GANs for Limited Labeled Data

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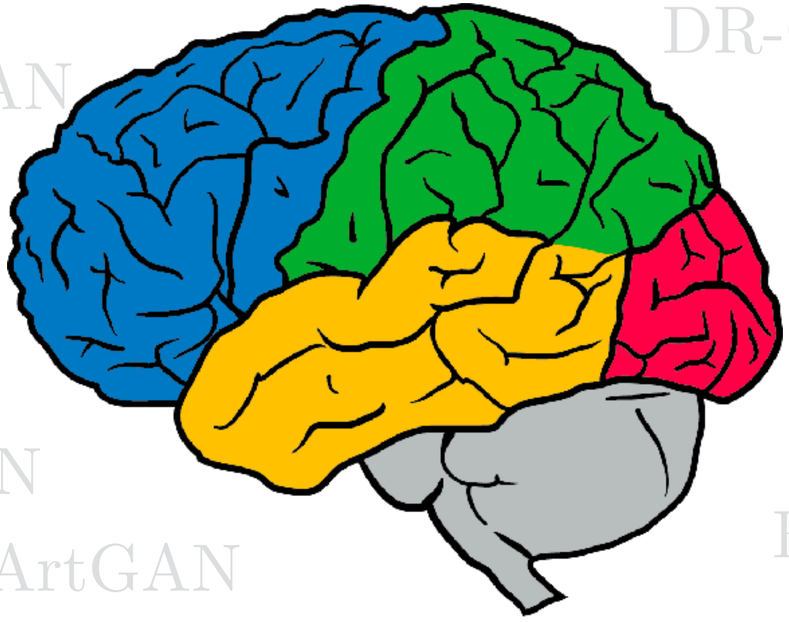
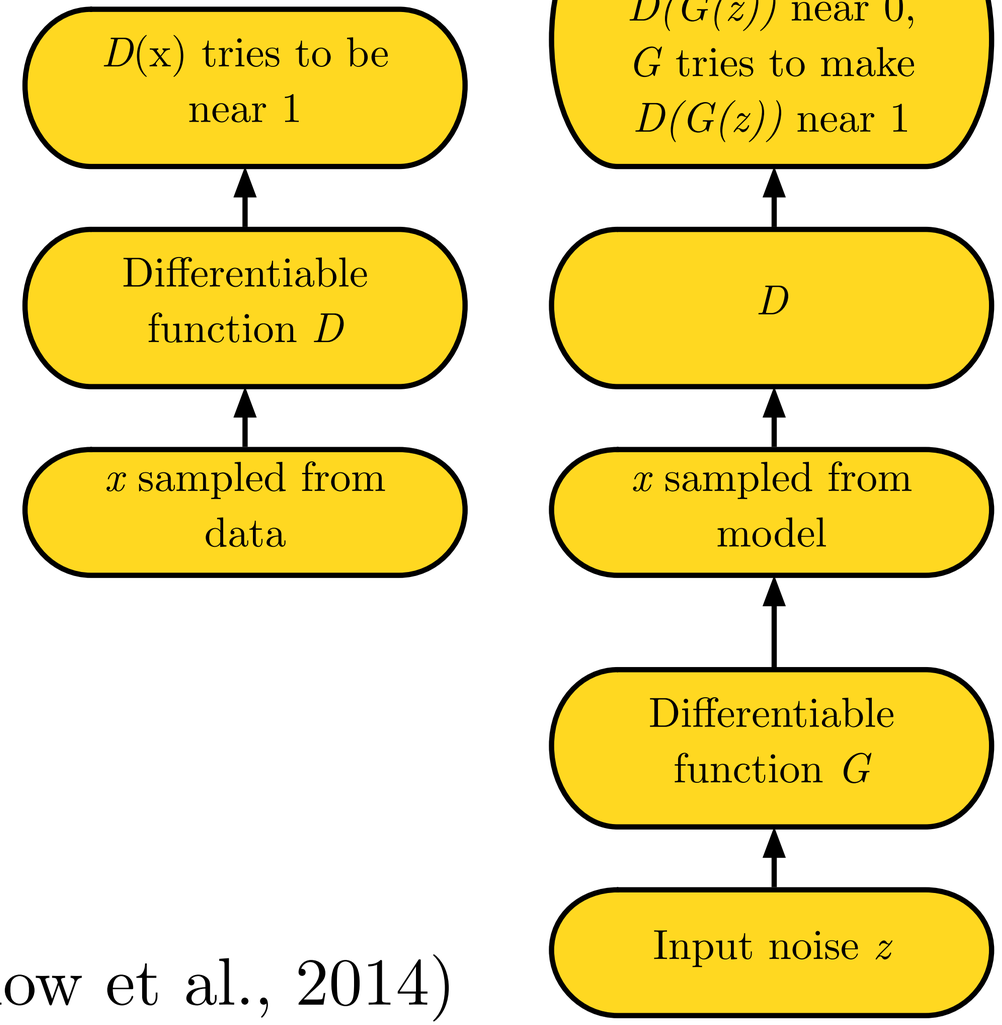


