
FontGen

Generating fonts using a neural net

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```
In[21]:= ClearAll["Global`*"]  
SetDirectory[NotebookDirectory[]];
```

I spend a lot of time trying to identify and download fonts, so a program that could do it for me would be wonderful. There are many academic papers on the subject, but none of them have published their code, so I decided to implement it myself and learn more about deep learning along the way.

Data

The data is a whopping 13+ gigabytes and was scraped from the internet by someone else. It can be downloaded [here](#).

```
Import["fonts.hdf5", {"Dimensions"}]  
  
⟨| /fonts → {56 443, 62, 64, 64} |⟩
```

I debugged the neural net using a much smaller dataset, consisting of my personal collection of fonts. The smaller dataset was created by running a script written by the same guy who got the original data.

```
Import["fonts.small.hdf5", {"Dimensions"}]  
f = Import["fonts.small.hdf5", {"Datasets", "fonts"}];  
Image[f[[1]][[1]]]  
  
⟨| /fonts → {21, 62, 64, 64} |⟩
```



Network

Each letter is 64x64 pixels.

```
(* We use 4 letters as input... *)
4 * 64^2
(* ... and get 62 letters as output. *)
62 * 64^2
```

```
16 384
```

```
253 952
```

There are $4 \cdot 64^2 = 16,384$ input neurons, and $62 \cdot 64^2 = 253,953$ output neurons. The letters chosen for the inputs are “B”, “A”, “S”, and “Q”.

```
(* http://bit.ly/2oeHyZX *)
Range[0, 25];
letters = AssociationThread[ToUpperCase[#] & /@ Alphabet[], %];
Lookup[letters, {"B", "A", "S", "Q"}]
Image[f[[1]][[#+ 1]]] & /@ %
```

```
{1, 0, 18, 16}
```

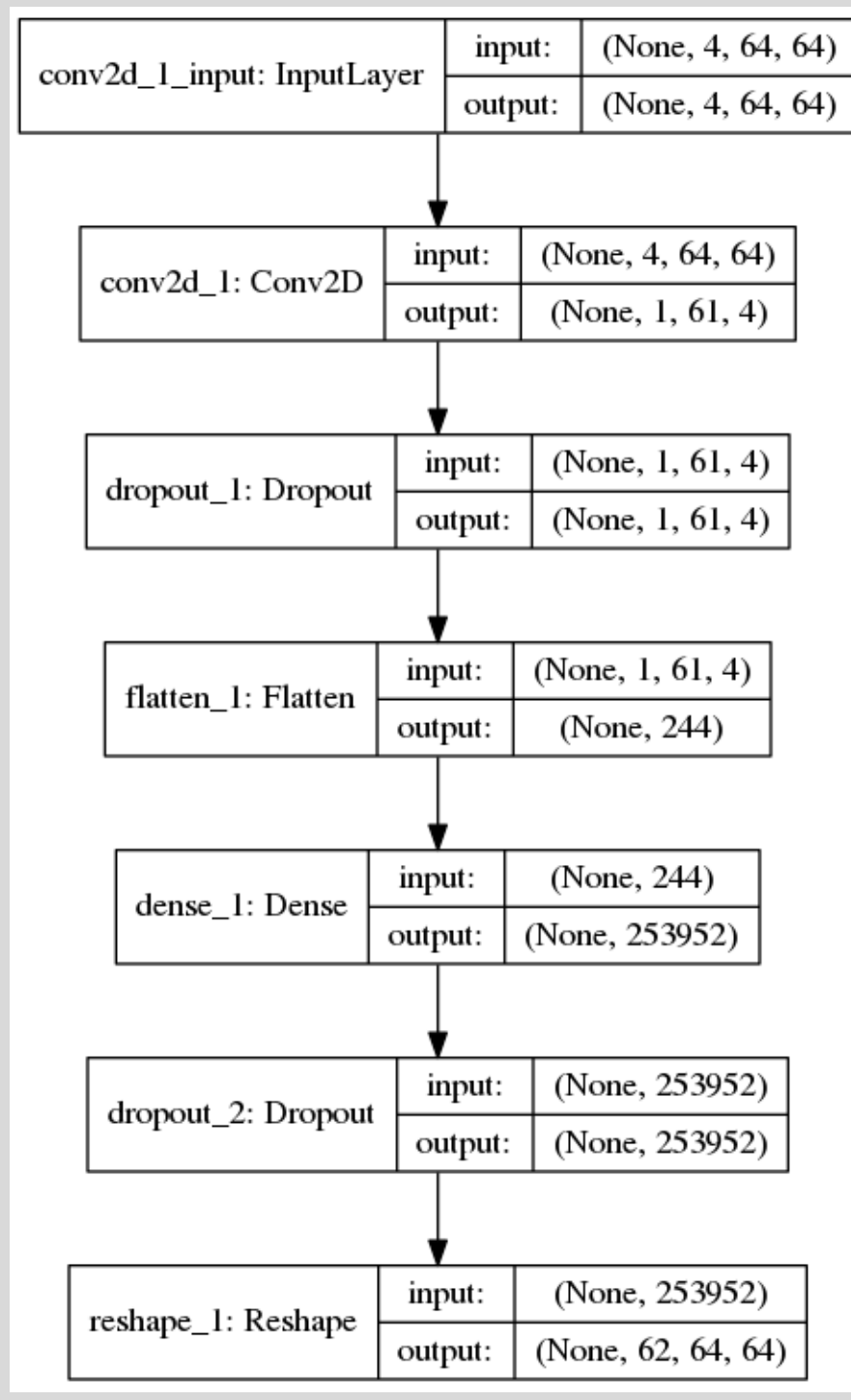


Model

In[4]:=

