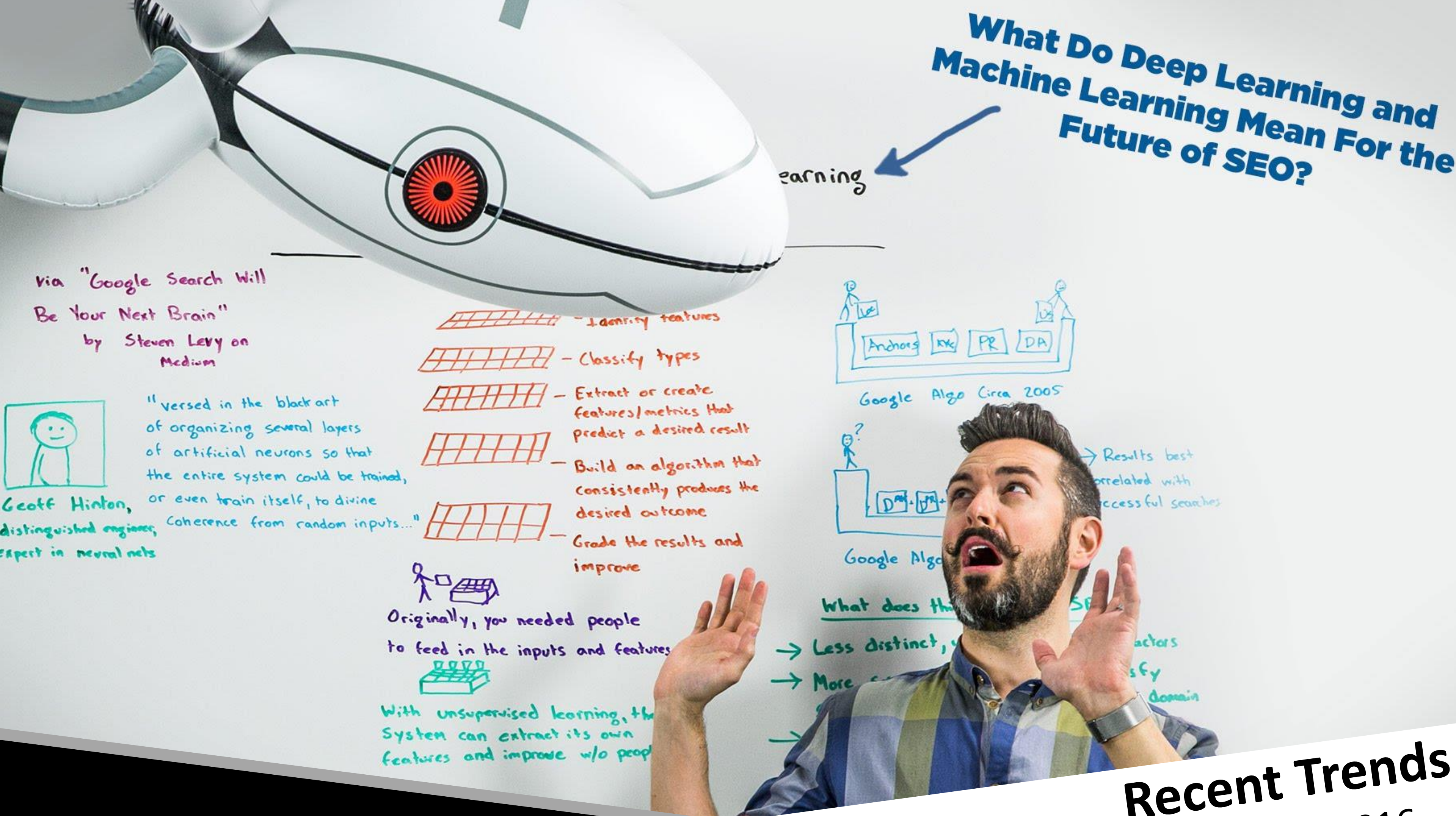

Recent Trends

Dec. 29th, 2016

Applied Deep Learning

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Outline

Deep Learning Issues

From “Going Deeper” to “Compressing more lightly”

