

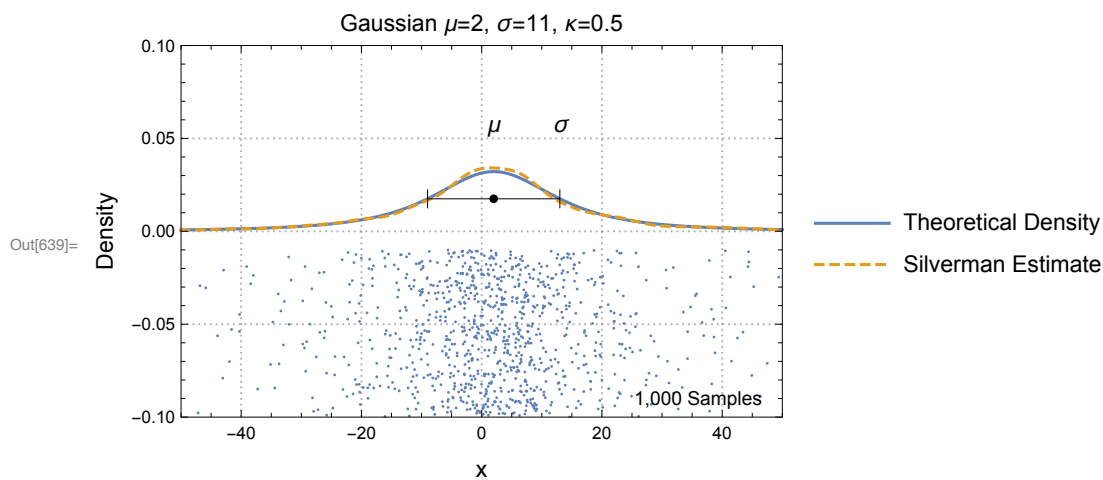
Evaluate Samples from TensorFlow Probability Student's t

Import Samples

```
In[596]:= StudentTSamples = Import[
  "/Users/kenricnelson/Documents/GitHub/Nonlinear-Statistical-Coupling/nsc/
  evaluation/studentt_sample.txt", "CSV"] // Flatten
```

```
In[605]:=  $\mu = 2$ ;  $\sigma = 11$ ;  $\kappa = 0.5$ ;
dist = CoupledNormalDistribution[ $\mu$ ,  $\sigma$ ,  $\kappa$ ];
estPDF = PDF[SmoothKernelDistribution[StudentTSamples, "Silverman"], x];
```

```
In[639]:= PlotCoupledDistSamples[dist, estPDF, StudentTSamples,  $\mu$ ,  $\sigma$ ,  $\kappa$ ]
```



Plotting Function for Comparison of Estimated Distribution

```
In[638]:= PlotCoupledDistSamples[dist_, estPDF_, samples_,  $\mu$ _,  $\sigma$ _,  $\kappa$ _] := Module[
  {h, ArrowDetails, f, g},
  h = Graphics[Line[{{0, 3/4}, {0, -3/4}}]];
  ArrowDetails = {
    (*Text["Scale", { $\mu + \sigma/2$ , f-0.03}], *)
    (*Text["Fluctuations", { $\mu + \sigma + \sqrt{\text{Abs}[\kappa]} / (1.0\sigma) + 2$ , g+0.02}], *)
    Text[Style[" $\mu$ ", 12], { $\mu$ , f + 0.04}],
    Text[Style[" $\sigma$ ", 12], { $\mu + \sigma + .25$ , f + 0.04}],
    (*Text[Style["1/ $\sigma$ ", 12], { $\mu + 1/\sigma - 0.$ , g+If[ $\kappa \geq 0$ , 0.05, -0.05]}], *)
    (*Text[Style[If[ $\kappa < 0$ , "- ", ""], "<>"  $\frac{\sqrt{2|\kappa|}}{\sigma}$ ], 8],
      { $\mu + 1/\sigma + \text{Sign}[\kappa] \sqrt{2\text{Abs}[\kappa]} / \sigma + \text{If}[\kappa \geq 0, 0.7, 1.25]$ ,
        g+If[ $\kappa \geq 0$ , -0.05, 0.1]}], *)
    PointSize[Medium],
    Point[{ $\mu$ , f}],
    (* Standard Deviation *)
```

```

Arrowheads[{{0.02, 1, {h, 0}}}],
Arrow[{{μ, f}, {μ + σ, f}}],
Arrow[{{μ, f}, {μ - σ, f}}],
(* Fluctuation *)
(*Point[{μ+1/σ,g}],Point[{μ-1/σ,g}],*)
(*Arrowheads[{{(*{0.02,0,{h,0}},*)}.03}],
Arrow[{{μ+1/σ(*-Sign[κ] √(2Abs[κ]/(1+κ))/σ*),g},{μ+1/σ+ Sign[κ] √(2Abs[κ]/σ,g)}],
Arrow[{{μ-1/σ(*+Sign[κ] √(2Abs[κ]/(1+κ))/σ*),g},{μ-1/σ-Sign[κ] √(2Abs[κ]/σ,g)}],*)
Text[Style["1,000 Samples", 10], {36, -.09}]
} /. {f → PDF[dist, μ + σ], g → PDF[dist, μ + 1 / σ]};

Show[
Plot[
{PDF[dist, x],
Style[estPDF, Dashed]
},
{x, -50, 50},
PlotTheme → "Detailed",
PlotRange → {{-50, 50}, {-0.1, 0.1}},
(*PlotLegends→None,*)
PlotLegends → {
Style["Theoretical Density", Smaller],
Style["Silverman Estimate", Smaller]},
PlotRange → Full,
PlotLabel → Style["Gaussian μ=" <> ToString[μ] <>
", σ=" <> ToString[σ] <> ", κ=" <> ToString[κ], Medium],
FrameLabel → {Style["x", Medium], Style["Density", Medium]},
Epilog → ArrowDetails
],
ListPlot[
Transpose@{samples, RandomReal[{-0.1, -0.01},
Length[samples]]}
]
]
]

```

Scraps