Adversarial Nets Framework



(Goodfellow et al., 2014)

Overcoming limited data with GANs

- Missing data
  - Semi-supervised learning
- Set-member supervision
- Unsupervised correspondence learning
- Replace data collection with simulation
- Simulated environments and training data
- Domain adaptation

What is in this image?

(Yeh et al., 2016)

Generative modeling reveals a face

(Yeh et al., 2016)

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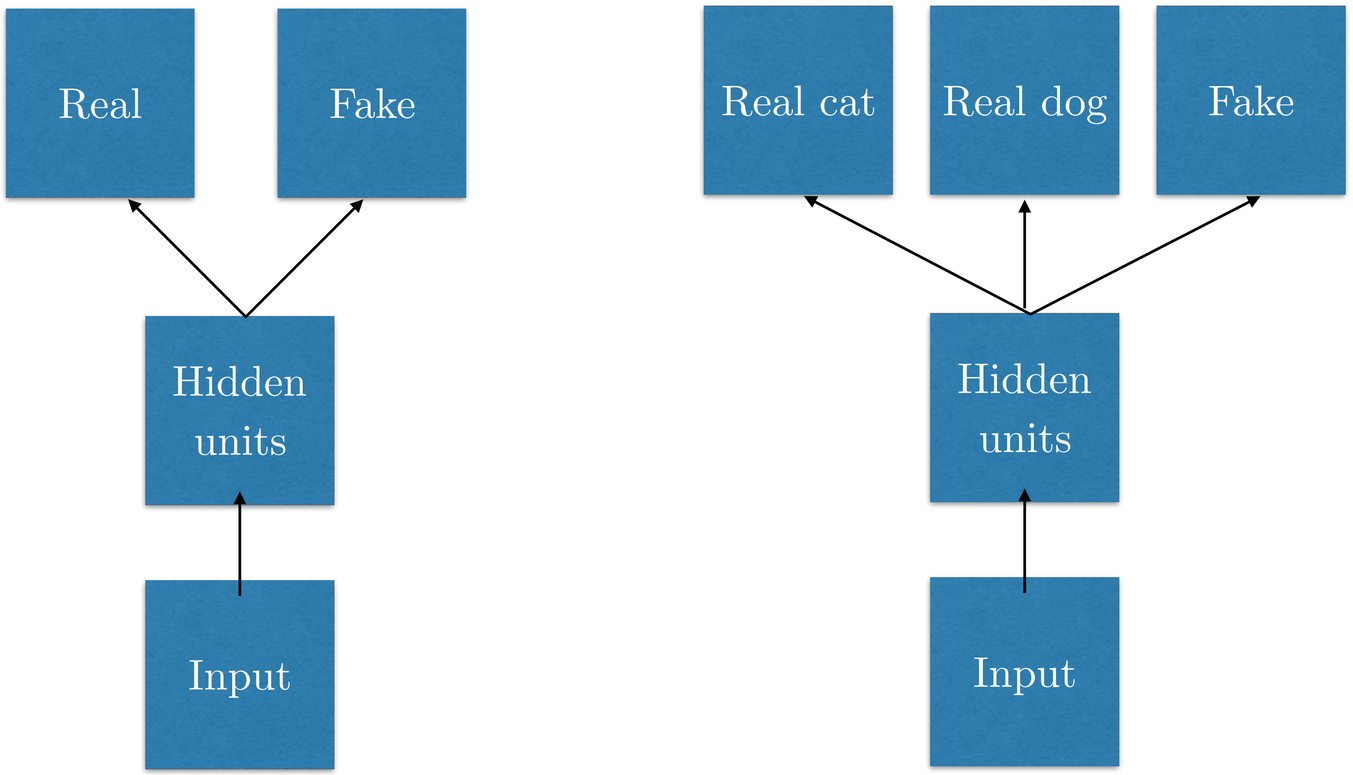
Supervised Discriminator



