Visually Identifying Rank

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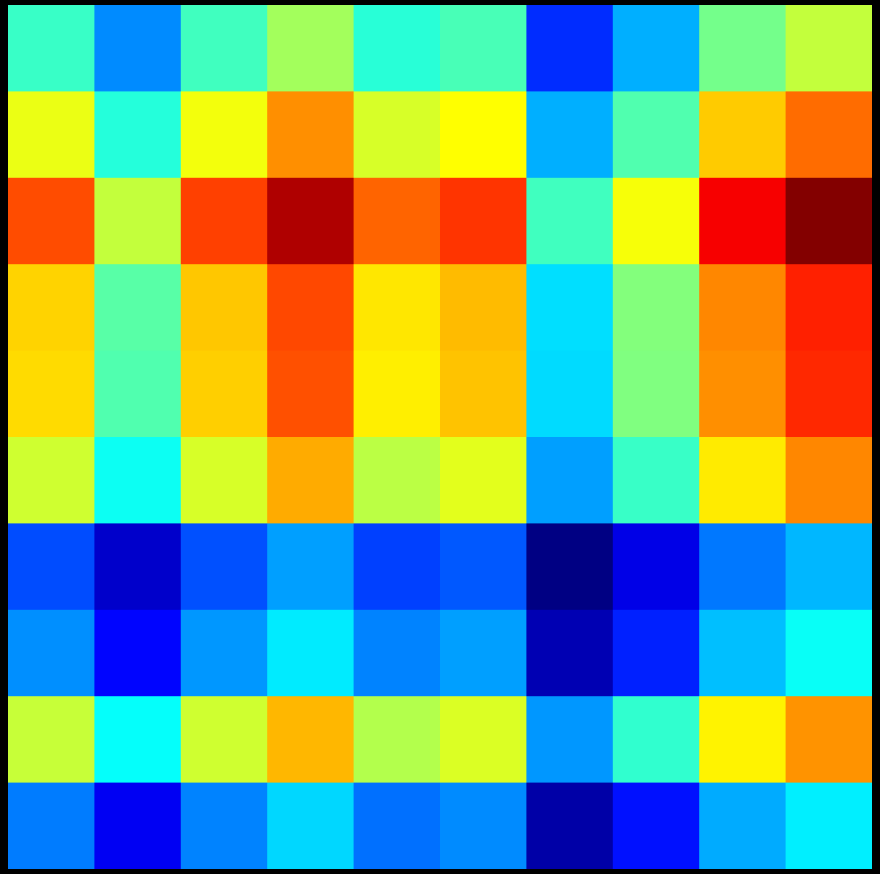
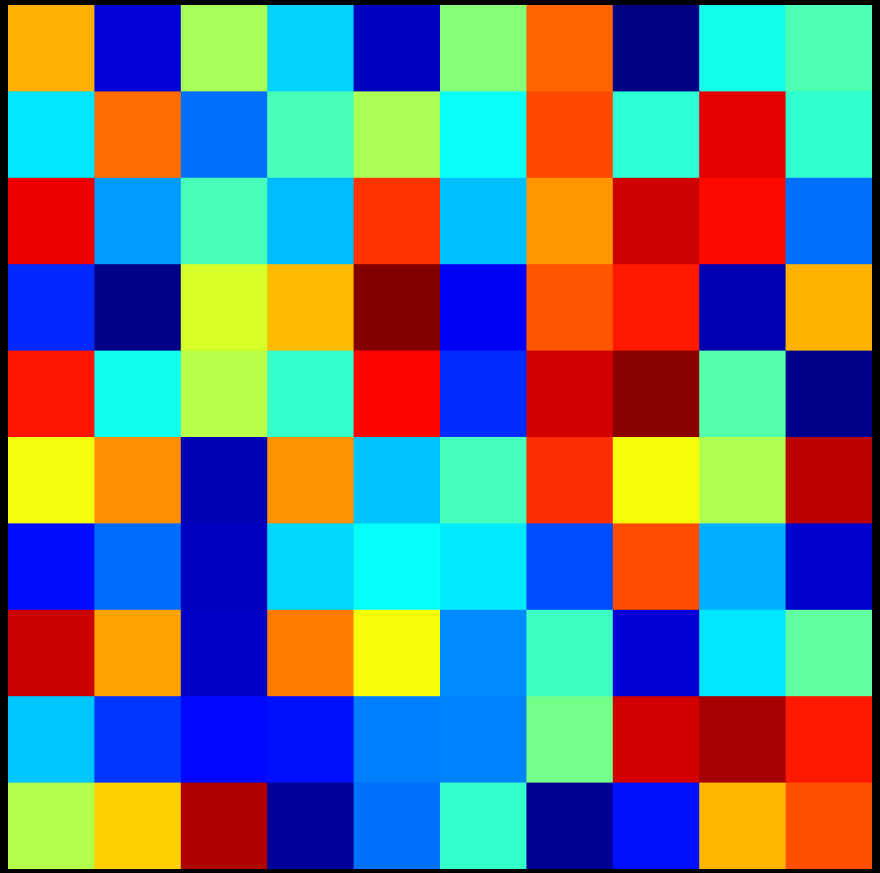
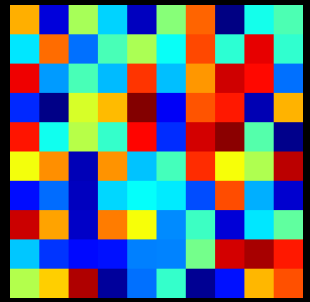