CNN v.s. RNN

Deep Learning in Robotics

Generative Models

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Deep Learning Issues

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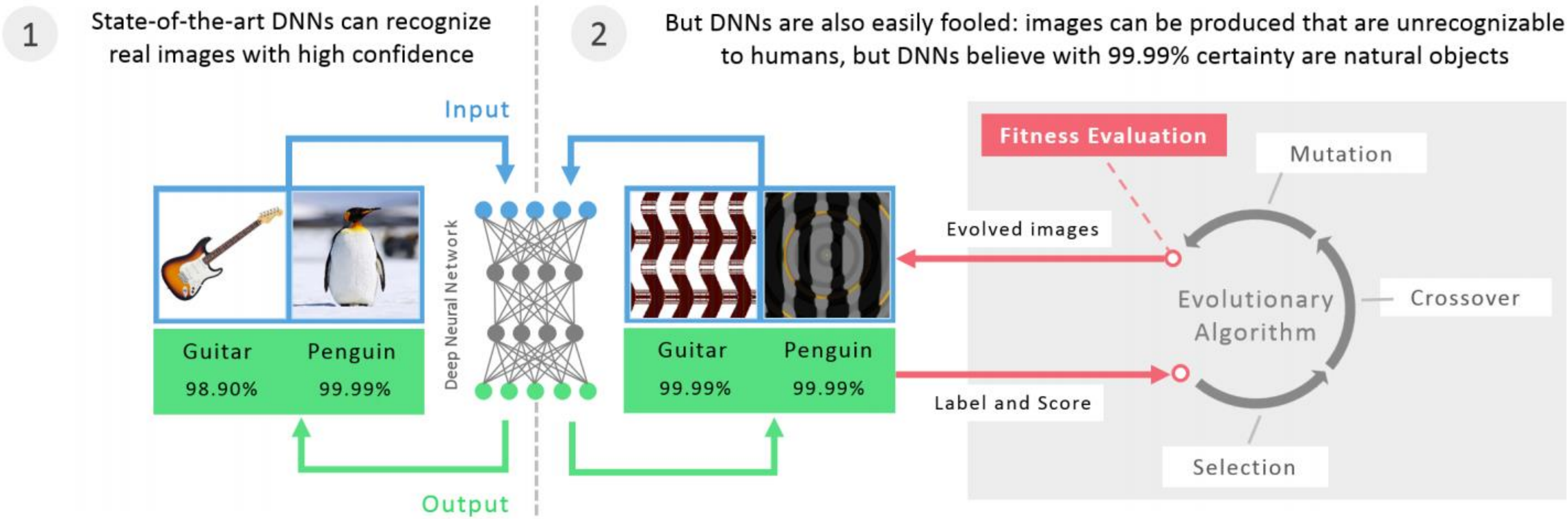
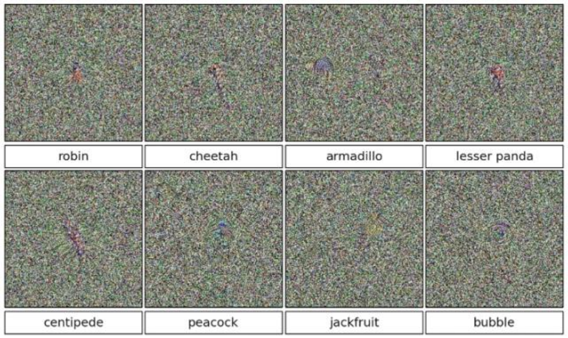
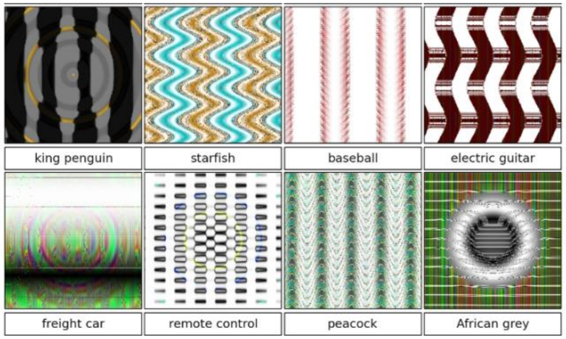
Generative Models

