

```

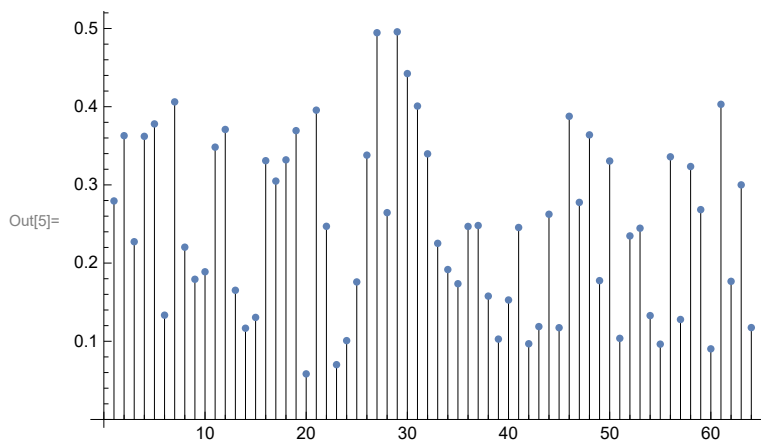
In[1]:= MyPeriodogram[x_, col_ : Black, range_ : All] :=
  ListPlot[Abs@Fourier[x][[ ;; Ceiling[Dimensions[x][[1]]/2]]],
    PlotRange -> range, Filling -> Axis, FillingStyle -> {Thickness[0.05], col}]
MyHighpass[a_] := ListConvolve[{-1, -2, 7, -2, -1}/15.0,
  ListConvolve[{-1, -2, 7, -2, -1}/15.0, a, 1, 0], 1, 0]
SetDirectory@NotebookDirectory[];
(* First some random sequence *)
seqUnfiltered = RandomReal[] & /@ Range[128];

```

```

In[5]:= MyPeriodogram[seqUnfiltered - 0.5]

```



```

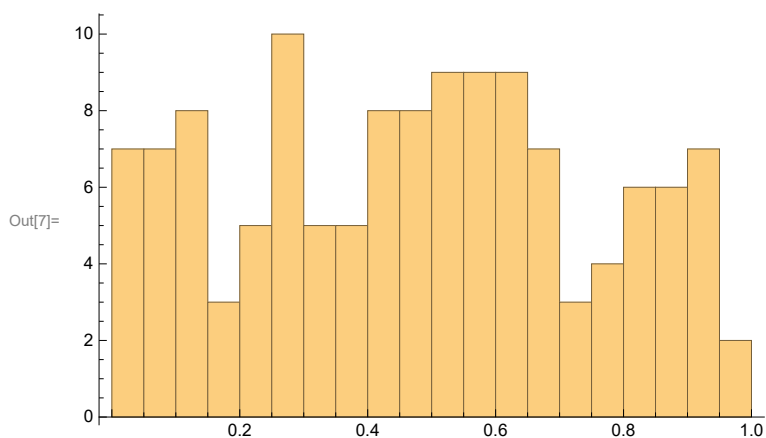
In[6]:=

```

```

In[7]:= Histogram[seqUnfiltered, 16]

```

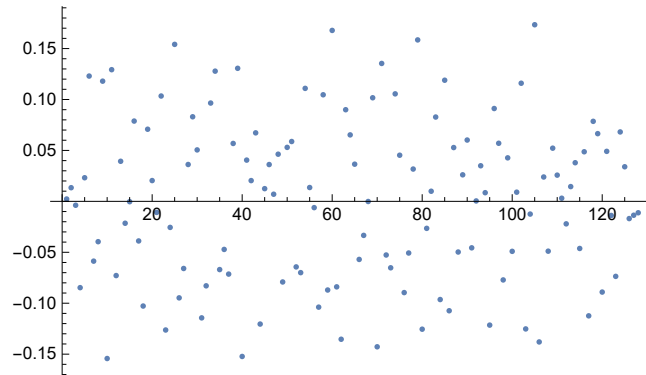


```

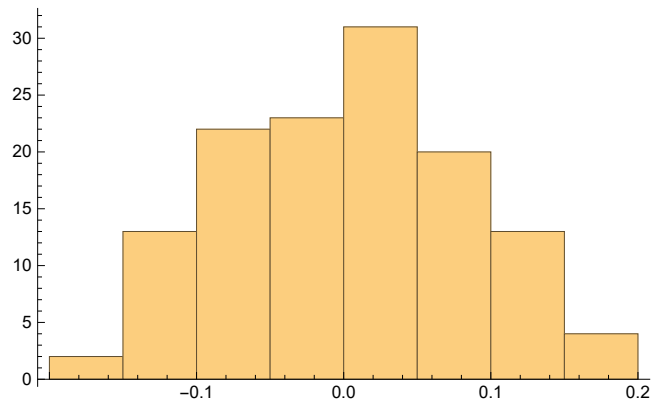
In[8]:= (* High pass filtered version of the noise *)

```

```
In[9]:= GraphicsGrid[
  {{ListPlot[MyHighpass[seqUnfiltered]]}, {Histogram[MyHighpass[seqUnfiltered]]}}
```



```
Out[9]=
```



```
In[10]:=
```

```
In[11]:= Export["afterHighpass.png", GraphicsGrid[{{ListPlot[MyHighpass[seqUnfiltered]]},
  {Histogram[MyHighpass[seqUnfiltered]]}}]]];
```

```
In[12]:= RemapHistogram1D[a_] := Module[{c, dim, b}, dim = Dimensions[a][[1]];
```

```
  b = a;
```

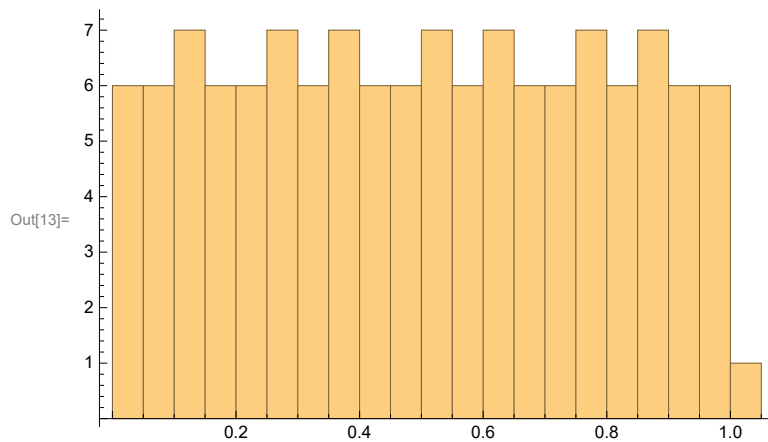
```
  c = Sort[Table[{i, a[[i]]}, {i, 1, dim}], #1[[2]] < #2[[2]] &];
```

```
  Do[it = c[[i, 1]];
```

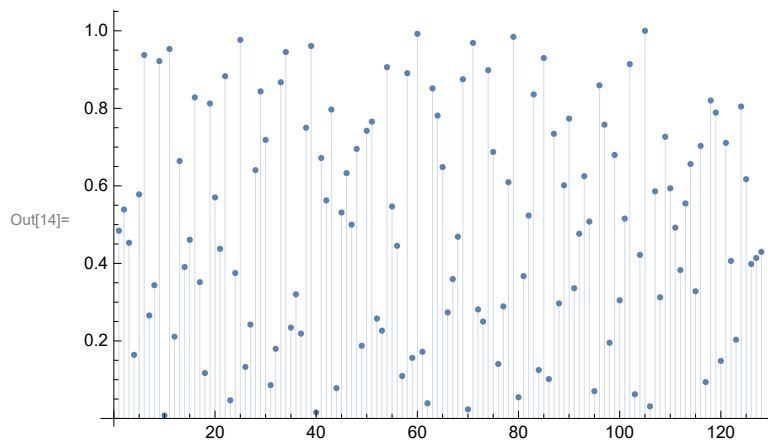
```
    b[[it]] = i / dim, {i, dim}];
```

```
  b]
```

```
In[13]:= Histogram[RemapHistogram1D[MyHighpass[seqUnfiltered]], 16]
```

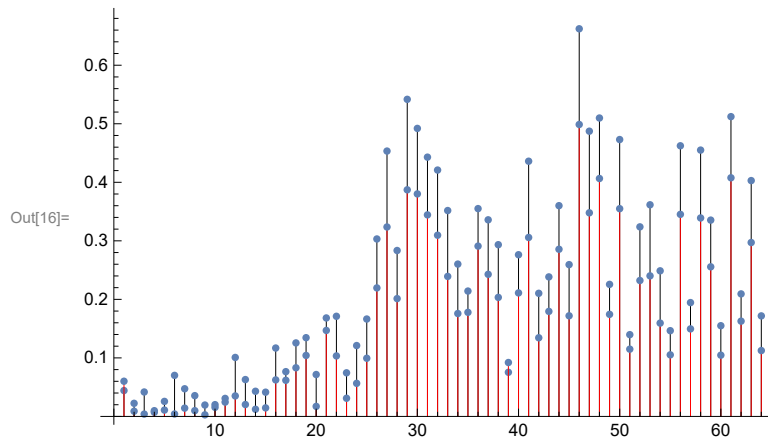


```
In[14]:= ListPlot[RemapHistogram1D[MyHighpass[seqUnfiltered]], Filling -> Axis]
```