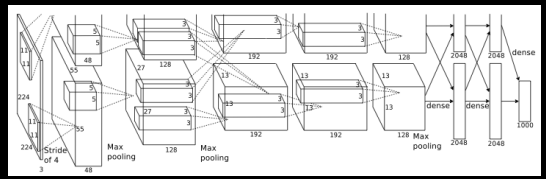
Approach

1.3	…	5.6
...	…	...
-2.5	…	6.0

A Matrix



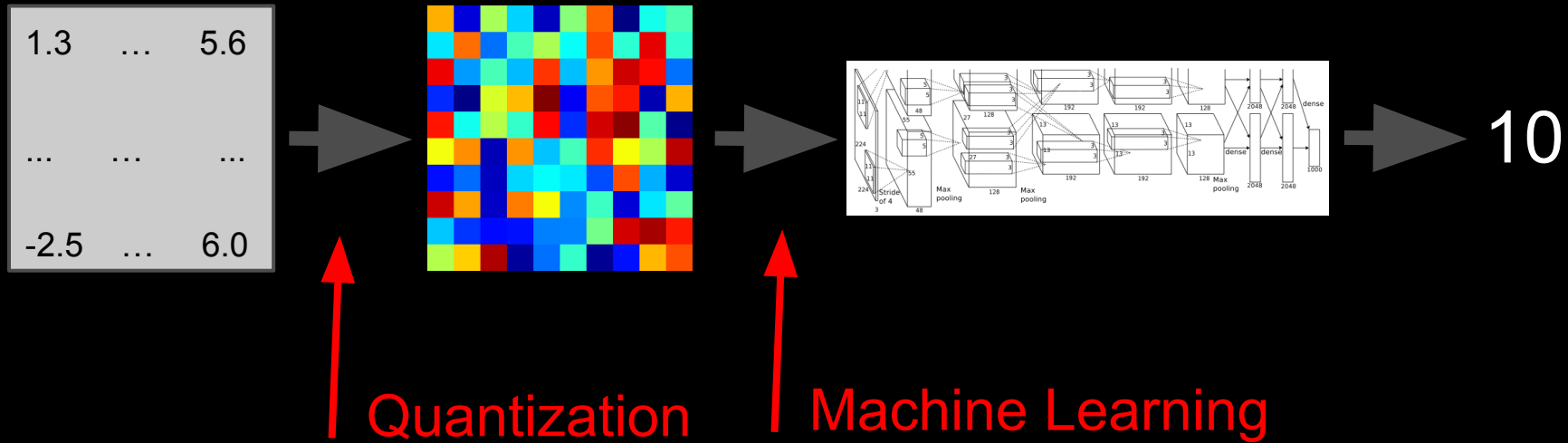
A .png



Computer Vision + Machine Learning

10

Why this shouldn’t work



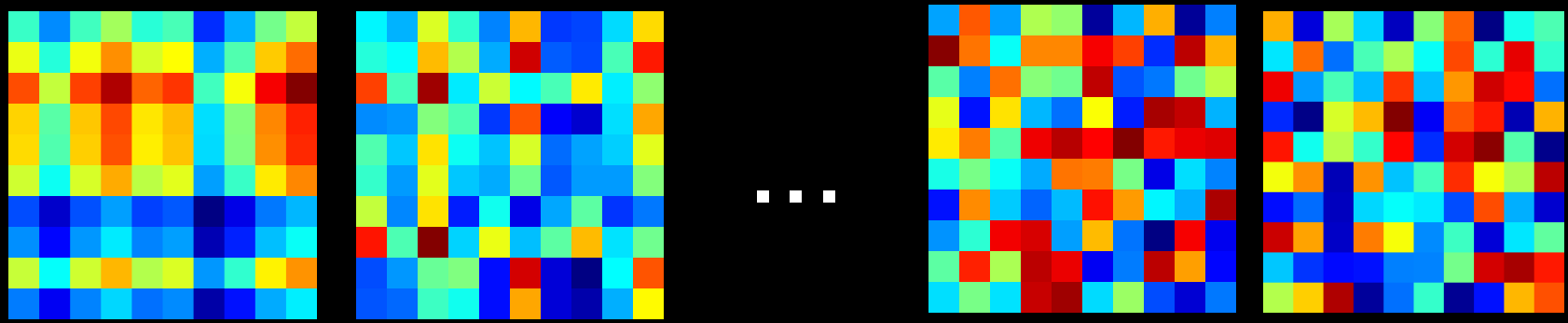
Did you really do this?

Yes. Every number is a real experiment.

Please don’t tell our advisors. Please?

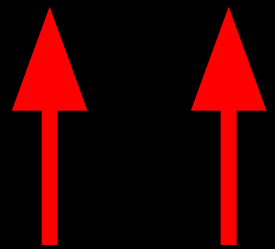
Setup

