```
makeList[list_, w_] :=
 Table[{i, Take[list, {i, i + w - 1}]}, {i, 1, Length[list] - w + 1}]

getKnnPosition[list_, v_, n_, distance_] := Flatten[Position[list[[All, 2]], #] & /@
   Nearest[list[[All, 2]], v, n, DistanceFunction → distance], 2]

(* non-weighted avergage of Nearest neighbour values *)
(* the value is the base(first element) nearest-
 position + n in the original data *)
knnReg[data_, list_, v_, w_, distance_, n_] :=
 Mean[data[[getKnnPosition[list, v, w, distance] + n]]]

metric = {EuclideanDistance, SquaredEuclideanDistance,
   ManhattanDistance, ChessboardDistance, BrayCurtisDistance,
   CanberraDistance, CosineDistance, CorrelationDistance};

plotKNN[knn_, sym_] := Column[Table[{sym <> ": " <> ToString[metric[[j]]];
    mean = Mean[Abs[knn[[j]][[All, 2]] - knn[[j]][[All, 1]]]];
    st = Sqrt[Variance[Abs[knn[[j]][[All, 2]] - knn[[j]][[All, 1]]]]];
    max = Max[Abs[knn[[j]][[All, 2]] - knn[[j]][[All, 1]]]];
    min = Min[Abs[knn[[j]][[All, 2]] - knn[[j]][[All, 1]]]];
    Legended[
     ListLinePlot[{Take[knn[[j]][[All, 2]], -200], Take[knn[[j]][[All, 1]], -200]},
      PlotStyle -> {RGBColor[128 / 255, 165 / 255, 42 / 255],
        RGBColor[216 / 255, 139 / 255, 28 / 255]}, PlotStyle -> {Blue, Red},
      PlotLabel → sym, ImageSize → 500, PlotRange → All],
     {Row[{LineLegend[{Directive[Thick, RGBColor[128 / 255, 165 / 255, 42 / 255]]},
         {"Actual:{}"}]}],
      Row[{LineLegend[{Directive[Thick, RGBColor[216 / 255, 139 / 255, 28 / 255]]},
         {"Forecast:k-NN:{}"}]}], Row[{"μ_Error=", ToString[mean] <> ""}],
      Row[{"σ_Error=", ToString[st] <> ""}], Row[{"Max=", ToString[max] <> ""}],
      Row[{"Min=", ToString[min, TraditionalForm] <> ""}]}],
    Mean[Abs[knn[[j]][[All, 2]] - knn[[j]][[All, 1]]]], metric[[j]]},

   {j, 1, Length[metric]}]
 ]
```

Sample computations:

```
(* partitions a list as if a sliding window *)
list = makeList[Range[20], 4]
```

```
{{1, {1, 2, 3, 4}}, {2, {2, 3, 4, 5}}, {3, {3, 4, 5, 6}}, {4, {4, 5, 6, 7}},
 {5, {5, 6, 7, 8}}, {6, {6, 7, 8, 9}}, {7, {7, 8, 9, 10}}, {8, {8, 9, 10, 11}},
 {9, {9, 10, 11, 12}}, {10, {10, 11, 12, 13}}, {11, {11, 12, 13, 14}},
 {12, {12, 13, 14, 15}}, {13, {13, 14, 15, 16}}, {14, {14, 15, 16, 17}},
 {15, {15, 16, 17, 18}}, {16, {16, 17, 18, 19}}, {17, {17, 18, 19, 20}}}
```

```
j = 1; (*Euclidean metric*)
m = 4;
n = 0;
i = 11;
v = Take[Range[20], {-(m - 1), 0} + i]
knnReg[Range[20], Take[list, {1, i - 2 * m}], v, 1, metric[[j]], n + m + 0]
```

```
{8, 9, 10, 11}
```

```
7
```

Nearest nighbour to {8,9,10,11} in the list below is {3,4,5,6} since the mertic is Euclidean and the 3+m=7, or 7th element is 7:

```
Take[list, {1, i - 2 * m}]
```

```
{{1, {1, 2, 3, 4}}, {2, {2, 3, 4, 5}}, {3, {3, 4, 5, 6}}}
```

But element 7 is actually {7,8,9,10}, to be assurend that all the data used for k-NN regression is before the selected vector in this case {8,9,10,11} for i = 11.

