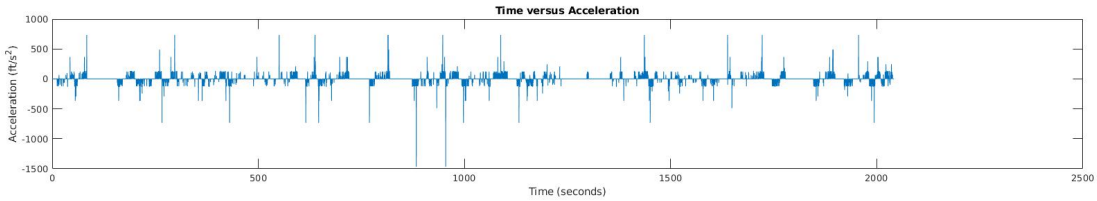
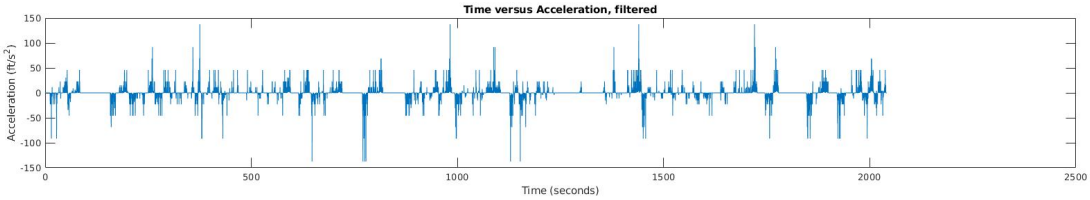
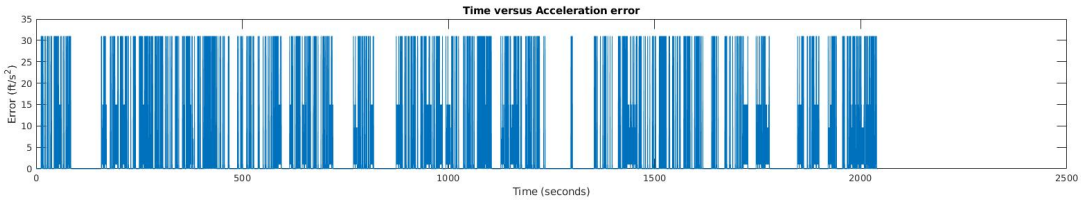
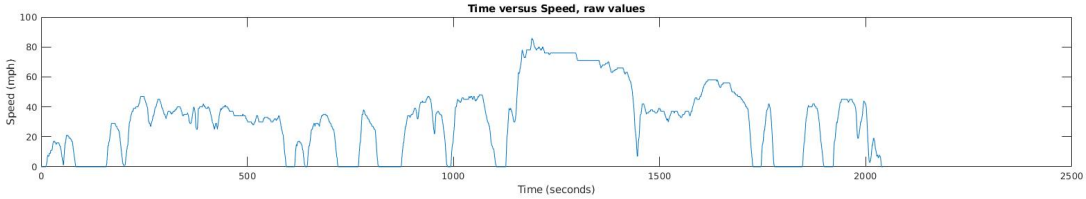
Peter Dranishnikov
Lab 4
EEL 4685c Section 01
Due: February 26th, Spring 2019

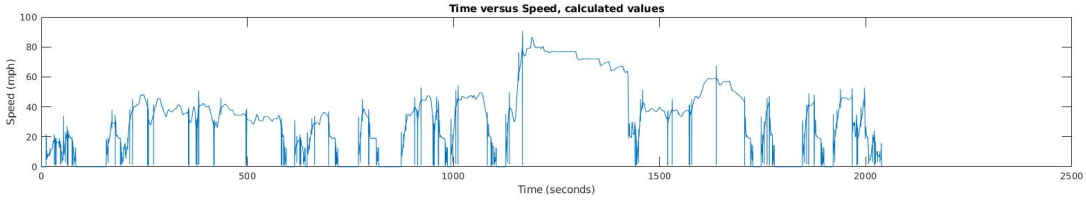
This lab involved the continued use of the datalogs of the professor's vehicle's CAN bus.
Images:
Using datalog1.csv as input

