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Building AI in Your Company

Introduction

Andrew Ng

Building AI in your company

- Case studies of complex AI products
- Roles in an AI team
- AI Transformation Playbook
- Taking your first step

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Building AI in Your Company

Case study: Smart speaker

Andrew Ng

Smart speaker

Amazon
Echo / Alexa

Google
Home

Apple
Siri

Baidu
DuerOS

"Hey device, tell me a joke"

"*Hey device, tell me a joke*"

Steps to process the command:

1. Trigger word/wakeword detection
2. Speech recognition
3. Intent recognition
4. Execute joke

Audio → "Hey device"? (0/1)

A → B

Audio → "tell me a joke"

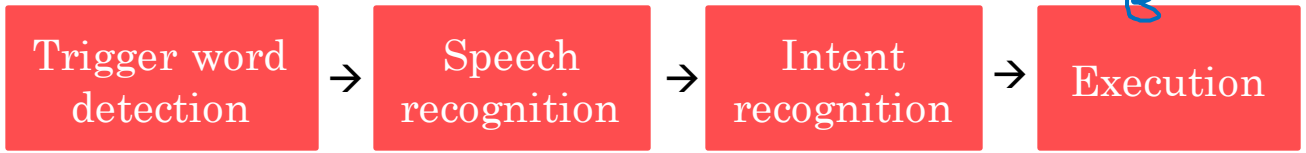
A → B

"tell me a joke"

A

joke?
time?
music?
call?
weather?

B



AI pipeline

"*Hey device, set timer for 10 minutes*"

Steps to process the command:

1. Trigger word/wakeword detection — Audio → "Hey device"? (0/1)
2. Speech recognition — Audio → "set timer for 10 minutes"
3. Intent recognition — "set timer for 10 minutes" → timer
4. a) Extract duration

   "Set timer for 10 minutes"

   "Let me know when 10 minutes is up"

   b) Start timer with set duration

Other functions

- Play music
- Volume up/down
- Make call
- Current time
- Units conversion
- Simple question
- …

Key steps:

1. Trigger/wakeword detection
2. Speech recognition
3. Intent recognition
4. Specialized program to execute command

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Case study: Self-driving car

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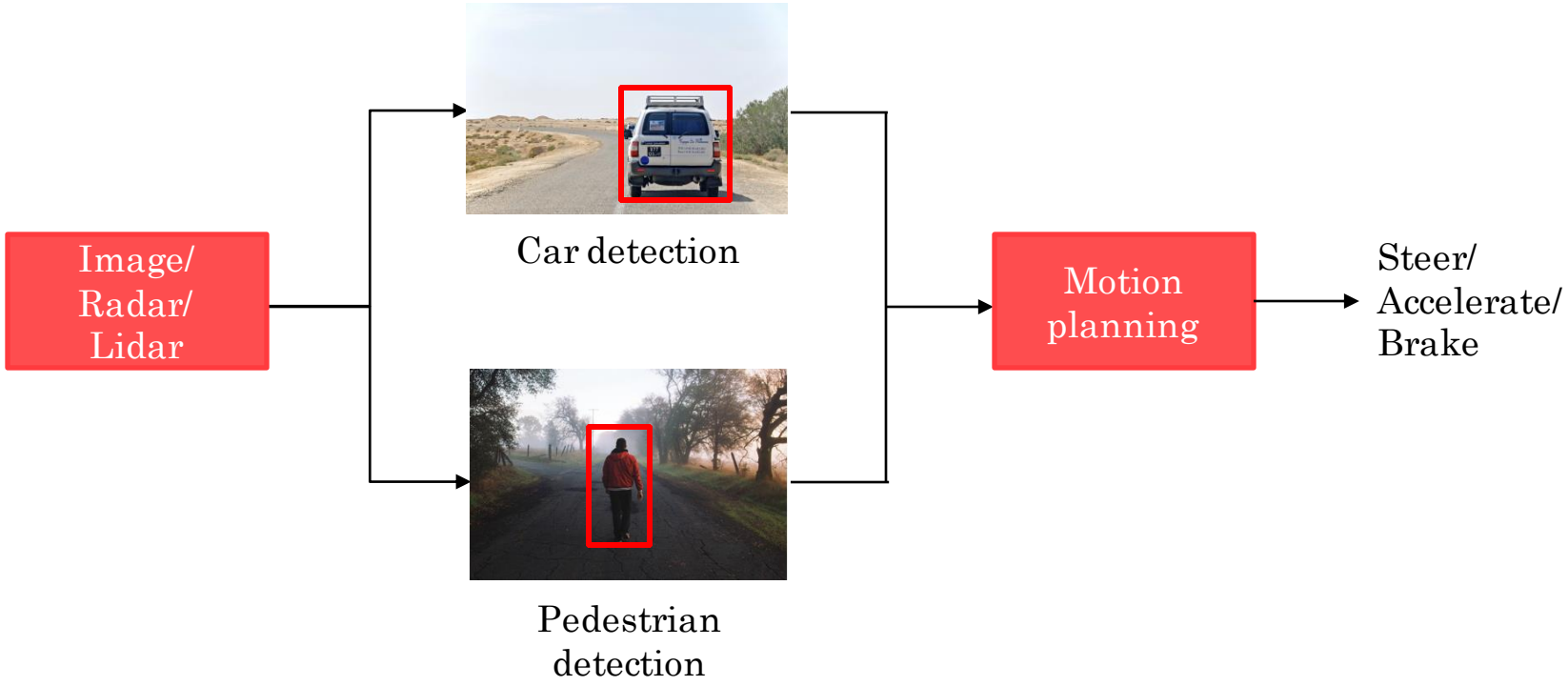
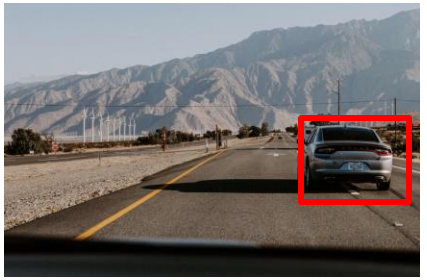
Steps for deciding how to drive

