custom

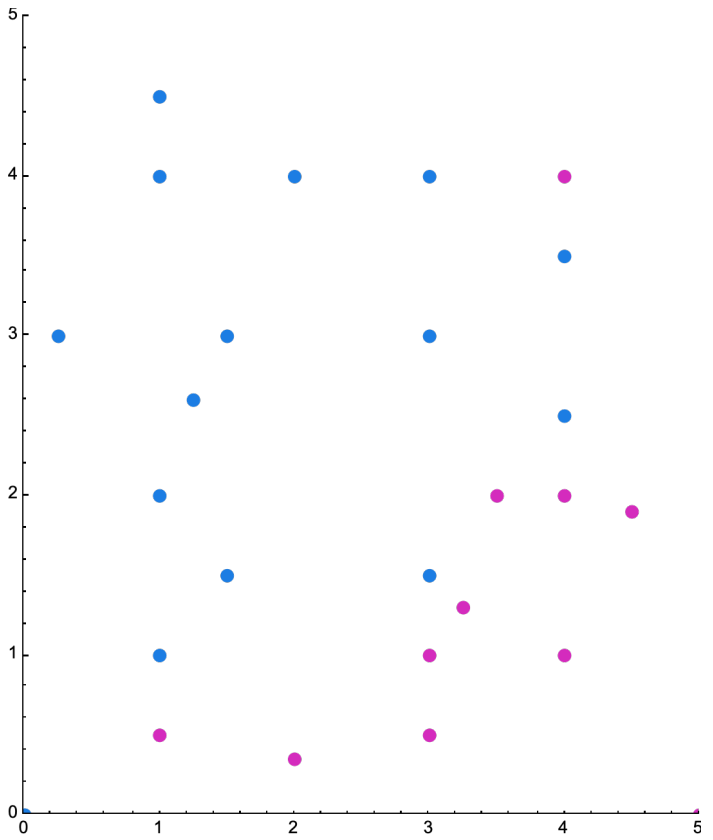
data

In[1]:=
```
list = Tuples[Range[0, 10, 0.1], 2];
low = {{1, 1}, {1, 2}, {0, 0}, {1.5, 3}, {3, 3}, {3, 1.5}, {4, 2.5},
    {4, 3.5}, {3, 4}, {1.5, 1.5}, {2, 4}, {1, 4}, {1, 4.5}, {1.25, 2.6}, {0.25, 3}};
high = {{3.5, 2}, {4, 4}, {4, 2}, {5, 0}, {3, 1},
    {2, 0.35}, {3, 0.5}, {3.25, 1.3}, {4, 1}, {4.5, 1.9}, {4.5, 3.75}, {4.5, 3}};
```

graph

In[ ]:=
```
ListPlot[Tooltip@{low, high}, PlotRange → {{0, 5}, {0, 5}},
 PlotStyle → {{RGBColor[0.11, 0.49, 0.89], PointSize[Large]}, {RGBColor[0.83, 0.17, 0.74], PointSize[Large]}},
 AspectRatio → Full]
```

