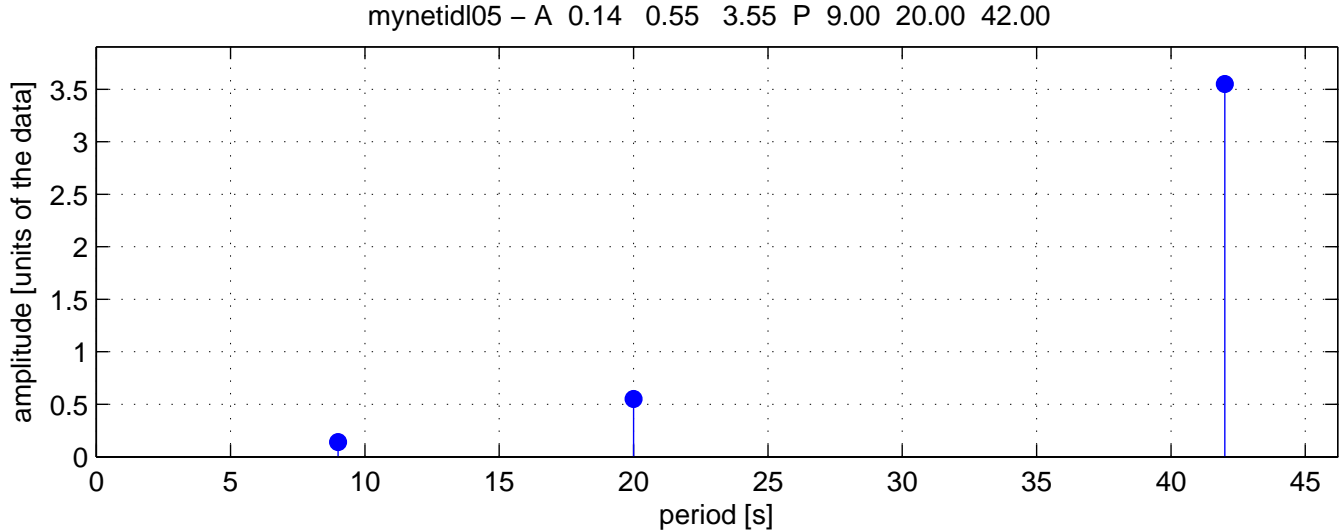
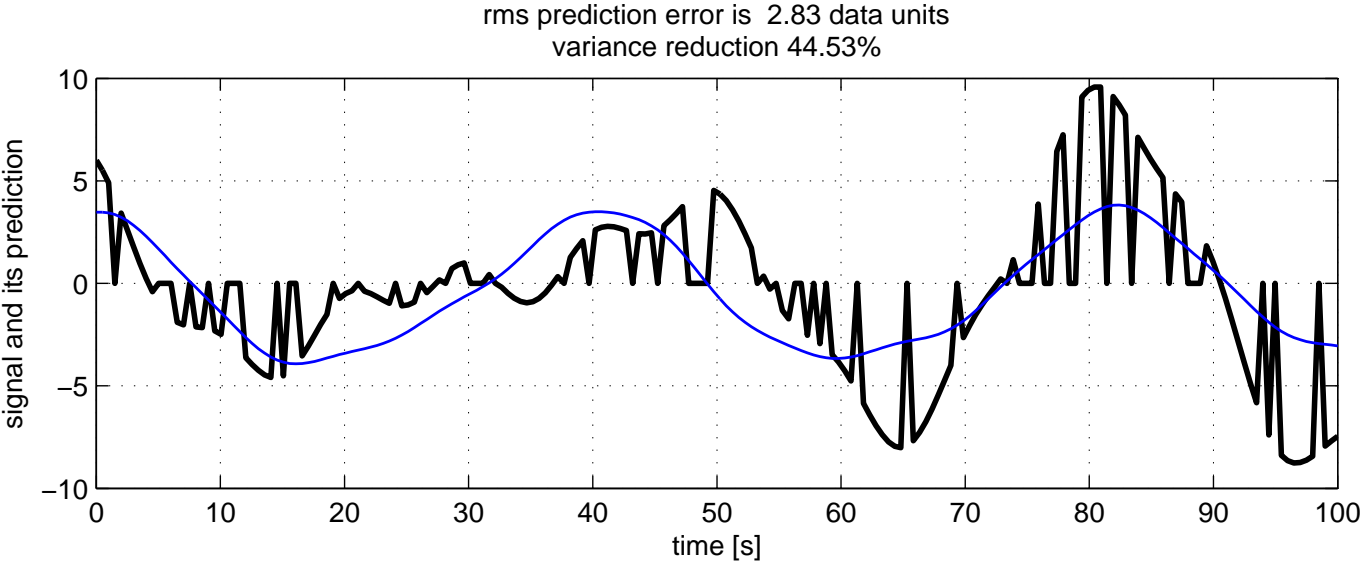
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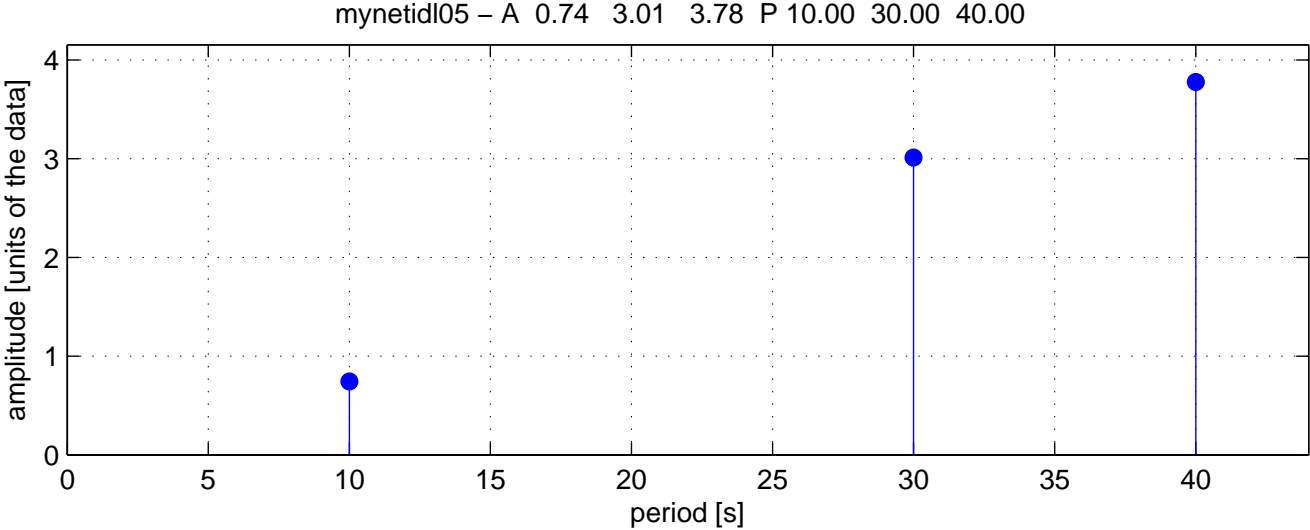