(Odena 2016, Salimans et al 2016)

Semi-Supervised Classification

MNIST: 100 training labels -> 80 test mistakes

SVHN: 1,000 training labels -> 4.3% test error

CIFAR-10: 4,000 labels -> 14.4% test error

(Dai et al 2017)

Useful for differential privacy: Papernot et al, 2016

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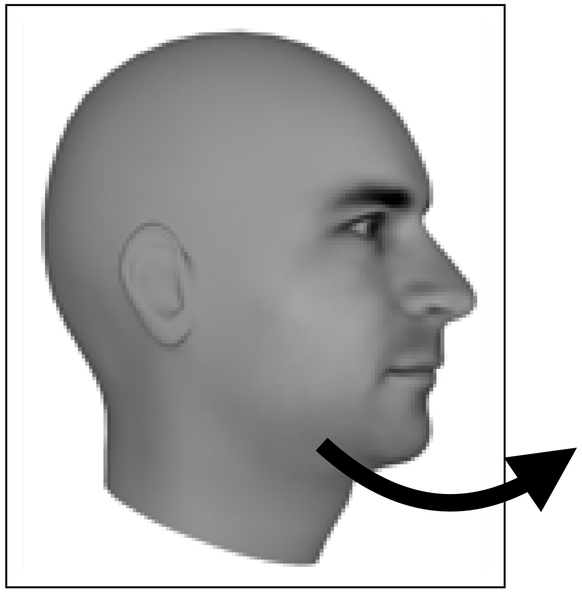
Next Video Frame Prediction