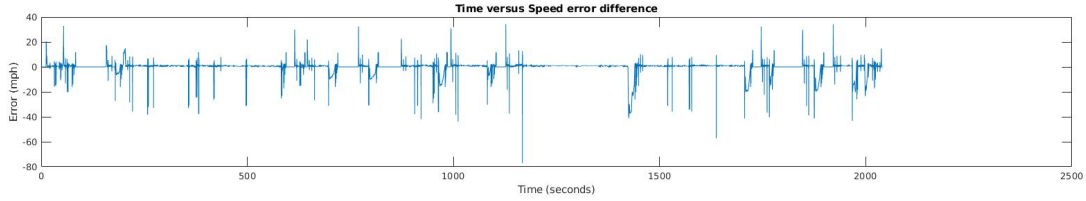




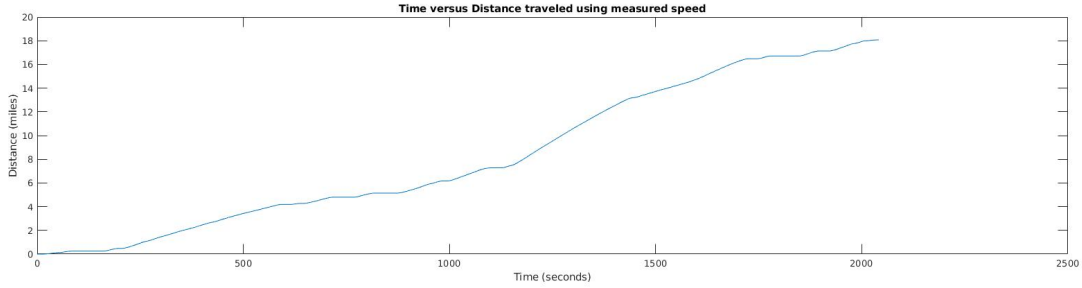


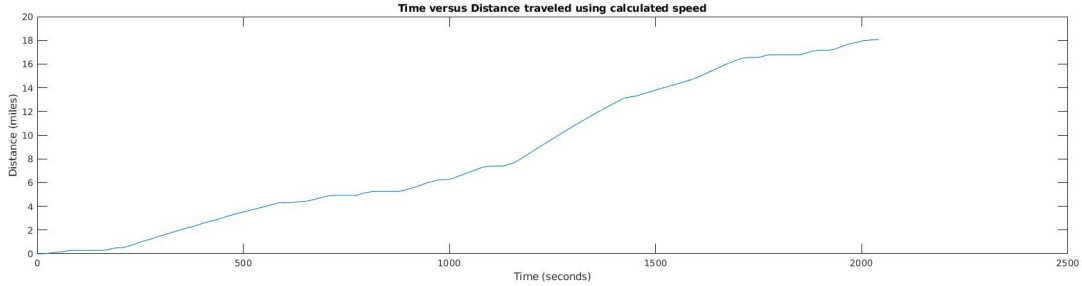




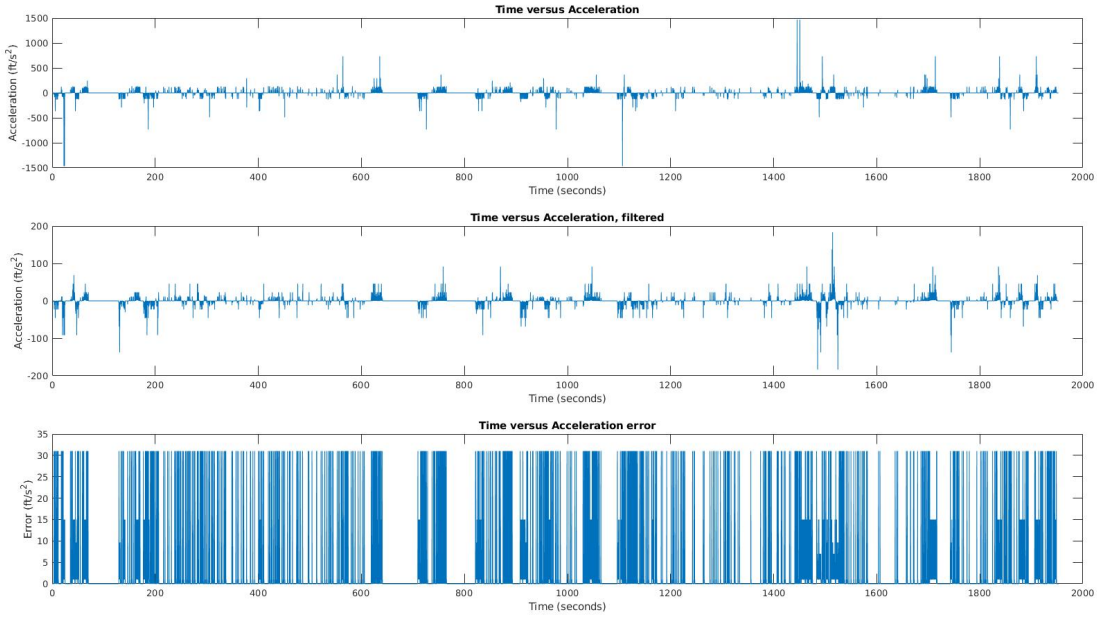


Peter Dranishnikov
Lab 4