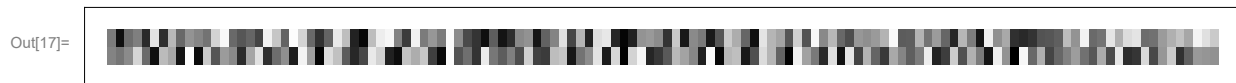


```
In[15]:= Export["afterHighpassAndRemap.png", GraphicsGrid[
  {{ListPlot[RemapHistogram1D[MyHighpass[seqUnfiltered]], Filling -> Axis}},
  {Histogram[RemapHistogram1D[MyHighpass[seqUnfiltered]]}]]];
```

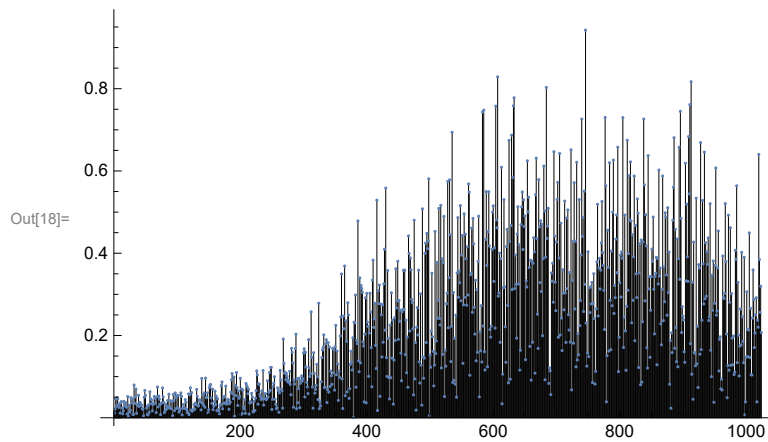
```
In[16]:= Show[MyPeriodogram[RemapHistogram1D[MyHighpass[seqUnfiltered]] - 0.5],  
             MyPeriodogram[MyHighpass[seqUnfiltered] * 2.7, Red]]
```



```
In[17]:= ArrayPlot[  
          {seqUnfiltered, seqUnfiltered, RemapHistogram1D[MyHighpass[seqUnfiltered]],  
          RemapHistogram1D[MyHighpass[seqUnfiltered]]}]
```



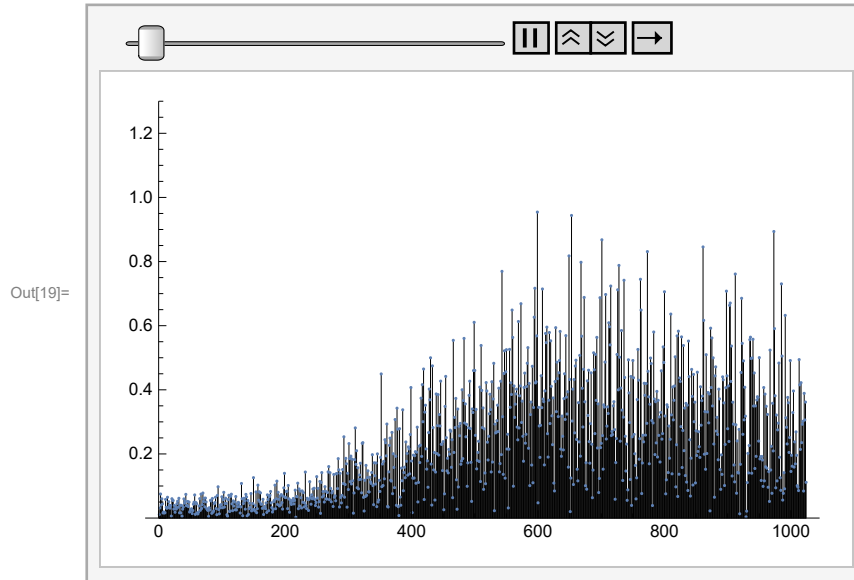
```
In[18]:= MyPeriodogram[RemapHistogram1D[MyHighpass[RandomReal[] & /@ Range[2048]]] - 0.5]
```



```

In[19]:= ListAnimate[
  {MyPeriodogram[RemapHistogram1D[MyHighpass[RandomReal[] & /@Range[2048]]] - 0.5,
    Black, {0, 1.3}}, MyPeriodogram[RemapHistogram1D[MyHighpass[RemapHistogram1D[
      MyHighpass[RandomReal[] & /@Range[2048]]]]] - 0.5, Black, {0, 1.3}]]]

```



```

In[20]:= Export["highPassRemapTwice.gif",
  {MyPeriodogram[RemapHistogram1D[MyHighpass[RemapHistogram1D[
    MyHighpass[RandomReal[] & /@Range[2048]]]]] - 0.5, Black, {0, 1.3}},
  MyPeriodogram[RemapHistogram1D[MyHighpass[RandomReal[] & /@Range[2048]]] - 0.5,
    Black, {0, 1.3}]], "DisplayDurations" -> 2];

```

```

In[21]:= (* Like in first post, we will assume sample count of 1000 *)
sampleCount = 2000;

```

```

In[22]:= sineFunction[x_] := 0.5 + Sin[x/500 * 2 * π] * 0.5;
originalSineSignal = sineFunction[#1] & /@Range[sampleCount];
(* 1 bit quantization of dithered sine signal*)
quantizedDitheredSineSignal =
  Round[sineFunction[#1] + RandomReal[] - 0.5] & /@Range[sampleCount];
quantizedDitheredSineSignalGolden =
  Round[sineFunction[#1] + FractionalPart[GoldenRatio * #1] - 0.5] & /@
  Range[sampleCount];

```

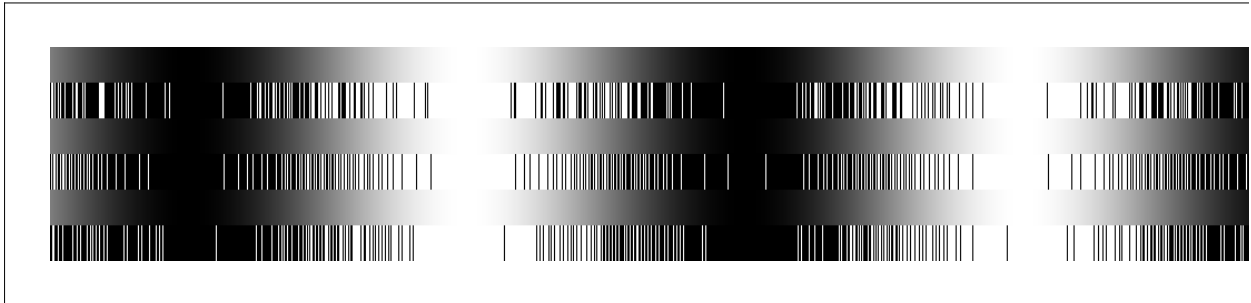
```

In[26]:= quantizedDitheredBlueSineSignal =
  Round[sineFunction[#1] & /@Range[sampleCount] + RemapHistogram1D[
    MyHighpass[RemapHistogram1D[MyHighpass[RemapHistogram1D[MyHighpass[
      RandomReal[] & /@Range[sampleCount]]]]]]] - 0.5];

```

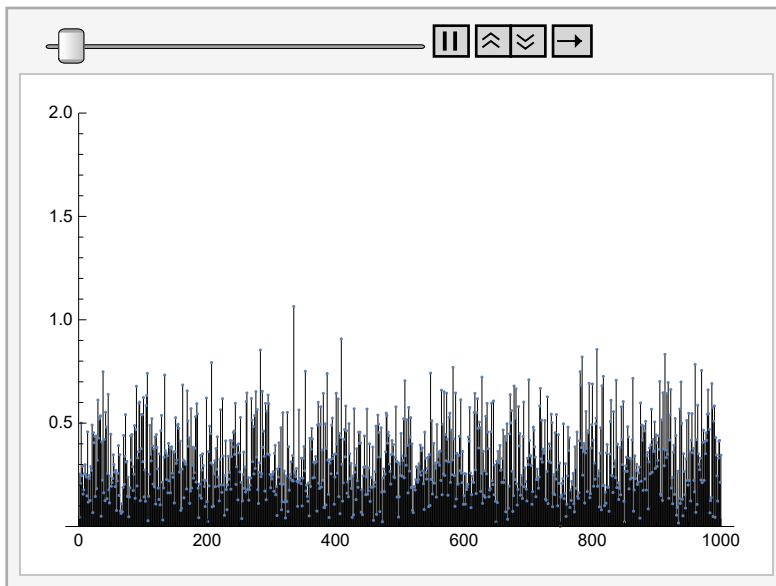
```
In[27]:= ArrayPlot[Join[Nest[Join[#, #, 1] &, {originalSineSignal}, 5],
  Nest[Join[#, #, 1] &, {quantizedDitheredSineSignal}, 5],
  Nest[Join[#, #, 1] &, {originalSineSignal}, 5],
  Nest[Join[#, #, 1] &, {quantizedDitheredSineSignalGolden}, 5],
  Nest[Join[#, #, 1] &, {originalSineSignal}, 5],
  Nest[Join[#, #, 1] &, {quantizedDitheredBlueSineSignal}, 5]]]
```