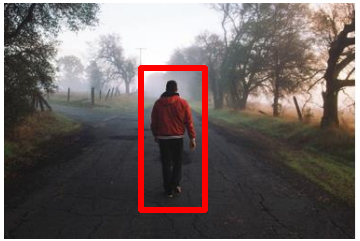


Key steps:

1. Car detection

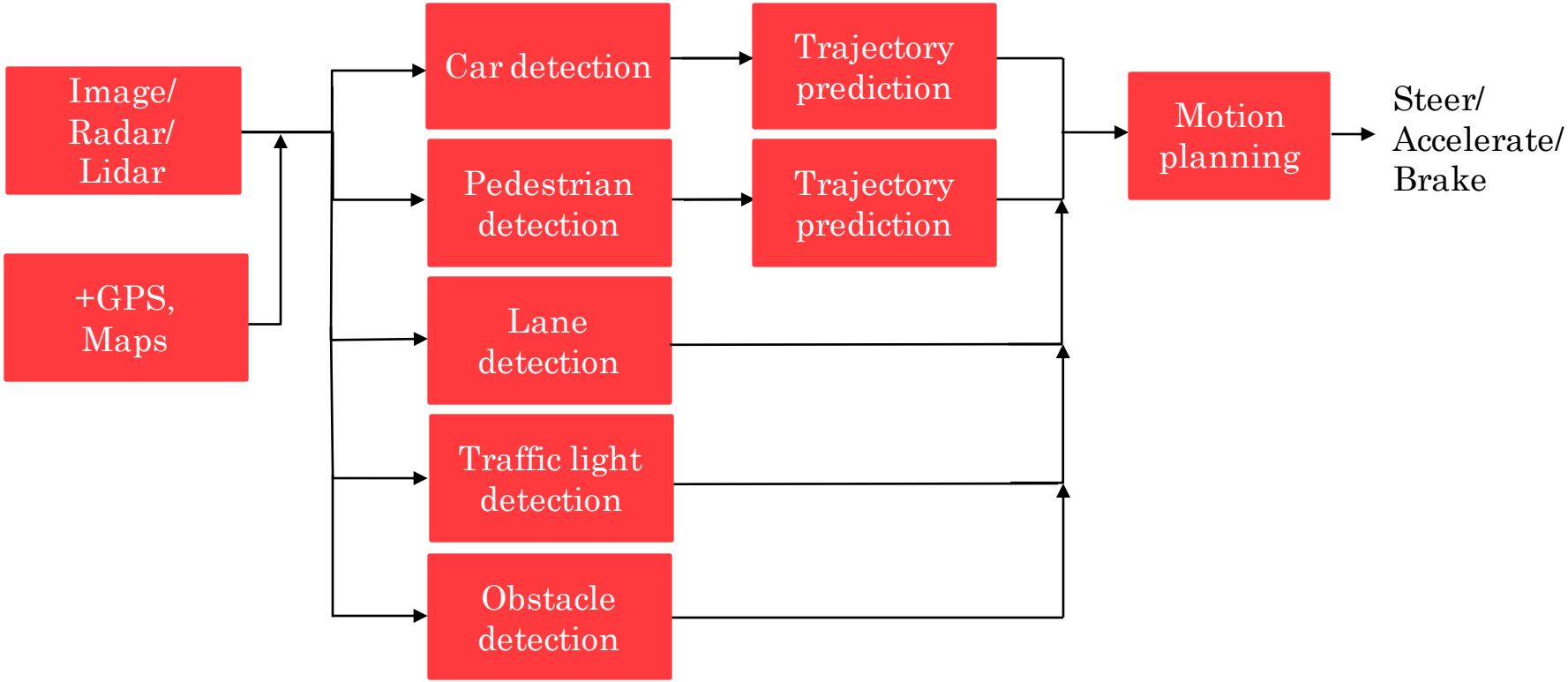


2. Pedestrian detection



3. Motion planning

Steps for deciding how to drive



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Example roles of an AI team

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Example roles

- Software Engineer
  - E.g., joke execution, ensure self-driving reliability, …
- Machine Learning Engineer

- Machine Learning Researcher
  - Extend state-of-the-art in ML

Applied ML Scientist

Example roles

- Data Scientist
  - Examine data and provide insights
  - Make presentation to team/executive
- Data Engineer
  - Organize data
  - Make sure data is saved in an easily accessible, secure and cost effective way
- AI Product Manager
  - Help decide what to build; what's feasible and valuable

→ 1 MB (megabyte)
→ 1,000 MB = GB (gigabyte)
→ 1,000,000 MB = TB (terabyte)
→ 1,000,000,000 MB = PB (petabyte)

Getting started with a small team