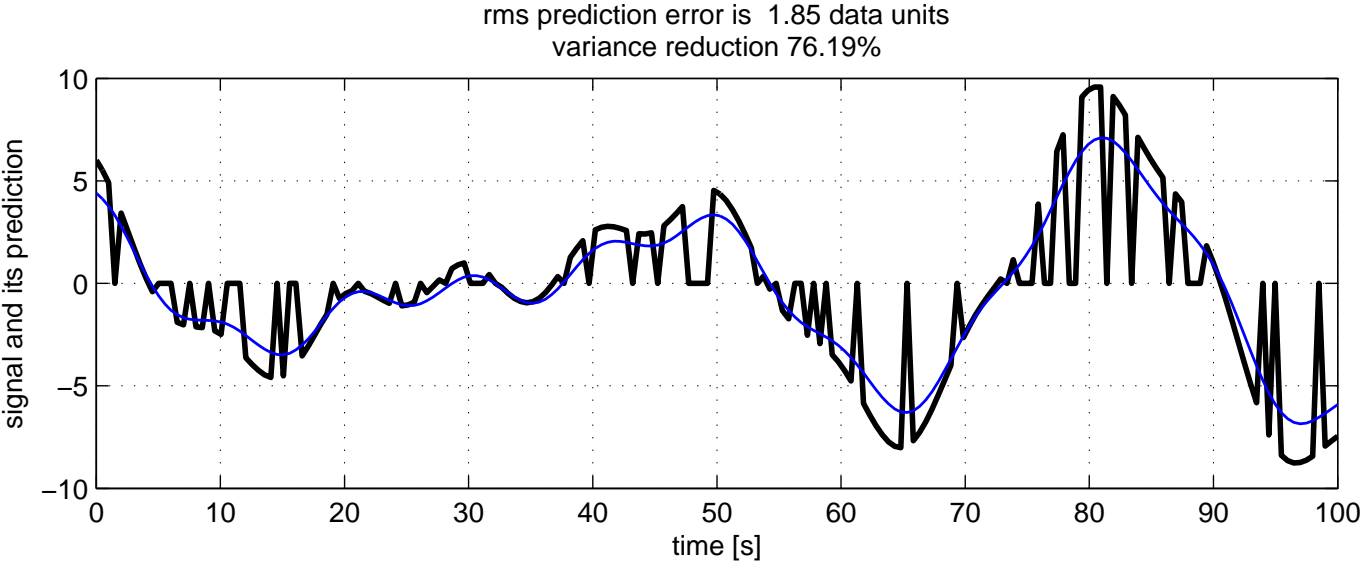
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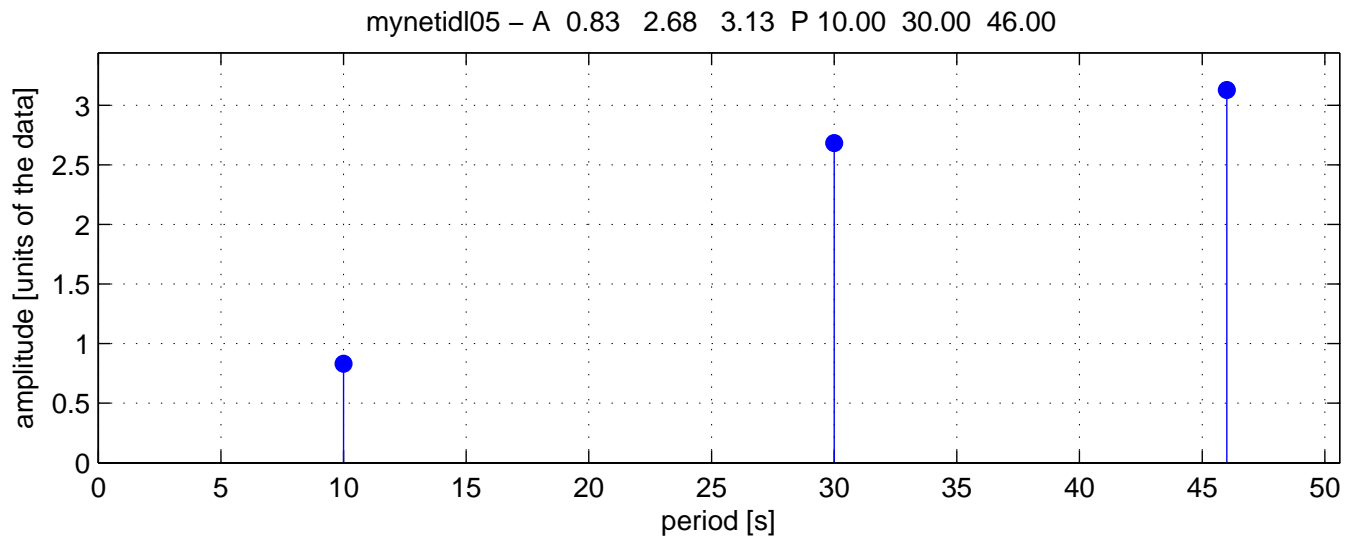
