

ExcelNet

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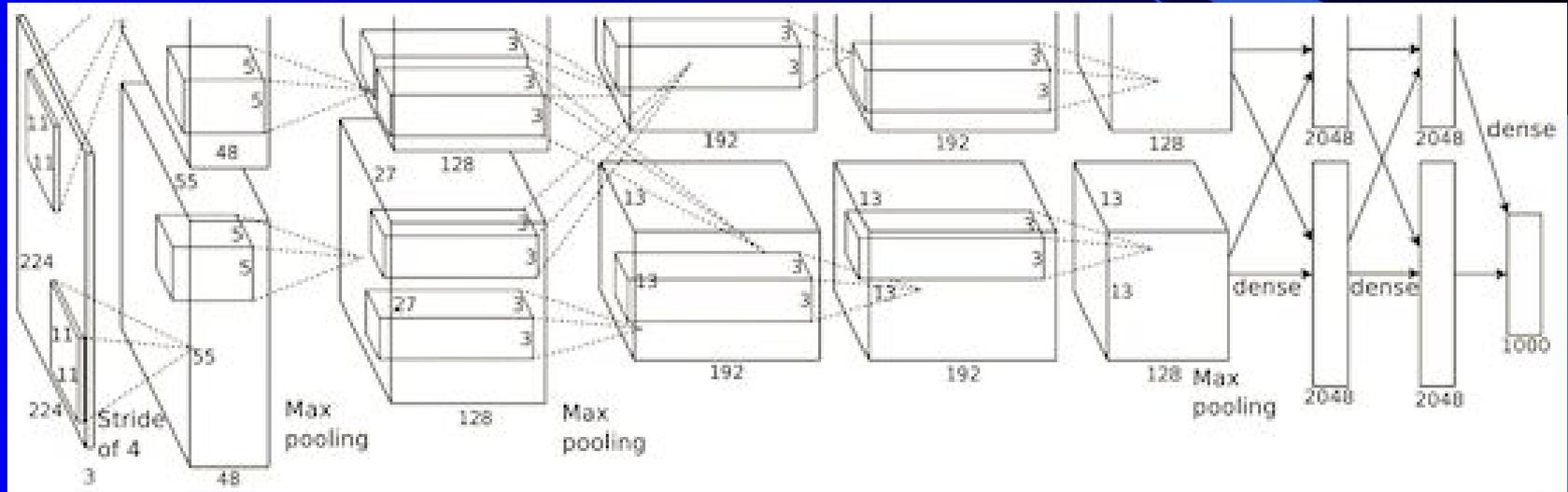
**Carnegie
Mellon
University**



SIGBOVIK 2016
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Deep Learning

CNNs Rule Everything Around Me



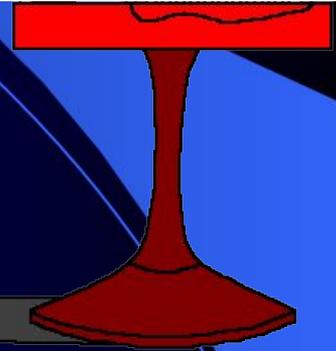
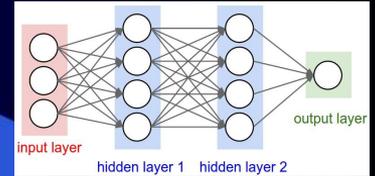
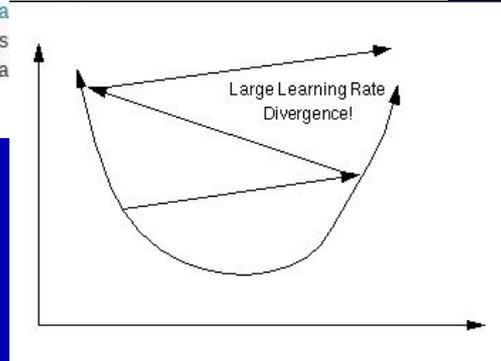
Big Questions about Deep Learning

- How do we leverage deep learning?
- How do we deploy to users in the cloud?
- How do we achieve 6σ reliability?
- How do we help non-programmers?
- How do we enable power users?
- How do we maximize value?
- ...



CNNs are Hard!!!

```
if (use_global_stats_) {  
  // use the stored mean/variance estimates.  
  const Dtype scale_factor = this->blobs_[2]->cpu_data()[0] == 0 ?  
    0 : 1 / this->blobs_[2]->cpu_data()[0];  
  caffe_gpu_scale(variance_.count(), scale_factor,  
    this->blobs_[0]->gpu_data(), mean_.mutable_gpu_data());  
  caffe_gpu_scale(variance_.count(), scale_factor,  
    this->blobs_[1]->gpu_data(), variance_.mutable_gpu_data());  
} else {  
  // compute mean  
  caffe_gpu_gemv<Dtype>(CblasNoTrans, channels_ * num, spatial_dim,  
    1. / (num * spatial_dim), bottom_data,  
    spatial_sum_multiplier_.gpu_data(), 0.,  
    num_by_chans_.mutable_gpu_data(),  
    caffe_gpu_gemv<Dtype>(CblasTrans,  
    num_by_chans_.gpu_data(), ba  
    mean_.mutable_gpu_data());  
}
```