- 1 Software Engineer, or
- 1 Machine Learning Engineer/Data Scientist , or
- Nobody but yourself

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AI Transformation Playbook (Part I)

Andrew Ng

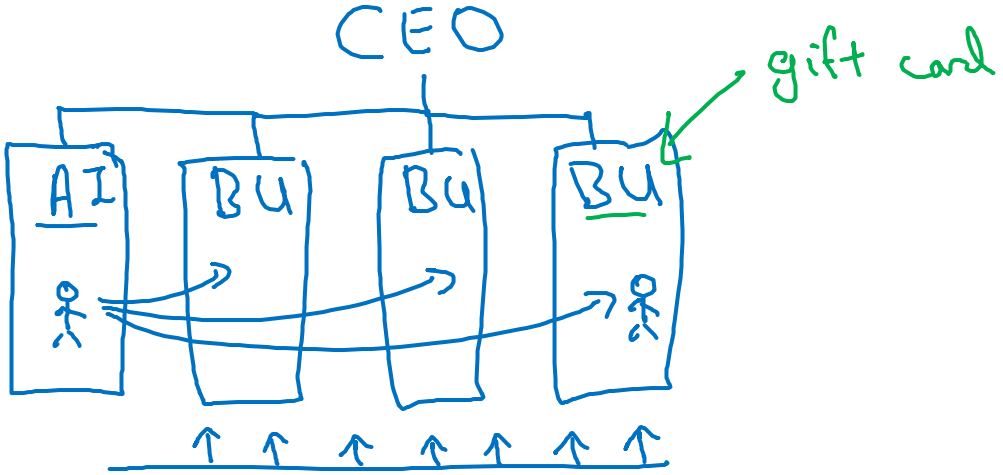
AI Transformation Playbook

1. Execute pilot projects to gain momentum
2. Build an in-house AI team
3. Provide broad AI training
4. Develop an AI strategy
5. Develop internal and external communications

1. Execute pilot projects to gain momentum

- More important for the initial project to succeed rather than be the most valuable
- Show traction within 6-12 months
- Can be in-house or outsourced

2. Build an in-house AI team



BU= Business Unit

AI function can be under CTO, CIO, CDO, etc. or a new CAIO

3. Provide broad AI training

Role	What they should learn

The smart CLO knows they should *curate* rather than *create* content

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AI Transformation Playbook (Part II)

