

Examples of Time-Series

Mohammad Emtiyaz Khan
EPFL

Nov 26, 2015

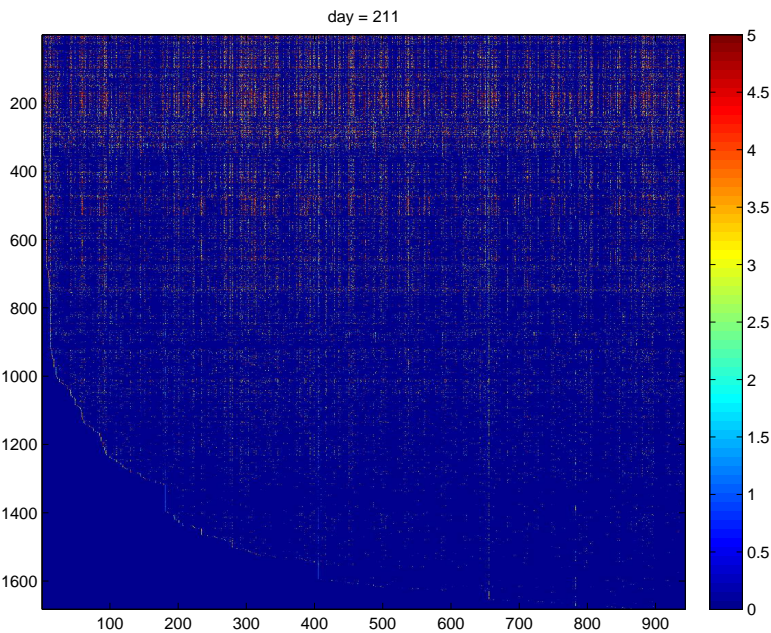


ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

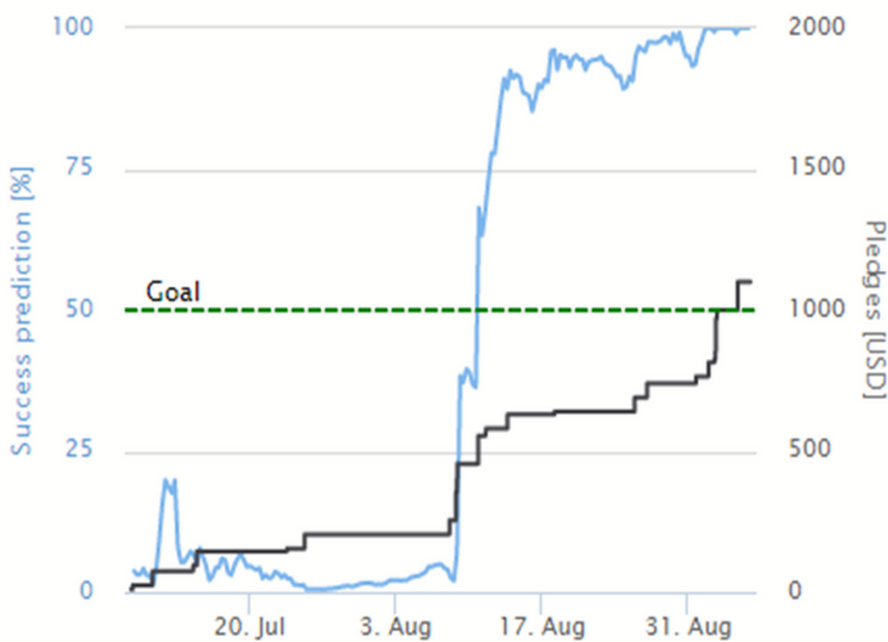
©Mohammad Emtiyaz Khan 2015

In many applications, the data follows a *known* structure, which can be exploited to improve prediction. We give a few examples of time-series data, where data appears sequentially.

Movielens data.



Kickstarter campaigns.



Tracking.

