

Vienna



Deep Learning

Meetup

7 June 2018 @ A1 Telekom Austria



Vienna Deep Learning Meetup

The Organizers:



Thomas Lidy
Musimap



Jan Schlüter
OFAI



Alex Schindler
AIT & TU Wien



19th Deep Learning Meetup

Agenda:

- Welcome (Thomas Lidy, VDLM; Mario Meir-Huber, A1)
- Intro: Visual Computing: Then and Now - Alexander Schindler, AIT
- **Fast, Accurate And Customized Visual Similarity Search On Real-world Images**
 - Enes Deumić & Vedran Vekić, Data Scientists at Styria.ai
- Announcements
 - *30 minutes break*
- **Mon Style - Machine Learning in the Fashion Domain**
 - Alexander Schindler, AIT and Matthias Hecker, CTO at Mon Style
- Hot Topics & Latest News - Rene Donner, CTO at Contextflow
- Networking and Discussions



Announcements



AI AUSTRIA

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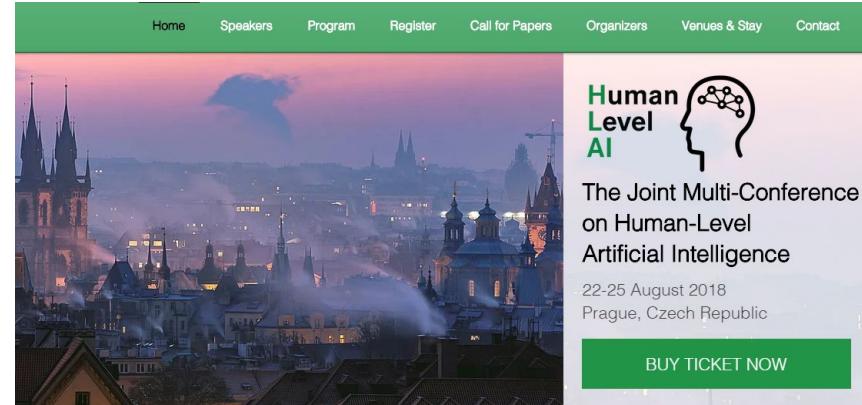
Sepp Hochreiter
Head of the AI Lab at Johannes
Kepler University Linz,
AI Pioneer



Human Level AI Conference 2018

22 - 25 August, Prague

- **3 day academic conference**
 - Who's it for: researchers
- **2 day Future of AI Track**
 - Who's it for: technology enthusiasts, researchers and anyone wanting to learn more about AI!
- Speakers from: Facebook AI Research, Microsoft, Uber AI Labs, Google DeepMind and more.



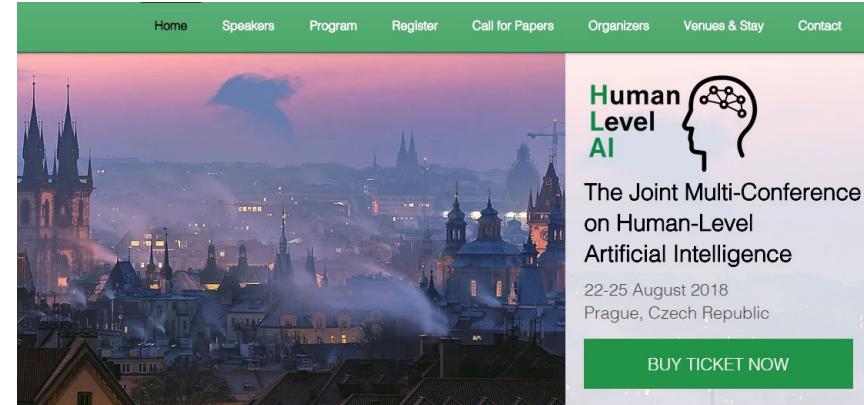
10% discount for Vienna Deep Learning community using code:
VDL-HLAI18

<https://www.hlai-conf.org/>

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A screenshot of the Human Level AI Conference 2018 website. The header is green with white text: Home, Speakers, Program, Register, Call for Papers, Organizers, Venues & Stay, Contact. Below the header is a large image of the Prague city skyline at dusk. To the right of the image is the conference logo, which includes a stylized profile of a human head with a brain inside. The text "Human Level AI" is written vertically next to the logo. Below the logo is the text "The Joint Multi-Conference on Human-Level Artificial Intelligence". At the bottom right of the image area is a green button with white text that says "BUY TICKET NOW".

Win 1 of 2 free tickets:

<https://goo.gl/yvu2Rb>
(till June 17th)

Job Announcements



Hiring **deep learning enthusiasts** at pre-doc and post-doc level!

- Junior Researcher (m/f) in Computer Vision
- Researcher (m/f) in Computer Vision

<https://www.fhstp.ac.at/de/offene-stellen-karriere/junior-researcher-m-f-in-computer-vision-patt-304543>

<https://www.fhstp.ac.at/de/offene-stellen-karriere/researcher-m-f-in-computer-vision-pattern-rec-304544>

Applications until July 1, 2018 to: bewerbungen@fhstp.ac.at

If you have questions, just send an informal mail to Matthias Zeppelzauer

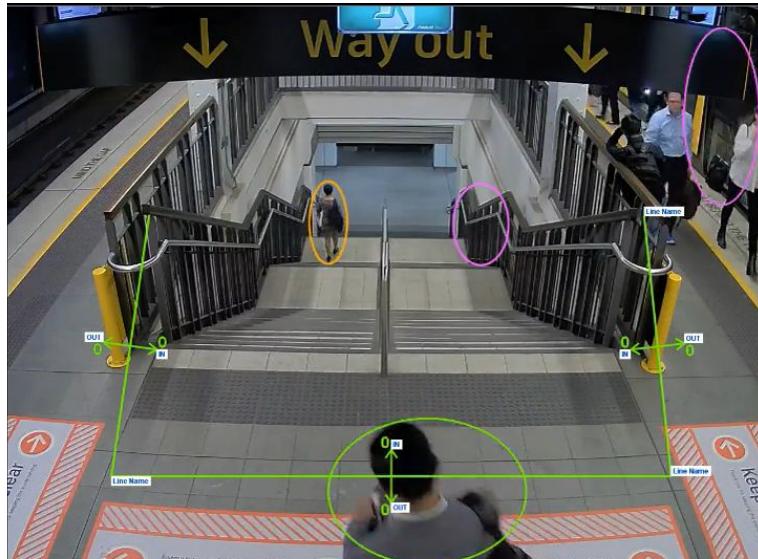
m.zeppelzauer@fhstp.ac.at or just call: +43 2742 313228 652

Looking forward to hearing from you! ☺

Machine Learning for video surveillance

More-than-real-time requirement
Performance optimization
Challenging image quality

→ job@kiwisecurity.com



Deep learning for counting in crowded scenes



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Hot Topics & Latest News

a short block at every meetup
to briefly present recent papers and news

Send us contributions (tom.lidy@gmail.com)
or come with slides to do a short block yourself!

