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% ECE 403 Lab 3
% Author: Noah Rondeau

load D_build_tr.mat
load D_build_te.mat

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%
% TRAINING
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% format training data
Xtr = D_build_tr(1:8,:);
Ytr = D_build_tr(9:10,:);

X_hat = [Xtr' ones(640, 1)];
Y_hat = Ytr';

W_hat = pinv(X_hat)*Y_hat;
W = W_hat(1:8, :);
b = W_hat(9, :)' ;

%
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%
% TESTING
%
=====
%

% format testing data
Xte = D_build_te(1:8,:);
Yte = D_build_te(9:10,:);

% predict values
Yp = W' * Xte + b;

% calculate overall relative error
ep = norm(Yte - Yp, 'fro') / norm(Yte, 'fro');

fprintf('===== RESULTS =====\n');
fprintf('Overall relative error = %f% \n', 100*ep);

figure(1);
hold on;
axis([0 140 0 45]);
plot(1:128, Yte(1,:), 'b');
plot(1:128, Yp(1,:), 'r');
title('Comparison of true and predicted Y(1) (heating load)');
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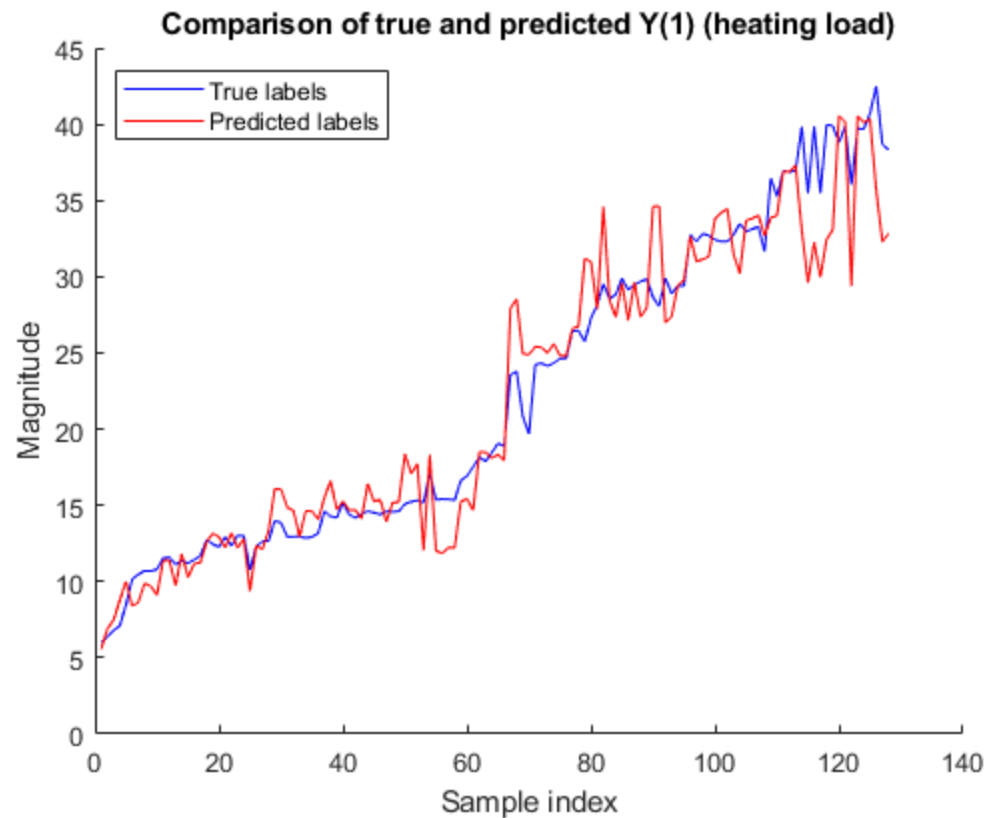
legend('True labels', 'Predicted labels', 'Location', 'northwest');
xlabel('Sample index');
ylabel('Magnitude');
hold off;

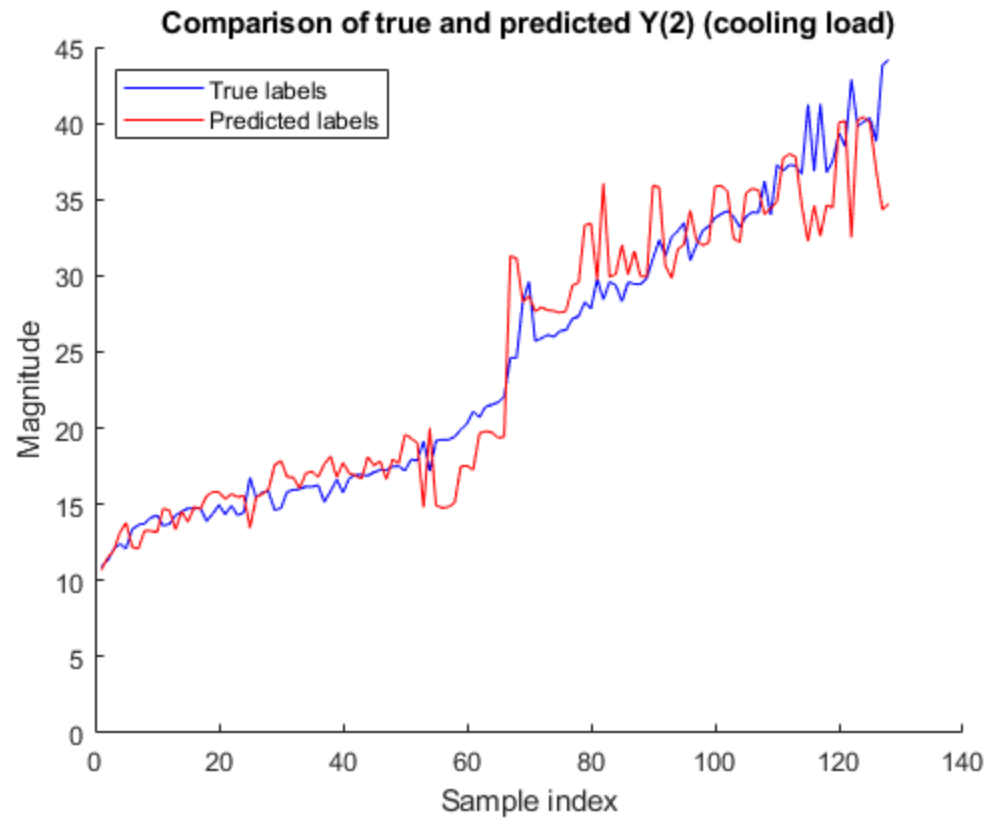
figure(2);
hold on;
axis([0 140 0 45]);
plot(1:128, Yte(2,:), 'b');
plot(1:128, Yp(2,:), 'r');
title('Comparison of true and predicted Y(2) (cooling load)');
legend('True labels', 'Predicted labels', 'Location', 'northwest');
xlabel('Sample index');
ylabel('Magnitude');
hold off;

fprintf('\n\n');

===== RESULTS =====
Overall relative error = 10.869144

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