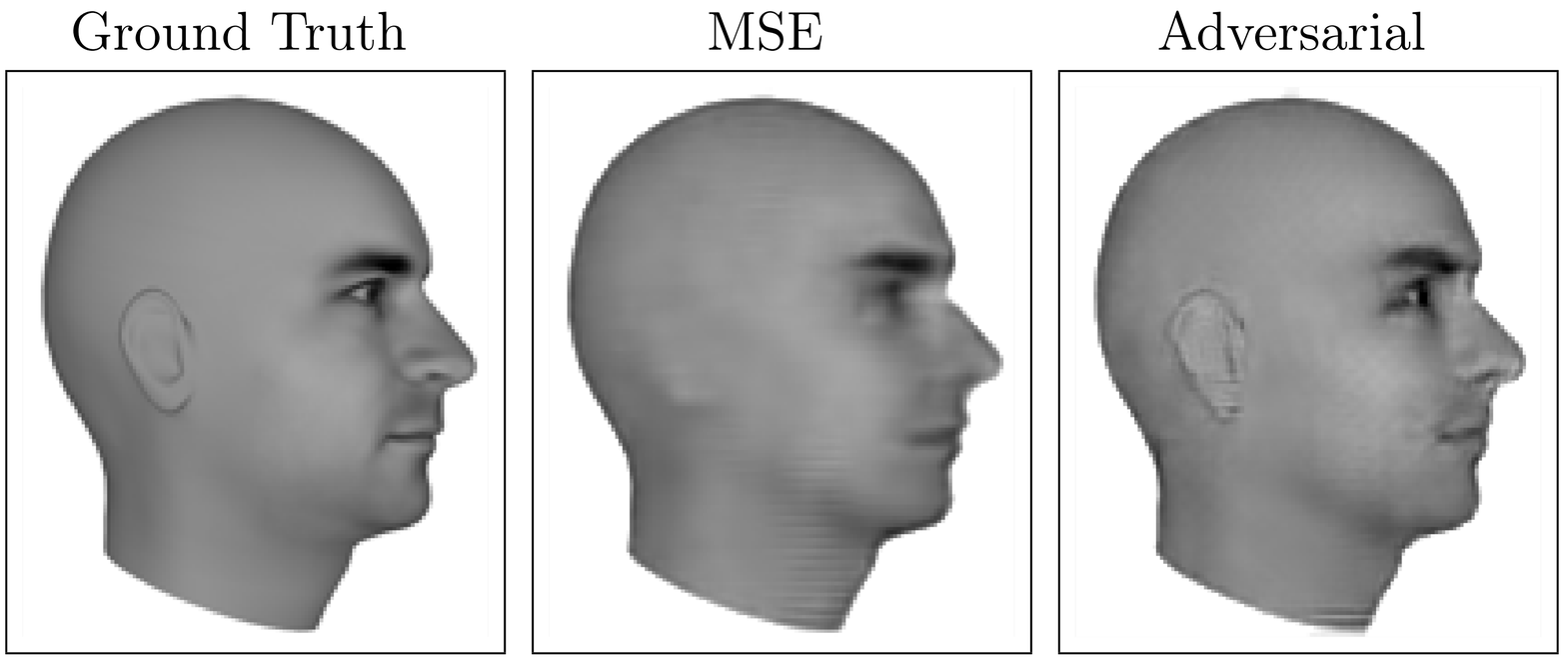
Ground Truth



What happens next?

(Lotter et al 2016)

Next Video Frame Prediction



(Lotter et al 2016)

Next Video Frame(s) Prediction

Mean Squared Error

Mean Absolute Error

Adversarial

(Mathieu et al. 2015)

(Raffel, 2017)

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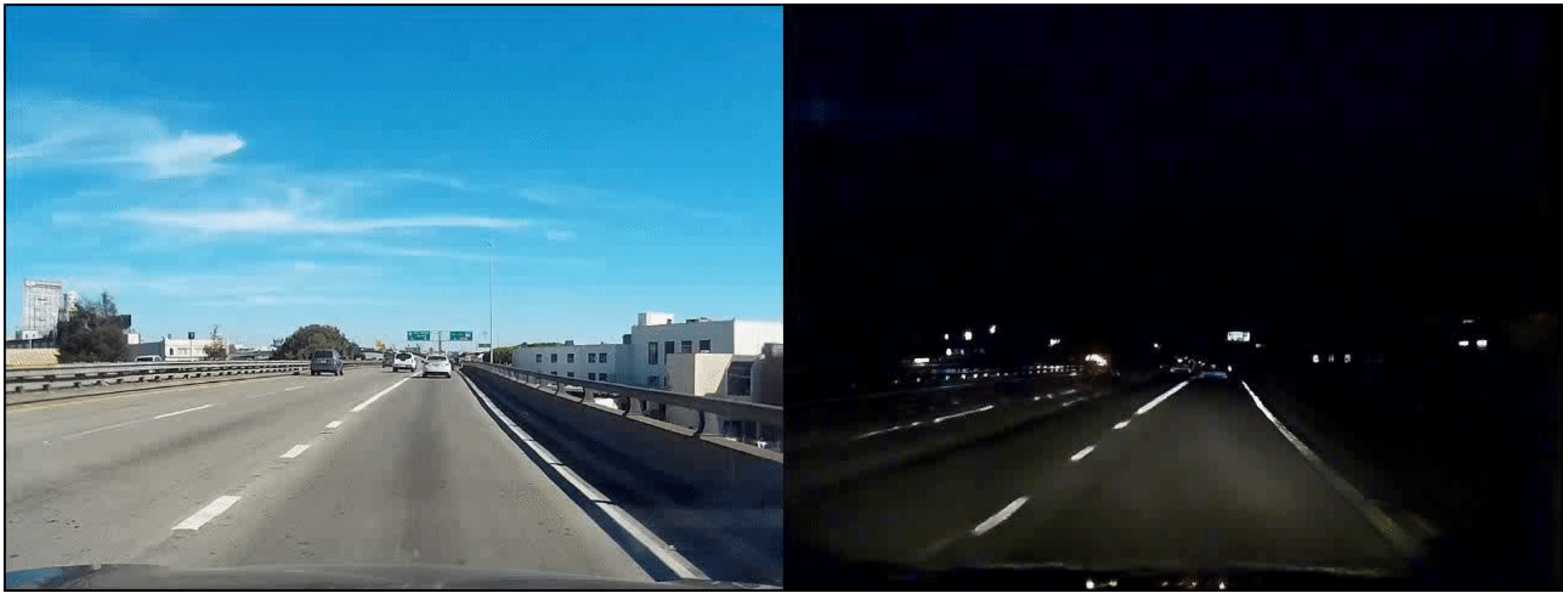
Unsupervised Image-to-Image Translation