Hot Topics & Latest News

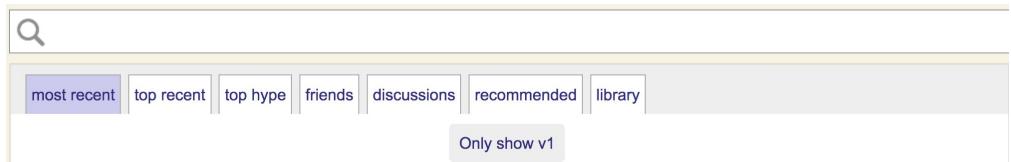
- **ICLR – International Conference on Learning Representations**
April 30 - May 3, Vancouver
iclr.cc
- **ICML – International Conference on Machine Learning**
July 10 - July 15, Stockholm
icml.cc
- **NIPS – Neural Information Processing Systems**
December 3 - December 8, Montreal
nips.cc
- CVPR, ECCV, ...

Main Deep Learning Conferences 2018

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April 30 - May 3, Vancouver
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The Life of a DL Publication

- Arxiv.org
 - Arxiv-sanity.com
- Openreview.net
- Conference Proceedings



A screenshot of the Arxiv.org search interface. At the top, there is a search bar and a navigation bar with buttons for "most recent", "top recent", "top hype", "friends", "discussions", "recommended", and "library". Below the navigation bar, a button says "Only show v1". A purple header bar says "Showing most recent Arxiv papers:". Below this, a list of papers is displayed.

Relational Deep Reinforcement Learning
Vinicius Zambaldi, David Raposo, Adam Santoro, Victor Bapst, Yujia Li, Igor Babuschkin, Karl Tuyls, David Reichert, Timothy Lillicrap, Edward Lockhart, Murray Shanahan, Victoria Langston, Razvan Pascanu, Matthew Botvinick, Oriol Vinyals, Peter Battaglia
6/5/2018 cs.LG | stat.ML

1806.01830v1 [pdf](#)
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We introduce an approach for deep reinforcement learning (RL) that improves upon the efficiency, generalization capacity, and interpretability of conventional approaches through structured perception and relational reasoning. It uses self-attention to iteratively reason about the relations between entities in a scene and to guide a model-free policy. Our results show that in a novel navigation and planning task called Box-World, our agent finds interpretable solutions that improve upon baselines in terms of sample complexity, ability to generalize to more complex scenes than experienced during training, and overall performance. In the StarCraft II Learning Environment, our agent achieves state-of-the-art performance on six mini-games -- surpassing human grandmaster performance on four. By considering architectural inductive biases, our work opens new directions for overcoming important, but stubborn, challenges in deep RL.

Eliciting Binary Performance Metrics
Gaurush Hirandani, Shant Boodaghians, Ruta Mehta, Oluwasanmi Koyejo
6/5/2018 stat.ML | cs.LG
33 pages, 4 figures, 3 tables

1806.01827v1 [pdf](#)
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Spherical CNNs

Taco S. Cohen, Mario Geiger, Jonas Köhler, Max Welling

15 Feb 2018 (modified: 25 Feb 2018) ICLR 2018 Conference Blind Submission readers: everyone Show Bibtex Revisions

Abstract: Convolutional Neural Networks (CNNs) have become the method of choice for learning problems involving 2D planar images. However, a number of problems of recent interest have created a demand for models that can analyze spherical images. Examples include omnidirectional vision for drones, robots, and autonomous cars, molecular regression problems, and global weather and climate modelling. A naive application of convolutional networks to a planar projection of the spherical signal is destined to fail, because the space-varying distortions introduced by such a projection will make translational weight sharing ineffective.

In this paper we introduce the building blocks for constructing spherical CNNs. We propose a definition for the spherical cross-correlation that is both expressive and rotation-equivariant. The spherical correlation satisfies a generalized Fourier theorem, which allows us to compute it efficiently using a generalized (non-commutative) Fast Fourier Transform (FFT) algorithm. We demonstrate the computational efficiency, numerical accuracy, and effectiveness of spherical CNNs applied to 3D model recognition and atomization energy regression.

TL;DR: We introduce Spherical CNNs, a convolutional network for spherical signals, and apply it to 3D model recognition and molecular energy regression.

Keywords: deep learning, equivariance, convolution, group convolution, 3D, vision, omnidirectional, shape recognition, molecular energy regression

14 Replies

Equivariance under non-linearity

(anonymous)

19 Apr 2018 ICLR 2018 Conference Paper615 Public Comment readers: everyone

Comment: The paper nicely and theoretically propose an equivariant spherical cross-correlation for the rotation group. But it is not clear how the equivariance maintains in multiple layers with ReLU and BN inserted in between as the authors did in the experiments?

Sec 5.1 also shows that adding ReLU increase the difference by a large magnitude.

Good point

ICLR 2018 Conference Paper615 Authors

21 Apr 2018 ICLR 2018 Conference Paper615 Official Comment readers: everyone

Comment: This is a good point. The network is equivariant if all the layers are equivariant, so that is what we must show. It was shown in the paper "Group Equivariant Networks" (section 6.2) that arbitrary pointwise nonlinearities are equivariant to the action of the group. This is true for the so-called regular representations, which act by permuting the neurons, whereas other (steerable / induced) representations may require special equivariant nonlinearities.

The regular representation is what we denote by L_R in this paper:

$L_R f = f R^{-1}$,

where juxtaposition means composition. Applying a pointwise nonlinearity s to a feature map f can be written mathematically as:

$C_s f = s f$

Since L_R acts by composing on the right and C_s acts by composing from the left, we have:

$L_R C_s f = L_R (s f) = (s f) R^{-1} = s (f R^{-1}) = C_s L_R f$.

That is, the regular representation L_R and the nonlinear operator C_s commute.