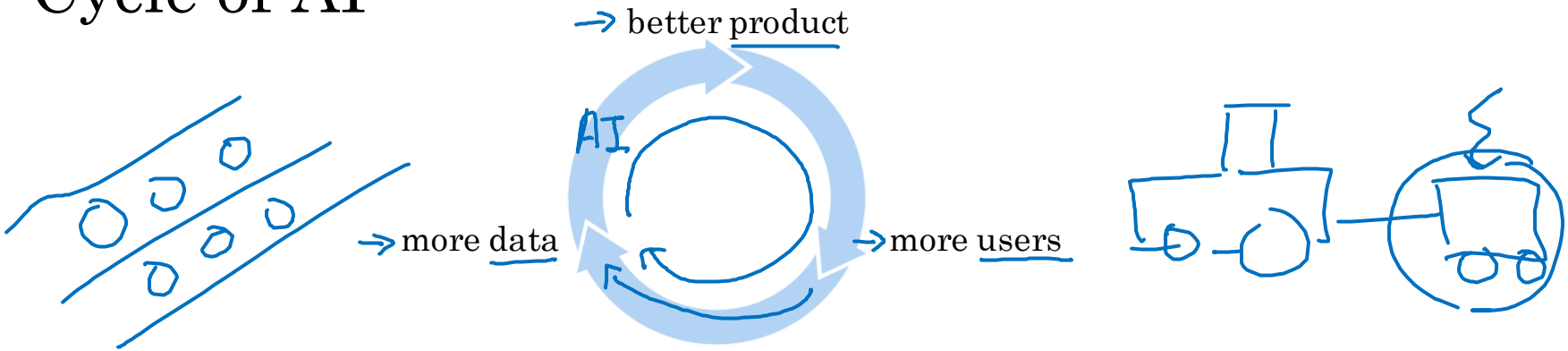
Andrew Ng

AI Transformation Playbook

1. Execute pilot projects to gain momentum
2. Build an in-house AI team
3. Provide broad AI training
4. Develop an AI strategy
5. Develop internal and external communications

4. Develop an AI strategy

- Leverage AI to create an advantage specific to your industry sector
- Design strategy aligned with the “Virtuous Cycle of AI”



4. Develop an AI strategy

- Consider creating a data strategy
  - -Strategic data acquisition
  - -Unified data warehouse
- Create network effects and platform advantages
  - -In industries with “winner take all” dynamics, AI can be an accelerator

5. Develop internal and external communications

- Investor relations
- Government relations
- Customer/user education
- Talent/recruitment
- Internal communications

You can download the AI Transformation Playbook in the next section.

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AI pitfalls to avoid

Andrew Ng

AI pitfalls to avoid

Don't:

- Expect AI to solve everything
- Hire 2-3 ML engineers and count solely on them to come up with use cases

Do:

- Be realistic about what AI can and cannot do given limitations of technology, data, and engineering resources
- Pair engineering talent with business talent and work cross-functionally to find feasible and valuable projects

AI pitfalls to avoid

Don't:

- Expect the AI project to work the first time
- Expect traditional planning processes to apply without changes
- Think you need superstar AI engineers before you can do anything

Do:

- Plan for AI development to be an iterative process, with multiple attempts needed to succeed
- Work with AI team to establish timeline estimates, milestones, KPIs, etc.
- Keep building the team, but get going with the team you have

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Taking your first step in AI

Andrew Ng

Some initial steps you can take

- Get friends to learn about AI
  - -This course
  - -Reading group
- Start brainstorming projects
  - -No project is too small
- Hire a few ML/DS people to help
- Hire or appoint an AI leader (VP AI, CAIO, etc.)
- Discuss with CEO/Board possibilities of AI Transformation
  - -Will your company be much more valuable and/or more effective if it were good at AI?

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Survey of major AI application areas (optional)