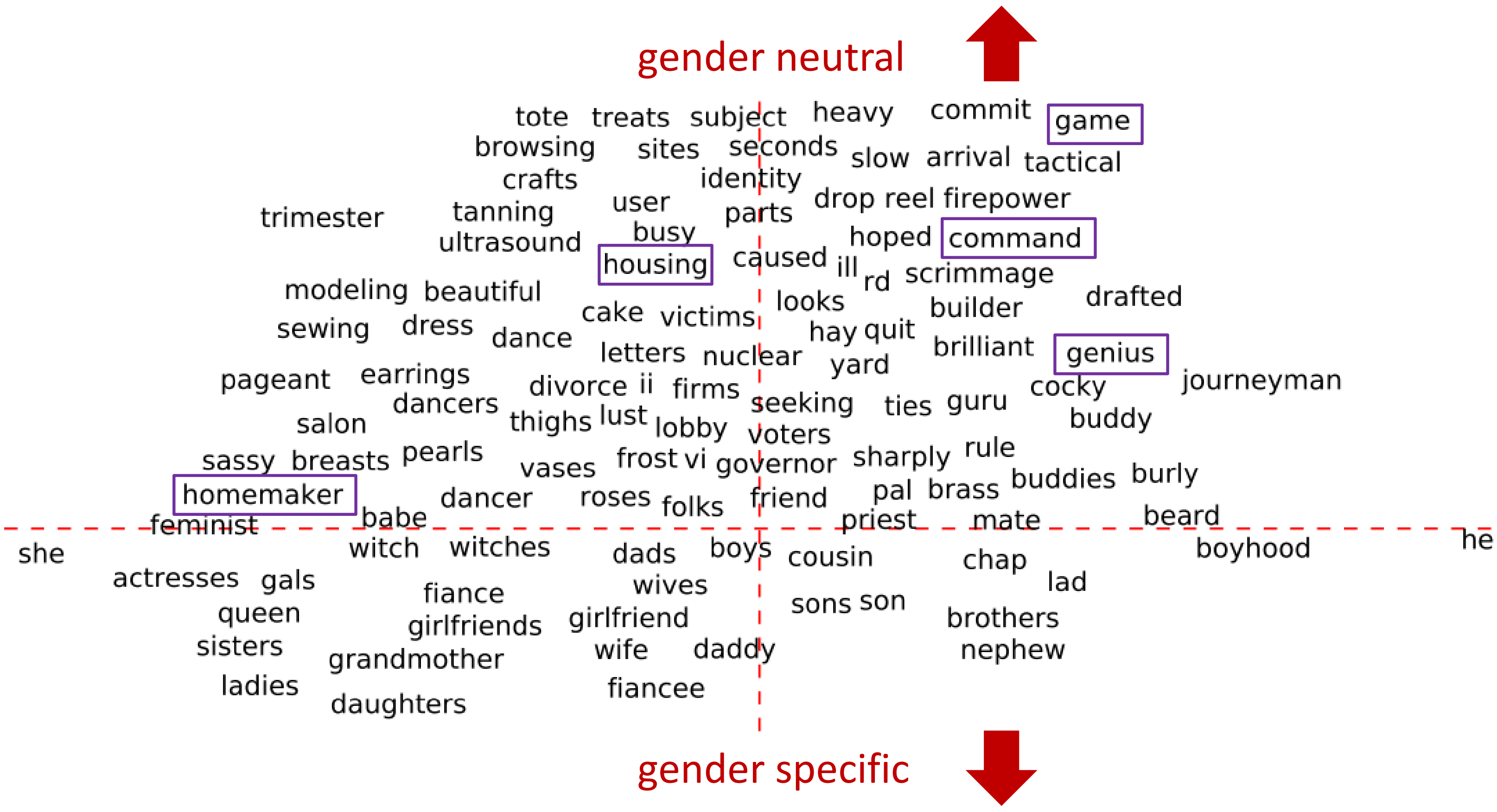
DNN are easily fooled







Bias Issue



Bolukbasi et al., “Man is to Computer Programmer as Woman is to Homemaker? Debiasing Word Embeddings,” arXiv:1607.06520.

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Model Compression

Deeper models achieve better accuracy: GoogLeNet, ResNet

SqueezeNet aims at AlexNet-level accuracy with smaller model, motivated by

i. Smaller CNNs require less communication across servers during distributed training
ii. less bandwidth to export a new model from the cloud to an autonomous car
iii. more feasible to deploy on FPGAs and other hardware with limited memory

Iandola et al., “SqueezeNet: AlexNet-level accuracy with 50x fewer parameters and <0.5MB model size,” arXiv:1602.07360.

