```
TIME_OFFSET = 0.9;
ERROR_WITH_ROLLER_MEASURMENT = 0.0005;
ERROR_FOR_CAPSTONE_MEASUREMENTS = 0.01;

one_mass_raw_data = readtable('one_mass.csv');
```

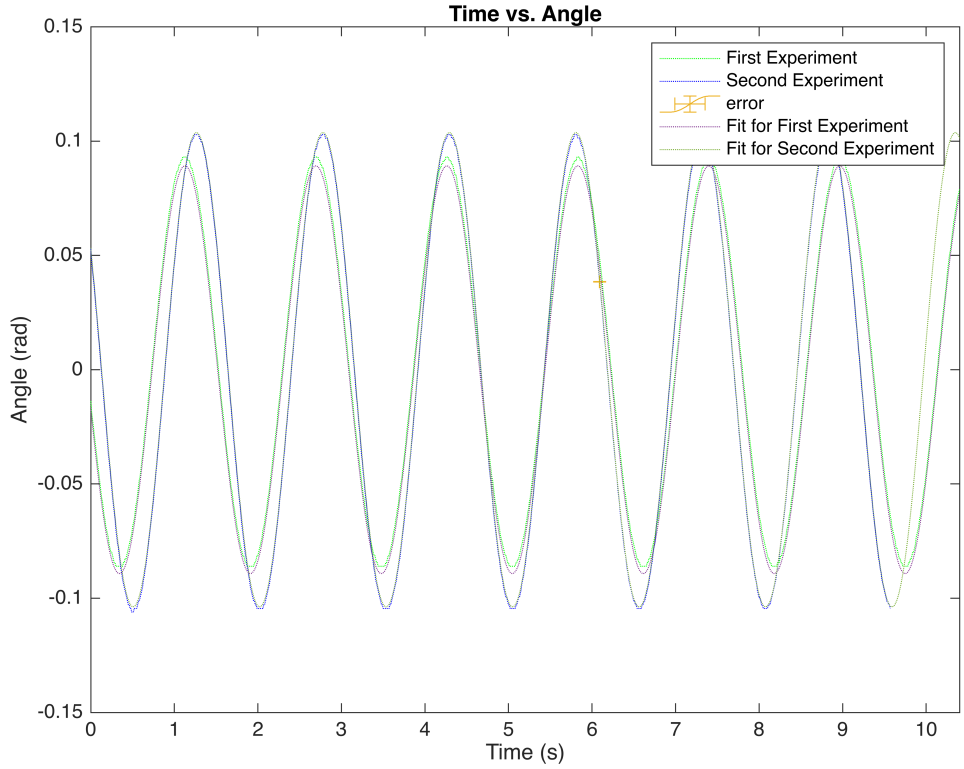
```
Warning: Column headers from the file were modified to make them valid MATLAB identifiers
before creating variable names for the table. The original column headers are saved in the
VariableDescriptions property.
Set 'VariableNamingRule' to 'preserve' to use the original column headers as table variable names.
```

```
time_vals_for_run_one = one_mass_raw_data.time1;
angle_vals_for_run_one = one_mass_raw_data.angle1 -
mean(one_mass_raw_data.angle1, "omitmissing");
plot(time_vals_for_run_one, angle_vals_for_run_one,':', "Color", "green")
hold on
time_vals_for_run_two = one_mass_raw_data.time2 - TIME_OFFSET;
angle_vals_for_run_two = one_mass_raw_data.angle2 -
mean(one_mass_raw_data.angle2, "omitmissing");
plot(time_vals_for_run_two, angle_vals_for_run_two,':', "Color", "blue")
% hold on
errorbar(time_vals_for_run_two(700:700,1:1),
angle_vals_for_run_two(700:700,1:1), 0.0001, 0.0001, 0.0001, 0.0001);
% cftool(time_vals_for_run_one, angle_vals_for_run_one, [],
standard_error_first_run)
% cftool(time_vals_for_run_two, angle_vals_for_run_two, [],
standard_error_second_run)
plot(fit_for_run_one,':')
plot(fit_for_run_two,':')

legend('First Experiment', 'Second Experiment', "error", 'Fit for First
Experiment',...