Paper for Today

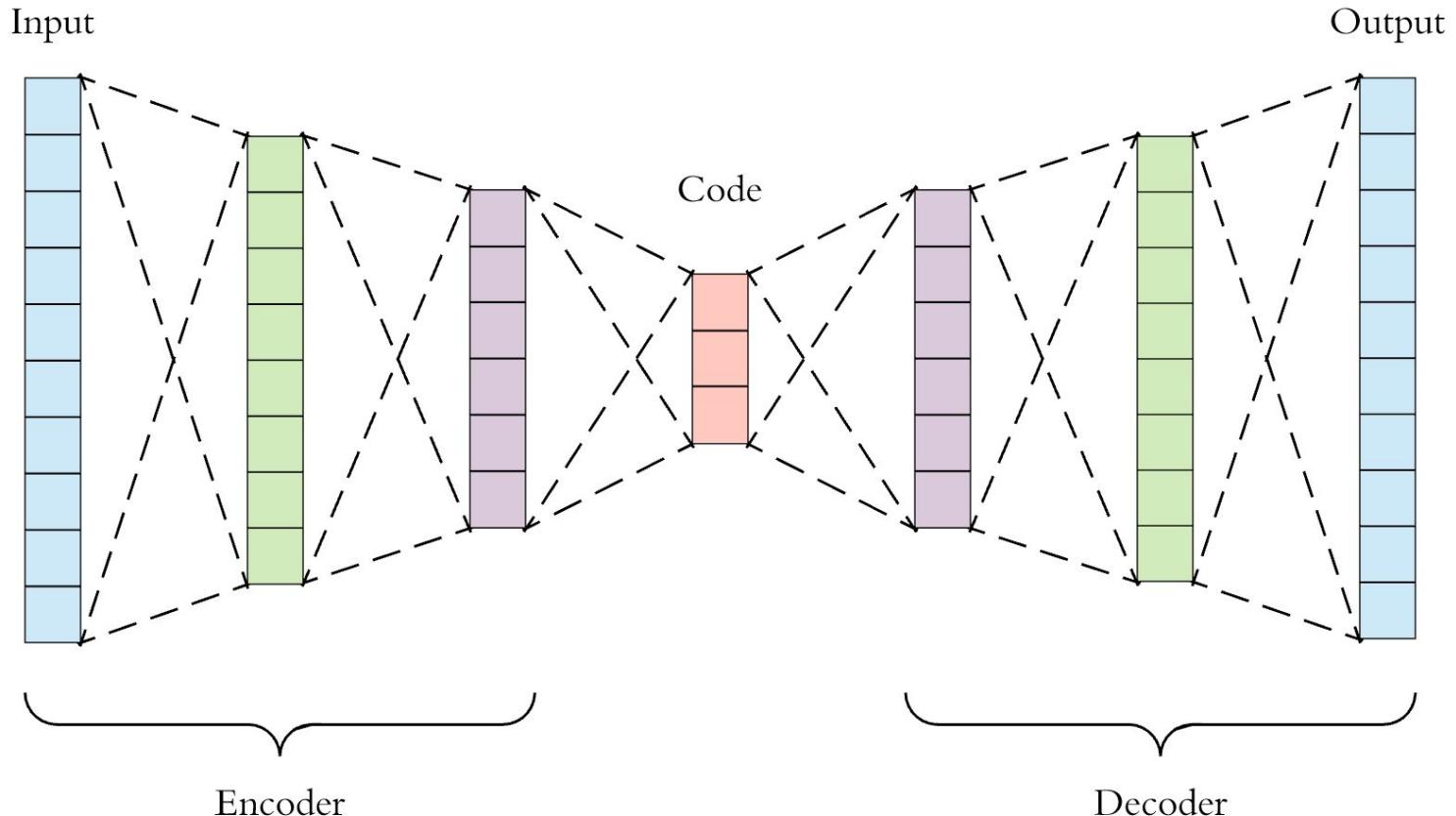
- Progressive Growing of GANs
<https://openreview.net/forum?id=Hk99zCeAb>
- Multi-Scale Dense Networks for Resource Efficient Image Classification
<https://openreview.net/forum?id=Hk2almxAAb>
- Shifting Mean Activation Towards Zero with Bipolar Activation Functions
<https://openreview.net/forum?id=B1Xqwdolz>

Progressive Growing of GANs

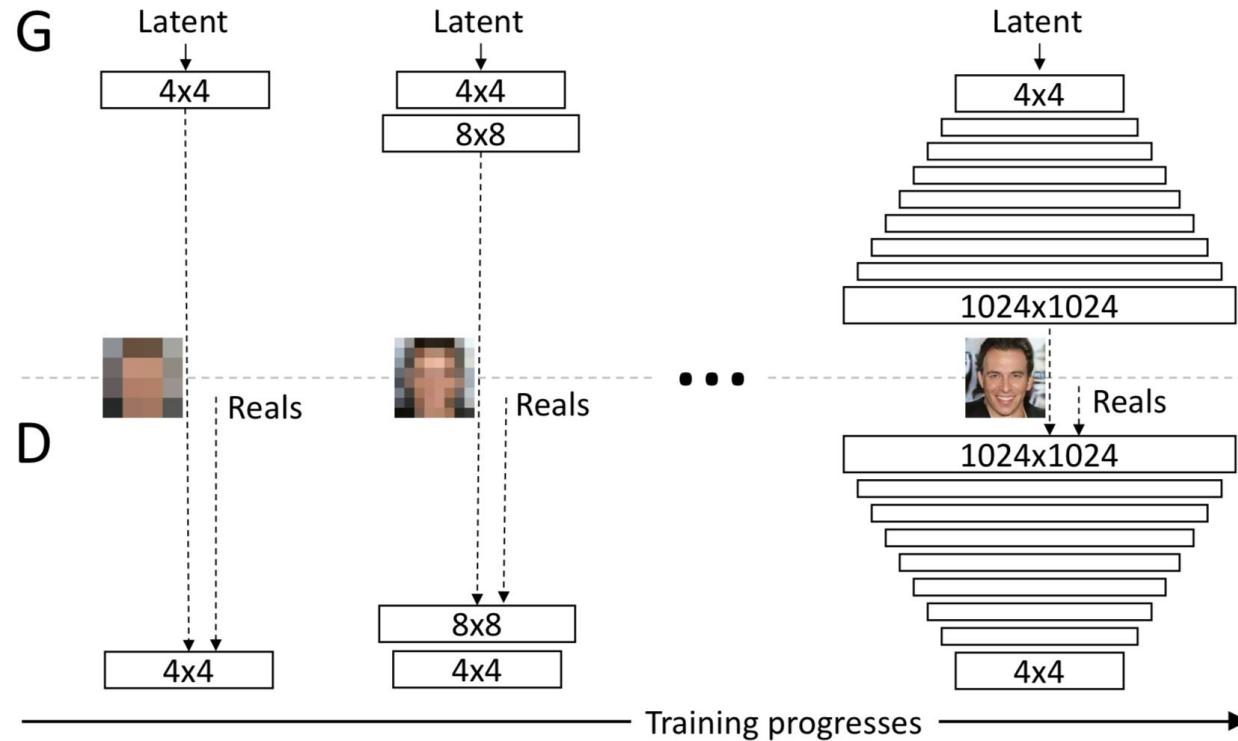
Progressive Growing of GANs

- New training methodology
 - start at low resolution
 - add new layers that model increasingly fine details as training progresses
- speeds up the training and greatly stabilizes it
- CELEBA images at 1024 x 1024