Out[27]=



```
In[28]:= ListAnimate[
  {MyPeriodogram[quantizedDitheredSineSignal - originalSineSignal, Black, {0, 2.0}],
  MyPeriodogram[quantizedDitheredSineSignalGolden - originalSineSignal,
  Red, {0, 2.0}], MyPeriodogram[
  quantizedDitheredBlueSineSignal - originalSineSignal, Green, {0, 2.0}]]]
```

Out[28]=



In[29]:=

```
Export["HighpassRemapDitherPeriodograms.gif",
  {MyPeriodogram[quantizedDitheredSineSignal - originalSineSignal, Black, {0, 2.0}],
  MyPeriodogram[quantizedDitheredSineSignalGolden - originalSineSignal, Red,
  {0, 2.0}], MyPeriodogram[quantizedDitheredBlueSineSignal - originalSineSignal,
  Green, {0, 2.0}]}, "DisplayDurations" -> 2];
```

```

In[30]:= blueGenerated = {0.46650001, 0.10200000, 0.59700000, 0.83450001,
    0.34999999, 0.01500000, 0.57050002, 0.80849999, 0.19050001,
    0.48050001, 0.93049997, 0.29750001, 0.63000000, 0.10400000, 0.79650003,
    0.46500000, 0.22650000, 0.95150000, 0.55449998, 0.21100000, 0.81250000,
    0.48500001, 0.03900000, 0.68849999, 0.26350001, 0.93599999, 0.40099999,
    0.73949999, 0.07850000, 0.61500001, 0.28349999, 0.91049999, 0.51550001,
    0.13400000, 0.80599999, 0.32800001, 0.61600000, 0.09150000, 0.83350003,
    0.33800000, 0.59050000, 0.17000000, 0.93699998, 0.64349997, 0.34099999,
    0.03750000, 0.58999997, 0.87199998, 0.48800001, 0.00650000, 0.30750000,
    0.75449997, 0.43900001, 0.98350000, 0.23450001, 0.54149997, 0.79299998,
    0.04150000, 0.42399999, 0.71300000, 0.23899999, 0.91450000, 0.57249999,
    0.10250000, 0.39199999, 0.96100003, 0.57499999, 0.26050001, 0.76499999,
    0.09500000, 0.49399999, 0.91200000, 0.24450000, 0.75000000, 0.46250001,
    0.01100000, 0.68250000, 0.34500000, 0.85100001, 0.15850000, 0.64499998,
    0.38650000, 0.96149999, 0.23800001, 0.74699998, 0.46399999, 0.02250000,
    0.68099999, 0.26600000, 0.94700003, 0.41150001, 0.66850001, 0.14500000,
    0.82099998, 0.49000001, 0.25500000, 0.98400003, 0.63950002, 0.18900000,
    0.50400001, 0.83700001, 0.04450000, 0.42750001, 0.67199999, 0.19000000,
    0.87500000, 0.36950001, 0.74150002, 0.12700000, 0.54250002, 0.83249998,
    0.34400001, 0.02550000, 0.50000000, 0.90499997, 0.60900003, 0.05500000,
    0.42950001, 0.73049998, 0.17500000, 0.88650000, 0.26699999, 0.67449999,
    0.38800001, 0.91750002, 0.16949999, 0.65549999, 0.37099999, 0.90600002,
    0.12899999, 0.47950000, 0.78299999, 0.14100000, 0.55549997, 0.91500002,
    0.22550000, 0.46100000, 0.78950000, 0.05750000, 0.61949998, 0.33149999,
    0.81000000, 0.05100000, 0.40400001, 0.60799998, 0.96300000, 0.18750000,
    0.64249998, 0.33899999, 0.80049998, 0.01300000, 0.59100002, 0.23100001,
    0.75700003, 0.31050000, 0.99199998, 0.40650001, 0.72100002, 0.13300000,
    0.50250000, 0.91799998, 0.23950000, 0.74449998, 0.41299999, 0.01150000,
    0.56150001, 0.87099999, 0.19850001, 0.65950000, 0.35949999, 0.83300000,
    0.09550000, 0.43149999, 0.65399998, 0.99800003, 0.39800000, 0.18449999,
    0.78200001, 0.50650001, 0.05200000, 0.69849998, 0.35600001, 0.88000000,
    0.19250000, 0.52350003, 0.76550001, 0.01400000, 0.35749999, 0.60000002,
    0.86400002, 0.10100000, 0.43300000, 0.70349997, 0.16400000, 0.83749998,
    0.47150001, 0.22200000, 0.89850003, 0.60850000, 0.08700000, 0.45050001,
    0.84950000, 0.27250001, 0.67600000, 0.05250000, 0.41900000, 0.93949997,
    0.57450002, 0.24200000, 0.78149998, 0.03050000, 0.46849999, 0.72049999,
    0.24950001, 0.93300003, 0.50700003, 0.12450000, 0.71050000, 0.29550001,
    0.99900001, 0.65600002, 0.48300001, 0.00000000, 0.40300000, 0.74049997,
    0.23999999, 0.94349998, 0.51999998, 0.15300000, 0.73850000, 0.43099999,
    0.98049998, 0.27399999, 0.67699999, 0.09200000, 0.52249998, 0.85799998,
    0.40200001, 0.02200000, 0.73650002, 0.24750000, 0.55650002, 0.95599997,
    0.40250000, 0.12100000, 0.58550000, 0.94800001, 0.31250000, 0.64999998,

```

0.14800000, 0.90300000, 0.51249999, 0.27800000, 0.78350002, 0.06950000,  
0.62750000, 0.28850001, 0.96050000, 0.39600000, 0.72350001, 0.10600000,  
0.49950001, 0.88200003, 0.28000000, 0.66649997, 0.01550000, 0.45100001,  
0.82599998, 0.16100000, 0.65249997, 0.34950000, 0.83800000, 0.17450000,  
0.55900002, 0.95099998, 0.40900001, 0.16800000, 0.65649998, 0.99150002,  
0.51849997, 0.32300001, 0.00600000, 0.78899997, 0.49849999, 0.17200001,  
0.62150002, 0.98949999, 0.32049999, 0.64600003, 0.13850001, 0.85500002,  
0.35450000, 0.63749999, 0.12950000, 0.82999998, 0.52050000, 0.22100000,  
0.95349997, 0.39449999, 0.76200002, 0.11650000, 0.62900001, 0.35800001,  
0.89950001, 0.25450000, 0.67850000, 0.05700000, 0.51150000, 0.83550000,  
0.36149999, 0.04900000, 0.57999998, 0.90450001, 0.30550000, 0.69300002,  
0.08000000, 0.49050000, 0.89499998, 0.23150000, 0.71700001, 0.44949999,  
0.05650000, 0.81550002, 0.54850000, 0.23600000, 0.89600003, 0.49250001,  
0.09400000, 0.70450002, 0.31150001, 0.90899998, 0.58050001, 0.03450000,  
0.35550001, 0.65300000, 0.91350001, 0.16650000, 0.38499999, 0.84100002,  
0.53799999, 0.11450000, 0.79750001, 0.32449999, 0.63300002, 0.11000000,  
0.84649998, 0.35650000, 0.64850003, 0.15800001, 0.81500000, 0.42250001,  
0.02050000, 0.56750000, 0.84299999, 0.19200000, 0.66450000, 0.31000000,  
0.92650002, 0.50099999, 0.08200000, 0.68699998, 0.27900001, 0.88300002,  
0.47049999, 0.13699999, 0.63650000, 0.95300001, 0.30350000, 0.56800002,  
0.02400000, 0.76749998, 0.25400001, 0.56550002, 0.96600002, 0.42800000,  
0.06600000, 0.69099998, 0.33199999, 0.75999999, 0.18150000, 0.92750001,  
0.38249999, 0.66200000, 0.17600000, 0.82200003, 0.42899999, 0.01850000,  
0.48350000, 0.86900002, 0.58149999, 0.00950000, 0.31349999, 0.76249999,  
0.43550000, 0.97100002, 0.27750000, 0.61199999, 0.08750000, 0.80549997,  
0.32100001, 0.59149998, 0.05350000, 0.73250002, 0.36500001, 0.89099997,  
0.16750000, 0.55049998, 0.81099999, 0.38100001, 0.11350000, 0.87849998,  
0.55400002, 0.25650001, 0.68900001, 0.06800000, 0.74250001, 0.33000001,  
0.96450001, 0.49100000, 0.19300000, 0.81699997, 0.51599997, 0.05600000,  
0.74599999, 0.26650000, 0.52300000, 0.92199999, 0.16450000, 0.67900002,  
0.37450001, 0.89999998, 0.24500000, 0.59350002, 0.04200000, 0.70899999,  
0.26899999, 0.94849998, 0.40000001, 0.66700000, 0.17850000, 0.92799997,  
0.39250001, 0.67799997, 0.22050001, 0.89399999, 0.51300001, 0.09800000,  
0.70099998, 0.34150001, 0.84149998, 0.12850000, 0.63150001, 0.28600001,  
0.89200002, 0.49800000, 0.08950000, 0.77999997, 0.23549999, 0.66500002,  
0.32200000, 0.97299999, 0.52550000, 0.15050000, 0.80100000, 0.33250001,  
0.62500000, 0.07100000, 0.81750000, 0.25000000, 0.67100000, 0.39649999,  
0.91949999, 0.16249999, 0.65200001, 0.30050001, 0.89749998, 0.48899999,  
0.08600000, 0.69450003, 0.36449999, 0.88800001, 0.16000000, 0.71799999,  
0.46300000, 0.22800000, 0.94499999, 0.56000000, 0.17299999, 0.76700002,  
0.43349999, 0.06450000, 0.79850000, 0.53750002, 0.20750000, 0.89649999,  
0.36350000, 0.63349998, 0.09050000, 0.78399998, 0.44999999, 0.17950000,  
0.95249999, 0.56599998, 0.29899999, 0.78750002, 0.06400000, 0.61449999,