Day to night

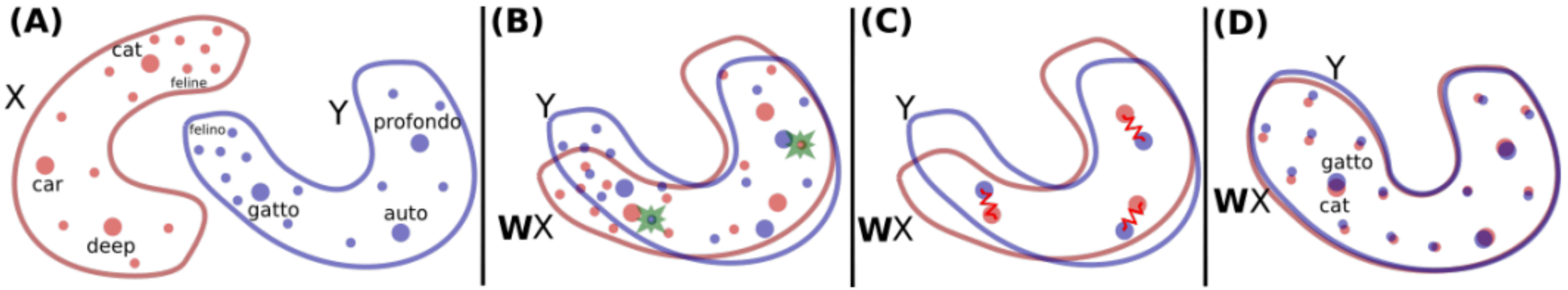


(Liu et al., 2017)

CycleGAN

(Zhu et al., 2017)

Translation without parallel corpora



(Conneau et al., 2017)

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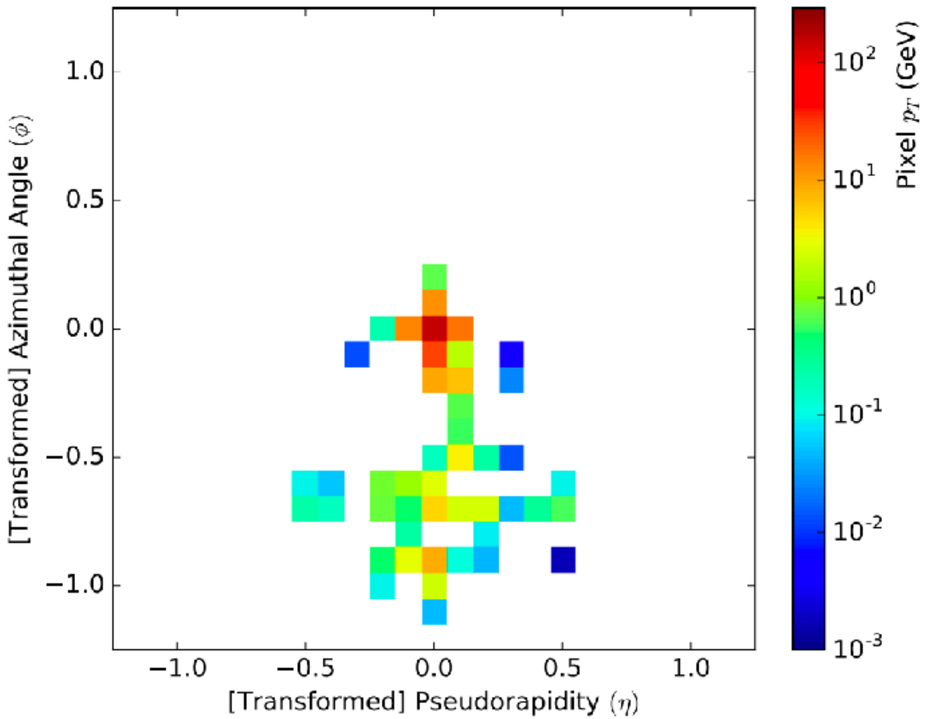
Simulating particle physics