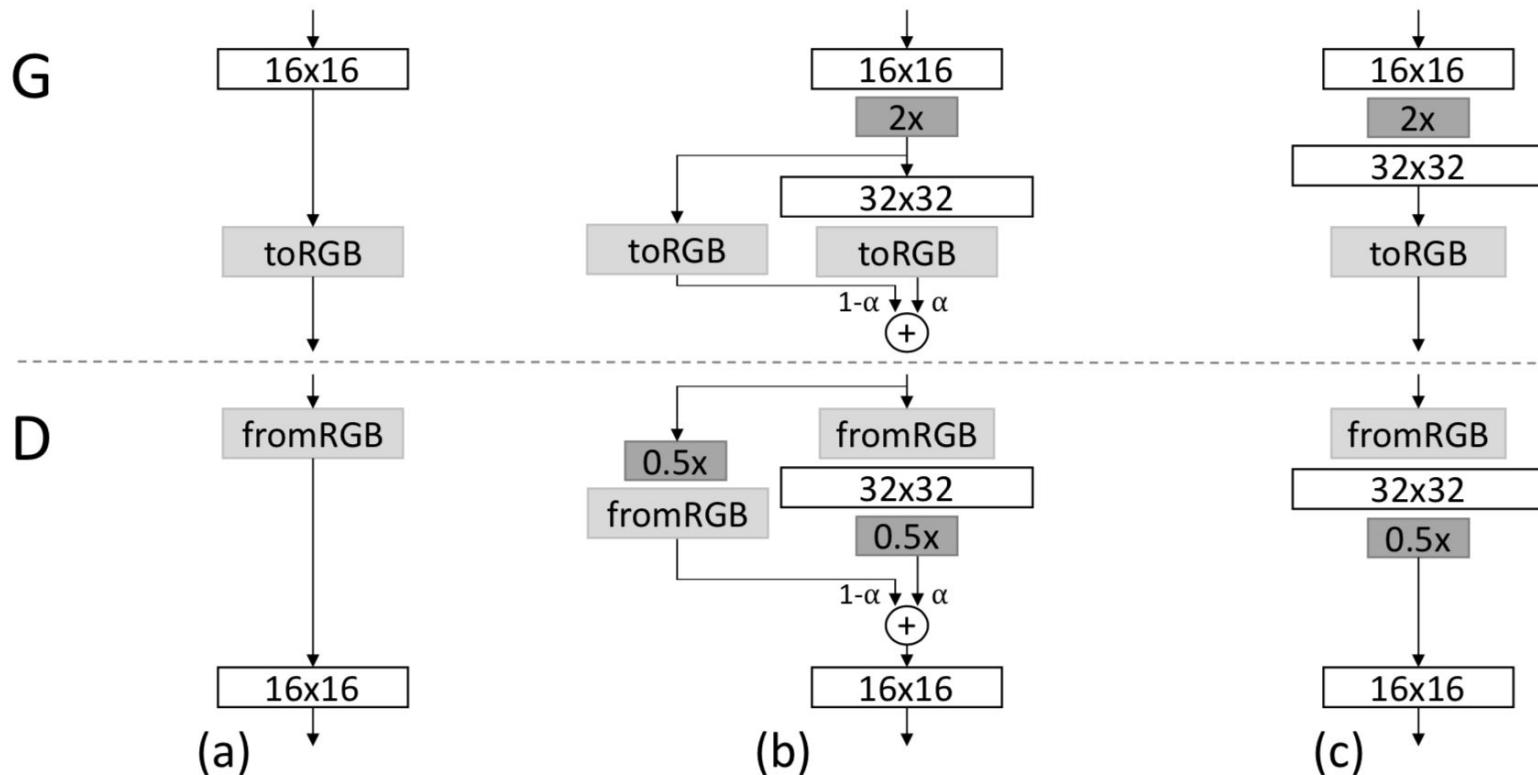
Related: Auto-Encoders – Greedy Pretraining