0.25700000, 0.95899999, 0.54100001, 0.27849999, 0.75800002, 0.08250000,  
0.43050000, 0.93400002, 0.56849998, 0.14650001, 0.78549999, 0.28250000,  
0.55849999, 0.90350002, 0.11800000, 0.44549999, 0.72750002, 0.29850000,  
0.88249999, 0.14049999, 0.63900000, 0.36399999, 0.86600000, 0.15899999,  
0.64899999, 0.30599999, 0.98150003, 0.59399998, 0.34850001, 0.01950000,  
0.72250003, 0.41800001, 0.93000001, 0.20900001, 0.53299999, 0.75749999,  
0.07250000, 0.37650001, 0.86849999, 0.53100002, 0.08300000, 0.69999999,  
0.30100000, 0.91850001, 0.50150001, 0.10750000, 0.70300001, 0.35100001,  
0.86799997, 0.13150001, 0.50849998, 0.76999998, 0.16900000, 0.39950001,  
0.97950000, 0.65799999, 0.17700000, 0.52149999, 0.92000002, 0.39850000,  
0.12500000, 0.74900001, 0.46450001, 0.06100000, 0.80199999, 0.52899998,  
0.20150000, 0.90750003, 0.38900000, 0.66250002, 0.19900000, 0.91549999,  
0.40700001, 0.68000001, 0.02900000, 0.34599999, 0.83899999, 0.61250001,  
0.06700000, 0.43650001, 0.87300003, 0.29499999, 0.72549999, 0.03600000,  
0.60549998, 0.32400000, 0.80900002, 0.05300000, 0.46149999, 0.70999998,  
0.21799999, 0.94550002, 0.38600001, 0.71350002, 0.10950000, 0.42699999,  
0.93099999, 0.54799998, 0.12650000, 0.71550000, 0.30199999, 0.89700001,  
0.45150000, 0.05550000, 0.57950002, 0.81800002, 0.19700000, 0.48449999,  
0.95400000, 0.24850000, 0.73350000, 0.48150000, 0.09750000, 0.86199999,  
0.36750001, 0.66799998, 0.24900000, 0.83499998, 0.12250000, 0.64050001,  
0.38299999, 0.92250001, 0.20400000, 0.70950001, 0.43750000, 0.03700000,  
0.79500002, 0.50999999, 0.25099999, 0.98000002, 0.56250000, 0.21400000,  
0.82700002, 0.47749999, 0.06550000, 0.69900000, 0.37799999, 0.92299998,  
0.20600000, 0.69950002, 0.42649999, 0.03100000, 0.79100001, 0.54200000,  
0.21150000, 0.90649998, 0.37050000, 0.73100001, 0.02450000, 0.58700001,  
0.21900000, 0.75950003, 0.33950001, 0.99650002, 0.55599999, 0.20350000,  
0.80750000, 0.45649999, 0.04500000, 0.69250000, 0.31200001, 0.95850003,  
0.52950001, 0.17800000, 0.77800000, 0.41400000, 0.02150000, 0.57849997,  
0.86100000, 0.22350000, 0.45449999, 0.79200000, 0.07200000, 0.61000001,  
0.25549999, 0.92500001, 0.39500001, 0.74949998, 0.10850000, 0.62400001,  
0.29949999, 0.94300002, 0.52499998, 0.15500000, 0.83200002, 0.35150000,  
0.65100002, 0.18000001, 0.84350002, 0.54750001, 0.02700000, 0.36849999,  
0.86549997, 0.54500002, 0.14200000, 0.81050003, 0.32900000, 0.68449998,  
0.00400000, 0.44749999, 0.73799998, 0.20999999, 0.92400002, 0.37250000,  
0.64950001, 0.15700001, 0.90950000, 0.53700000, 0.26949999, 0.75099999,  
0.06500000, 0.48750001, 0.87800002, 0.22400001, 0.54299998, 0.78799999,  
0.11700000, 0.46599999, 0.91100001, 0.30250001, 0.70150000, 0.09900000,  
0.50449997, 0.93550003, 0.31500000, 0.70499998, 0.12350000, 0.44900000,  
0.97649997, 0.63200003, 0.32350001, 0.02000000, 0.71399999, 0.40549999,  
0.90399998, 0.19100000, 0.66949999, 0.41100001, 0.98449999, 0.28749999,  
0.71499997, 0.15099999, 0.51400000, 0.81400001, 0.03150000, 0.32150000,  
0.73699999, 0.44150001, 0.99400002, 0.29650000, 0.72600001, 0.06000000,  
0.56300002, 0.26499999, 0.99100000, 0.65450001, 0.40750000, 0.10500000,