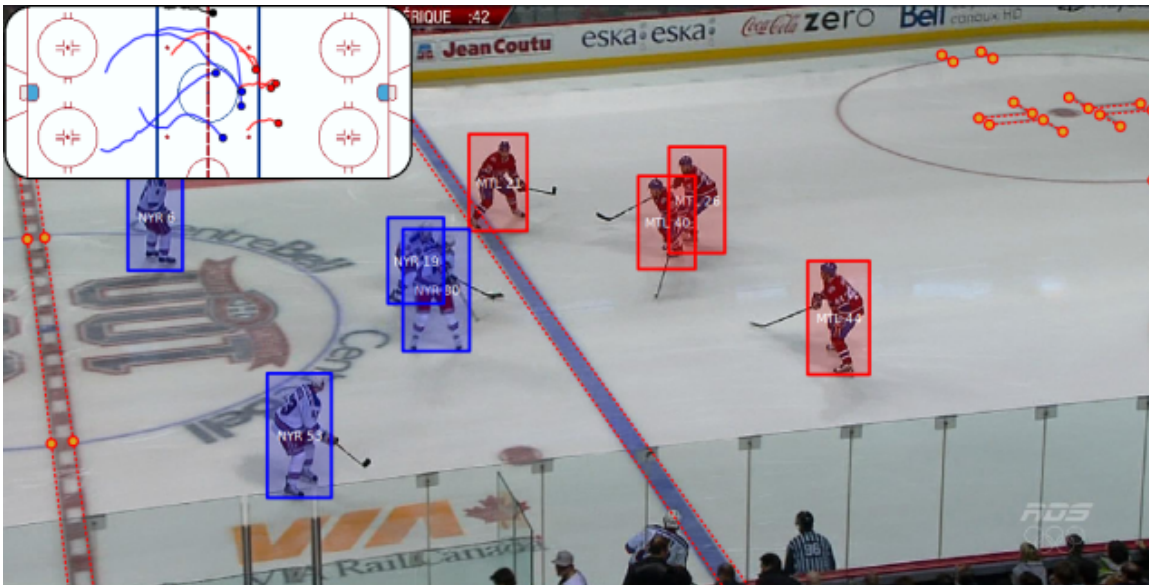