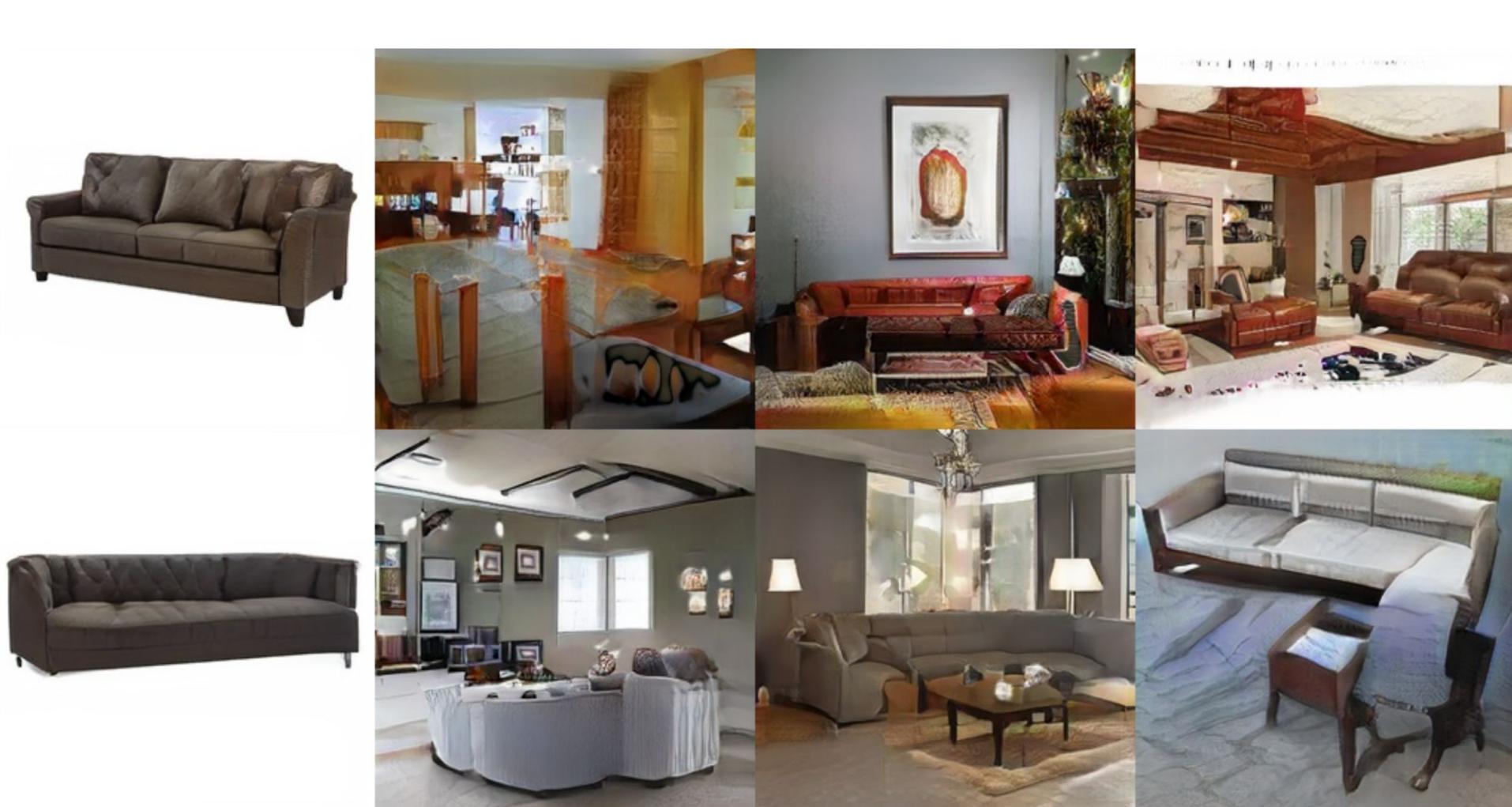


Progressive Growing of GANs



Smooth Fade-In of New Layers





Results

There is also a
[Video!](#)



Multi-Scale Dense Networks for Resource Efficient Image Classification

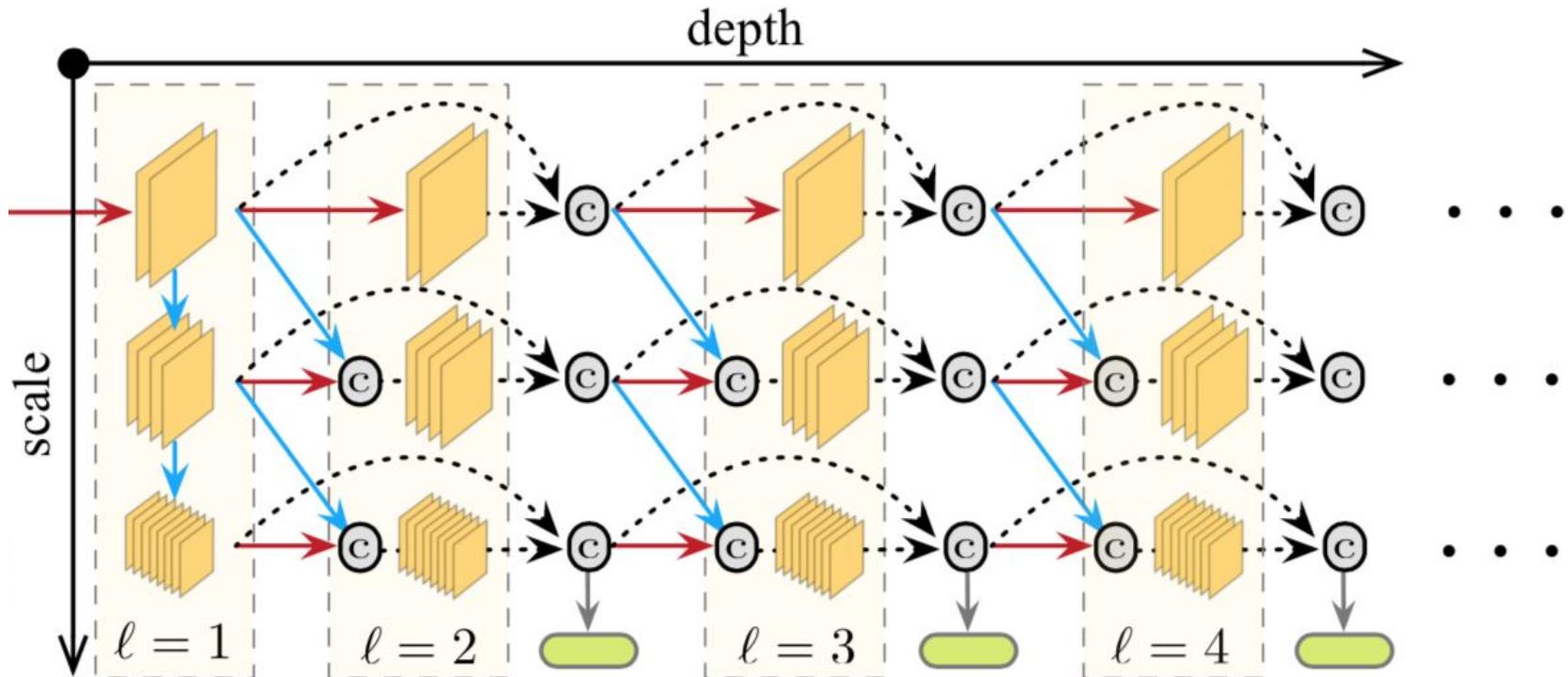
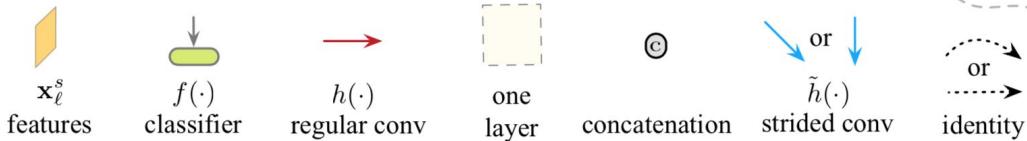
Multi-Scale Dense Networks For Resource Efficient Image Classification

- Computational resource limits at test time
- **anytime classification**
 - prediction for a test example is progressively updated
 - output of a prediction at any time
- **budgeted batch classification**
 - Fixed compute budget
 - can be spent unevenly across “easier” and “harder” inputs