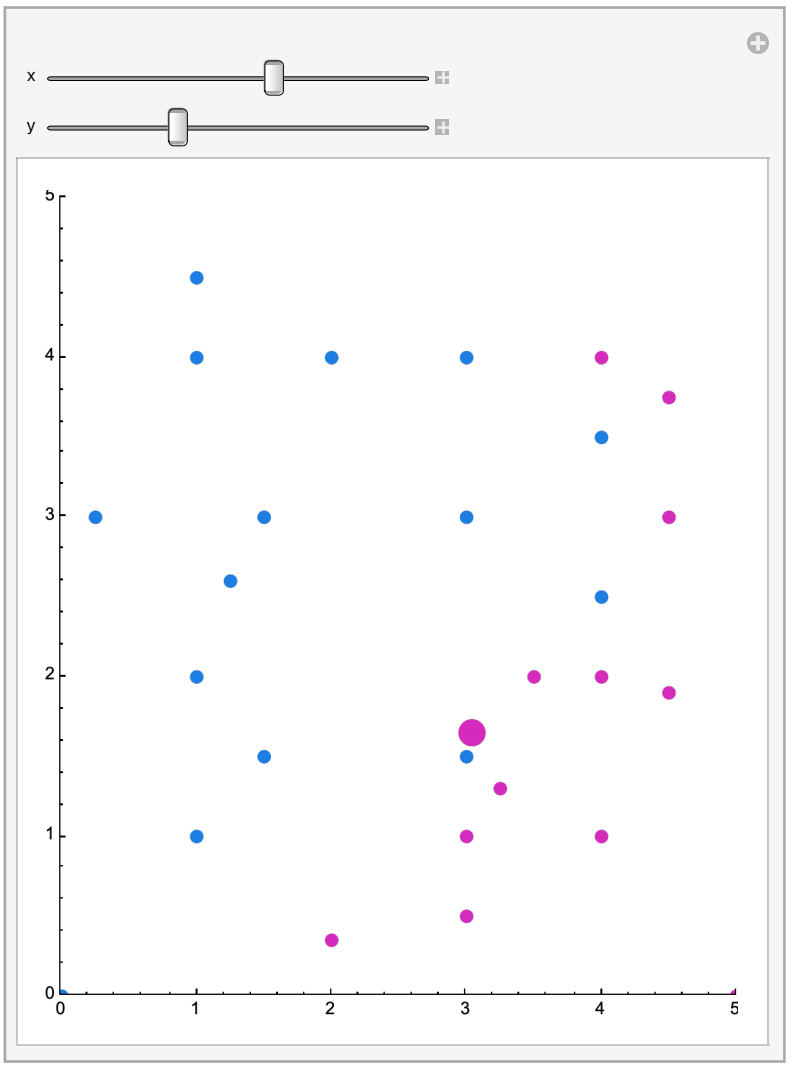
Out[ ]=



Manipulate

In[66]:=
```
Manipulate[ListPlot[Tooltip@{low, high, {{x, y}}}, PlotRange → {{0, 5}, {0, 5}},
  PlotStyle → {{RGBColor[0.11, 0.49, 0.89], PointSize[Large]}, {RGBColor[0.83, 0.17, 0.74], PointSize[Large]},
    {SVM[{x, y}], PointSize[0.04]}}, AspectRatio → Full], {x, 0, 5}, {y, 0, 5}]
```