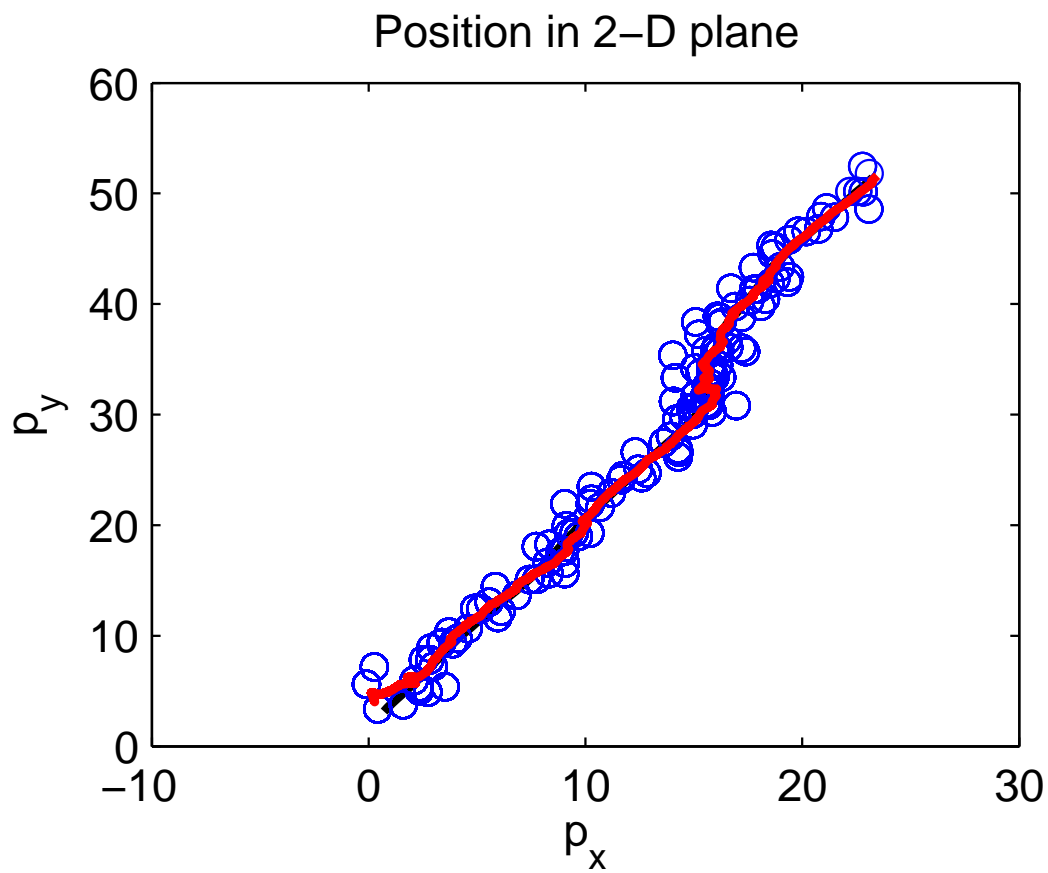
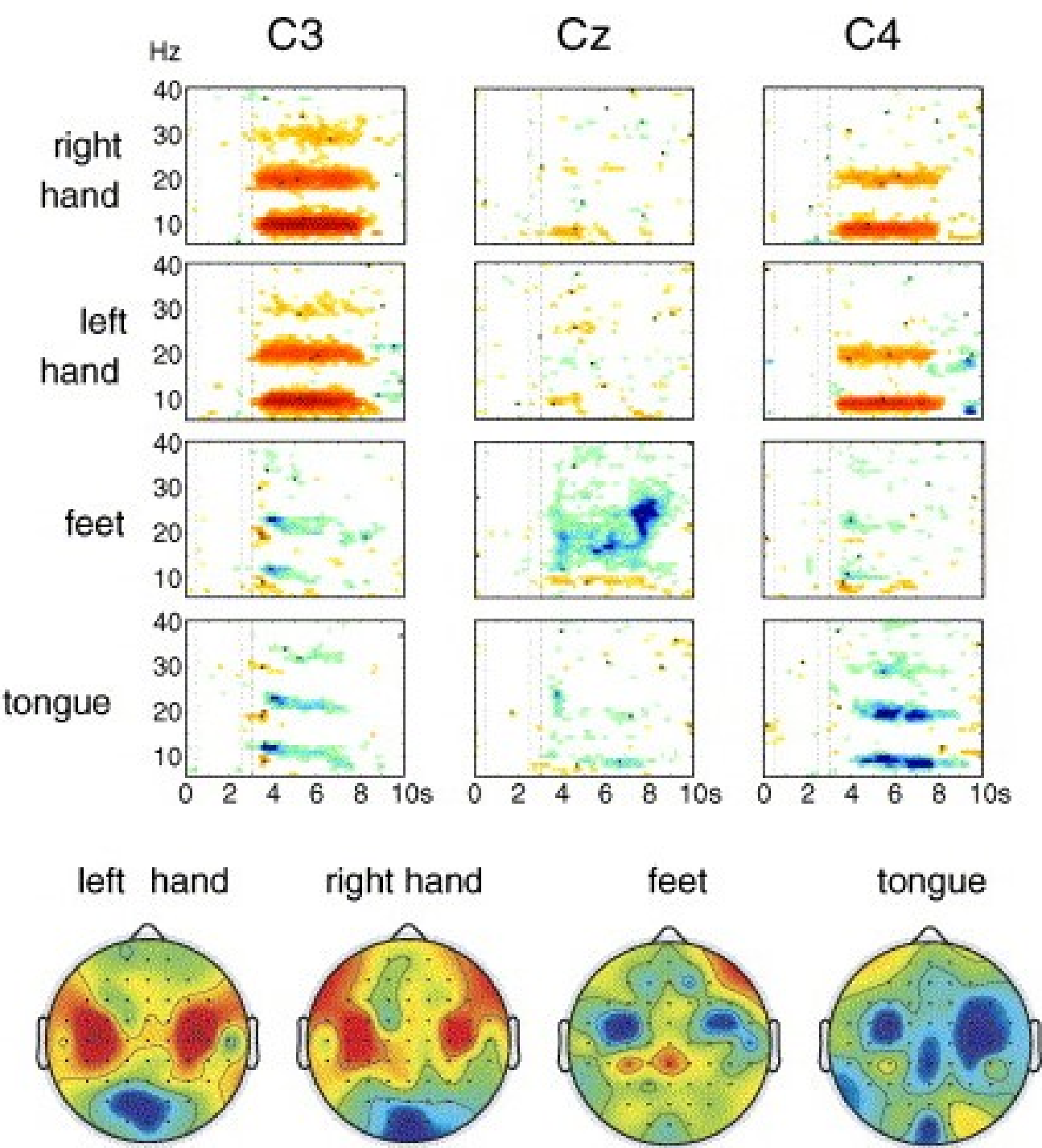