Save millions of dollars of CPU time by predicting outcomes of explicit simulations



(de Oliveira et al., 2017)

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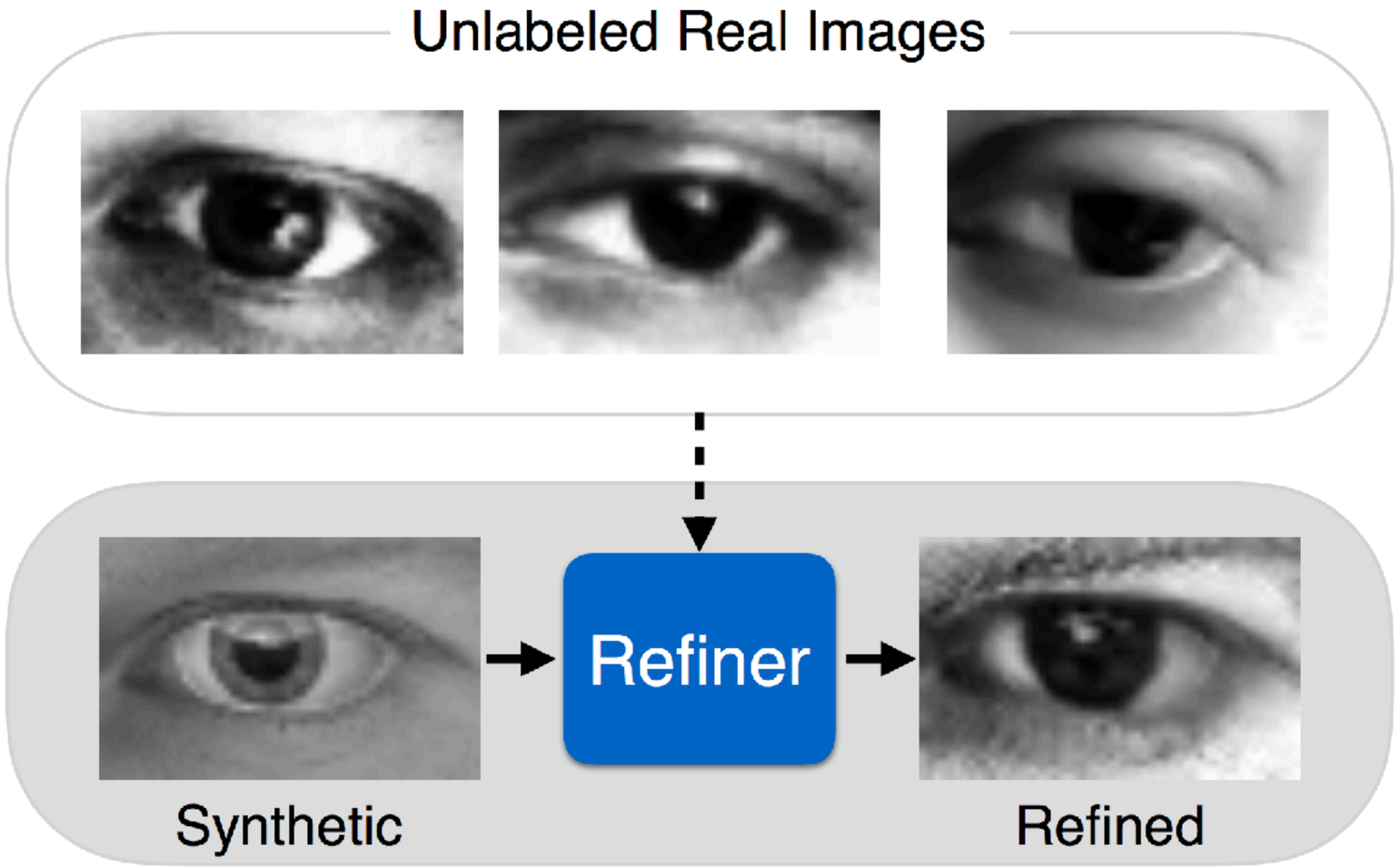
TEACHING AID

Apple's first research paper tries to solve a problem facing every company working on AI

GANs for simulated training data



(Shrivastava et al., 2016)

Autonomous Driving Data

Input labels

Synthesized image

(Wang et al., 2017)