Out[•]=

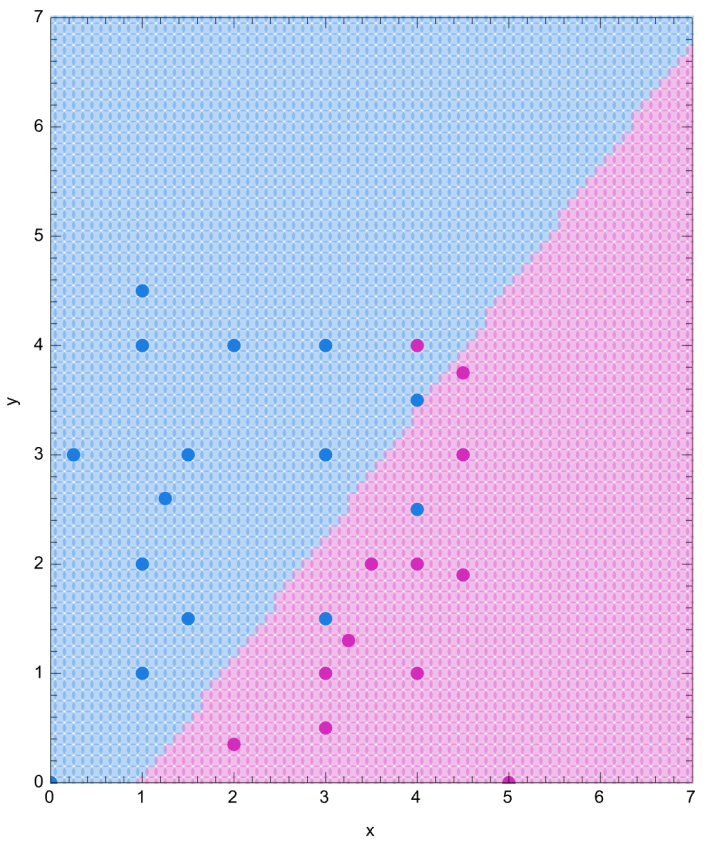


Linear Kernel

In[100]:=

```
SVM = Classify[<|RGBColor[0.11, 0.49, 0.89] → low, RGBColor[0.83, 0.17, 0.74] → high|>,
    Method → {"SupportVectorMachine", "KernelType" → "Linear", "SoftMarginParameter" → 100}];
colours = ParallelMap [SVM, list];
Show[Graphics[{Opacity[0.3], PointSize[0.02], Point[list, VertexColors → colours]},
  FrameLabel → {"x", "y"}, PlotRange → {{0, 7}, {0, 7}}, AspectRatio → Full, Options@ListPlot],
 ListPlot[Tooltip@{low, high}, PlotRange → {{0, 5}, {0, 5}},
  PlotStyle → {{RGBColor[0.11, 0.49, 0.89], PointSize[Large]}, {RGBColor[0.83, 0.17, 0.74], PointSize[Large]}},
  AspectRatio → Full]]
```