1. 10x10 Matrices
2. 10 Ranks
3. 1000 (.png) Images / Rank



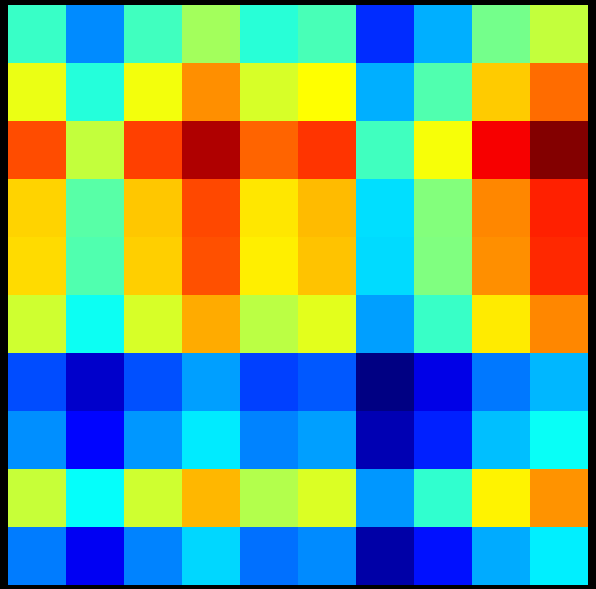
Does it work?

Learning method f / Feature map ϕ	*All Eng.*	Random Forest+Engineered *Gray SIFT BoW*	*Color SIFT BoW*	*LBP BoW*	RF + Pretrained $pool_5$	fc_7	Scratch CNN *Raw Pixels*	Chance
10-way Rank	38.1%	32.5%	36.5%	31.0%	33.7%	34.9%	**43.5%**	10%
Rank Deficiency	76.4%	73.1%	75.3%	73.9%	75.0%	76.3%	**78.6%**	50%

