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AI and Society

Introduction

Andrew Ng

AI and society

- AI and hype
- Limitations of AI

  -Bias

  -Adversarial attacks

  AI and Ethics
- AI, developing economies, and jobs
- Conclusion

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A realistic view of AI

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Goldilocks rule for AI

- Too optimistic: Sentient / super-intelligent AI killer robots coming soon
- Too pessimistic: AI cannot do everything, so an AI winter is coming
- Just right: AI can't do everything, but will transform industries

Limitations of AI

- Performance limitations
- Explainability is hard (but sometimes doable)

Right-sided Pneumothorax (collapsed lung)

[Rajpurkar et al. (2018). CheXNet: Radiologist-Level Pneumonia Detection on Chest X-Rays with Deep Learning.]
[Wang et al. (2017). ChestX-ray8: Hospital-scale Chest X-ray Database and Benchmarks on Weakly-Supervised Classification and Localization of Common Thorax Diseases. IEEE CVPR]
[Images source: NIH Clinical Center Image dataset: https://nihcc.app.box.com/v/ChestXray-NIHCC]

Limitations of AI

- Biased AI through biased data
- Adversarial attacks on AI

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Discrimination / Bias

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AI learning unhealthy stereotypes

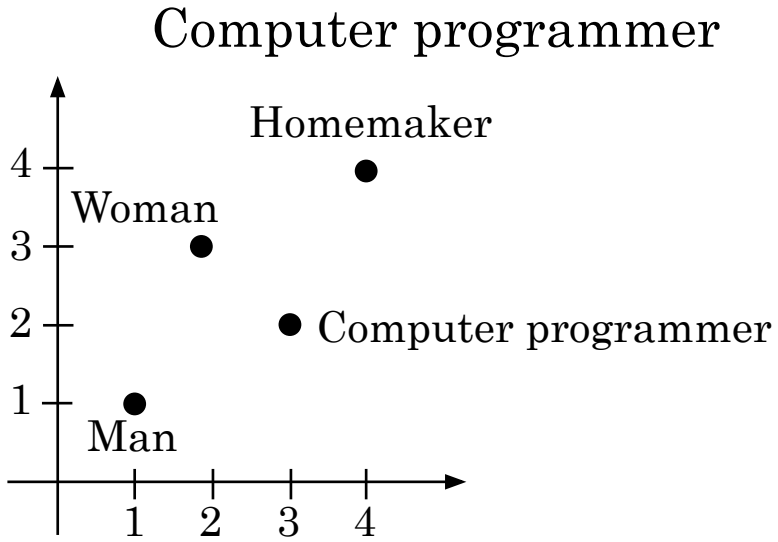
- Man : Woman as Father : Mother
- Man : Woman as King : Queen
- Man : Computer programmer as Woman : Homemaker

Man: (1,1)

Computer programmer: (3,2)

Woman: (2,3)

Homemaker: (4,4)



Bolukbasi et al. (2016). Man is to Computer Programmer as Woman is to Homemaker? Debiasing Word Embeddings.

Why bias matters

- Hiring tool that discriminated against women
- Facial recognition matching dark skinned individuals to criminal mugshots
- Bank loan approvals
- Toxic effect of reinforcing unhealthy stereotypes

Combating bias

- Technical solutions:
  - E.g., “zero out” the bias in words
  - Use less biased and/or more inclusive data
- Transparency and/or auditing processes
- Diverse workforce
  - Creates less biased applications

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Adversarial attacks on AI

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Adversarial attacks on AI

Hummingbird

Minor perturbation

Hammer

Hare

Minor perturbation

Desk

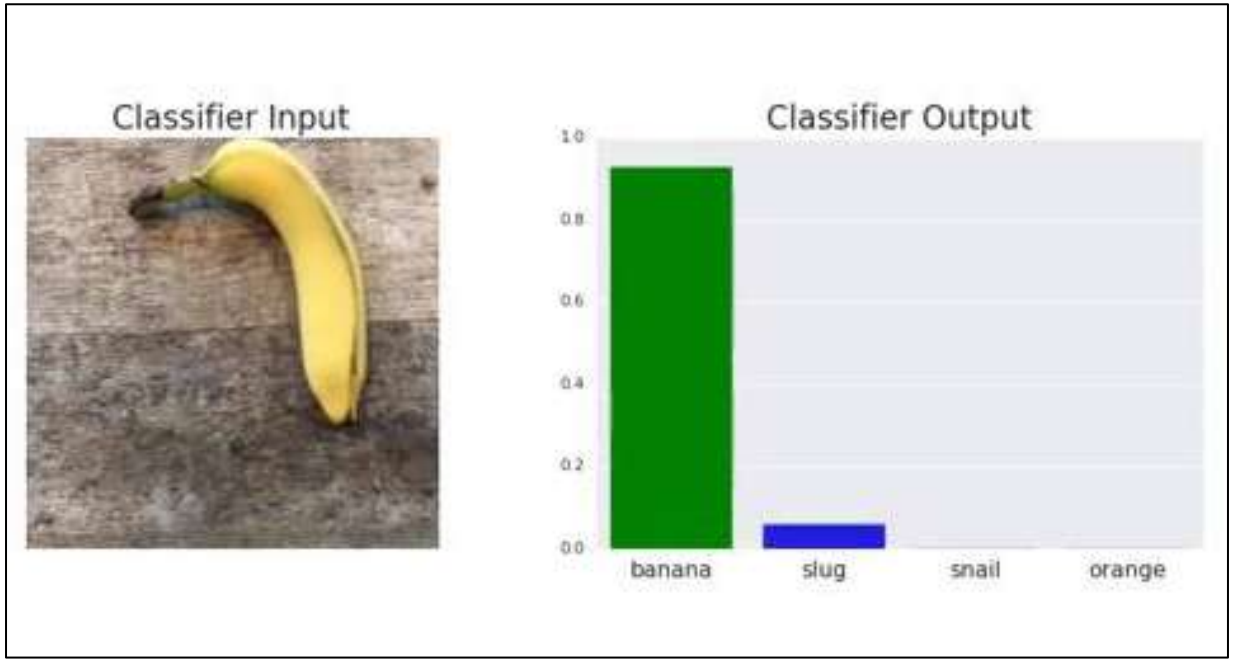
Physical attacks

"Milla Jovovich"