0.86750001, 0.54049999, 0.26449999, 0.71450001, 0.14450000, 0.89800000,  
0.52200001, 0.21750000, 0.80949998, 0.45500001, 0.01450000, 0.68750000,  
0.34050000, 0.85200000, 0.14749999, 0.66350001, 0.39399999, 0.94050002,  
0.27149999, 0.70400000, 0.02950000, 0.56500000, 0.26550001, 0.96200001,  
0.67400002, 0.34650001, 0.00100000, 0.48550001, 0.68949997, 0.99449998,  
0.42050001, 0.10700000, 0.75400001, 0.25200000, 0.57900000, 0.98250002,  
0.44000000, 0.13500001, 0.79549998, 0.32749999, 0.69499999, 0.06650000,  
0.49700001, 0.88849998, 0.29249999, 0.63050002, 0.10550000, 0.82499999,  
0.33649999, 0.59750003, 0.04800000, 0.78700000, 0.29200000, 0.54949999,  
0.94650000, 0.19450000, 0.45950001, 0.78649998, 0.07500000, 0.62300003,  
0.29300001, 0.93500000, 0.58649999, 0.13950001, 0.47350001, 0.78600001,  
0.00750000, 0.41549999, 0.68049997, 0.14900000, 0.75900000, 0.40599999,  
0.96749997, 0.20800000, 0.76450002, 0.33550000, 0.62800002, 0.14150000,  
0.81199998, 0.42150000, 0.03850000, 0.57099998, 0.88050002, 0.28099999,  
0.60149997, 0.06850000, 0.74199998, 0.39150000, 0.92850000, 0.21600001,  
0.51099998, 0.81950003, 0.13200000, 0.65149999, 0.31750000, 0.98750001,  
0.54350001, 0.25749999, 0.77300000, 0.01250000, 0.45249999, 0.69650000,  
0.18550000, 0.92900002, 0.30700001, 0.56099999, 0.77200001, 0.07900000,  
0.36899999, 0.85650003, 0.59899998, 0.03400000, 0.42500001, 0.74750000,  
0.22000000, 0.98549998, 0.53850001, 0.29100001, 0.74800003, 0.04050000,  
0.47700000, 0.82749999, 0.17749999, 0.66000003, 0.28900000, 0.98650002,  
0.60600001, 0.36600000, 0.07300000, 0.81650001, 0.60049999, 0.15950000,  
0.41650000, 0.95950001, 0.57300001, 0.15650000, 0.78049999, 0.46900001,  
0.20500000, 0.96550000, 0.57550001, 0.24650000, 0.87449998, 0.50300002,  
0.15400000, 0.77950001, 0.42350000, 0.02350000, 0.56050003, 0.87650001,  
0.20000000, 0.74000001, 0.28999999, 0.56650001, 0.96799999, 0.18650000,  
0.50800002, 0.81449997, 0.35850000, 0.05150000, 0.60650003, 0.88900000,  
0.40050000, 0.16200000, 0.79000002, 0.57200003, 0.00900000, 0.41700000,  
0.74349999, 0.24550000, 0.92350000, 0.50950003, 0.09300000, 0.69199997,  
0.33750001, 0.82849997, 0.07150000, 0.46349999, 0.70599997, 0.20200001,  
0.94400001, 0.30849999, 0.73600000, 0.48100001, 0.06050000, 0.82400000,  
0.26750001, 0.54650003, 0.78100002, 0.09850000, 0.37700000, 0.88550001,  
0.55299997, 0.11950000, 0.77749997, 0.26150000, 0.58200002, 0.99949998,  
0.44800001, 0.22950000, 0.73549998, 0.03300000, 0.48850000, 0.84600002,  
0.27599999, 0.61799997, 0.03250000, 0.77499998, 0.26850000, 0.54400003,  
0.84249997, 0.13800000, 0.46799999, 0.88450003, 0.29400000, 0.70700002,  
0.00450000, 0.38350001, 0.57749999, 0.93199998, 0.17399999, 0.64550000,  
0.33600000, 0.80699998, 0.04850000, 0.41049999, 0.61150002, 0.98850000,  
0.28299999, 0.68800002, 0.09600000, 0.43000001, 0.91900003, 0.65899998,  
0.06350000, 0.35350001, 0.61350000, 0.88400000, 0.15549999, 0.40500000,  
0.66900003, 0.99299997, 0.29600000, 0.60450000, 0.13650000, 0.87900001,  
0.51800001, 0.27300000, 0.77700001, 0.04100000, 0.60750002, 0.24699999,  
0.90700001, 0.39550000, 0.67350000, 0.18200000, 0.94250000, 0.52700001,

0.27700001, 0.76849997, 0.01650000, 0.46050000, 0.71950001, 0.24300000,  
0.94000000, 0.50749999, 0.14250000, 0.81849998, 0.33350000, 0.69150001,  
0.10350000, 0.45899999, 0.97200000, 0.63499999, 0.14350000, 0.46550000,  
0.89050001, 0.28450000, 0.68150002, 0.04550000, 0.48400000, 0.86350000,  
0.28200001, 0.68199998, 0.02650000, 0.46000001, 0.83099997, 0.14850000,  
0.64150000, 0.34349999, 0.80350000, 0.13249999, 0.43799999, 0.94450003,  
0.63099998, 0.09350000, 0.44499999, 0.76349998, 0.32550001, 0.96350002,  
0.20050000, 0.69400001, 0.41850001, 0.04000000, 0.81150001, 0.48699999,  
0.18700001, 0.66299999, 0.98900002, 0.30649999, 0.59850001, 0.10800000,  
0.75250000, 0.39100000, 0.94950002, 0.22149999, 0.70200002, 0.44049999,  
0.05000000, 0.79699999, 0.50599998, 0.23199999, 0.87550002, 0.58300000,  
0.04400000, 0.35400000, 0.84750003, 0.52649999, 0.10150000, 0.70550001,  
0.30500001, 0.93150002, 0.50900000, 0.12200000, 0.70050001, 0.28700000,  
0.99599999, 0.45350000, 0.76400000, 0.33050001, 0.00200000, 0.56950003,  
0.85549998, 0.21300000, 0.67650002, 0.31450000, 0.97399998, 0.49300000,  
0.17350000, 0.86299998, 0.55150002, 0.25900000, 0.74500000, 0.06150000,  
0.49500000, 0.89300001, 0.23300000, 0.70800000, 0.45199999, 0.02800000,  
0.73750001, 0.39050001, 0.92449999, 0.25999999, 0.62449998, 0.09450000,  
0.79900002, 0.46950001, 0.23700000, 0.93750000, 0.62250000, 0.13450000,  
0.48949999, 0.82450002, 0.34000000, 0.01700000, 0.58099997, 0.86250001,  
0.21450000, 0.45400000, 0.73400003, 0.18300000, 0.96950001, 0.53500003,  
0.30149999, 0.78450000, 0.05900000, 0.62699997, 0.28549999, 0.88099998,  
0.45800000, 0.10650000, 0.60200000, 0.84850001, 0.36050001, 0.01200000,  
0.47650000, 0.87349999, 0.57800001, 0.21950001, 0.99349999, 0.52850002,  
0.30899999, 0.83600003, 0.16500001, 0.72399998, 0.44400001, 0.01350000,  
0.69050002, 0.30450001, 0.90850002, 0.51700002, 0.11200000, 0.76950002,  
0.29449999, 0.53950000, 0.99500000, 0.23400000, 0.71600002, 0.47900000,  
0.03500000, 0.82249999, 0.33300000, 0.62199998, 0.08500000, 0.74650002,  
0.31850001, 0.96850002, 0.52450001, 0.15449999, 0.81599998, 0.34549999,  
0.64450002, 0.15350001, 0.90249997, 0.51499999, 0.27950001, 0.77899998,  
0.03800000, 0.62099999, 0.32949999, 0.80299997, 0.14300001, 0.49900001,  
0.96649998, 0.32650000, 0.76599997, 0.22849999, 0.59450001, 0.04350000,  
0.80500001, 0.34299999, 0.62849998, 0.13550000, 0.85600001, 0.35900000,  
0.61650002, 0.15000001, 0.88950002, 0.37500000, 0.66049999, 0.18099999,  
0.83649999, 0.44850001, 0.07000000, 0.61100000, 0.84799999, 0.21550000,  
0.52399999, 0.92949998, 0.38949999, 0.12750000, 0.62550002, 0.93250000,  
0.43500000, 0.11250000, 0.69349998, 0.28799999, 0.97799999, 0.60100001,  
0.37000000, 0.06200000, 0.80800003, 0.55800003, 0.31400001, 0.91600001,  
0.19750001, 0.72649997, 0.42550001, 0.00500000, 0.58450001, 0.80400002,  
0.20450000, 0.41249999, 0.99699998, 0.68650001, 0.23750000, 0.56349999,  
0.02100000, 0.80000001, 0.47600001, 0.13000000, 0.71649998, 0.31549999,  
0.96399999, 0.49200001, 0.17250000, 0.86699998, 0.55350000, 0.26800001,  
0.74849999, 0.02600000, 0.47250000, 0.82800001, 0.24150001, 0.56999999,