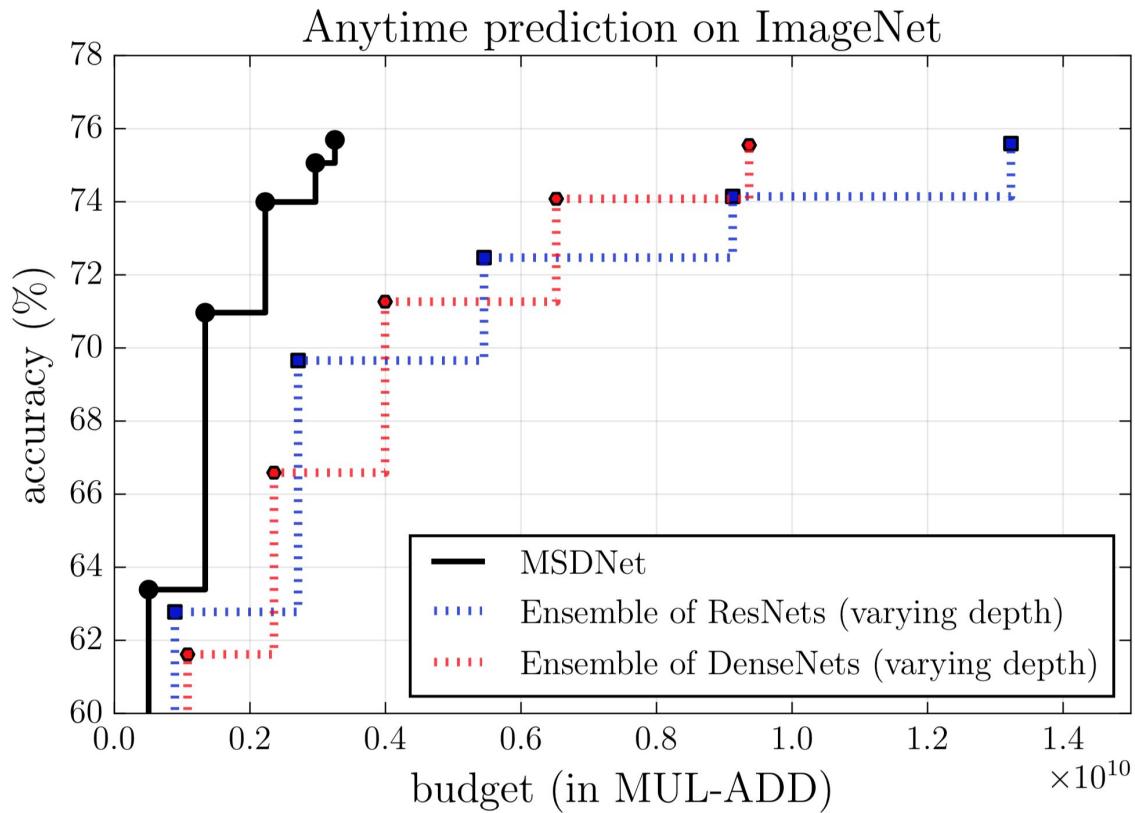
Easy and Difficult Examples



Network architecture



Accuracy vs Compute Budget

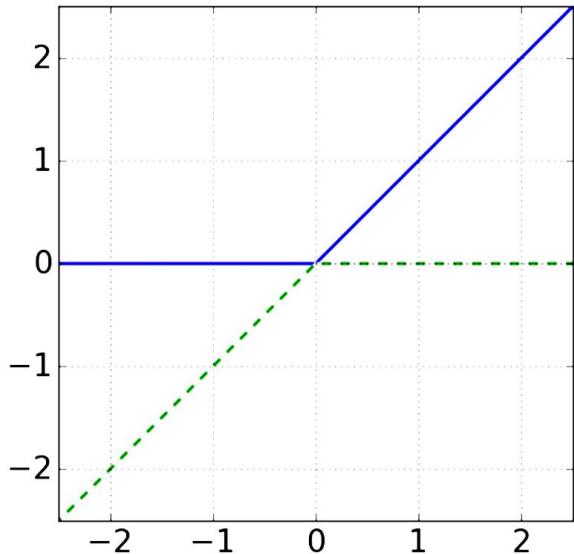
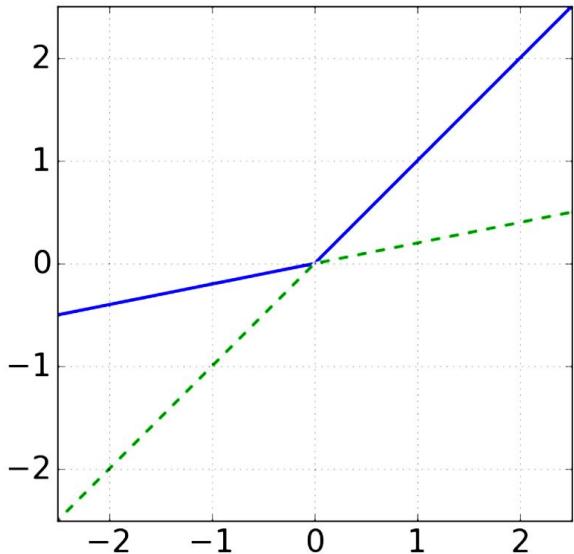
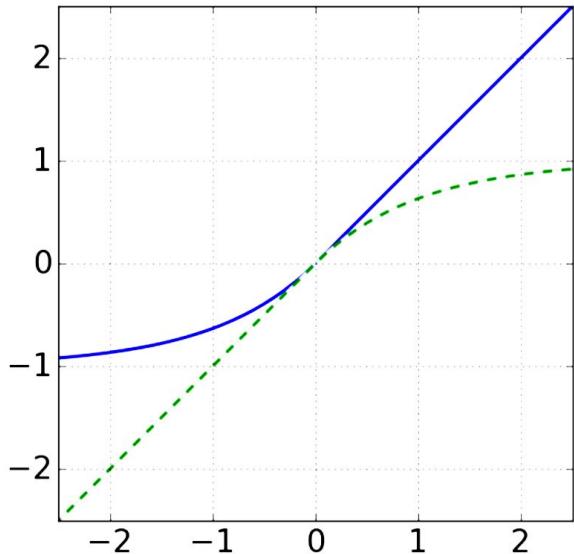