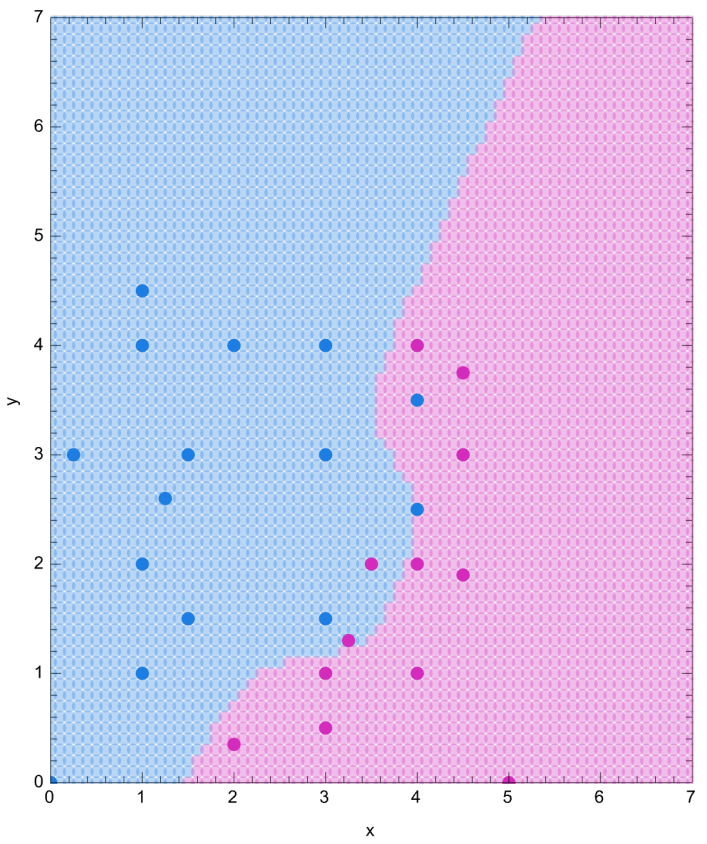
Out[•]=



Low Bias/High variance

In[ ]:=
```
SVM = Classify[<|RGBColor[0.11, 0.49, 0.89] → low, RGBColor[0.83, 0.17, 0.74] → high|>, Method →
    {"SupportVectorMachine", "KernelType" → "Polynomial", "BiasParameter" → 0, "PolynomialDegree" → 5}];
colours = ParallelMap [SVM, list];
Show[Graphics[{Opacity[0.3], PointSize[0.02], Point[list, VertexColors → colours]},
  FrameLabel → {"x", "y"}, PlotRange → {{0, 7}, {0, 7}}, AspectRatio → Full, Options@ListPlot],
 ListPlot[Tooltip@{low, high}, PlotRange → {{0, 5}, {0, 5}},
  PlotStyle → {{RGBColor[0.11, 0.49, 0.89], PointSize[Large]}, {RGBColor[0.83, 0.17, 0.74], PointSize[Large]}},
  AspectRatio → Full]]
```

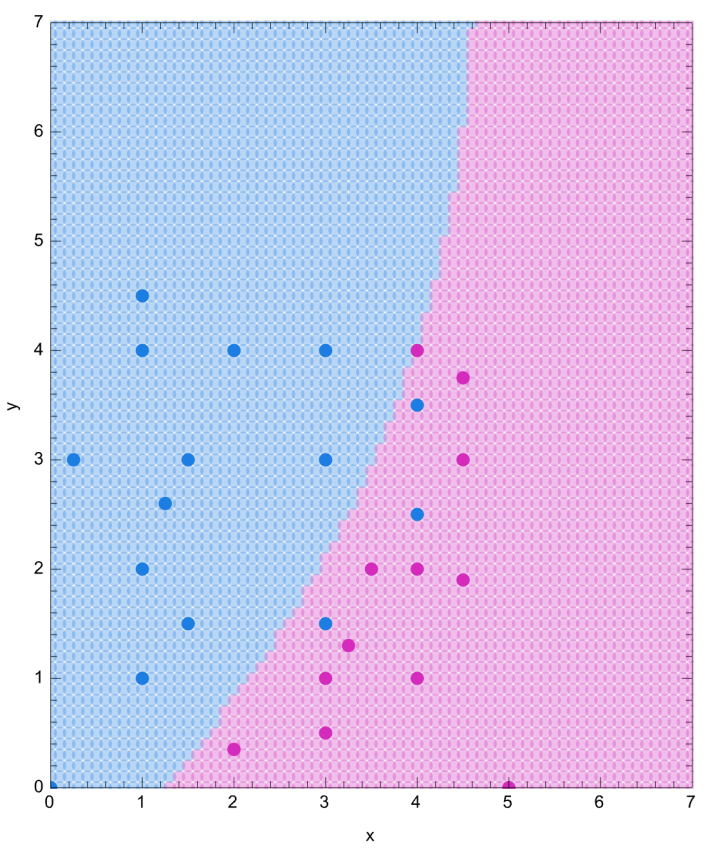
Out[ ]=



Higher Bias

In[ ]:=
```
SVM = Classify[<|RGBColor[0.11, 0.49, 0.89] → low, RGBColor[0.83, 0.17, 0.74] → high|>, Method →
    {"SupportVectorMachine", "KernelType" → "Polynomial", "BiasParameter" → 3, "PolynomialDegree" → 5}];
colours = ParallelMap [SVM, list];
Show[Graphics[{Opacity[0.3], PointSize[0.02], Point[list, VertexColors → colours]},
  FrameLabel → {"x", "y"}, PlotRange → {{0, 7}, {0, 7}}, AspectRatio → Full, Options@ListPlot],
 ListPlot[Tooltip@{low, high}, PlotRange → {{0, 50}, {0, 50}},
  PlotStyle → {{RGBColor[0.11, 0.49, 0.89], PointSize[Large]}, {RGBColor[0.83, 0.17, 0.74], PointSize[Large]}},
  AspectRatio → Full]]
```