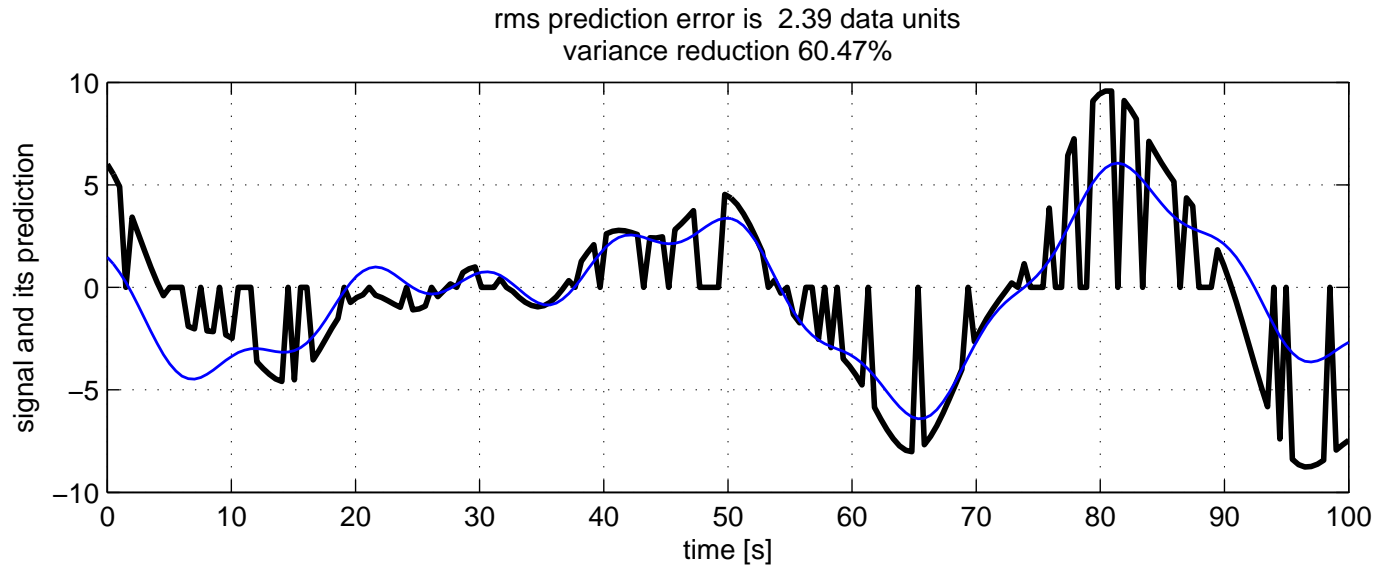
Homework 3 — Data reduction



Homework 3 — Data reduction



Homework 3 — Data reduction



Homework 4 — All of the above