Shifting Mean Activation Towards Zero With Bipolar Activation Functions

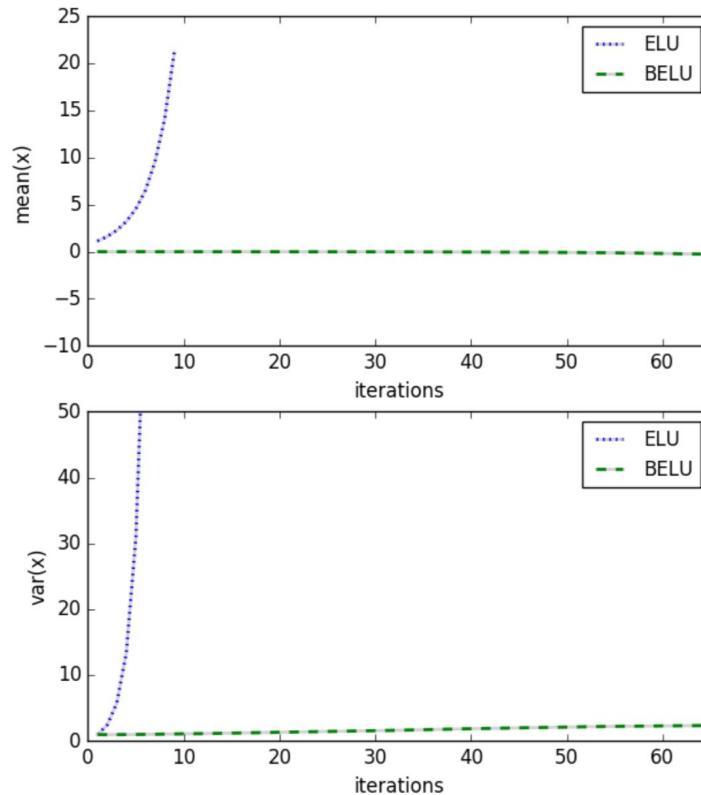
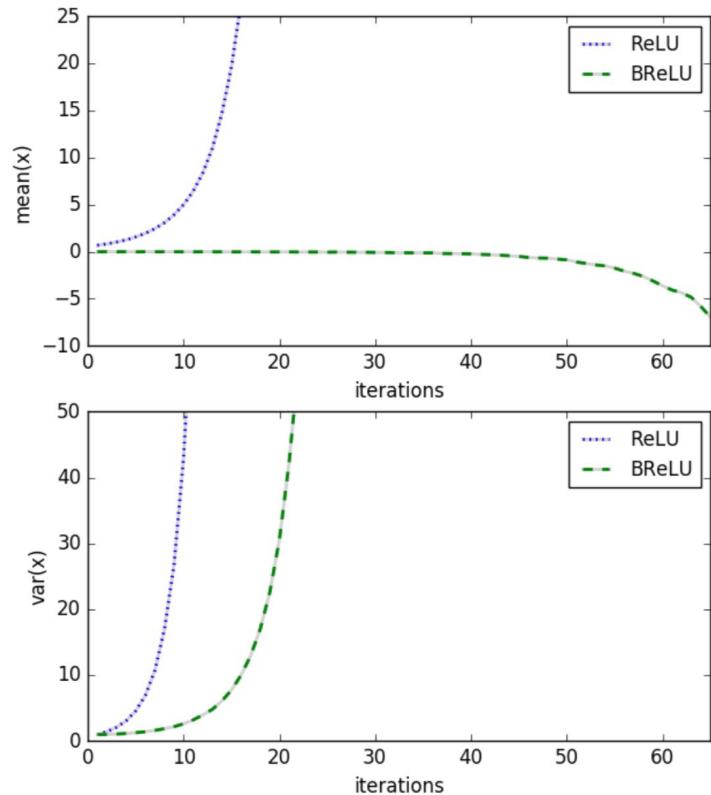
Shifting Mean Activation Towards Zero With Bipolar Activation Functions

- ReLU: non-zero mean activations, evergrowing variance
- BatchNorm for mitigation, normalize mean/var at each layer
 - ‘End-of-pipe’ solution
- **Key idea:**
 - Invert every second activation function!
 - Zero mean, slowly growing variance
 - Fixes the underlying problem
- Faster convergence, stable training, higher accuracy

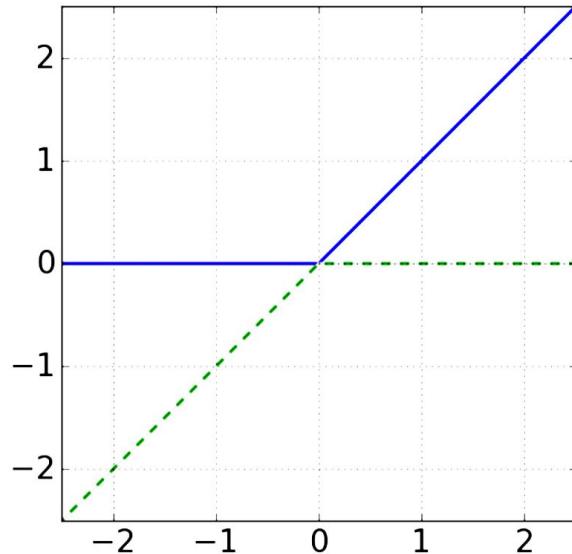
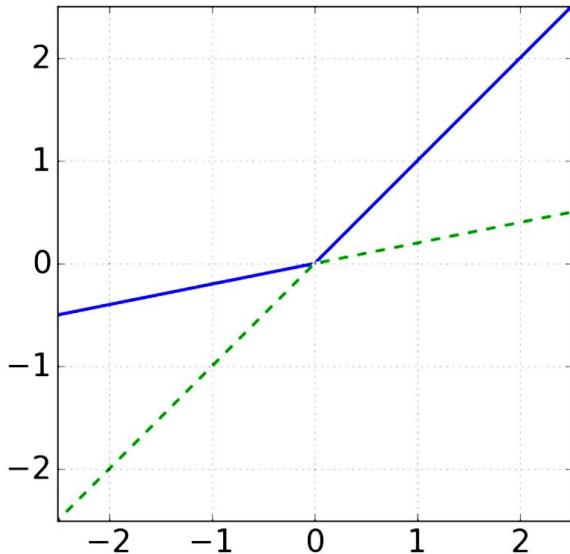
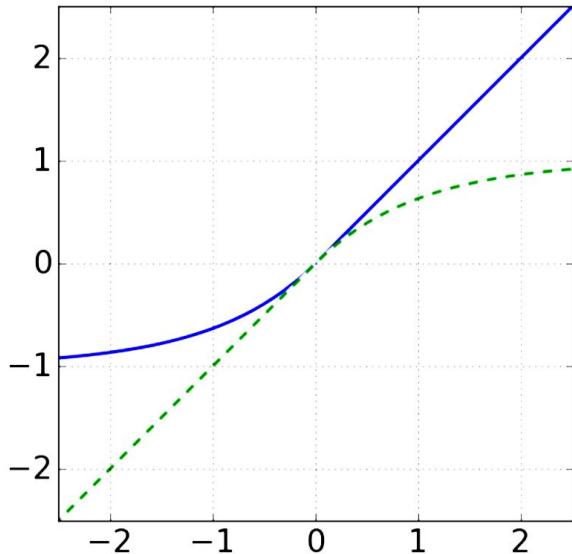
Blue: ELU – Leaky ReLU – RELU