EEL 4685c Section 01
Due: February 26th, Spring 2019

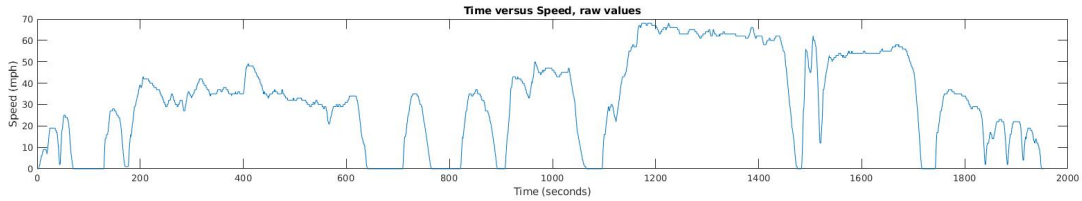


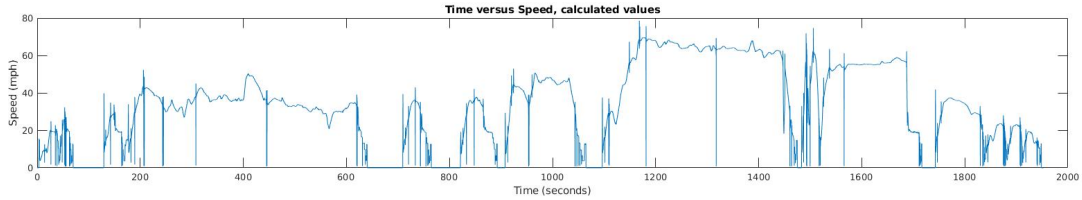


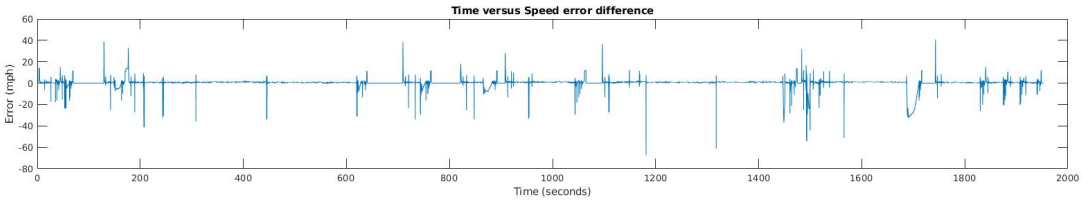
Using datalog4.csv as input:

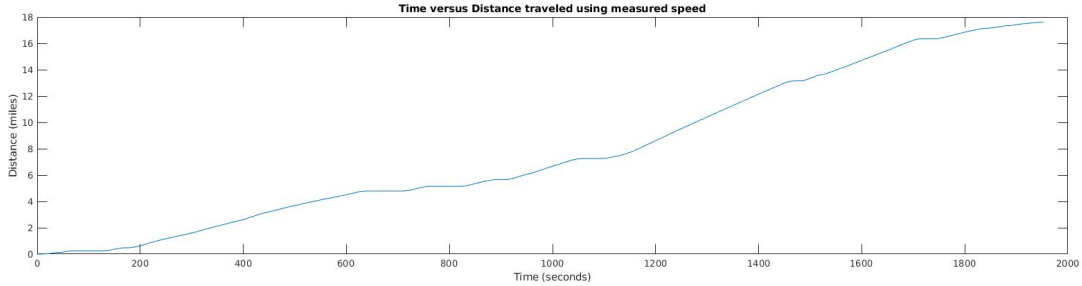


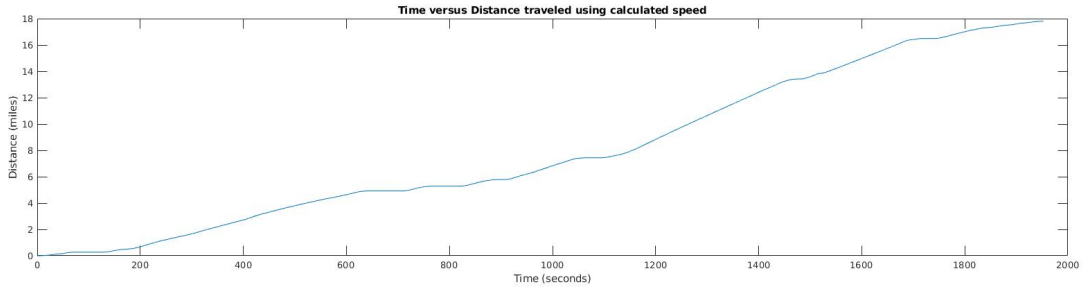
Peter Dranishnikov
Lab 4
EEL 4685c Section 01
Due: February 26th, Spring 2019











Peter Dranishnikov
Lab 4
EEL 4685c Section 01
Due: February 26th, Spring 2019

Matlab functions:

```
% Author: Peter Dranishnikov
% Lab 4
% EEL 4685c Section 01
% Due: February 26th, Spring 2019
%lab 4 part 1a-d
function [result, result_filter] = part1(filename)
    f = fopen(filename,'r');

    junk = fgetl(f);  % remove header line w/o worrying about contents
    % Assume: Time (sec), Accel. Position (%), Boost (PSI), Fuel Economy (MPG),
Gear Position (Gear), Engine RPM (RPM), Vehicle Speed (mph)
    % read file, one data point per row
    data = reshape(fscanf(f,'%f, %f, %f, %f, %d, %d, %d'), 7,[])';
    disp(sprintf('%d data points read', size(data,1)));    %report how many points
were read from file

    dat_len = length(data);
    spd = data(:,7);
    time = data(:,1);
    time_diff = data(2:dat_len,1)-data(1:dat_len-1,1);
    %part a
    acc = [0;(-22/15)*((spd(2:1:dat_len) - spd(1:1:dat_len-1)) ./ time_diff)];

    subplot(3,1,1);
    plot(time,acc);
    title("Time versus Acceleration");
    xlabel("Time (seconds)");
    ylabel("Acceleration (ft/s^2)");

    %part b
    %i'm in dsp
    avg = (1/32).*ones(1,32);
    spd_window = filter(avg, 1, spd);
    acc_filter = [0; (-22/15)*((spd_window(2:1:dat_len) - spd_window(1:1:dat_len-
1)) ./ time_diff)];
    subplot(3,1,2);
    plot(time, acc_filter);
    title("Time versus Acceleration, filtered");
    xlabel("Time (seconds)");
    ylabel("Acceleration (ft/s^2)");

    %part c
    subplot(3,1,3);
    perdiff = abs((acc - acc_filter)./acc_filter);
    perdiff(~isfinite(perdiff)) = 0;
    plot(time, perdiff);
    title("Time versus Acceleration error");
    xlabel("Time (seconds)");
    ylabel("Error (ft/s^2)");

    %part d
```