Out[ ]=

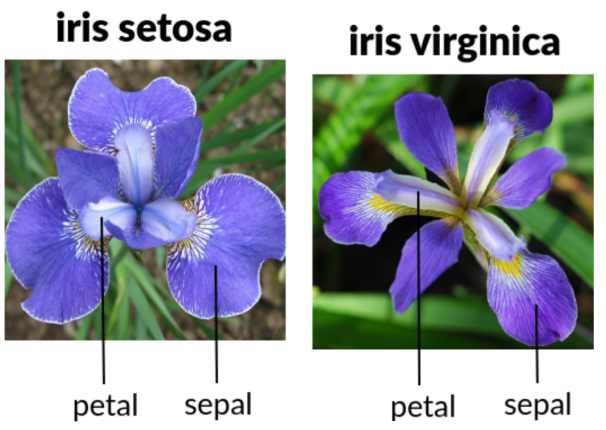


flower

data

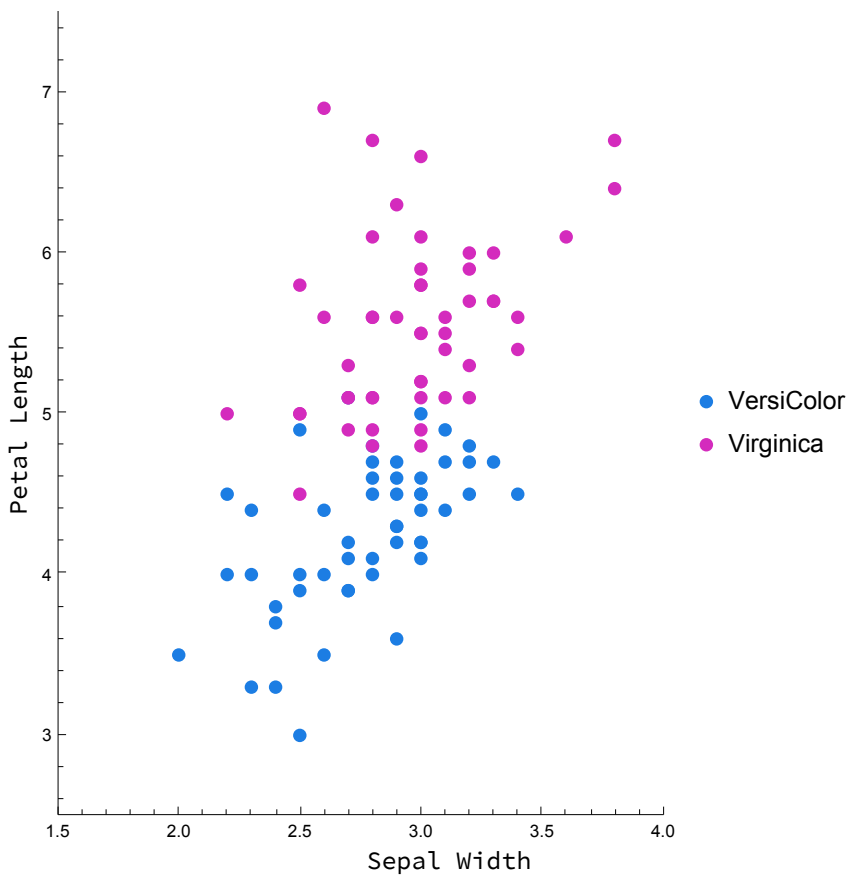
In[1]:=
```
label[func_] := Labeled[func, {"Sepal Width", "Petal Length"}, {Bottom, Left}, RotateLabel → True]
flowerlist = Tuples[Range[0, 8, 0.1], 2];
flowerlist2 = {#} & /@ Tuples[Range[0, 8, 0.2], 2];
Virginica = {{3.2, 4.7}, {3.2, 4.5}, {3.1, 4.9}, {2.3, 4.}, {2.8, 4.6}, {2.8,
  4.5}, {3.3, 4.7}, {2.4, 3.3}, {2.9, 4.6}, {2.7, 3.9}, {2., 3.5},
   {3., 4.2}, {2.2, 4.}, {2.9, 4.7}, {2.9, 3.6}, {3.1, 4.4}, {3., 4.5}, {2.7, 4.1}, {2.2,
  4.5}, {2.5, 3.9}, {3.2, 4.8}, {2.8, 4.}, {2.5, 4.9}, {2.8, 4.7},
   {2.9, 4.3}, {3., 4.4}, {2.8, 4.8}, {3., 5.}, {2.9, 4.5}, {2.6, 3.5}, {2.4, 3.8}, {2.4,
  3.7}, {2.7, 3.9}, {2.7, 5.1}, {3., 4.5}, {3.4, 4.5}, {3.1, 4.7}, {2.3, 4.4},