The Solution



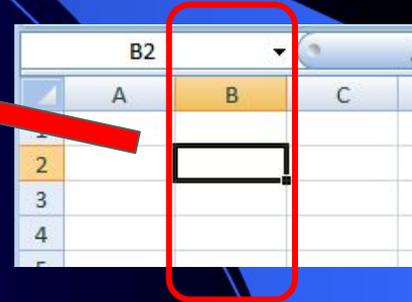
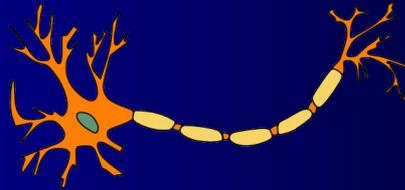
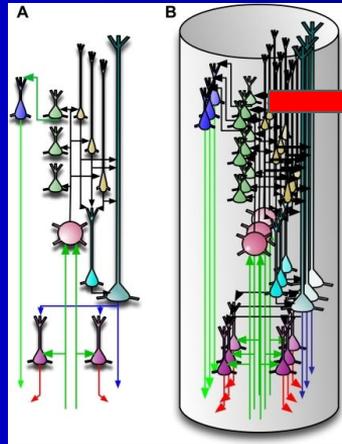
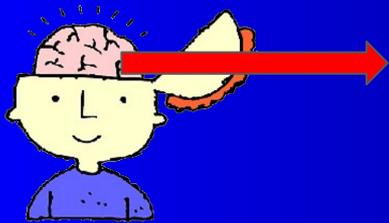
Microsoft Excel

Excel is the #1 tool in business

It's just like the human brain

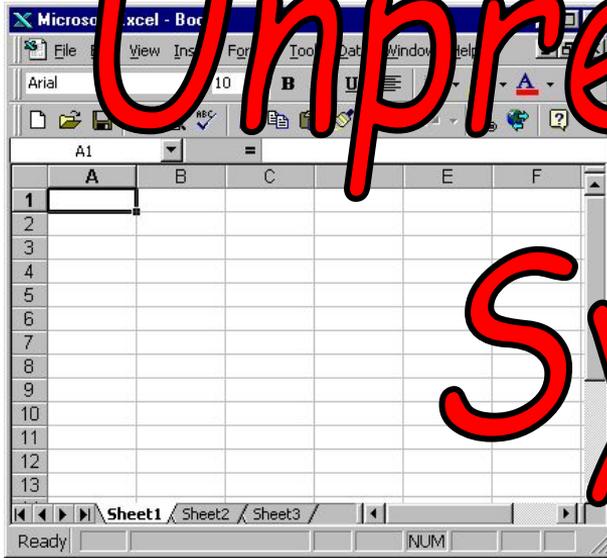
Columns in Excel \Leftrightarrow
Cortical Columns in Brain

Cells in Excel \Leftrightarrow
Cells in Brain

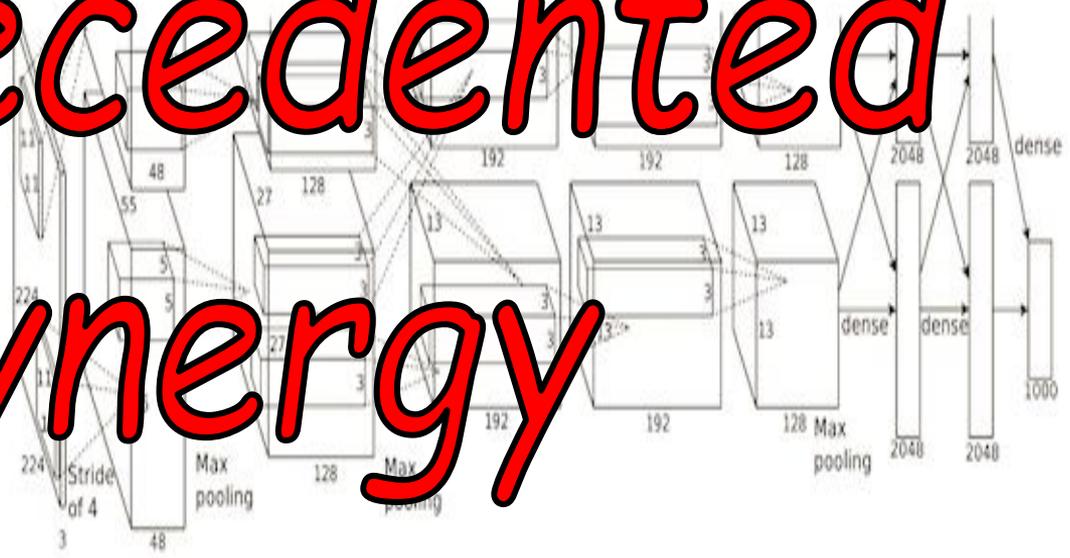


Today

Unprecedented Synergy



Microsoft Excel



Convolutional Neural Networks

Convolutional Neural Networks

FOR
DUMMIES

1. Set of non-linear functions with lots of parameters
2. CNN Prediction = function evaluation
3. Function vocabulary
 - a. Inner product: $c^T x + b$
 - b. Half-wave Rectification: $\max(x, 0)$
 - c. Max-pooling: $\max(x_{i:i+k, j:j+k})$
 - d. Softmax activation $\exp(-f_i) / (\sum_i(\exp(-f_i)))$
4. All we need are Excel formulas!