    'Fit for Second Experiment')

xlabel("Time (s)")
ylabel("Angle (rad)")
xlim([0, max(time_vals_for_run_one)])
title("Time vs. Angle")
hold off

hold off
one_mass = readtable('lab_2_mesurments_one_mass.xlsx');
two_masses= readtable('lab_2_mesurments_two_masses.xlsx');
two_masses.actual_height_from_top = two_masses.Var4;
two_masses.omega_from_capstone = two_masses.Var5;
hold off
```




```
% One Mass
scatter(one_mass.actual_height_from_top, one_mass.omega_from_capstone,
"Color", "green", 'DisplayName','one mass')
hold on
errorbar(one_mass.actual_height_from_top, one_mass.omega_from_capstone,
ERROR_WITH_ROLLER_MEASURMENT , ERROR_WITH_ROLLER_MEASURMENT,
ERROR_FOR_CAPSTONE_MEASUREMENTS, ERROR_FOR_CAPSTONE_MEASUREMENTS, "Color",
"green", 'DisplayName','one mass - error', 'HandleVisibility','off');
hold on
% Two Masses
scatter(two_masses.Var4, two_masses.Var5, "Color", "blue",
'DisplayName','two masses')
hold on
errorbar(two_masses.Var4, two_masses.Var5, ERROR_WITH_ROLLER_MEASURMENT ,
ERROR_WITH_ROLLER_MEASURMENT, ERROR_FOR_CAPSTONE_MEASUREMENTS,
ERROR_FOR_CAPSTONE_MEASUREMENTS, "Color", "blue", 'DisplayName','two masses
- error', 'HandleVisibility','off');
hold on
% Fit
fitted_function = @(x) (9.81/(x+0.07))^0.5;
fitted_function_2 = @(x) (9.81/(x+0.05))^0.5;
% cftool(two_masses.Var4, two_masses.Var5, [], ones(1,
length(two_masses.Var5)) * ERROR_FOR_CAPSTONE_MEASUREMENTS)
fplot(fitted_function, [min(one_mass.actual_height_from_top),
max(one_mass.actual_height_from_top)],'--', "Color", [0.9290, 0.6940,
0.1250], 'DisplayName','fit')
```

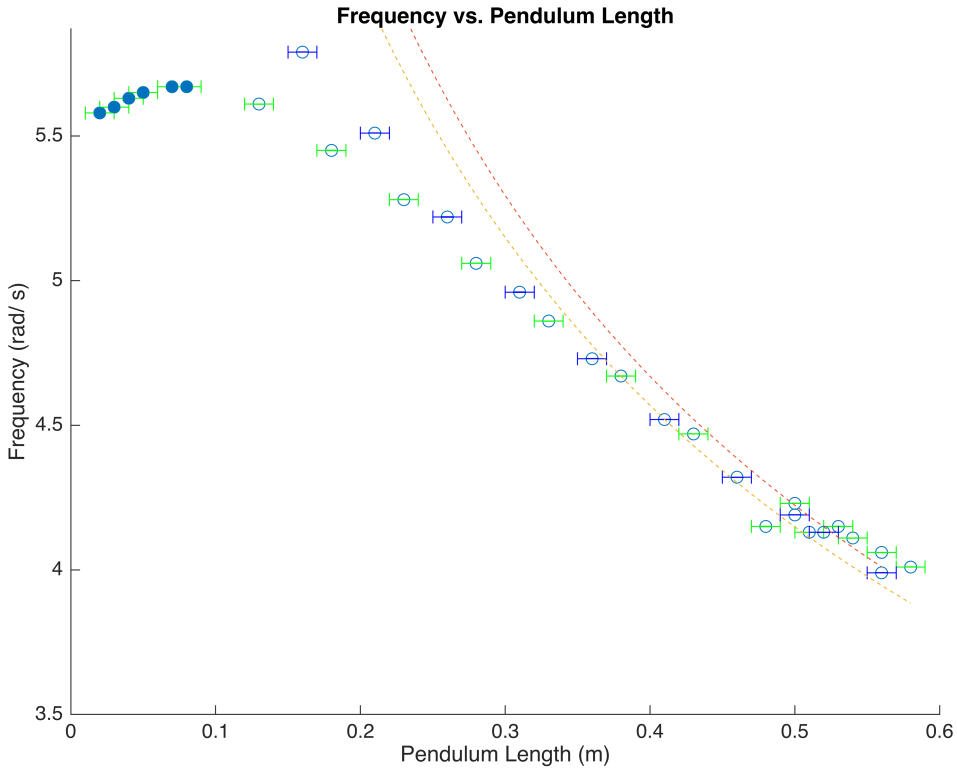
```
Warning: Function behaves unexpectedly on array inputs. To improve performance, properly vectorize
your function to return an output with the same size and shape as the input arguments.
```

```
fplot(fitted_function_2, [min(two_masses.actual_height_from_top),
max(two_masses.actual_height_from_top)],'--', "Color", [0.9290, 0.2940,
0.150], 'DisplayName','fit')
```

```
Warning: Function behaves unexpectedly on array inputs. To improve performance, properly vectorize
your function to return an output with the same size and shape as the input arguments.
```

```
hold on
% Excluded Points
excluded_vals_in_one_mass = filter_data_by_x_vals(one_mass, 0.1);
excluded_vals_in_two_masses = filter_data_by_x_vals(two_masses, 0.1);
hold on
scatter(excluded_vals_in_two_masses.actual_height_from_top,
excluded_vals_in_two_masses.omega_from_capstone, "filled", "Color", "red",
'DisplayName','one mass - excluded values for fit')
hold on
scatter(excluded_vals_in_one_mass.actual_height_from_top,
excluded_vals_in_one_mass.omega_from_capstone, "filled", "Color", "red",
'DisplayName','two masses - excluded values for fit')


hold off
% legend
ylim([3.5, max(one_mass.omega_from_capstone + 0.2)])
title("Frequency vs. Pendulum Length")
xlabel("Pendulum Length (m)")
ylabel("Frequency (rad/ s)")
```




```
function error = get_std(y_vals)
    error = ones(1, length(y_vals)) .* ...
        std(y_vals - mean(y_vals, "omitmissing"), "omitmissing") ...
        ./ sqrt(length(y_vals));
end

function filltered_data = filter_data_by_x_vals(table, min_val)
    filltered_data = table(table.actual_height_from_top < min_val, :);
end
```