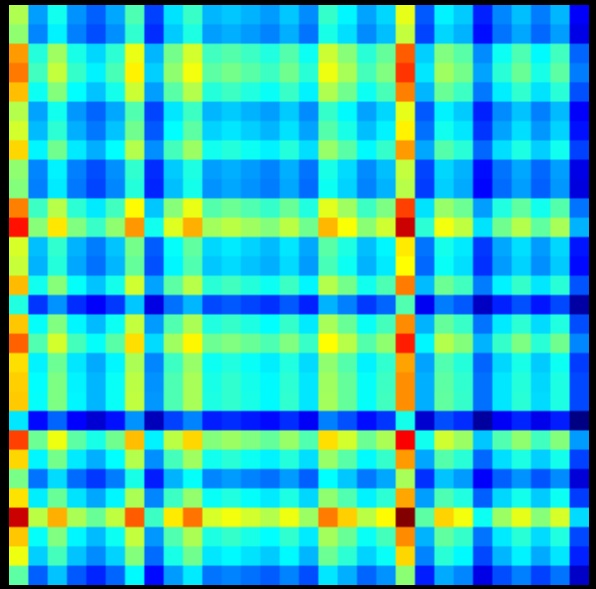


Does it generalize?

Train (10x10)



Test (30x30)



Does it generalize?

Train Dim.	Test Dim.	Random Forest+Engineered				RF + Pretrained		Scratch CNN
		All Eng.	*Gray SIFT*	*Color SIFT*	*LBP*	$pool_5$	fc_7	*Raw Pixels*
10×10	10×10	38.1%	32.5%	36.5%	31.0%	33.7%	34.9%	**43.5%**
	15×15	33.7%	31.5%	33.5%	27.3%	25.7%	26.1%	**37.9%**
	30×30	**25.9%**	19.1%	25.3%	19.4%	17.7%	17.5%	24.1%
15×15	10×10	33.0%	28.1%	32.0%	26.5%	13.9%	14.4%	**34.1%**
30×30		**25.8%**	22.7%	23.8%	21.6%	11.5%	11.8%	10.0%

Why bother?

1. Better than traditional linear algebra
2. Lets us answer questions about matrices, linear algebra

Comparison with Linear Algebra

Lin. Algebra: SVD, Determinant,...

Pros:

- 100% Accuracy

Cons:

- Boring
- > O(n^2)
- Requires numbers

Computer Vision: SIFT+RF, CNN

Pros:

- Requires images
- O(n^2)
- ***Exciting and dangerous***

Cons:

- 78.6% Accuracy

What colormap is best?

Let's talk colormaps.

May 7, 2011 at 2:04 pm (powerfully stupid graphics)

T. Lennert and J. Martine
attentional-filtering perfo

[for less ranty, try he

Dear everyone who
perceptual disaster.
sector of these plots'

March 7, 2012

The 'jet' colormap must die! Or: how to improve your map plots and create your own nice colormaps.