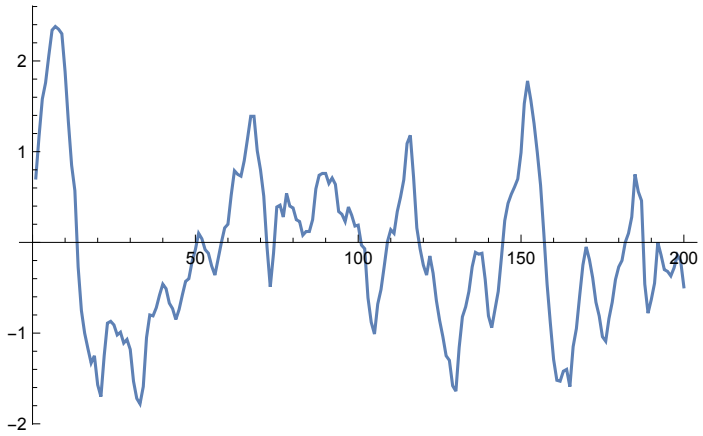
Let's use the actual data:

In[64]:=
```
nino34 = Drop[Import[
     "/Users/darashayda1xfer/Desktop/Weather/SOI/anom forecast/nino3_4_anoms.txt",
     "Table"], -5];
nino34 = Flatten[nino34[[All, 5]]];
Length[nino34]
```

Out[66]=
```
768
```

In[67]:=
```
ListLinePlot[Take[nino34, -200]]
```

Out[67]=




```
Short[nino34]
```

```
{-1.42, -1.31, -1.04, -1.12, -1.38, <<758>>, -0.37, -0.28, -0.14, -0.2, -0.49}
```

Let's turn the data into differences for possibly better accuracy:

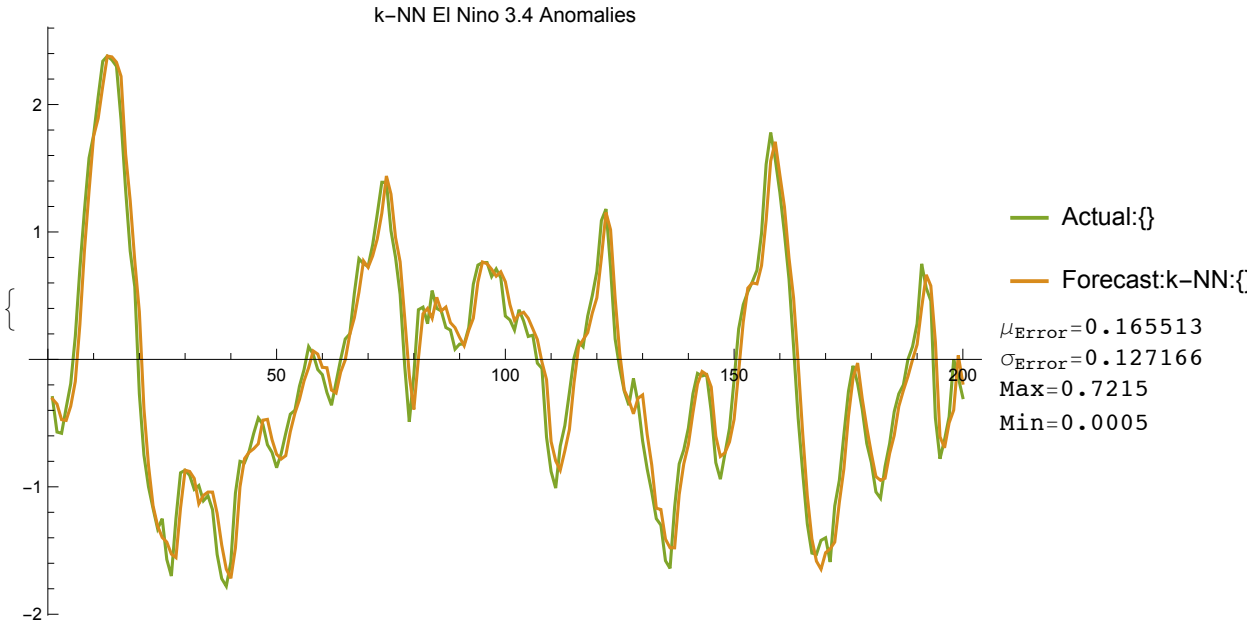
In[68]:=
```
delay = 1;
delta = Drop[Drop[-Join[ConstantArray[0, delay], nino34] +
      Join[nino34, ConstantArray[0, delay]], 1], -1];
```