0.95649999, 0.18250000, 0.51450002, 0.82650000, 0.37599999, 0.03650000,  
0.76800001, 0.46700001, 0.14550000, 0.59500003, 0.97600001, 0.31950000,  
0.69550002, 0.09650000, 0.42300001, 0.91649997, 0.61900002, 0.13050000,  
0.38400000, 0.91299999, 0.57700002, 0.14000000, 0.77850002, 0.45750001,  
0.21650000, 0.90200001, 0.54000002, 0.13100000, 0.72149998, 0.39700001,  
0.95700002, 0.21500000, 0.53899997, 0.78500003, 0.12000000, 0.47400001,  
0.89899999, 0.28950000, 0.69749999, 0.04700000, 0.40450001, 0.86150002,  
0.59549999, 0.04650000, 0.32499999, 0.88150001, 0.41200000, 0.75550002,  
0.08800000, 0.61699998, 0.28049999, 0.88349998, 0.50199997, 0.07650000,  
0.76150000, 0.27550000, 0.55949998, 0.90100002, 0.12400000, 0.44600001,  
0.72899997, 0.23500000, 0.98699999, 0.54699999, 0.31099999, 0.82150000,  
0.12050000, 0.64099997, 0.39750001, 0.93900001, 0.27200001, 0.71850002,  
0.00350000, 0.44350001, 0.68400002, 0.19800000, 0.93449998, 0.38749999,  
0.73000002, 0.07050000, 0.60250002, 0.25350001, 0.92150003, 0.38000000,  
0.71749997, 0.11600000, 0.52600002, 0.90050000, 0.23000000, 0.49599999,  
0.84700000, 0.17649999, 0.69599998, 0.47200000, 0.06250000, 0.82050002,  
0.33399999, 0.70249999, 0.11400000, 0.54900002, 0.90549999, 0.40349999,  
0.10300000, 0.77149999, 0.50500000, 0.22250000, 0.98199999, 0.63800001,  
0.42449999, 0.03000000, 0.76899999, 0.29150000, 0.55699998, 0.95749998,  
0.20850000, 0.48649999, 0.75849998, 0.00250000, 0.35249999, 0.58899999,  
0.95999998, 0.27450001, 0.68300003, 0.05450000, 0.48199999, 0.85750002,  
0.27050000, 0.60949999, 0.04750000, 0.78250003, 0.26400000, 0.58950001,  
0.98299998, 0.42600000, 0.11500000, 0.70749998, 0.32699999, 0.97700000,  
0.53450000, 0.17900001, 0.77399999, 0.48600000, 0.08850000, 0.83399999,  
0.34799999, 0.63450003, 0.15750000, 0.81900001, 0.44299999, 0.05400000,  
0.57150000, 0.85949999, 0.18850000, 0.62000000, 0.29699999, 0.99550003,  
0.68599999, 0.36550000, 0.00850000, 0.54449999, 0.83950001, 0.19949999,  
0.67949998, 0.32850000, 0.97450000, 0.51650000, 0.16300000, 0.82550001,  
0.34750000, 0.72500002, 0.02750000, 0.58749998, 0.32600001, 0.80150002,  
0.04250000, 0.40950000, 0.59799999, 0.98799998, 0.24250001, 0.75199997,  
0.43849999, 0.03550000, 0.58850002, 0.85000002, 0.37200001, 0.08550000,  
0.58499998, 0.93849999, 0.26199999, 0.75500000, 0.53600001, 0.00050000,  
0.35200000, 0.66750002, 0.98500001, 0.29049999, 0.59200001, 0.12549999,  
0.86000001, 0.36199999, 0.66100001, 0.20250000, 0.87400001, 0.56449997,  
0.01600000, 0.42100000, 0.77249998, 0.14700000, 0.51050001, 0.86650002,  
0.22499999, 0.53049999, 0.91700000, 0.16850001, 0.65050000, 0.36250001,  
0.87250000, 0.13600001, 0.49550000, 0.79449999, 0.19400001, 0.55250001,  
0.97250003, 0.30800000, 0.63849998, 0.12600000, 0.85250002, 0.35299999,  
0.64749998, 0.17100000, 0.84899998, 0.50050002, 0.05050000, 0.68349999,  
0.33500001, 0.81999999, 0.07350000, 0.47499999, 0.71100003, 0.21200000,  
0.95499998, 0.38699999, 0.65750003, 0.18400000, 0.84399998, 0.45699999,  
0.08450000, 0.60399997, 0.86949998, 0.15600000, 0.44650000, 0.72950000,  
0.22600000, 0.87750000, 0.45300001, 0.08900000, 0.52100003, 0.95200002,

0.25150001, 0.72850001, 0.48249999, 0.08150000, 0.84050000, 0.34900001,  
 0.64399999, 0.17150000, 0.86049998, 0.49349999, 0.11300000, 0.80650002,  
 0.34250000, 0.63400000, 0.09700000, 0.82950002, 0.25049999, 0.67750001,  
 0.40799999, 0.97750002, 0.27350000, 0.68550003, 0.06300000, 0.51899999,  
 0.86449999, 0.20100001, 0.44700000, 0.77050000, 0.01900000, 0.59249997,  
 0.23649999, 0.77550000, 0.41000000, 0.99049997, 0.28650001, 0.71200001,  
 0.14399999, 0.56699997, 0.92549998, 0.41999999, 0.08650000, 0.69700003,  
 0.37750000, 0.89249998, 0.16550000, 0.51200002, 0.83999997, 0.26249999,  
 0.61849999, 0.05800000, 0.79250002, 0.49649999, 0.17550001, 0.89349997,  
 0.36700001, 0.66149998, 0.19149999, 0.87949997, 0.47549999, 0.09000000,  
 0.71149999, 0.37900001, 0.91000003, 0.25250000, 0.60699999, 0.03350000,  
 0.72200000, 0.37300000, 0.87599999, 0.16050000, 0.64300001, 0.35699999,  
 0.84200001, 0.11900000, 0.62599999, 0.25950000, 0.92600000, 0.38850001,  
 0.67500001, 0.19599999, 0.95800000, 0.41350001, 0.77100003, 0.22900000,  
 0.58399999, 0.00550000, 0.70850003, 0.34450001, 0.81300002, 0.07800000,  
 0.41450000, 0.63599998, 0.99250001, 0.28150001, 0.59600002, 0.08100000,  
 0.79049999, 0.47000000, 0.23050000, 0.93349999, 0.56199998, 0.15200000,  
 0.73150003, 0.37149999, 0.94199997, 0.20649999, 0.52749997, 0.76650000,  
 0.07400000, 0.37349999, 0.84549999, 0.59299999, 0.00700000, 0.31299999,  
 0.75300002, 0.43599999, 0.97549999, 0.20299999, 0.67049998, 0.37400001,  
 0.94999999, 0.27000001, 0.62050003, 0.18350001, 0.94099998, 0.66399997,  
 0.36300001, 0.02500000, 0.56900001, 0.88599998, 0.30300000, 0.62650001,  
 0.08400000, 0.80449998, 0.30399999, 0.56400001, 0.92699999, 0.16350000,  
 0.44200000, 0.69000000, 0.11550000, 0.87150002, 0.29800001, 0.55000001,  
 0.79350001, 0.10000000, 0.44100001, 0.85850000, 0.19550000, 0.68500000,  
 0.41949999, 0.98100001, 0.27500001, 0.61549997, 0.09950000, 0.74400002,  
 0.31700000, 0.94900000, 0.51749998, 0.13900000, 0.72700000, 0.38200000,  
 0.94749999, 0.16150001, 0.63249999, 0.25799999, 0.82900000, 0.55199999,  
 0.01750000, 0.36100000, 0.85900003, 0.54549998, 0.14950000, 0.81349999,  
 0.33100000, 0.67549998, 0.04300000, 0.47450000, 0.84450001, 0.18050000,  
 0.65350002, 0.36649999, 0.85299999, 0.09250000, 0.47799999, 0.72299999,  
 0.21250001, 0.97049999, 0.53549999, 0.26300001, 0.73500001, 0.02850000,  
 0.47099999, 0.82300001, 0.15150000, 0.63999999, 0.28400001, 0.88749999,  
 0.46200001, 0.10450000, 0.78850001, 0.54600000, 0.23250000, 0.99000001,  
 0.43200001, 0.75349998, 0.31650001, 0.00150000, 0.55500001, 0.85450000,  
 0.21050000, 0.67250001, 0.38550001, 0.94599998, 0.25850001, 0.61299998,  
 0.07600000, 0.73199999, 0.31799999, 0.98600000, 0.53149998, 0.25299999,  
 0.74550003, 0.04950000, 0.47850001, 0.85350001, 0.19499999, 0.66600001,  
 0.38999999, 0.96249998, 0.21699999, 0.72450000, 0.45550001, 0.14600000,  
 0.87050003, 0.37950000, 0.63550001, 0.03950000, 0.79400003, 0.24400000,  
 0.67299998, 0.39899999, 0.97350001, 0.27100000, 0.63700002, 0.12300000,  
 0.83050001, 0.45850000, 0.17050000, 0.64649999, 0.96899998, 0.23850000,  
 0.46750000, 0.72799999, 0.16599999, 0.95050001, 0.52800000, 0.28500000,

```

0.79949999, 0.07700000, 0.69800001, 0.45600000, 0.24050000, 0.99750000,
0.65499997, 0.47999999, 0.07550000, 0.79600000, 0.33450001, 0.59950000,
0.02300000, 0.75650001, 0.24349999, 0.43950000, 0.99849999, 0.58350003,
0.25600001, 0.75599998, 0.07750000, 0.49450001, 0.89450002, 0.23350000,
0.72000003, 0.43450001, 0.11750000, 0.87000000, 0.60500002, 0.34200001,
0.01000000, 0.71249998, 0.42199999, 0.93800002, 0.22450000, 0.74299997,
0.43250000, 0.08050000, 0.61400002, 0.92100000, 0.24100000, 0.50349998,
0.77649999, 0.07450000, 0.44450000, 0.85149997, 0.20950000, 0.53250003,
0.80250001, 0.04600000, 0.42850000, 0.70649999, 0.21349999, 0.97000003,
0.53649998, 0.29350001, 0.79799998, 0.10050000, 0.64200002, 0.37549999,
0.95450002, 0.21850000, 0.74100000, 0.51349998, 0.16700000, 0.96499997,
0.43700001, 0.76050001, 0.32249999, 0.00800000, 0.58249998, 0.83850002,
0.37850001, 0.08350000, 0.60299999, 0.91399997, 0.30000001, 0.58600003,
0.09100000, 0.82349998, 0.35049999, 0.61750001, 0.12800001, 0.87699997,
0.36800000, 0.67000002, 0.22750001, 0.95550001, 0.53399998, 0.18799999,
0.79149997, 0.43399999, 0.06900000, 0.61049998, 0.88700002, 0.38450000,
0.11150000, 0.73449999, 0.47299999, 0.93650001, 0.33849999, 0.03200000,
0.55100000, 0.85399997, 0.19650000, 0.66549999, 0.31900001, 0.97149998,
0.53200001, 0.15250000, 0.83149999, 0.34700000, 0.65850002, 0.20550001,
0.89550000, 0.57650000, 0.06750000, 0.44250000, 0.85049999, 0.18950000,
0.67150003, 0.38150001, 0.91149998, 0.19350000, 0.51950002, 0.75050002,
0.01050000, 0.35499999, 0.58800000, 0.97500002, 0.24600001, 0.76300001,
0.55750000, 0.00300000, 0.41749999, 0.73900002, 0.22700000, 0.88999999,
0.50550002, 0.07950000, 0.75150001, 0.24800000, 0.52999997, 0.97899997,
0.31999999, 0.64700001, 0.13349999, 0.85699999, 0.36000001, 0.65700001,
0.18600000, 0.88499999, 0.49149999, 0.11100000, 0.73299998, 0.41499999,
0.89150000, 0.33700001, 0.05950000, 0.60350001, 0.86500001, 0.38049999,
0.12150000, 0.62349999, 0.90149999, 0.39350000, 0.13750000, 0.62949997,
0.92049998, 0.40849999, 0.11850000, 0.77450001, 0.53350002, 0.18500000,
0.90799999, 0.30950001, 0.57599998, 0.84500003, 0.11050000, 0.39300001,
0.64800000, 0.97850001, 0.27649999, 0.57400000, 0.05850000, 0.77600002,
0.26100001, 0.57349998, 0.96700001, 0.40149999, 0.10900000, 0.71899998,
0.41600001, 0.94150001, 0.20700000, 0.49750000, 0.77350003, 0.01800000,
0.59649998, 0.22300000, 0.76099998, 0.31600001, 0.91250002};