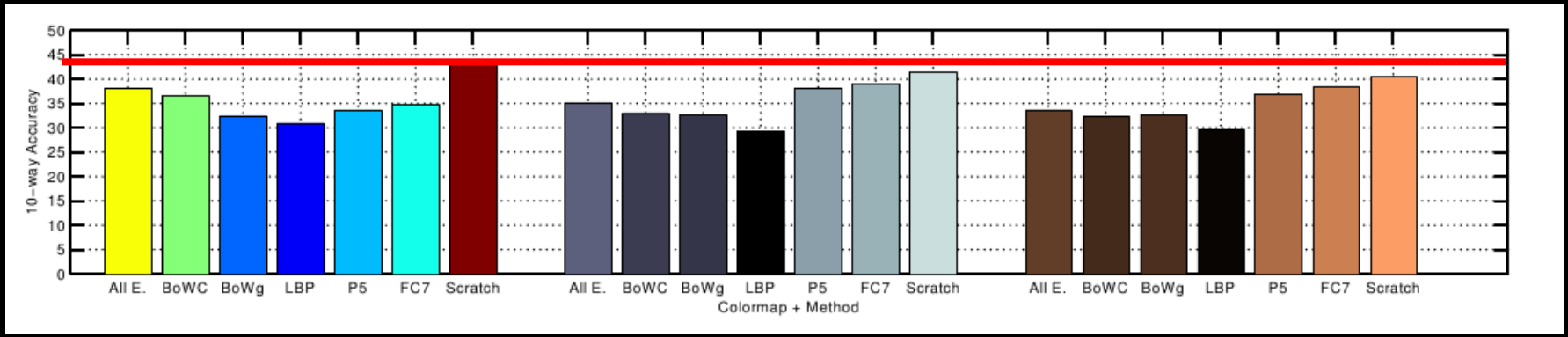
endolith commented on May 16, 2012

This is subjective: a matter of sane defaults vs consistency with matlab, but here are the arguments against `jet` as default:

Rainbow Color Map (Still) Considered Harmful:

> Research has shown that the rainbow color map is rarely the optimal choice when displaying data with a pseudocolor map. The rainbow color map confuses viewers through its lack of perceptual ordering, obscures data through its uncontrolled luminance variation, and actively misleads interpretation through the introduction of non-data-dependent gradients.

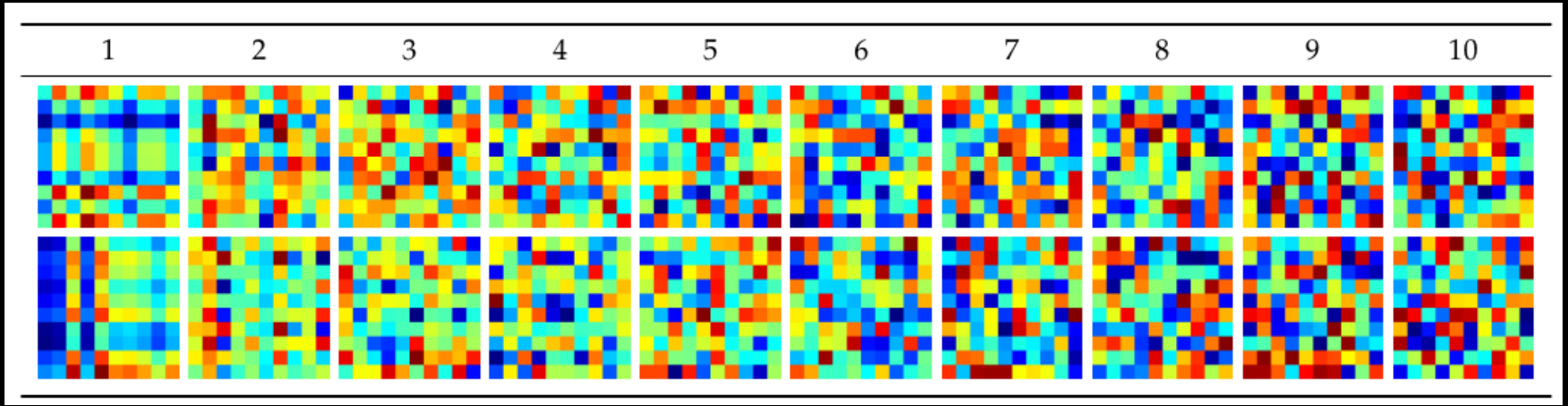
What colormap is best?



