INPUT

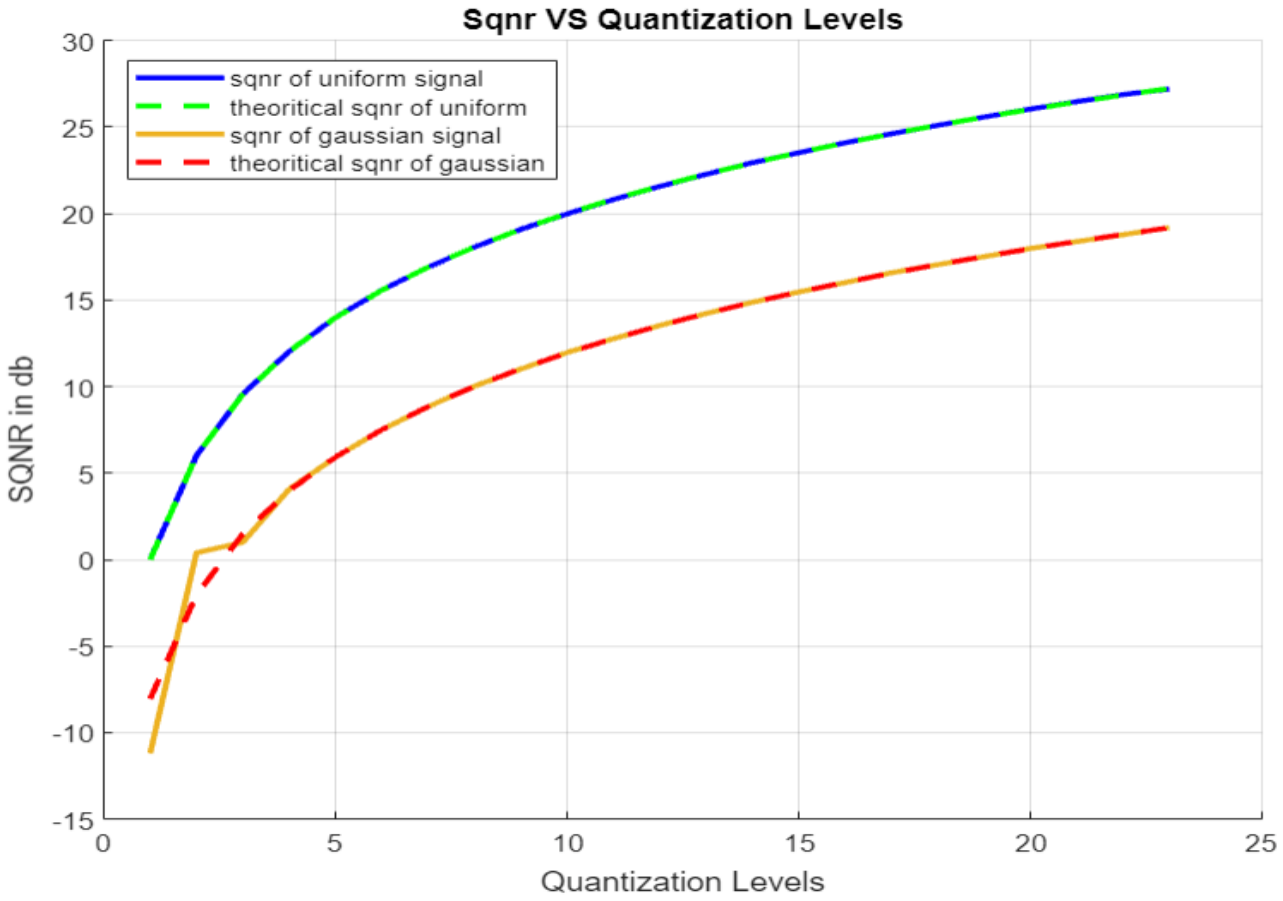
```
clc;
close all;
Q=23;
levels = 1:Q;
N=100000;
x=rand(1,100000)-1/2;
signal_power_unif = sum((x).^2) / N ;
mx = max(x);
mn = min(x);
step = (mx-mn)./levels;
for i= 1:Q
 index = round((x-mn)/step(i));
 xq = mn+ index*step(i);
 noise = xq - x;
 noise_power = sum((noise).^2) / N ;
 sqnr_u(i) = 10*log10(signal_power_unif/noise_power);
 disp([i,"-",sqnr_u(i)]);
end
hold on ;
plot(levels,sqnr_u,'b',LineWidth=2);
plot(levels, 10*log10(12*signal_power_unif*(levels.^2)/(mx-mn)^2),'--g',LineWidth=2);

%Gaussian Signal

y=randn(1,N)/sqrt(12);
maxy = max(y);
miny = min(y);
disp(maxy);
disp(miny);
signal_power = sum((y).^2) / N ;
step = (maxy-miny)./levels;
for i= 1:Q
 in = round((y-miny)/step(i));
 yq = miny + in*step(i);
 noise = yq - y;
 noise_power = sum((noise).^2) / N ;
 sqnr(i) = 10*log10(signal_power/noise_power);
 disp([(i),"-",sqnr(i)]);
end
plot(levels,sqnr,LineWidth=2);
plot(levels, 10*log10(12*signal_power*(levels.^2)/(maxy-miny)^2) ,'--r',LineWidth=2);
xlabel("Quantization Levels");
ylabel("SQNR in db");
title("Sqnr VS Quantization Levels");
legend('sqnr of uniform signal' , 'theoritical sqnr of uniform','sqnr of gaussian
signal','theoritical sqnr of gaussian','Location','northwest')
grid on;
```

SQNR (db) of Uniform signal

"1"	"-"	"0.028462"
"2"	"-"	"6.0378"
"3"	"-"	"9.5634"
"4"	"-"	"12.0277"
"5"	"-"	"13.9845"
"6"	"-"	"15.5641"
"7"	"-"	"16.9263"
"8"	"-"	"18.0737"
"9"	"-"	"19.1092"
"10"	"-"	"20.0051"
"11"	"-"	"20.8494"
"12"	"-"	"21.573"
"13"	"-"	"22.2909"
"14"	"-"	"22.9296"
"15"	"-"	"23.5096"
"16"	"-"	"24.0853"
"17"	"-"	"24.6165"
"18"	"-"	"25.113"
"19"	"-"	"25.5915"
"20"	"-"	"26.0613"
"21"	"-"	"26.4578"
"22"	"-"	"26.8482"
"23"	"-"	"27.2339"

SQNR (db) of Gaussian Signal

"1"	"-"	"-10.7429"
"2"	"-"	"0.36034"
"3"	"-"	"1.4741"
"4"	"-"	"4.3804"
"5"	"-"	"6.2734"
"6"	"-"	"7.8585"
"7"	"-"	"9.1965"
"8"	"-"	"10.351"
"9"	"-"	"11.3889"
"10"	"-"	"12.2887"
"11"	"-"	"13.128"
"12"	"-"	"13.8723"
"13"	"-"	"14.5709"
"14"	"-"	"15.2235"
"15"	"-"	"15.8129"
"16"	"-"	"16.3878"
"17"	"-"	"16.9087"
"18"	"-"	"17.3952"
"19"	"-"	"17.8769"
"20"	"-"	"18.3224"
"21"	"-"	"18.7335"
"22"	"-"	"19.1441"
"23"	"-"	"19.5248"


Sqnr VS Quantization Levels
sqnr of uniform signal
theoritical sqnr of uniform
sqnr of gaussian signal
theoritical sqnr of gaussian
SQNR in db
Quantization Levels
30
25
20
15
10
5
0
-5
-10
-15
0
5
10
15
20
25