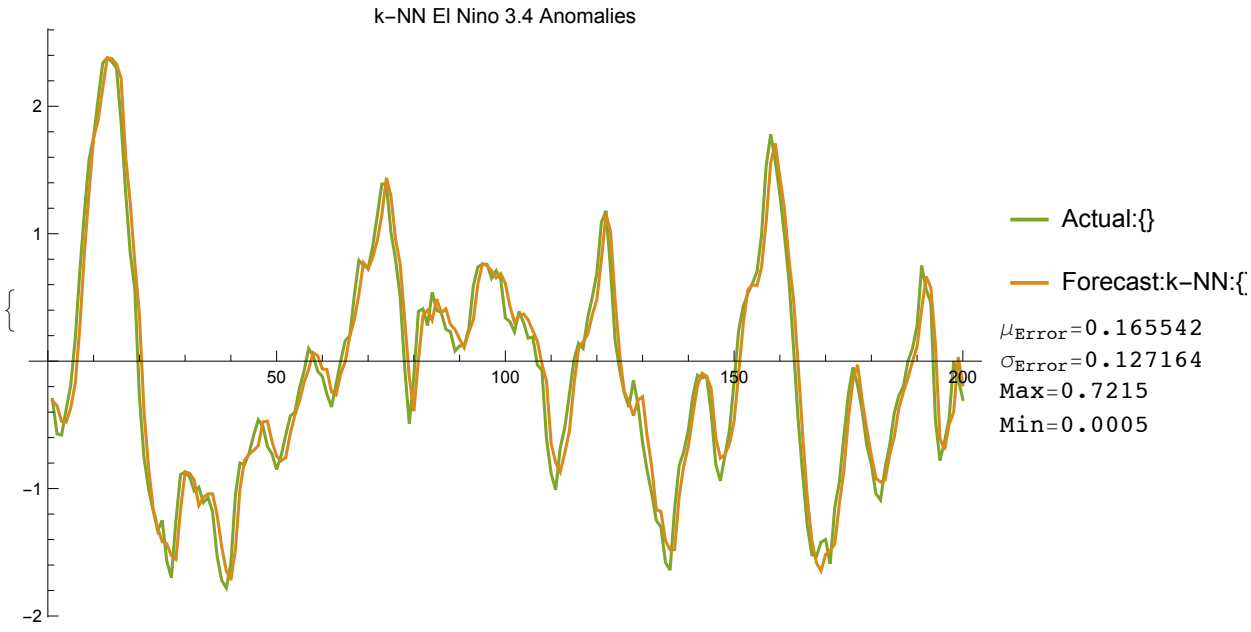
In[70]:=
```
Short[delta]
```

Out[70]//Short= {0.11, 0.27, -0.08, <<761>>, 0.14, -0.06, -0.29}

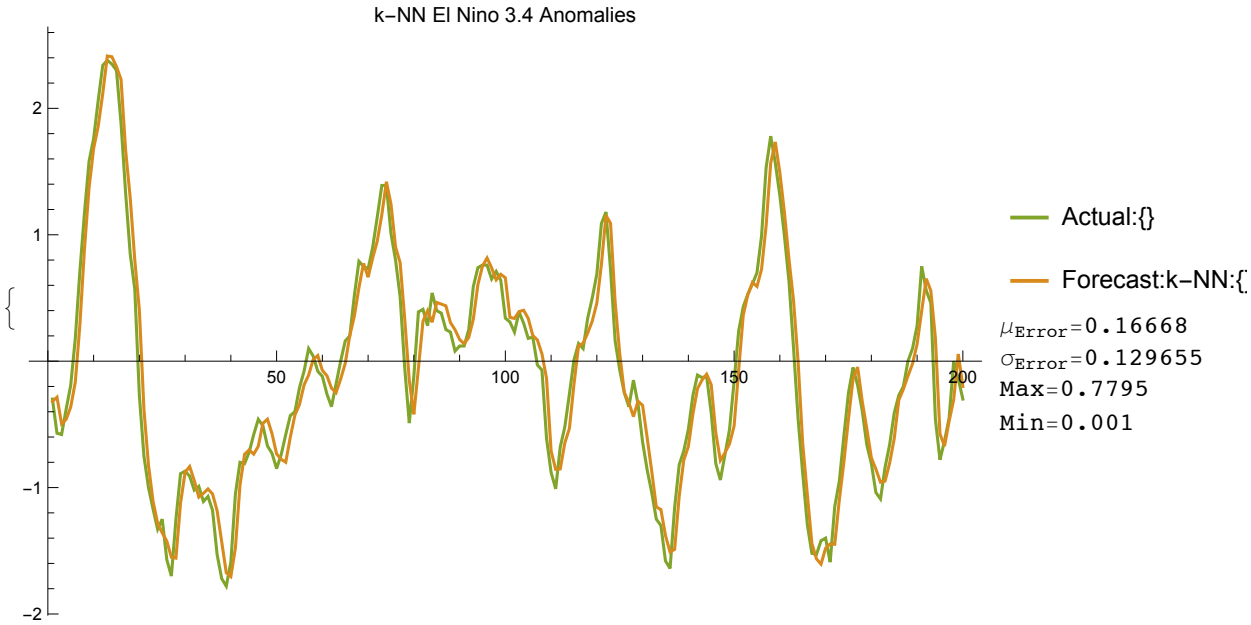
In[71]:=
```
m = 6;
listd = makeList[delta, m];
n = 0; (*starts from 0 to 5 for next 6 months *)
metric = {EuclideanDistance, SquaredEuclideanDistance,
    ManhattanDistance, ChessboardDistance, BrayCurtisDistance,
    CanberraDistance, CosineDistance, CorrelationDistance};
knn = Table[
    Table[

     (* at i we go back to m-1 previous values *)
     v = Take[delta, {-(m - 1), 0} + i];
     (* 1-2m to assure all candidate nearest are from the past *)
     {nino34[[i]] +
       knnReg[delta, Take[listd, {1, i - 2 * m}], v, 20, metric[[j]], n + m + 0],
      nino34[[i + 1]], metric[[j]]},

     {i, 100, Length[delta] - m, 1}


    ],

    {j, 1, Length[metric]}];
```