```

```

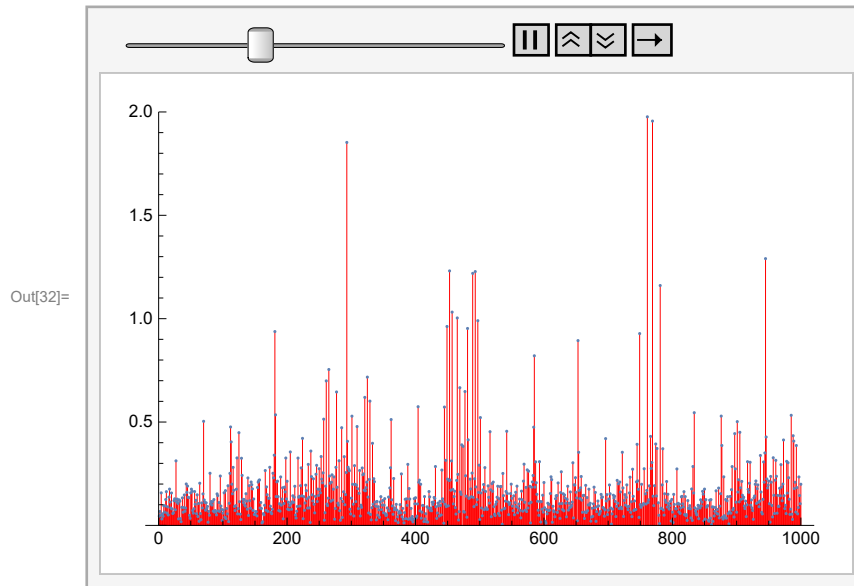
In[31]:= quantizedDitheredBlueGeneratedSineSignal =
Round[sineFunction[#1] & /@ Range[sampleCount] + blueGenerated - 0.5];

```

```

In[32]:= ListAnimate[
  {MyPeriodogram[quantizedDitheredSineSignal - originalSineSignal, Black, {0, 2.0}],
   MyPeriodogram[quantizedDitheredSineSignalGolden - originalSineSignal, Red,
    {0, 2.0}], MyPeriodogram[quantizedDitheredBlueSineSignal - originalSineSignal,
    Green, {0, 2.0}], MyPeriodogram[quantizedDitheredBlueGeneratedSineSignal -
    originalSineSignal, Yellow, {0, 2.0}]}]

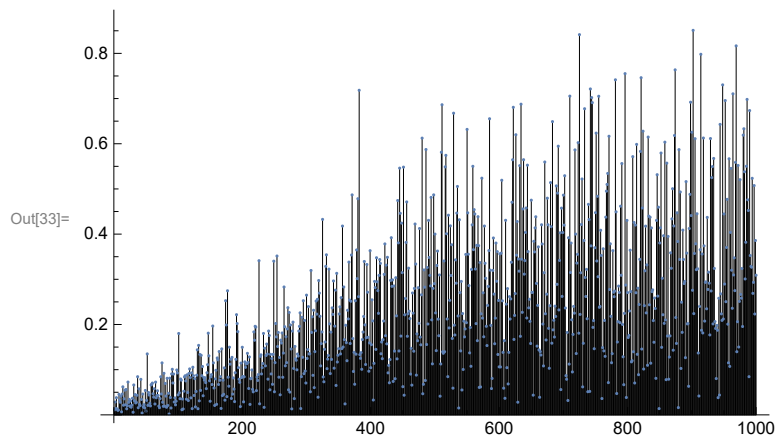
```

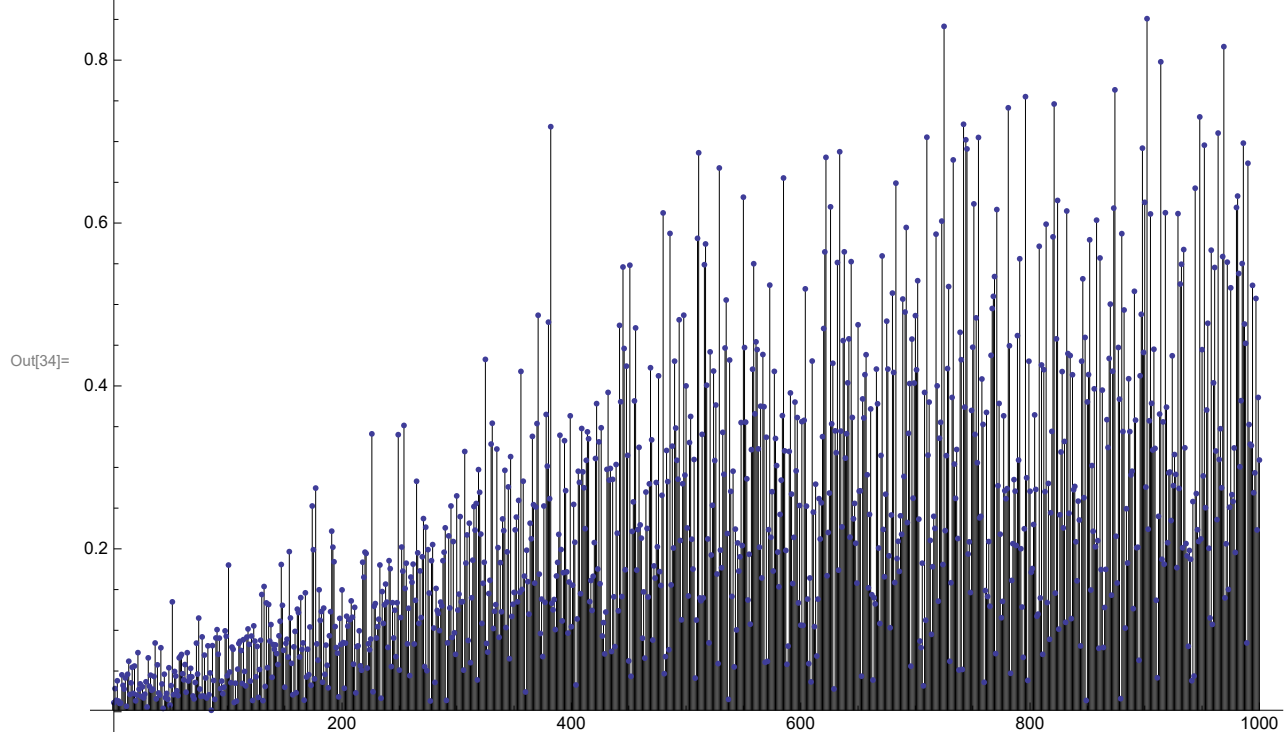
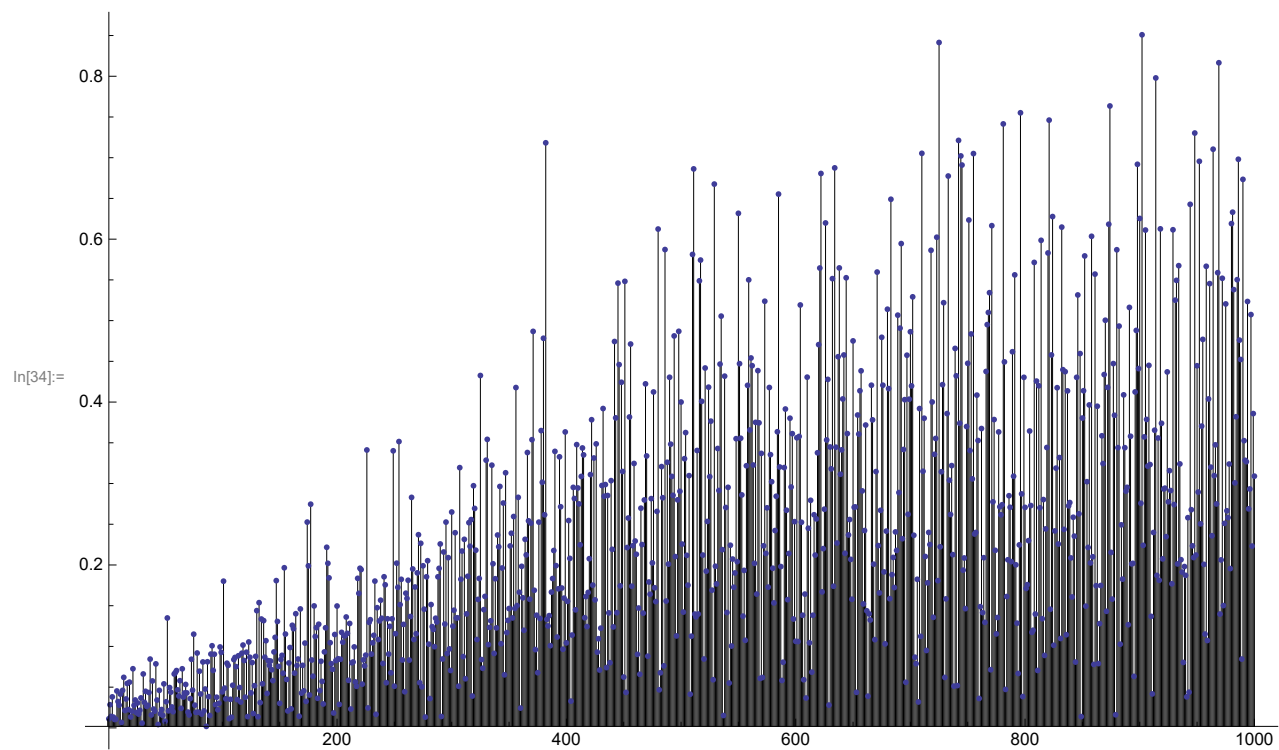


```

In[33]:= MyPeriodogram[blueGenerated - 0.5]