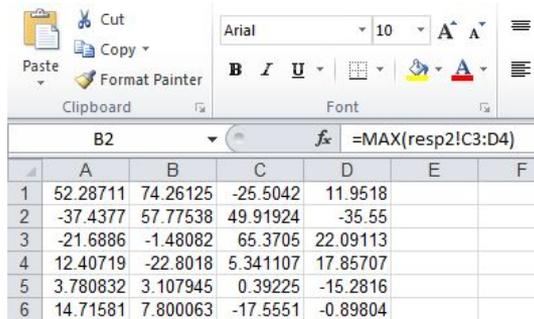
How does it work?

1. Leveraging MS Excel® Enterprise-level multimedia/vector arithmetic middleware service to do scientific computing
2. Write once, deploy anywhere (desktop, server, mobile)!

It looks like you're building a neural network. Would you like help?

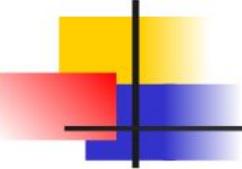
- Yes
- No

Max Pooling
in Excel



	A	B	C	D	E	F
1	52.28711	74.26125	-25.5042	11.9518		
2	-37.4377	57.77538	49.91924	-35.55		
3	-21.6886	-1.48082	65.3705	22.09113		
4	12.40719	-22.8018	5.341107	17.85707		
5	3.780832	3.107945	0.39225	-15.2816		
6	14.71581	7.800063	-17.5551	-0.89804		





From backprop to bespoke

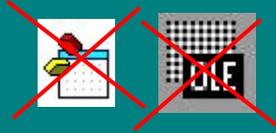
1. No backprop - none needed
2. Weights are at your fingertips
3. For power users and beginners alike
4. Artisanal data science



Surf Into the Network

Absolutely **no**:

1. Visual Basic / VBScript
2. Excel Macros
3. ActiveX / OLE



Get it on the world wide web at:

<http://www.deepexcel.net/>

Over 21K Visitors Already!



Business Plan

1. MNIST: Free
2. Imagenet: \$10 / Month
3. Semantic Segmentation: \$20 / Month
4. ??????
5. Profit



1st in Kaggle!!!*

The screenshot shows the Kaggle website interface for the Digit Recognizer competition. At the top, there's a navigation bar with 'kaggle' logo and links for 'Just', 'Competitions', 'Datasets', 'Scripts', 'Jobs', and 'Community'. There are 'Sign up' and 'Login' buttons. Below the navigation bar, the competition title 'Digit Recognizer' is displayed, along with 'Knowledge • 1,124 teams'. A progress bar shows the competition is over, with a date of 'Sat 31 Dec 2016 (9 months to go)'. The leaderboard is titled 'Public Leaderboard - Digit Recognizer' and includes a note: 'This leaderboard is calculated on approximately 25% of the test data. The final results will be based on the other 75%, so the final standings may be different.' A table lists the top 10 teams. The team 'JesseBrizzi' is highlighted with a red box, showing a score of 0.99886, 4 entries, and a submission time of Fri, 01 Apr 2016 15:05:23.

#	Δ1w	Team Name	Score	Entries	Last Submission UTC (Best - Last Submission)
1	—	Andre lopes	0.99957	19	Mon, 22 Feb 2016 03:18:44 (-2d)
2	—	He Qinyao	0.99943	1	Thu, 04 Feb 2016 07:29:18
3	—	markopr	0.99914	3	Fri, 26 Feb 2016 19:25:20
4	new	morpheusoc	0.99900	1	Mon, 28 Mar 2016 16:34:04
5	↑627	Gaki51	0.99900	2	Mon, 28 Mar 2016 16:40:40
6	↓2	jkgiesler	0.99886	1	Mon, 21 Mar 2016 17:46:18
7	new	JesseBrizzi	0.99886	4	Fri, 01 Apr 2016 15:05:23
8	↓3	Akmarov Konstantin	0.99857	8	Tue, 16 Feb 2016 04:51:53
9	↓3	sunyam	0.99786	2	Wed, 24 Feb 2016 06:15:12
10	↓3	Jim Fleming	0.99743	2	Tue, 02 Feb 2016 20:43:09

Praise for ExcelNet

"Either a con or a crazy." -- Hacker News

"One tool to rule them all." -- Yangqing Jia

"Meh" -- Yan LeCun

"10/10" -- Reddit

"Why??!!" -- CMU Grad Student

"Don't you have, you know, research to do?" -- UW Grad Student

"These guys must be smoking pot..." -- David's Advisor



Thank You!

Thank you!

<http://www.deepexcel.net/>