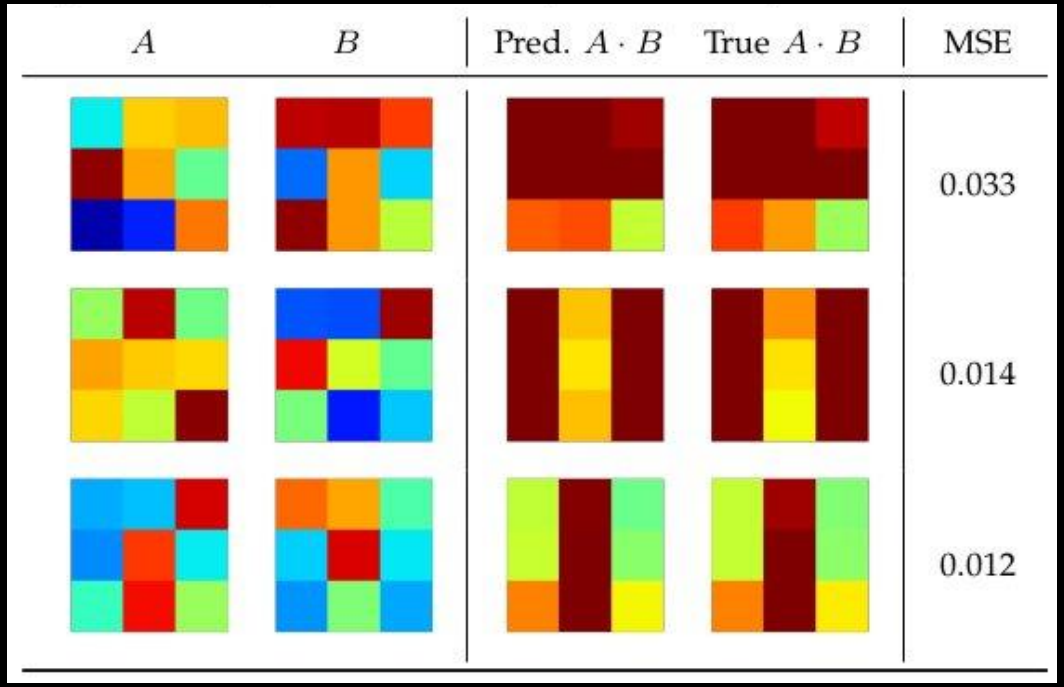
Jet is #1!

MATLAB is vindicated! Bye Bye Haters!

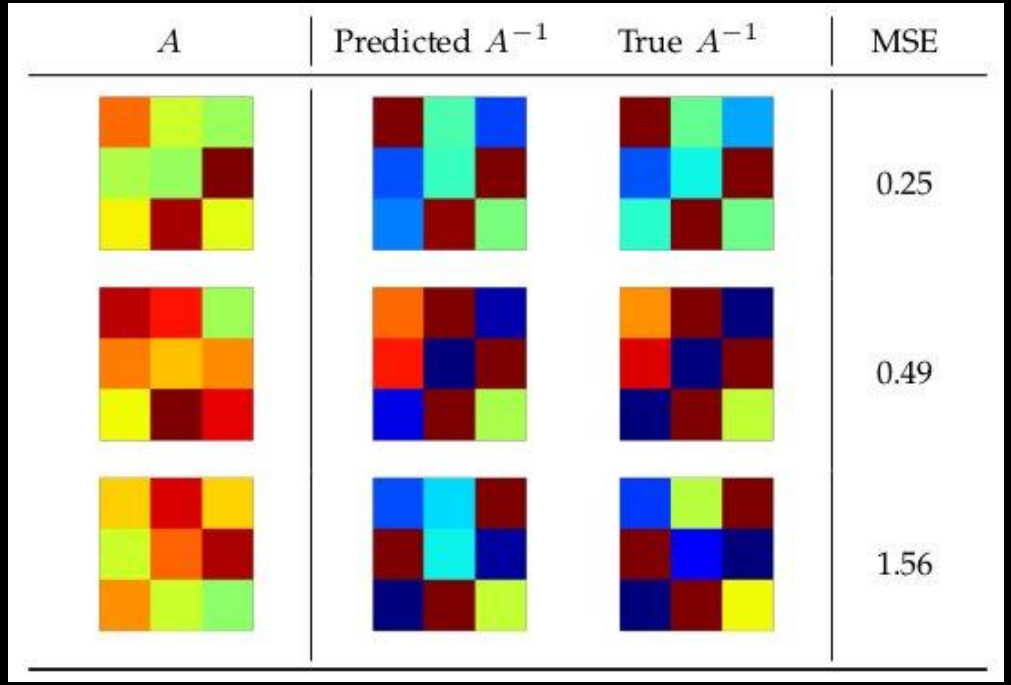
What matrices smell what rank?