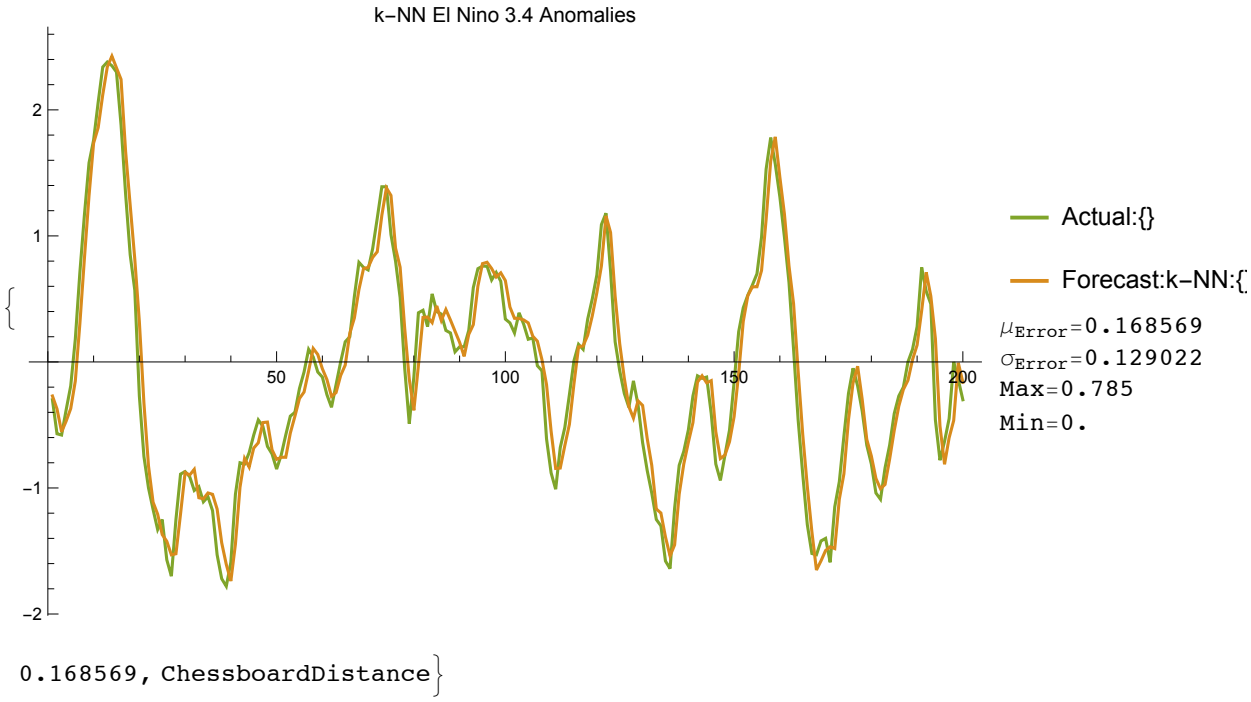
In[76]:=
```
plotKNN[knn, "k-NN El Nino 3.4 Anomalies"]
```