Peter Dranishnikov
Lab 4
EEL 4685c Section 01
Due: February 26th, Spring 2019

```
    result = acc;
    result_filter = acc_filter;
end

% Author: Peter Dranishnikov
% Lab 4
% EEL 4685c Section 01
% Due: February 26th, Spring 2019
%lab 4 part 2
function [result] = part2(filename)
    f = fopen(filename,'r');

    junk = fgetl(f);  % remove header line w/o worrying about contents
    % Assume: Time (sec), Accel. Position (%), Boost (PSI), Fuel Economy (MPG),
Gear Position (Gear), Engine RPM (RPM), Vehicle Speed (mph)
    % read file, one data point per row
    data = reshape(fscanf(f,'%f, %f, %f, %f, %d, %d, %d'), 7,[])';
    disp(sprintf('%d data points read', size(data,1)));    %report how many points
were read from file

    spd = data(:,7);
    time = data(:,1);
    gear_ratio = [0, 3.45, 1.95, 1.30, 0.97, 0.78, 0.67]; %add zero in front for
easier concat
    rpm = data(:,6);
    gear = data(:,5) + 1;
    filt_spd = spd;
    filt_spd(gear > 1) = 0;

    corrected_ratio = gear_ratio(gear)' + filt_spd;

    spd_calc = (rpm .* (60 * pi * 25)) ./ ((5280 * 12 * 4.11) .* corrected_ratio);
    spd_calc(~isfinite(spd_calc)) = 0;

    spd_diff = spd_calc - spd;

    subplot(3,1,1);
    plot(time, spd);
    title("Time versus Speed, raw values");
    xlabel("Time (seconds)");
    ylabel("Speed (mph)");

    subplot(3,1,2);
    plot(time, spd_calc);
    title("Time versus Speed, calculated values");
    xlabel("Time (seconds)");
    ylabel("Speed (mph)");

    subplot(3,1,3);
    plot(time, spd_diff);
    title("Time versus Speed error difference");
    xlabel("Time (seconds)");
```

Peter Dranishnikov
Lab 4
EEL 4685c Section 01
Due: February 26th, Spring 2019

```
    ylabel("Error (mph)");

    result = spd_calc;
end

% Author: Peter Dranishnikov
% Lab 4
% EEL 4685c Section 01
% Due: February 26th, Spring 2019
%lab 4 part 3
function [result, result_2] = part3(filename)
    f = fopen(filename,'r');

    junk = fgetl(f);  % remove header line w/o worrying about contents
    % Assume: Time (sec), Accel. Position (%), Boost (PSI), Fuel Economy (MPG),
Gear Position (Gear), Engine RPM (RPM), Vehicle Speed (mph)
    % read file, one data point per row
    data = reshape(fscanf(f,'%f, %f, %f, %f, %d, %d, %d'), 7,[])';
    disp(sprintf('%d data points read', size(data,1)));    %report how many points
were read from file

    dat_len = length(data);
    spd = data(:,7);
    time = data(:,1);
    time_diff = data(2:dat_len,1)-data(1:dat_len-1,1);

    dist_val = cumsum([0;(0.5 .* spd(2:dat_len) + 0.5 .* spd(1:dat_len-1)) .*
(time_diff./3600)]);

    subplot(2,1,1);
    plot(time, dist_val);
    title("Time versus Distance traveled using measured speed");
    xlabel("Time (seconds)");
    ylabel("Distance (miles)");

    %copy and paste from part 2 to meet submission compliance
    gear_ratio = [0, 3.45, 1.95, 1.30, 0.97, 0.78, 0.67]; %add zero in front for
easier concat
    rpm = data(:,6);
    gear = data(:,5) + 1;
    filt_spd = spd;
    filt_spd(gear > 1) = 0;

    corrected_ratio = gear_ratio(gear)' + filt_spd;
    spd_calc = (rpm .* (60 * pi * 25)) ./ ((5280 * 12 * 4.11) .* corrected_ratio);
    spd_calc(~isfinite(spd_calc)) = 0;

    dist_calc = cumsum([0;(0.5 .* spd_calc(2:dat_len) + 0.5 .* spd_calc(1:dat_len-
1)) .* (time_diff./3600)]);

    subplot(2,1,2);
    plot(time, dist_calc);
```

Peter Dranishnikov
Lab 4
EEL 4685c Section 01
Due: February 26th, Spring 2019

```
    title("Time versus Distance traveled using calculated speed");
    xlabel("Time (seconds)");
    ylabel("Distance (miles)");

    result = dist_val;
    result_2 = dist_calc;
end
```