```







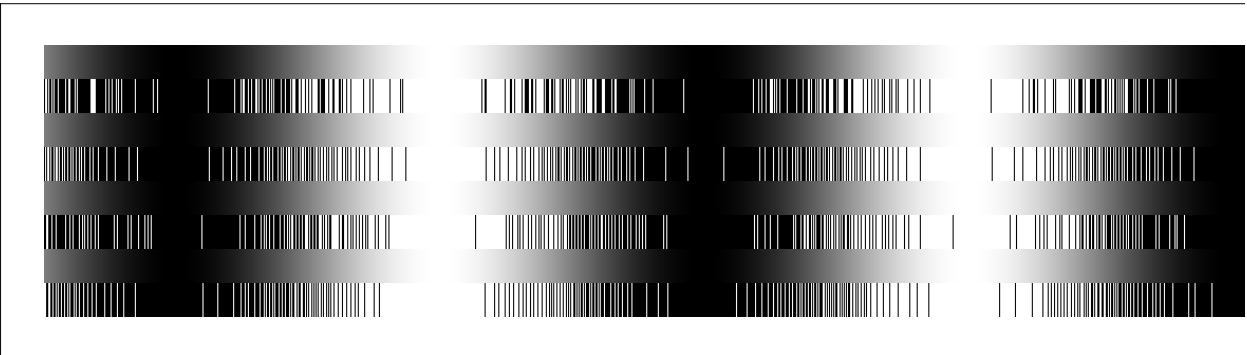
```
In[35]:= (*Example of problems with highpass and remap - some patterns remain locally *)
ArrayPlot[{Nest[RemapHistogram1D[MyHighpass[#]] &,
  RandomReal[] & /@ Range[128], 10][[32 ;; 64]]}]
```

Out[35]=



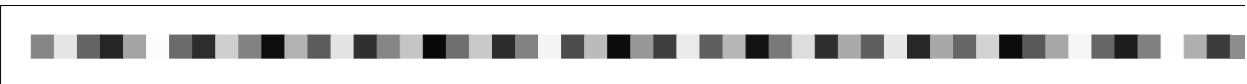
```
In[36]:= ArrayPlot[Join[Nest[Join[#, #, 1] &, {originalSineSignal}, 5],
  Nest[Join[#, #, 1] &, {quantizedDitheredSineSignal}, 5],
  Nest[Join[#, #, 1] &, {originalSineSignal}, 5],
  Nest[Join[#, #, 1] &, {quantizedDitheredSineSignalGolden}, 5],
  Nest[Join[#, #, 1] &, {originalSineSignal}, 5],
  Nest[Join[#, #, 1] &, {quantizedDitheredBlueSineSignal}, 5],
  Nest[Join[#, #, 1] &, {originalSineSignal}, 5],
  Nest[Join[#, #, 1] &, {quantizedDitheredBlueGeneratedSineSignal}, 5]]]
```

Out[36]=

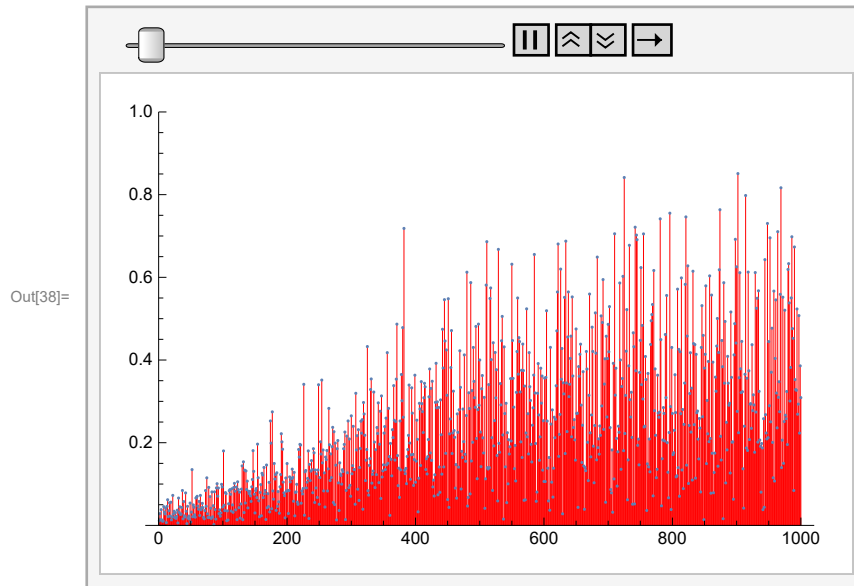


```
In[37]:= ArrayPlot[{blueGenerated[[1 ;; 64]]}]
```

Out[37]=



```
In[38]:= ListAnimate[{MyPeriodogram[blueGenerated - 0.5, Red, {0, 1}], MyPeriodogram[
  RemapHistogram1D[MyHighpass[RandomReal[] & /@ Range[2000]]] - 0.5, Black, {0, 1}]]}
```



```
In[39]:= Export["highpassremapvsgenerated.gif",
  {MyPeriodogram[blueGenerated - 0.5, Red, {0, 1}],
   MyPeriodogram[RemapHistogram1D[MyHighpass[RandomReal[] & /@ Range[2000]]] - 0.5,
    Black, {0, 1}]], "DisplayDurations" -> 2];
```

```
In[40]:= Export["all1dtechniquescomparedfrequencies.gif",
  {MyPeriodogram[quantizedDitheredSineSignal - originalSineSignal, Black, {0, 2.0}],
   MyPeriodogram[quantizedDitheredSineSignalGolden - originalSineSignal, Red,
    {0, 2.0}], MyPeriodogram[quantizedDitheredBlueSineSignal - originalSineSignal,
    Green, {0, 2.0}], MyPeriodogram[quantizedDitheredBlueGeneratedSineSignal -
    originalSineSignal, Yellow, {0, 2.0}]], "DisplayDurations" -> 2];
```