Fails to see stop sign

Banana

Physical attacks



[Sharif et al. (2016). Accessorize to a Crime: Real and Stealthy Attacks on State-of-the-Art Face Recognition.]
[Eykholt et al. (2018). Physical Adversarial Examples for Object Detectors.]
[Brown et al. (2018). Adversarial Patch.]

Adversarial defenses

- Defenses do exist, but incur some cost
- Similar to spam vs. anti-spam, we may be in an arms race for some applications

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Adverse uses of AI

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Adverse uses of AI

- DeepFakes
  - Synthesize video of people doing things they never did
- Undermining of democracy and privacy
  - Oppressive monitoring of individuals
- Generating fake comments
- Spam vs. anti-spam and fraud vs. anti-fraud

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AI and developing economies

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Developing economies

"leapfrog"

-Mobile phones

-Mobile payments

-Online education

How developing economies can build AI

- US and China are leading, but all AI communities are still immature
- Focus on AI to strengthen a country's vertical industries
- Public-private partnerships to accelerate development

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AI and jobs

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AI's impact on jobs worldwide

Jobs replaced by 2030

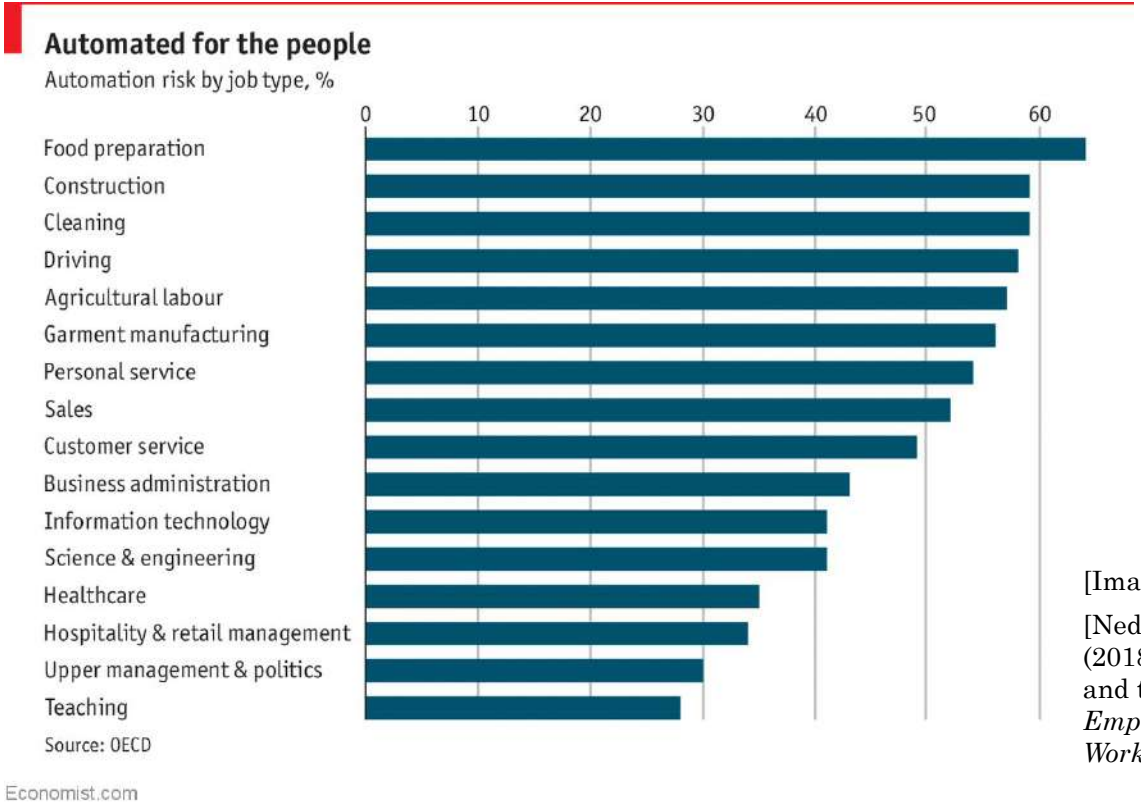
400-800 mil

Jobs created by 2030

555-890 mil

[Source: McKinsey Global Institute.]

AI's impact on jobs worldwide



[Image credit: Economist.com]

[Nedelkoska, L. and G. Quintini. (2018). Automation, skills use and training. *OECD Social, Employment and Migration Working Papers*, No. 202.]

Some solutions

- Conditional basic income: provide a safety net but incentivize learning
- Lifelong learning
- Political solutions

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AI for Everyone

Conclusion

Andrew Ng

What you've learned

- What is AI?
- Building AI projects
- Building AI in your company
- AI and society

Keep learning!

- Online courses, books, blogs, ...
- deeplearning.ai mailing list

Thank you!