   {3., 4.1}, {2.5, 4.}, {2.6, 4.4}, {3., 4.6}, {2.6, 4.}, {2.3, 3.3}, {2.7, 4.2},
  {3., 4.2}, {2.9, 4.2}, {2.9, 4.3}, {2.5, 3.}, {2.8, 4.1}};
VersiColor = {{3.3, 6.}, {2.7, 5.1}, {3., 5.9}, {2.9, 5.6}, {3., 5.8}, {3., 6.6},
   {2.5, 4.5}, {2.9, 6.3}, {2.5, 5.8}, {3.6, 6.1}, {3.2, 5.1}, {2.7, 5.3}, {3., 5.5},
  {2.5, 5.}, {2.8, 5.1}, {3.2, 5.3}, {3., 5.5}, {3.8, 6.7}, {2.6, 6.9},
   {2.2, 5.}, {3.2, 5.7}, {2.8, 4.9}, {2.8, 6.7}, {2.7, 4.9}, {3.3, 5.7}, {3.2, 6.},
  {2.8, 4.8}, {3., 4.9}, {2.8, 5.6}, {3., 5.8}, {2.8, 6.1}, {3.8, 6.4},
   {2.8, 5.6}, {2.8, 5.1}, {2.6, 5.6}, {3., 6.1}, {3.4, 5.6}, {3.1, 5.5}, {3., 4.8},
  {3.1, 5.4}, {3.1, 5.6}, {3.1, 5.1}, {2.7, 5.1},
   {3.2, 5.9}, {3.3, 5.7}, {3., 5.2}, {2.5, 5.}, {3., 5.2}, {3.4, 5.4}, {3., 5.1}};
```