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CNN is also able to capture knowledge from windowed data for sequential input

RNN mainly benefits from learning the sequential information → order matters

Efficiency? Effectiveness? Combination?

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Deep Learning in Robotics

Traditional: humanoids or manipulators

Trend: policy search framework / reinforcement learning

- Failure cost is expensive
  - Cloud robotics
  - Learning from demonstration
- Decisions should be made in real time
  - Model size reduction
  - Transferring learned knowledge for a new task

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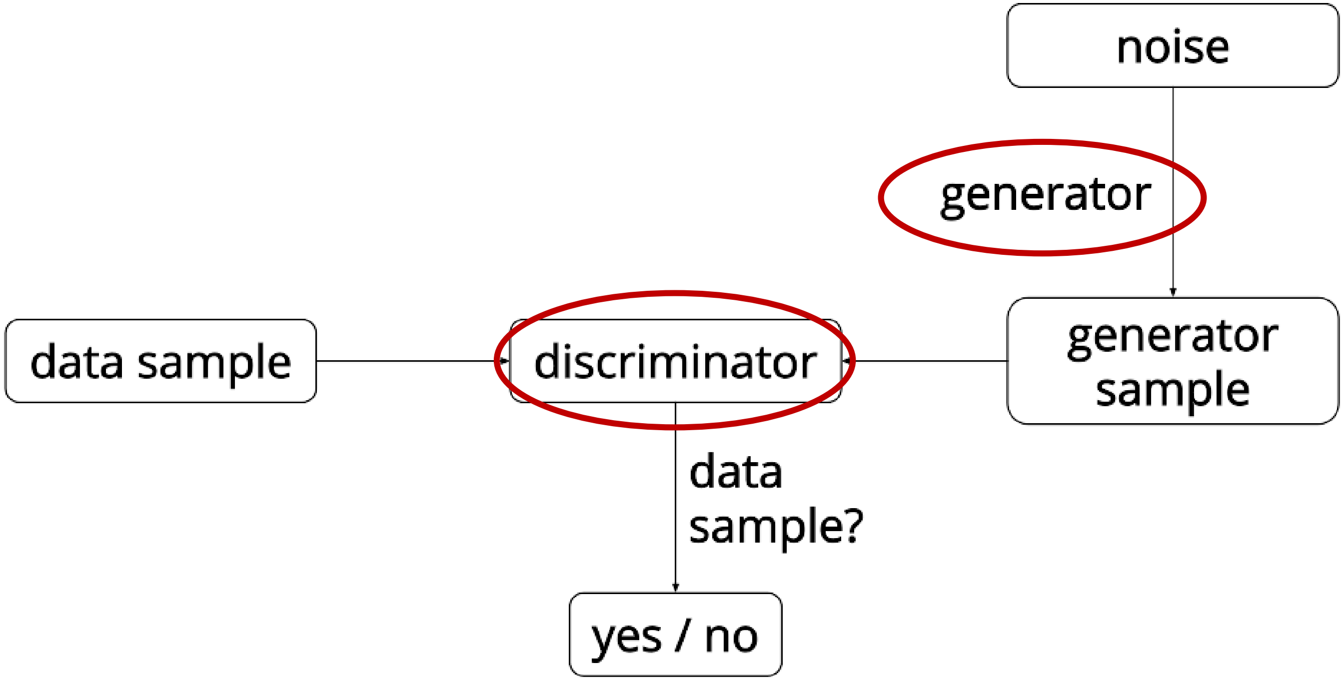
Generative Adversarial Networks (GAN)



Two players reach a Nash equilibrium to produce an optimal generator

Concluding Remarks

Deep Learning Issues
- DNNs are easily fooled
- Bias issue

From “Going Deeper” to “Compressing more lightly”
- less communication
- less bandwidth to export
- feasible to deploy

CNN v.s. RNN

Deep Learning in Robotics: policy search/reinforcement learning
- Expensive cost: cloud robot, learning from demonstration
- Real-time decision: model compression, knowledge transfer

Generative Models: GAN
- Adversarial framework: generator & discriminator