```
Import["img/model.png"]
```

Out[4]=



Running `model.save_weights()` saves the model and its weights to an HDF5 file, which can be loaded to recreate the model (see the documentation).

In[43]:=

```
Import["model.hdf5", {"Dimensions"}]
```

Out[43]=

```
<| /conv2d_1/conv2d_1/bias:0 → {4}, /conv2d_1/conv2d_1/kernel:0 → {4, 4, 64, 4},  
/dense_1/dense_1/bias:0 → {253 952}, /dense_1/dense_1/kernel:0 → {244, 253 952} |>
```

Evaluation

```
(* Transforms a list of image arrays to a list of images. *)  
displayFont[f_] := Map[Map[Image, #] &, f];
```

I tested the model on the font Ubuntu Mono, which is available for download [here](#).

In[39]:=

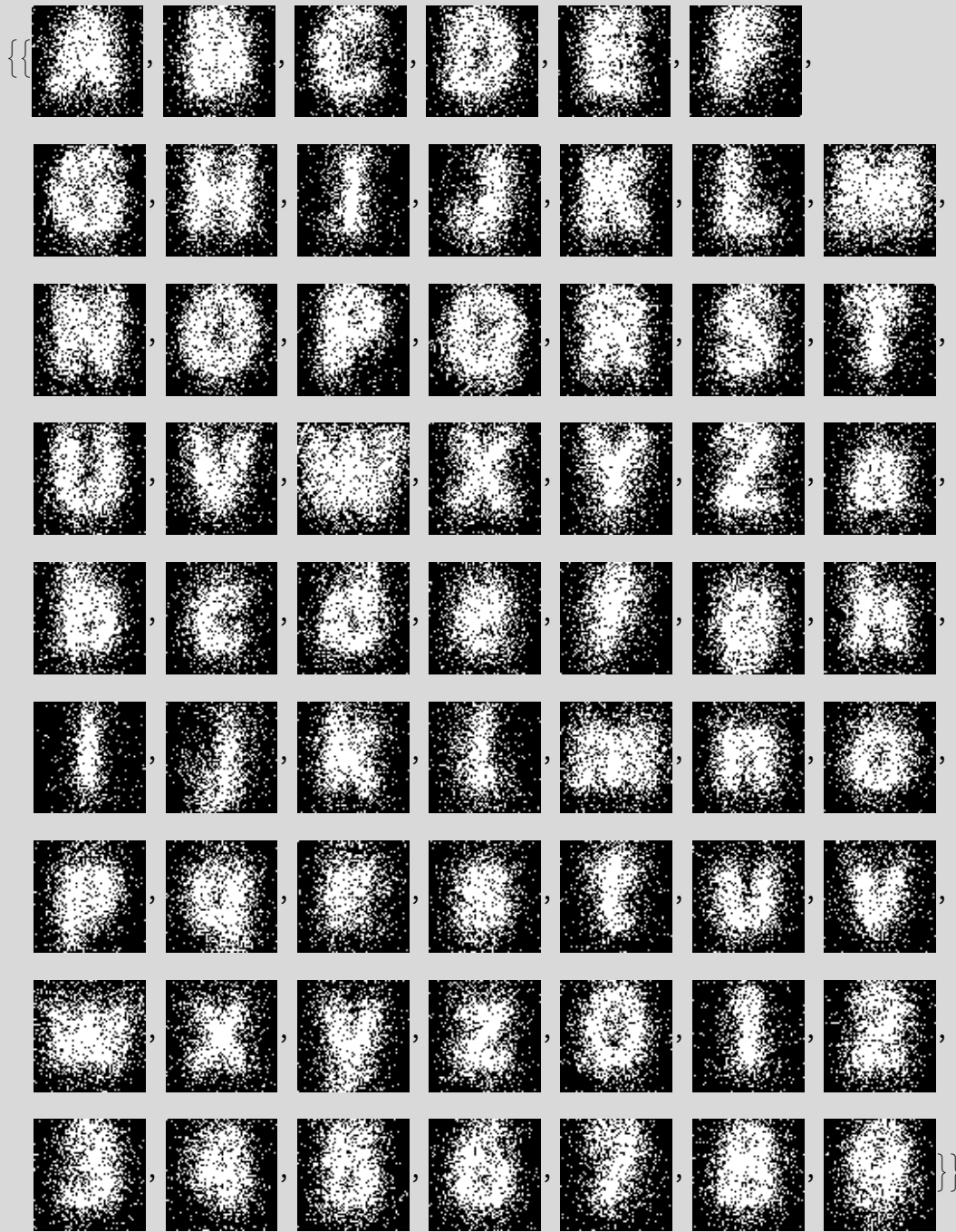
```
testInput = Import["test.hdf5", {"input"}];  
displayFont[testInput]  
output = Import["test.hdf5", {"output"}];  
displayFont[output]
```

Out[40]=

```
{ { B , A , S , Q } }
```



Out[42]=



You can make out the individual letters, but clearly this isn't an exact recreation. Since I'm still relatively new to deep learning, I'm fairly pleased with these results.

Acknowledgements

- <https://erikbern.com/2016/01/21/analyzing-50k-fonts-using-deep-neural-networks.html>
- <https://research.google.com/pubs/pub45369.html>

- Fonsi Bonilla, for answering all of my questions.