Shifting Mean Activation Towards Zero with Bipolar Activation Functions

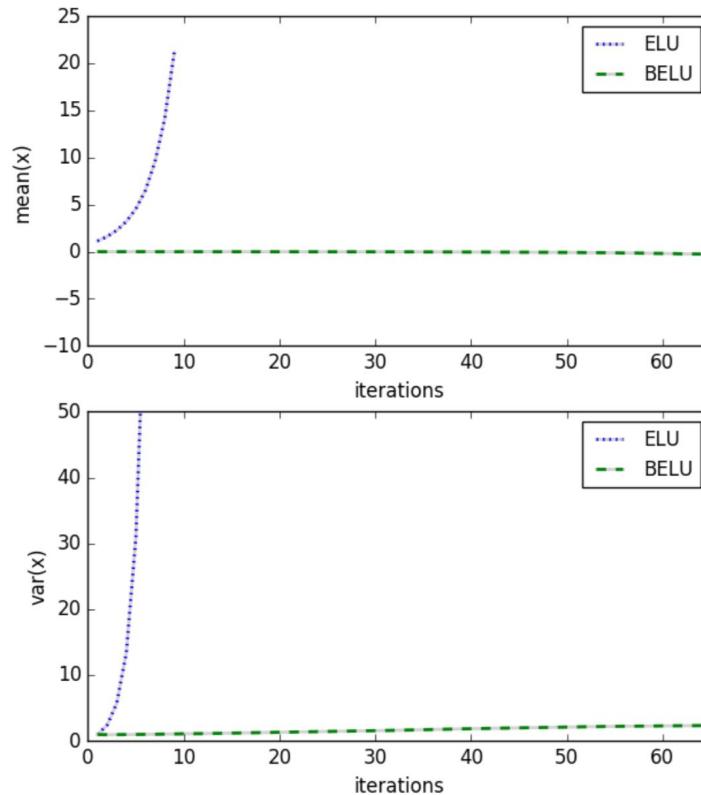
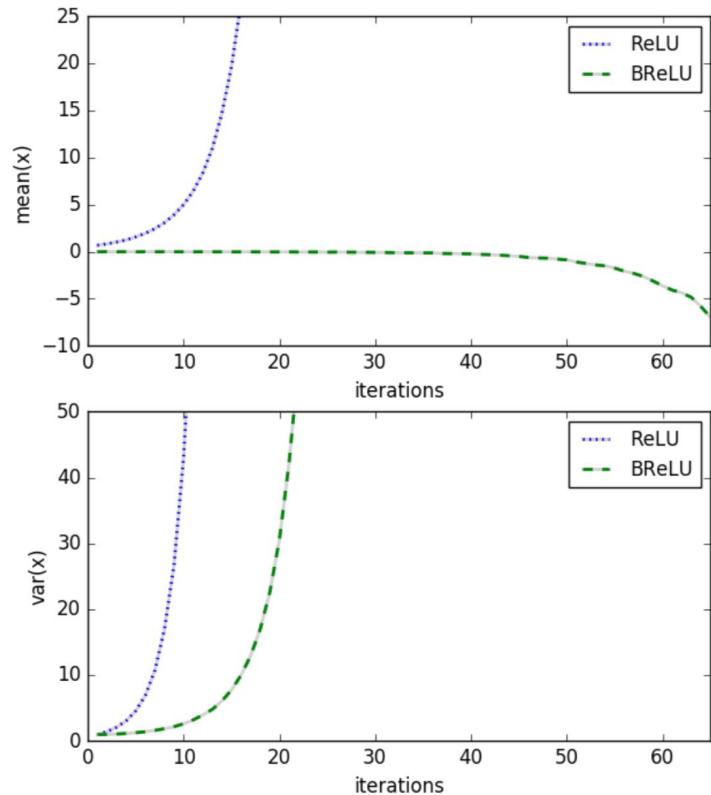


ELU – Leaky ReLU – RELU, and Bipolar Versions



$$f_B(x_i) = \begin{cases} f(x_i), & \text{if } i \bmod 2 = 0 \\ -f(-x_i), & \text{if } i \bmod 2 \neq 0 \end{cases}$$

Shifting Mean Activation Towards Zero with Bipolar Activation Functions



Faster Training / Great Results without BatchNorm

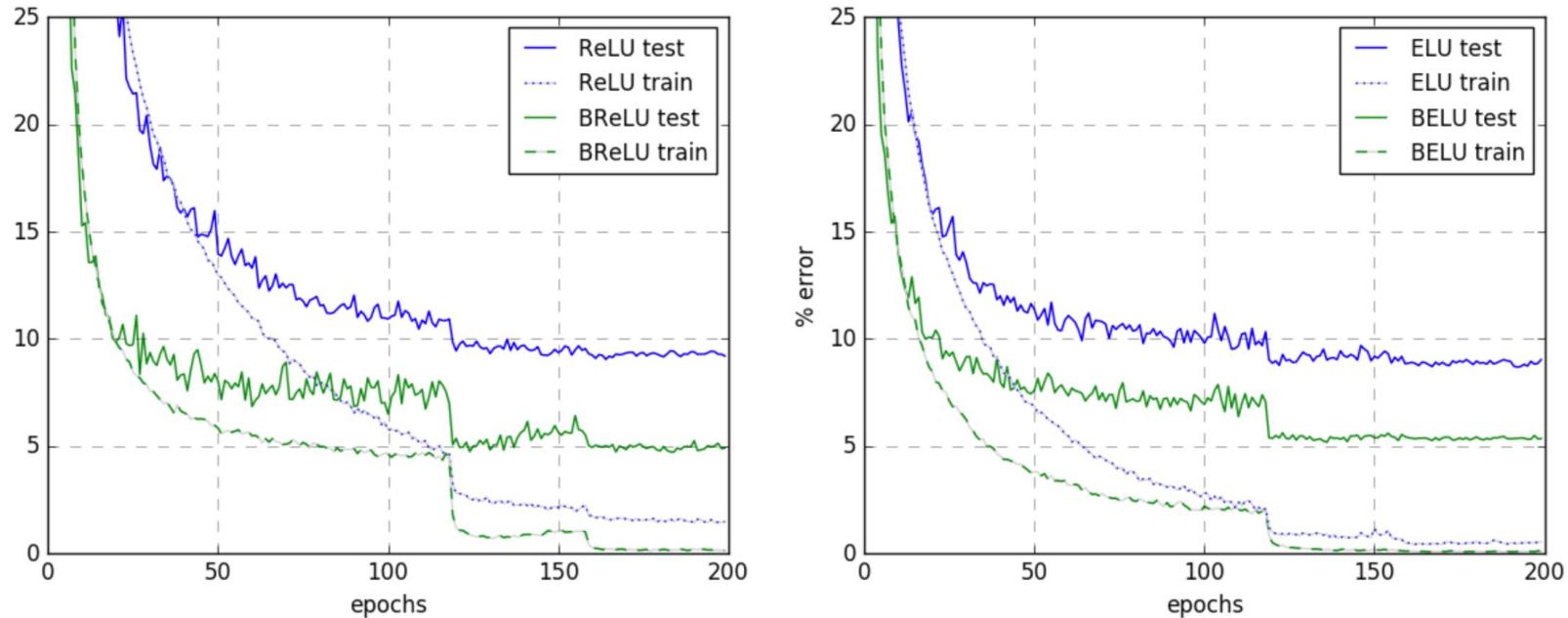


Table 5: CIFAR-10 test error with moderate data augmentation [%]

Network	ReLU	BReLU	ELU	BELU
OrientedResponseNet-28 (no BN, 30% dropout)	9.20	4.91	9.03	5.35
WideResNet-28 (no BN, 30% dropout)	9.78	6.03	7.69	6.12

Hot Topics & Latest News

a short block at every meetup
to briefly present recent papers and news

Send us contributions (tom.lidy@gmail.com)
or come with slides to do a short block yourself!

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Next Meetup: September