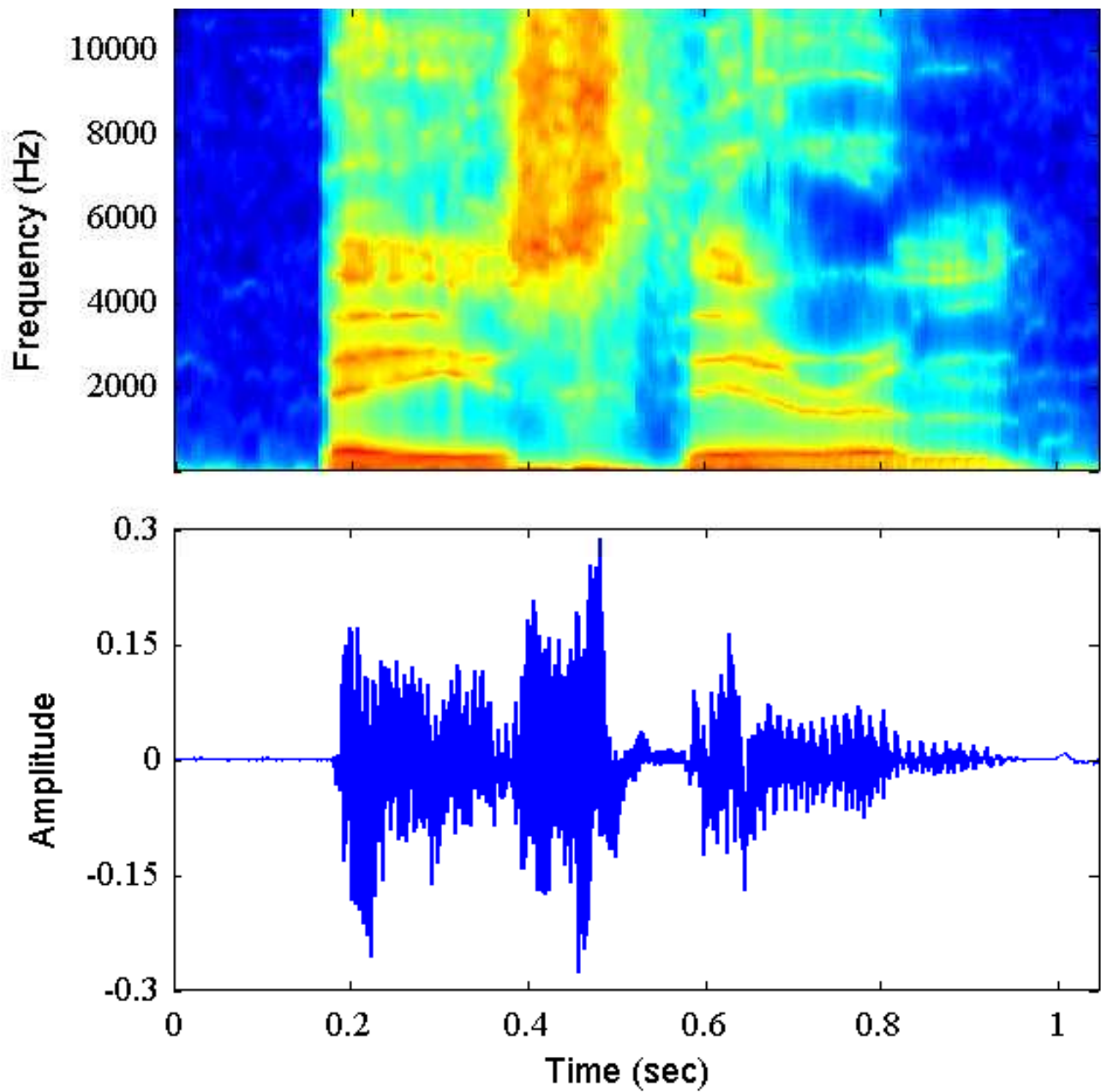


