In[443]:=
```
(*FastICA Negentropy Uniform. Initial value is w=
 {1,0} and w=w=RandomReal[{-Sqrt[3],Sqrt[3]},2] *)
x = RandomReal[{-Sqrt[3], Sqrt[3]}, 1000];
y = RandomReal[{-Sqrt[3], Sqrt[3]}, 1000];
```

In[445]:=
```
A = {{5, 10}, {10, 2}};
```

In[446]:=
```
mt = A.{x, y};
```

In[447]:=
```
ma = Transpose[mt];
ListPlot[{ma[[All]]}, PlotRange → {{-30, 30}, {-30, 30}}];
```

In[449]:=
```
mt = mt - Mean[Transpose[mt]];
```

In[450]:=
```
Covariance[Transpose[mt]]
```

Out[450]=
```
{{121.312, 69.521}, {69.521, 104.655}}
```

In[451]:=
```
Eigenvalues[Covariance[Transpose[mt]]]
```

Out[451]=
```
{183.002, 42.9654}
```

In[452]:=
```
Eigenvectors[Covariance[Transpose[mt]]]
```

Out[452]=
```
{{-0.74798, -0.663721}, {0.663721, -0.74798}}
```

In[453]:=
```
d12 = 1 / Sqrt[Eigenvalues[Covariance[Transpose[mt]]][[1]]]
d22 = 1 / Sqrt[Eigenvalues[Covariance[Transpose[mt]]][[2]]]
dmat = DiagonalMatrix[{d12, d22}]
```

Out[453]=
```
0.0739218
```

Out[454]=
```
0.15256
```

Out[455]=
```
{{0.0739218, 0.}, {0., 0.15256}}
```

In[456]:=
```
emat = Transpose[Eigenvectors[Covariance[Transpose[mt]]]]
```

Out[456]=
```
{{-0.74798, 0.663721}, {-0.663721, -0.74798}}
```

In[457]:=
```
vmat = emat.dmat.Transpose[emat]
```

Out[457]=
```
{{0.108564, -0.0390399}, {-0.0390399, 0.117918}}
```

In[458]:=
```
x = RandomReal[{-Sqrt[3], Sqrt[3]}, 1000];
y = RandomReal[{-Sqrt[3], Sqrt[3]}, 1000];
mt = A.{x, y};
mt = mt - Mean[Transpose[mt]];
```

In[462]:=
```
zmat = vmat.mt;
```

In[463]:=
```
za = Transpose[zmat];
ListPlot[{za[[All]]}, PlotRange → {{-3, 3}, {-3, 3}}];
```

In[465]:=
```
(*
w=RandomReal[{-Sqrt[3],Sqrt[3]},2];
*)

w = {1, 0};

(*w={2,20};//N*)

(*w=w/Norm[w]//N*)
epsilon = 0.0001;
n = Length[x];
cnt = 1;
wbefore = w;
While[cnt < n,
 wbefore = w;
 w = (1 / n) * Sum[Tanh[w.zmat[[All, i]]] * zmat[[All, i]], {i, 1, n}] -
    (1 / n) * Sum[1 - (Tanh[w.zmat[[All, i]]])^2, {i, 1, n}] * w;
 w = w / Norm[w];
 Print["cnt=", cnt];
 Print["w=", w];

 If[1 - epsilon <= Abs[w.wbefore] && Abs[w.wbefore] <= 1 + epsilon,
  Print["収束した:"];
  Print["w=", w];
  Print["cnt=", cnt];
  Print["Abs[w.wbefore]=", Abs[w.wbefore]];
  cnt = n;
 ];
 ++cnt;
]
Kurtosis[w.zmat] - 3
```

```
cnt=1
w={0.968458, -0.249176}
cnt=2
w={0.974443, -0.224635}
cnt=3
w={0.974017, -0.226477}
収束した:
w={0.974017, -0.226477}
cnt=3
Abs[w.wbefore]=0.999998
```

Out[471]=
```
-1.22385
```

In[472]:=
```
(* True Value*)
tmat = vmat.A;
truemat = {};
i = 1;
While[i ≤ 2,
  truemat = Append[truemat, tmat[[All, i]] / Norm[tmat[[All, i]]]];
  i++;
 ];
truemat = Transpose[truemat];
MatrixForm[truemat]
```

Out[477]//MatrixForm=

$$\begin{pmatrix} 0.153076 & 0.988437 \\ 0.988214 & -0.15163 \end{pmatrix}$$

In[478]:=
```
w = RandomReal[{-Sqrt[3], Sqrt[3]}, 2];
epsilon = 0.0000000001;
n = Length[x];
cnt = 1;
wbefore = w;
While[cnt < n,
 wbefore = w;
 w = (1 / n) * Sum[Tanh[w.zmat[[All, i]]] * zmat[[All, i]], {i, 1, n}] -
    (1 / n) * Sum[1 - (Tanh[w.zmat[[All, i]]])^2, {i, 1, n}] * w;
 w = w / Norm[w];
 Print["cnt=", cnt];
 Print["w=", w];

 If[1 - epsilon <= Abs[w.wbefore] && Abs[w.wbefore] <= 1 + epsilon,
  Print["収束した:"];
  Print["w=", w];
  Print["cnt=", cnt];
  Print["Abs[w.wbefore]=", Abs[w.wbefore]];
  cnt = n;
 ];
 ++cnt;
]
Kurtosis[w.zmat] - 3
```

```
cnt=1
w={0.924872, -0.380278}
cnt=2
w={0.976089, -0.217372}
cnt=3
w={0.973884, -0.227046}
cnt=4
w={0.97406, -0.22629}
cnt=5
w={0.974046, -0.226349}
cnt=6
w={0.974047, -0.226344}
収束した:
w={0.974047, -0.226344}
cnt=6
Abs[w.wbefore]=1.
```

Out[484]= -1.22391

In[485]:= **MatrixForm[truemat]**

Out[485]//MatrixForm=

$$\begin{pmatrix} 0.153076 & 0.988437 \\ 0.988214 & -0.15163 \end{pmatrix}$$

In[486]:= **Transpose[vmat.A].w**

Out[486]= {-0.0742533, 1.0164}