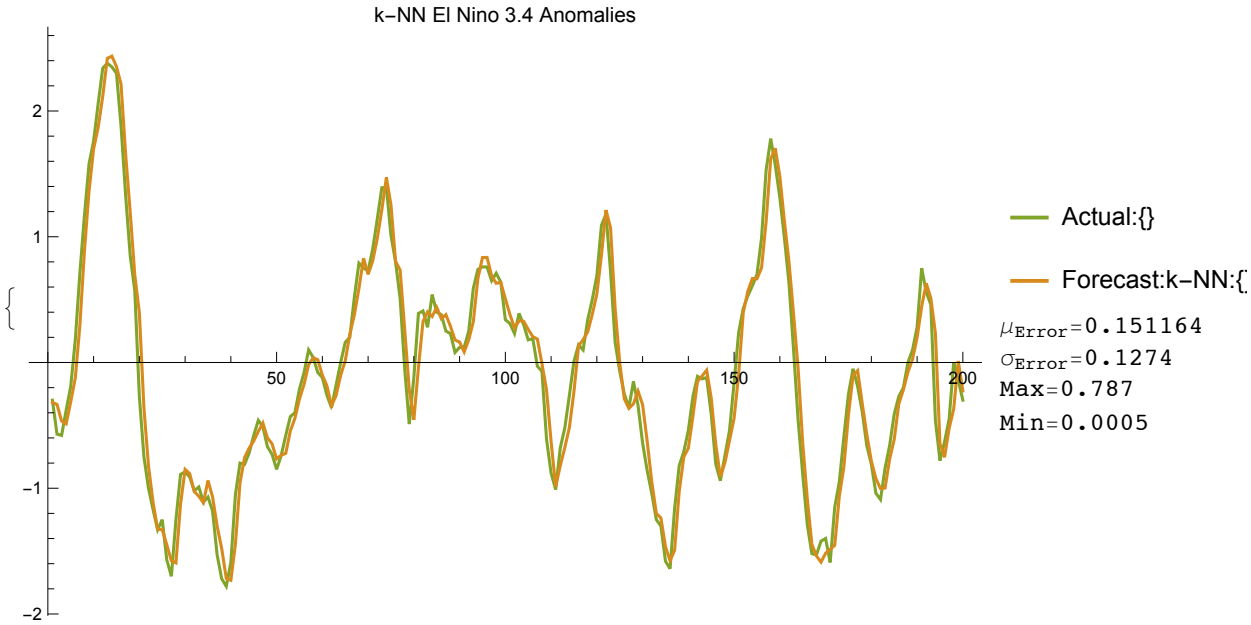
0.165542, SquaredEuclideanDistance}



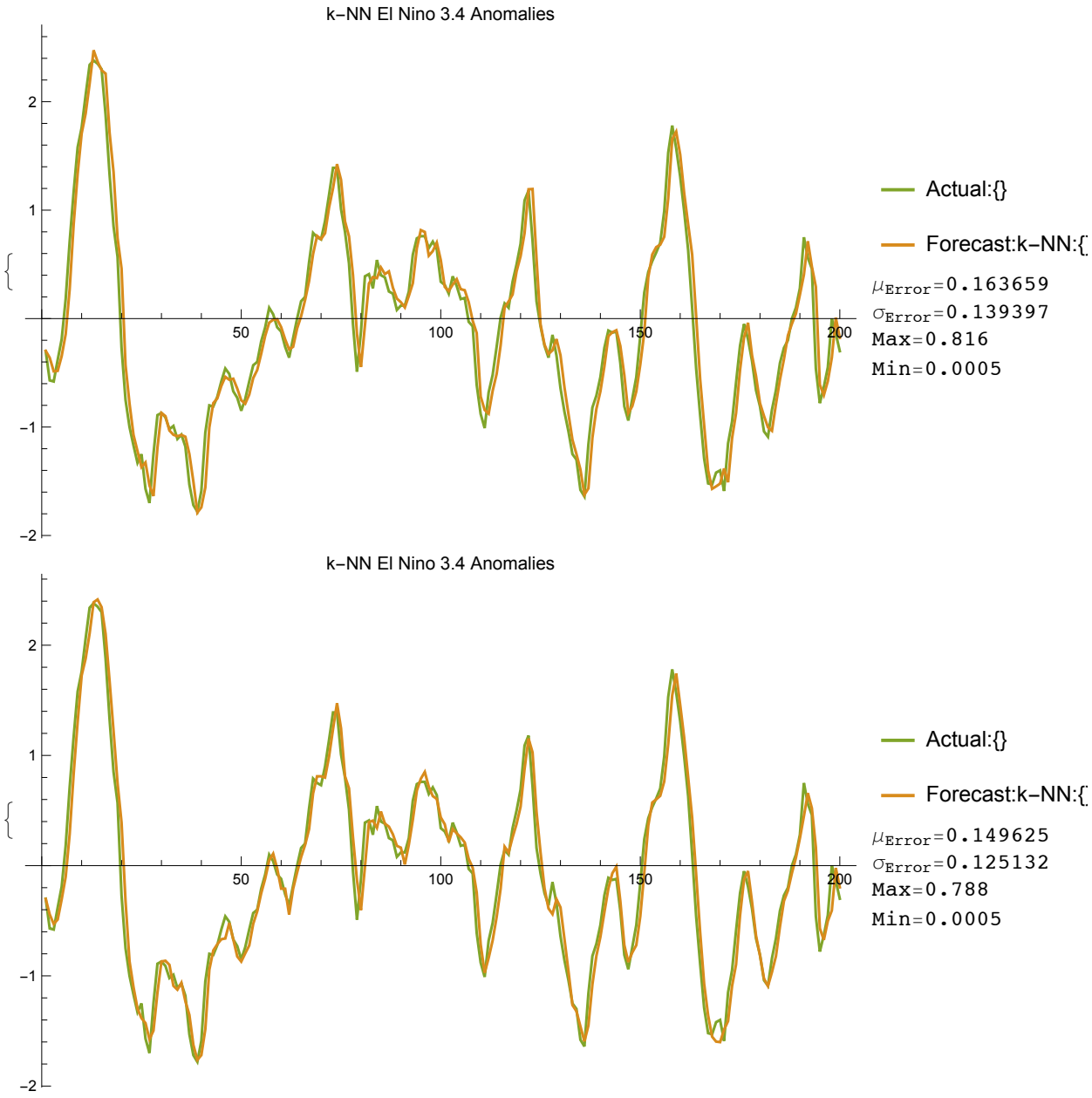


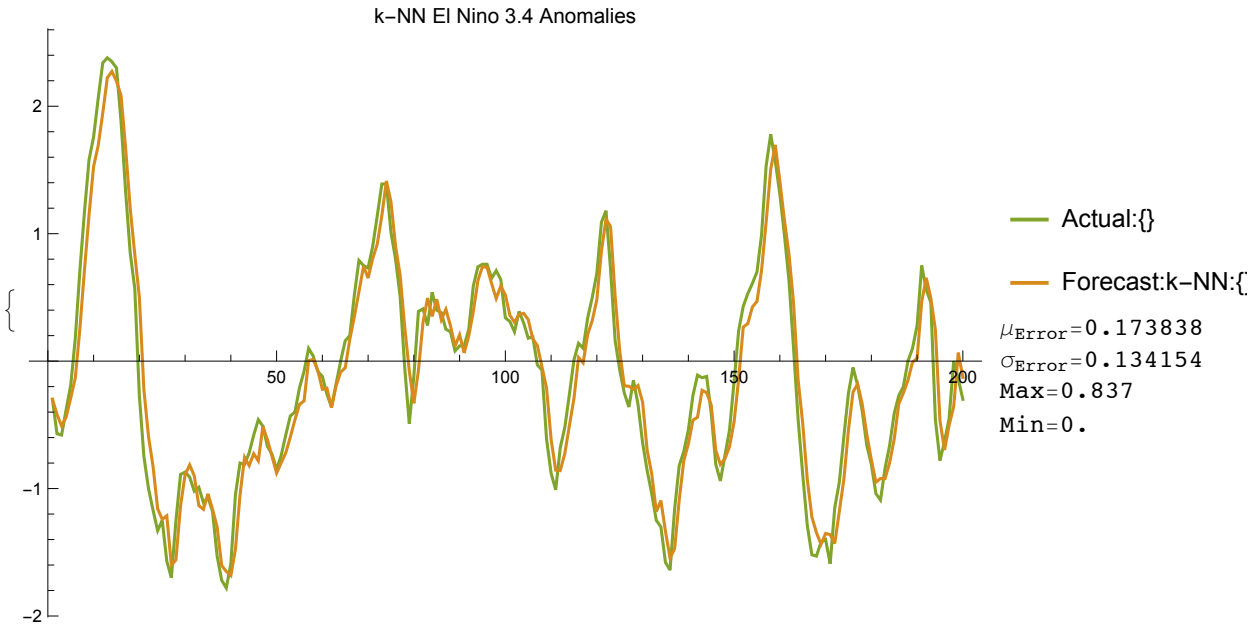
0.168569, ChessboardDistance}

Out[76]=



0.151164, BrayCurtisDistance}


k–NN El Nino 3.4 Anomalies
2
1
−1
−2
50
100
150
200
Actual:{}
Forecast:k–NN:{
μError=0.163659
σError=0.139397
Max=0.816
Min=0.0005
k–NN El Nino 3.4 Anomalies
2
1
−1
−2
50
100
150
200
Actual:{}
Forecast:k–NN:{
μError=0.149625
σError=0.125132
Max=0.788
Min=0.0005



0.173838, CorrelationDistance}