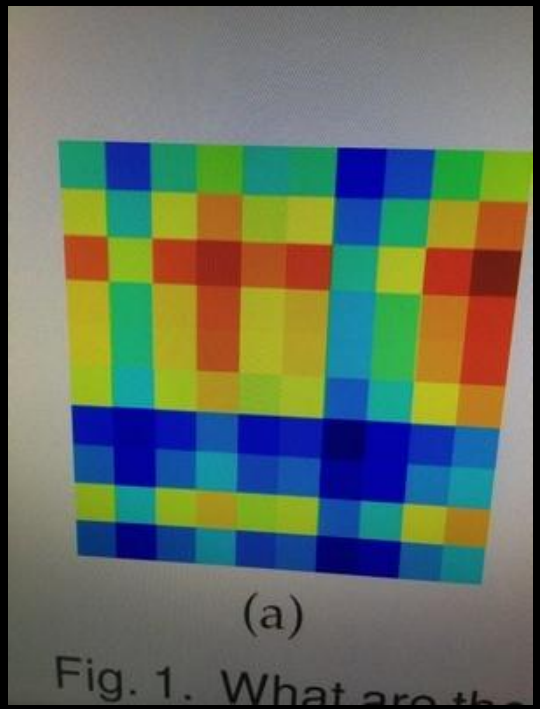
Structured outputs: Deep Multiplication



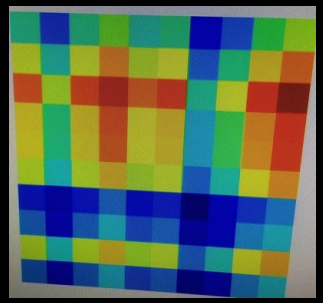
Structured outputs: Deep Inverse



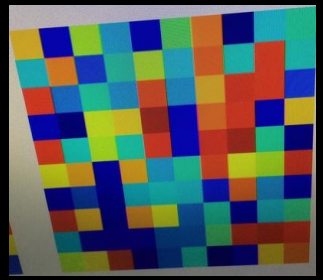
Legacy Matrices



Cellphone Picture

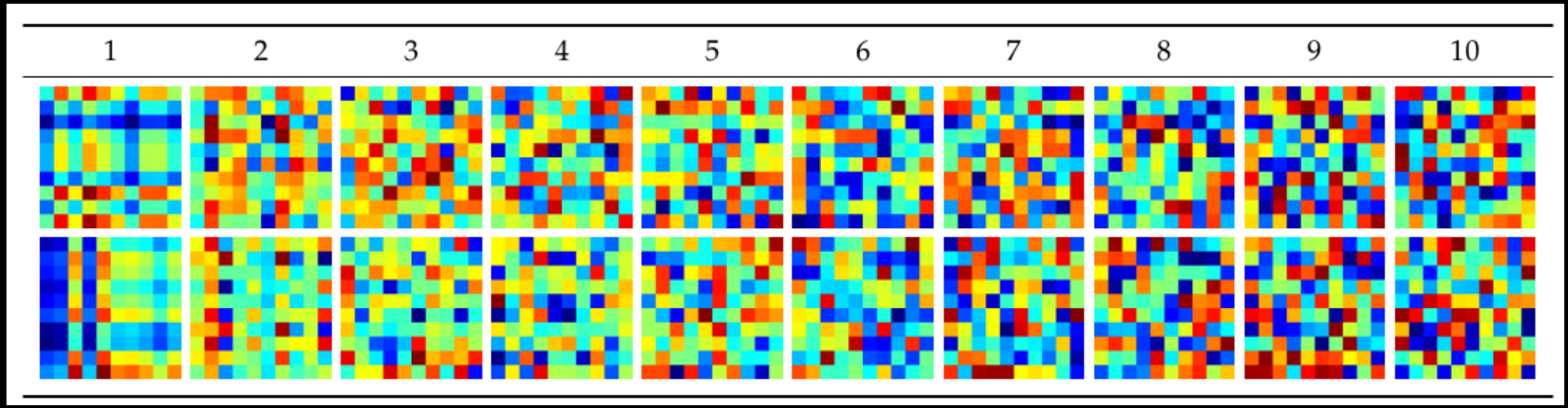


Rank 1



Rank 10

Thank You!



We gratefully acknowledge NVIDIA for GPUs used in this very serious research.