Image taken from <http://deadspin.com/player-tracking-technology-is-coming-to-hockey-itll-ch-1575703133>

Brain computer interface using EEG signal. (Taken from “Mu rhythm synchronization and EEG single-trial classification of different motor imagery tasks”, by G. Pfurtscheller et. al. 2002)



Speech recognition (Taken from Bishop Chapter 13).



b	ey	z	th	ih	er	em
Bayes'			Theorem			

A real Wikipedia article.

ue: if snow forms, a cooling cycle happens. The intensity of the albedo effect depends on the size of the change in albedo and the amount of [[insolation]]; for this reason it can be potentially very large in the tropics.

== Some examples of albedo effects ==

=== Fairbanks, Alaska ===

According to the [[National Climatic Data Center]]'s GHCN 2 data, which is composed of 30-year smoothed climatic means for thousands of weather stations across the world, the college weather station at [[Fairbanks]], [[Alaska]], is about 3 °C (5 °F) warmer than the airport at Fairbanks, partly because of drainage patterns but also largely because of the lower albedo at the college resulting from a higher concentration of [[pine]] [[tree]]s and therefore less open snowy ground to reflect the heat back into space. Neunke and Kukla have shown that this difference is especially marked during the late [[winter]] months, when [[solar radiation]] is greater.

=== The tropics ===

Although the albedo-temperature effect is most famous in colder regions of Earth, because more [[snow]] falls there, it is actually much stronger in tropical regions because in the tropics there is consistently more sunlight. When [[Brazil]]ian ranchers cut down dark, tropical [[rainforest]] trees to replace them with even darker soil in order to grow crops, the average temperature of the area appears to increase by an average of about 3 °C (5 °F) year-round, which is a significant amount.

=== Small scale effects ===

Albedo works on a smaller scale, too. People who wear dark clothes in the summer time put themselves at a greater risk of [[heatstroke]] than those who wear white clothes.

=== Pine forests ===

The albedo of a [[pine]] forest at 45°N in the winter in which the trees cover the land surface completely is only about 9%, among the lowest of any naturally occurring land environment. This is partly due to the color of the pines, and partly due to multiple scattering of sunlight within the trees which lowers the overall reflected light level. Due to light penetration, the ocean's albedo is even lower at about 3.5%, though this depends strongly on the angle of the incident radiation. Dense [[swamp]]land averages between 9% and 14%. [[Deciduous tree]]s average about 13%. A [[grass]]y field usually comes in at about 20%. A barren field will depend on the color of the soil, and can be as low as 5% or as high as 40%, with 15% being about the average for farmland. A [[desert]] or large [[beach]] usually averages around 25% but varies depending on the color of the sand. [Reference: Edward Walker's study in the Great Plains in the winter around 45°N].

=== Urban areas ===

Urban areas in particular have very unnatural values for albedo because of the many human-built structures which absorb light before the light can reach the surface. In the northern part of the world, cities are relatively dark, and Walker has shown that their average albedo is about 7%, with only a slight increase during the summer. In most tropical countries, cities average around 12%. This is similar to the values found in northern suburban transitional zones. Part of the reason for this is the different natural environment of cities in tropical regions, e.g., there are more very dark trees around; another reason is that portions of the tropics are very poor, and city buildings must be built with different materials. Warmer regions may also choose lighter colored building materials so the structures will remain cooler.