(Raffel, 2017)

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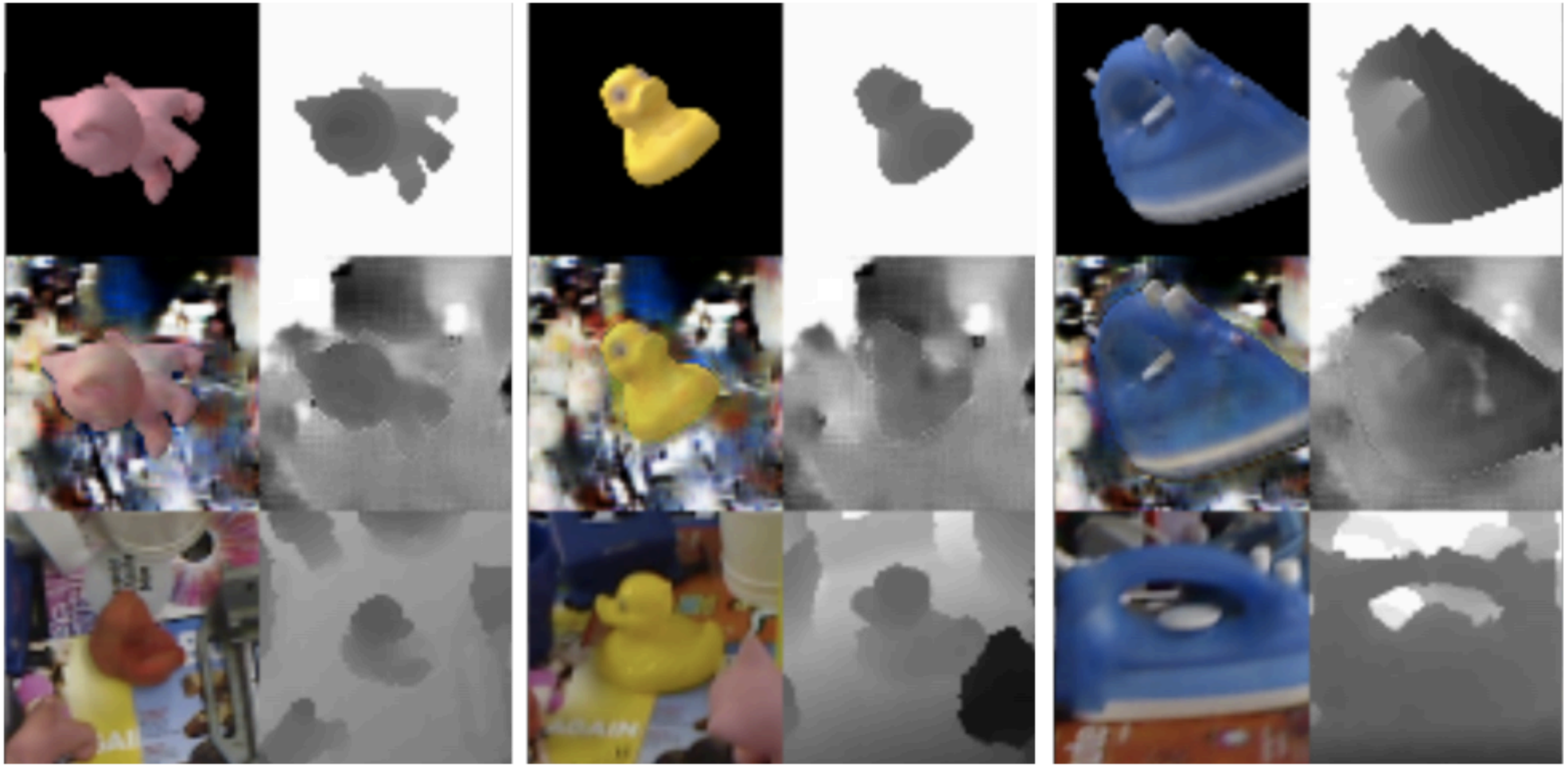
Domain Adaptation

- Domain Adversarial Networks (Ganin et al, 2015)

- Professor forcing (Lamb et al, 2016): Domain-Adversarial learning in RNN hidden state

GANs for domain adaptation



(Bousmalis et al., 2016)

Questions