```
% EE698Z: Machine Learning for Wireless Communications
% MATLAB ASSIGNMENT : SBL and Relevance Vector Machine
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M=40;
N=20;
Do=7;
density = Do/M;

noise = [-20, -15, -10, -5, 0];% dB matrix
vars = 10.^(noise/10);% noise variance matrix
NMSE = zeros(5,1);

for itr = 1:2000
    nmse = zeros(5);

    for j = 1:5

        phi = randn(N,M);%Qno 2 part-1
        w = sprandn(M,1, density);%Qno 2 part-2
        mu = ones(M,1);
        A = diag(100* ones(M,1));
        t = phi*w + sqrt(vars(j)).*randn(N,1);%Qno 2 part-3
        %updating parameters
        while 1

            Sig = inv((1/vars(j)) * phi' * phi + A);% eqn-12
            mu_new = (1/vars(j)) * Sig * phi' * t;% eqn-13

            if (norm(mu-mu_new)^2)/(norm(mu)^2) <= 1e-3
                mu = mu_new;
                break
            else
                mu = mu_new;
            end
            G = 1 - diag(A) .* diag(Sig);% gamma
            A = diag(G./(mu.^2 +eps));% alpha

        end

        Wmp = mu;
        nmse(j) = (norm(Wmp-w)^2/norm(w)^2);
    end

    NMSE= NMSE + nmse;
end

NMSE = NMSE ./ itr;% Average value after itr iterations
semilogy(noise,NMSE,'-o');%Qno 5 plot of NMSE

xlabel('Noise Variance (in dB)');
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ylabel('Average NMSE');
title('NMSE vs Noise Variance');
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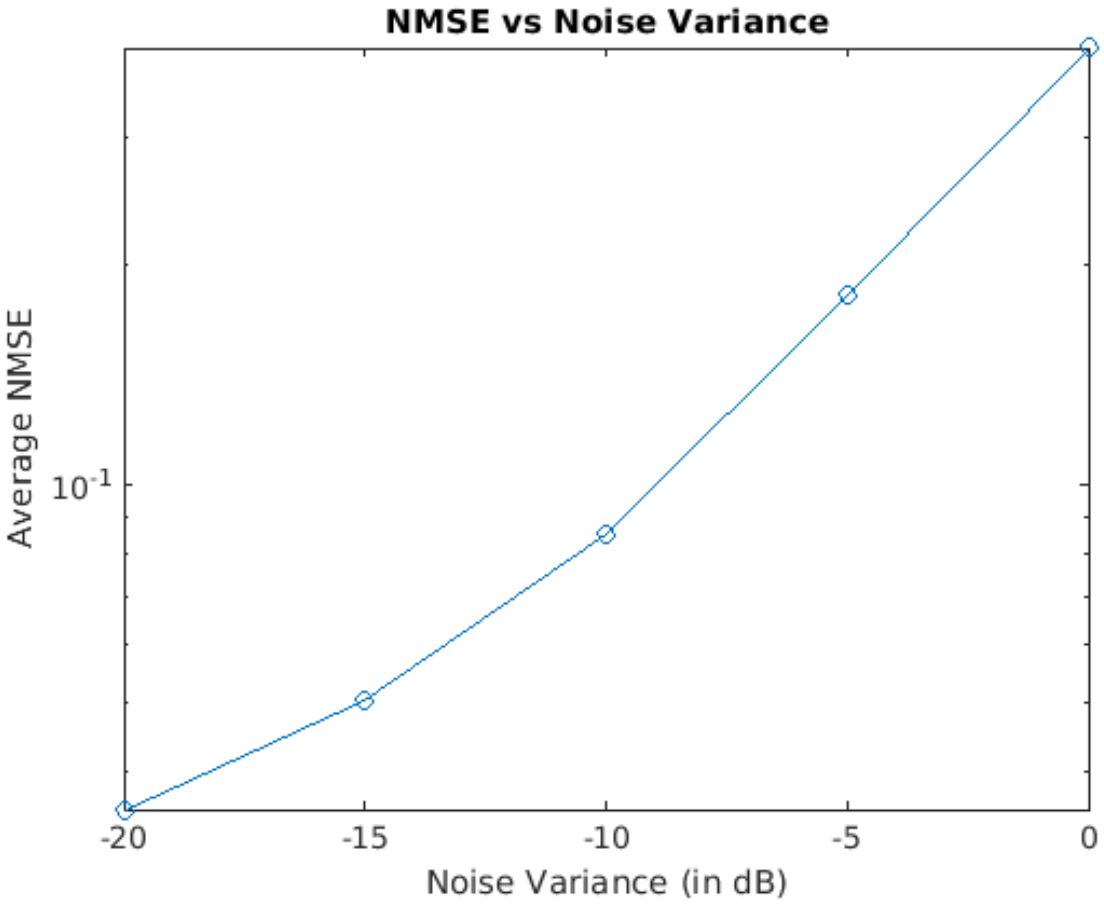

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