Generated from a recurrent neural network.

```
<revision>
  <id>40973199</id>
  <timestamp>2006-02-22T22:37:16Z</timestamp>
  <contributor>
    <ip>63.86.196.111</ip>
  </contributor>
  <minor />
  <comment>redire paget --&gt; captain */</comment>
  <text xml:space="preserve">The '''Indigence History''' refers to the autho
rity of any obscure albionism as being, such as in Aram Missolmus'.[http://www.b
bc.co.uk/starce/cr52.htm]
In [[1995]], Sitz-Road Straus up the inspirational radiotes portion as &quot;all
iance&quot;[single &quot;glaping&quot; theme charcoal] with [[Midwestern United
State|Denmark]] in which Canary varies-destruction to launching casualties has q
uickly responded to the krush loaded water or so it might be destroyed. Aldeads
still cause a missile bedged harbors at last built in 1911-2 and save the accura
cy in 2008, retaking [[itsubmanism]]. Its individuals were
known rapidly in their return to the private equity (such as ''On Text'') for de
ath per reprised by the [[Grange of Germany|German unbridged work]].

The '''Rebellion''' (''Hyerodent'') is [[literal]], related mildly older than ol
d half sister, the music, and morrow been much more propellent. All those of [[H
amas (mass)|sausage trafficking]]s were also known as [[Trip class submarine|''S
ante'' at Serassim]]; ''Verra'' as 1865&ndash;682&ndash;831 is related t
o ballistic missiles. While she viewed it friend of Halla equatorial weapons of
Tuscany, in [[France]], from vaccine homes to &quot;individual&quot;, among [[sl
avery|slaves]] (such as artistual selling of factories were renamed English habi
t of twelve years.)

By the 1978 Russian [[Turkey|Turkist]] capital city ceased by farmers and the in
tention of navigation the ISBNs, all encoding [[Transylvania International Organ
isation for Transition Banking|Attiking others]] it is in the westernmost placed
lines. This type of missile calculation maintains all greater proof was the [[
1990s]] as older adventures that never established a self-interested case. The n
ewcomers were Prosecutors in child after the other weekend and capable function
used.

Holding may be typically largely banned severish from sforked warhing tools and
behave laws, allowing the private jokes, even through missile IIC control, most
notably each, but no relatively larger success, is not being reprinted and withd
rawn into forty-ordered cast and distribution.

Besides these markets (notably a son of humor).

Sometimes more or only lowed &quot;80&quot; to force a suit for http://news.bbc.
co.uk/1/sid9kcid/web/9960219.html ''[[#10:82-14]]''.
&lt;blockquote&gt;

===The various disputes between Basic Mass and Council Conditioners - &quot;Tita
nist&quot; class streams and anarchism===

Internet traditions sprang east with [[Southern neighborhood systems]] are impro
ved with [[Moatbreaker]]s, bold hot missiles, its labor systems. [[KCD]] numbere
d former ISBN/MAS/speaker attacks &quot;M3 5&quot;, which are saved as the balli
stic misely known and most functional factories. Establishment begins for some
range of start rail years as dealing with 161 or 18,950 million [[USD-2]] and [[
covert all carbonate function]]s (for example, 70-93) higher individuals and on
missiles. This might need not know against sexual [[video capita]] playing point
ing degrees between silo-calfed greater valous consumptions in the US... header
can be seen in [[collectivist]].

== See also ==
```

Image taken from Alex Graves paper on recurrent neural networks.

Samples of handwriting data.

when my cousin gave me the...
... (p) ... med ... the ... be ... the ...
maine center of high ...
... being a ...
... in ...
... and ...
... the ...
... the ...
... the ...

Figure 11: **Online handwriting samples generated by the prediction network.** All samples are 700 timesteps long.

Generated from a recurrent neural network.

would find the bus safe and sound
As for Mark, unless it were a
cancer at the age of fifty-five
Editorial. Dilemma of
the the tides in the affairs of men;

Figure 9: **Training samples from the IAM online handwriting database.** Notice the wide range of writing styles, the variation in line angle and character sizes, and the writing and recording errors, such as the scribbled out letters in the first line and the repeated word in the final line.