graph



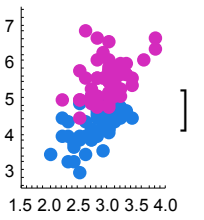
In[ ]:=
```
label@ListPlot[{Virginica, VersiColor}, PlotRange → {{1.5, 4}, {2.5, 7.5}},
  PlotStyle → {{RGBColor[0.11, 0.49, 0.89], PointSize[Large]}, {RGBColor[0.83, 0.17, 0.74], PointSize[Large]}},
  AspectRatio → Full, PlotLegends → {"VersiColor", "Virginica"}]
```

Out[ ]=



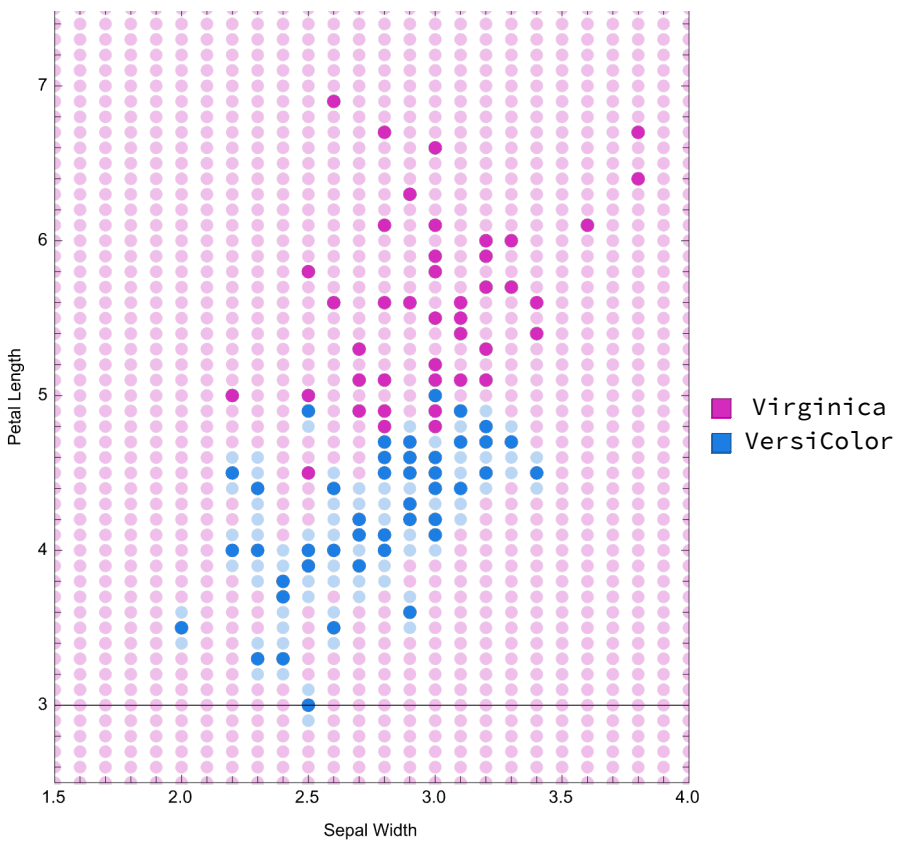
High Gamma scaling Parameter ⟹ Overfit

In[ ]:=
```
SVMFlower = Classify[<|RGBColor[0.11, 0.49, 0.89] → Virginica, RGBColor[0.83, 0.17, 0.74] → VersiColor|>,
   Method → {"SupportVectorMachine", "KernelType" → "RadialBasisFunction", "GammaScalingParameter" → 35}];
colours = ParallelMap [SVMFlower, flowerlist];
Show[
 Legended[Graphics[{Opacity[0.3], PointSize[0.02], Point[flowerlist, VertexColors → colours]}, FrameLabel →
    {"Sepal Width", "Petal Length"}, PlotRange → {{1.5, 4}, {2.5, 7.5}}, AspectRatio → Full, Options@ListPlot],
  Grid@{{RGBColor[0.83, 0.17, 0.74], "Virginica"}, {RGBColor[0.11, 0.49, 0.89], "VersiColor"}}],
```



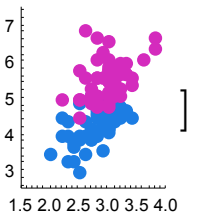
]

