MATLAB Section

In this section we will provide the results and code for problem 2 of the homework.

Results

In running our proposed optimization we found the optimal value of x_{ml} to be the follwoing output:

```
Optimal x : [0.48194    -0.46569     0.93641     0.92966]
```

We also plotted the measurement nonlinearity shown below.

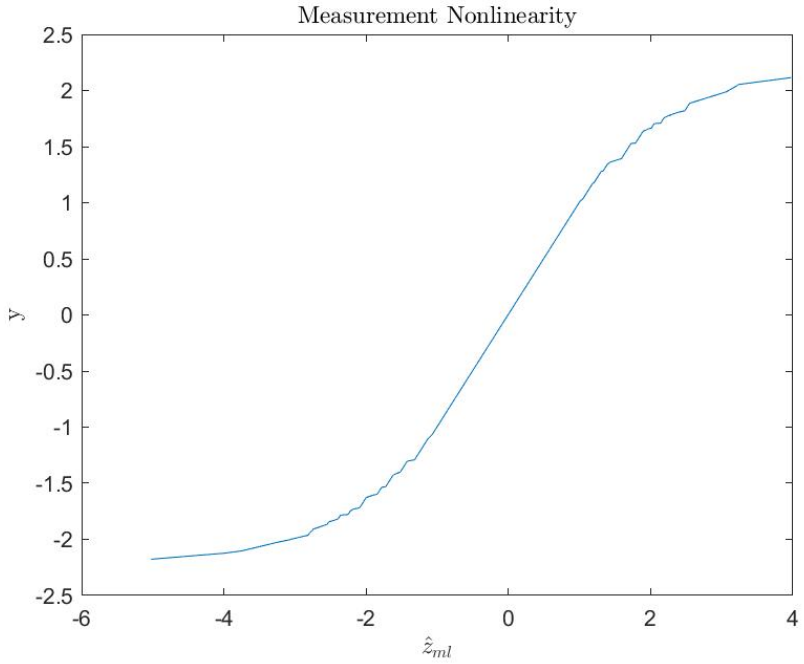

Figure 1: Measurement nonmlinearity

Code The follwoing code was used to produce these results:

```
%%
%  File: hw8 .m
%
%  Author: Thomas Kost
%
%  Date: 10 February 2022
%
```

```
%  @brief homework 8 matlab problems concerning nonlinear measurement
%  noise
%
clc,clear all,close all;
nonlin_meas_data;
disp('Determining Measurement Nonlinearity');
disp('-------------------------------------');
disp(' ');
disp('Beginning Optimization ...');
cvx_begin quiet
variables z(m) x(n)
maximize(-(m/2)*log(2*pi*sigma^2)-(1/(2*sigma^2))*sum((A*x-z).^2))
subject to
   for i = 1:m-1
       y(i+1)-y(i) >= alpha*(z(i+1)-z(i));
       y(i+1)-y(i) <= beta*(z(i+1)-z(i));

   end
cvx_end
disp(' ');
disp(['Optimal x : ', num2str(x')]);
nl_plot = figure();
plot(z,y);
title("Measurement Nonlinearity", 'Interpreter', 'latex');
xlabel('$\hat{z}_{ml}$', 'Interpreter', 'latex');
ylabel('y', 'Interpreter', 'latex');
saveas(nl_plot, 'nl_plot.jpg');
```