Out[ ]=

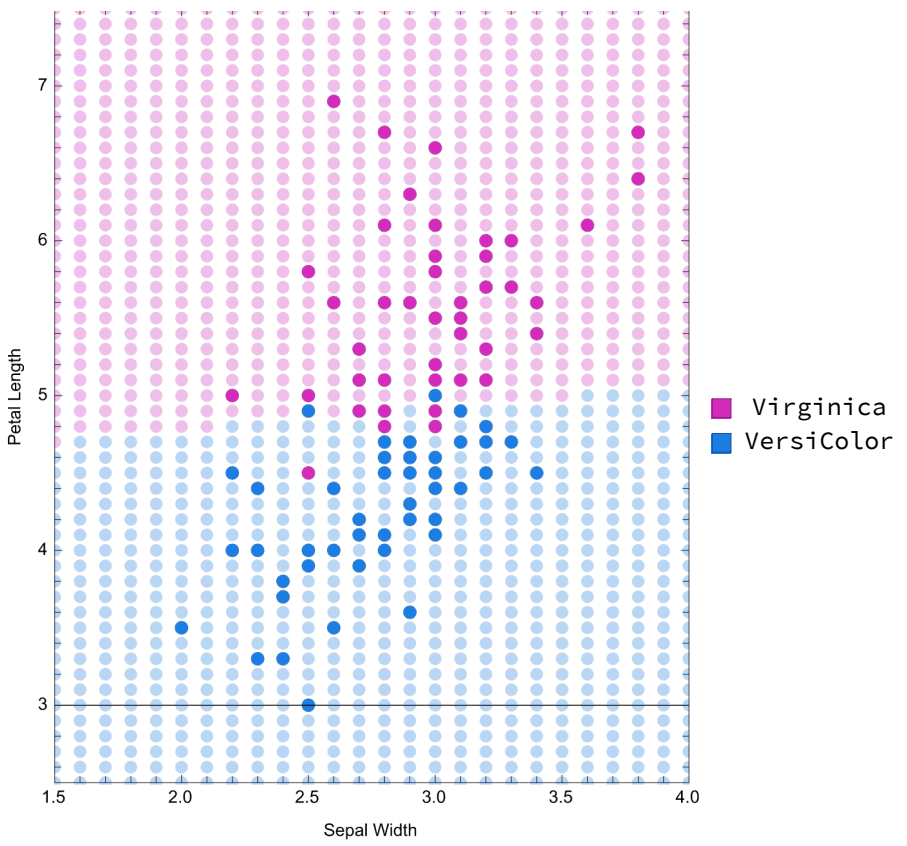


Linear: Ideal Model

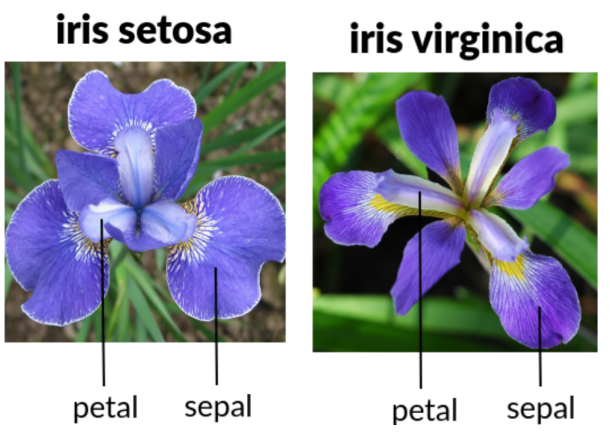
```
In[ ]:= SVMFlower = Classify[<|RGBColor[0.11, 0.49, 0.89] → Virginica, RGBColor[0.83, 0.17, 0.74] → VersiColor|>,
    Method → {"SupportVectorMachine", "SoftMarginParameter" → 50, "KernelType" → "Linear"}];
colours = ParallelMap [SVMFlower, flowerlist];
Show[
 Legended[Graphics[{Opacity[0.3], PointSize[0.02], Point[flowerlist, VertexColors → colours]}, FrameLabel →
    {"Sepal Width", "Petal Length"}, PlotRange → {{1.5, 4}, {2.5, 7.5}}, AspectRatio → Full, Options@ListPlot],
  Grid@{{RGBColor[0.83, 0.17, 0.74], "Virginica"}, {RGBColor[0.11, 0.49, 0.89], "VersiColor"}}],
```




```
Out[ ]=
```



Use




```
In[ ]:= SVMFlower = Classify[<|RGBColor[0.11, 0.49, 0.89] → Virginica, RGBColor[0.83, 0.17, 0.74] → VersiColor|>,
    Method → {"SupportVectorMachine", "SoftMarginParameter" → 1}];

In[ ]:= Manipulate[If[SVMFlower[{width, length}] === 🟦, 🟦 "Setosa", 🟪 "Virginica"], {width, 1, 10}, {length, 1, 10}]
```

```
Out[ ]=
```