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Computer Vision

- Image classification/Object recognition

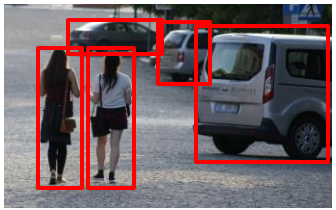
cat

-Face recognition

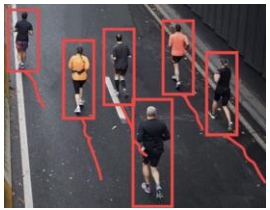
register

new

- Object detection

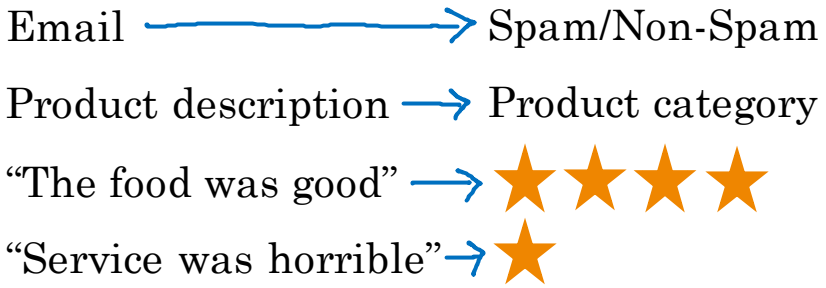


- Image segmentation
- Tracking



Natural Language Processing

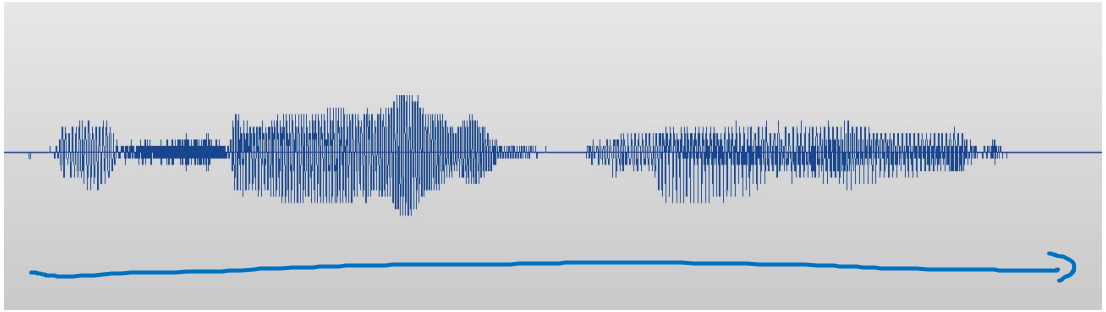
- Text classification
  - Sentiment recognition
- Information retrieval
  - E.g., web search
- Name entity recognition
- Machine translation



"Queen Elizabeth II knighted Sir Paul McCartney for his services to music at the Buckingham Palace."

AIは、新たな電気だ
AI is the new electricity

Speech



- Speech recognition (speech-to-text)
- Trigger word/wakeword detection
- Speaker ID
- Speech synthesis (text-to-speech, TTS)

```
The quick brown fox jumps over the lazy dog.
```

Generative AI

Artificial intelligence systems that can produce high quality content, specifically **text, images, and audio.**

- Text generation

"Suggest three funny, creative names for a line of chocolate ice cream" →

1. Choco-Chuckle Swirl
2. Fudge-tastic Delight
3. Silly Cocoa Scoops

- Image generation

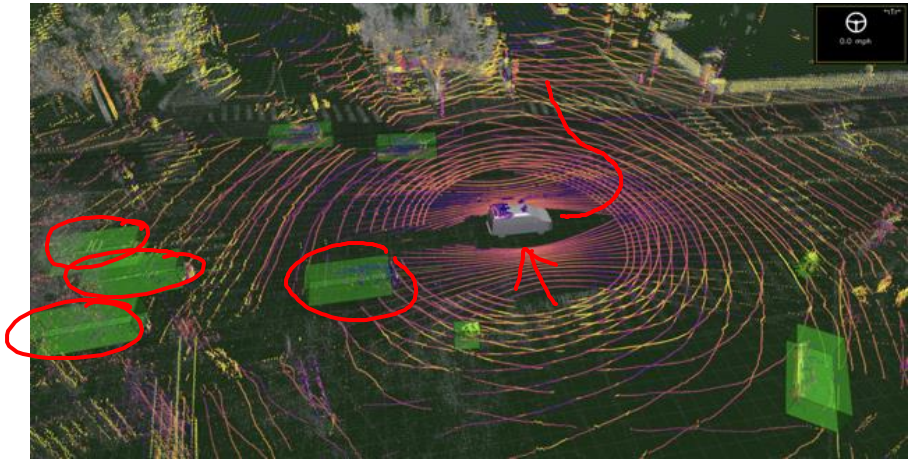
"a purple friendly robot eating ice-cream" →

- Audio generation
  - Speech, music

"drum solo 140 bpm"

Robotics

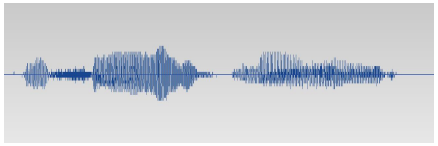
- Perception: figuring out what's in the world around you
- Motion planning: finding a path for the robot to follow
- Control: sending commands to the motors to follow a path



General machine learning

- Unstructured data (images, audio, text)

image



audio

AIは、新たな電気だ
AI is the new electricity

text

- Structured data

House size (square feet)	# of bedrooms	Price (1000$)
523	1	100
645	1	150
708	2	200

Clay batch #	Supplier	Mixing time (minutes)
001	ClayCo	35
034	GooClay	22
109	BrownStuff	28

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Survey of major AI techniques (optional)

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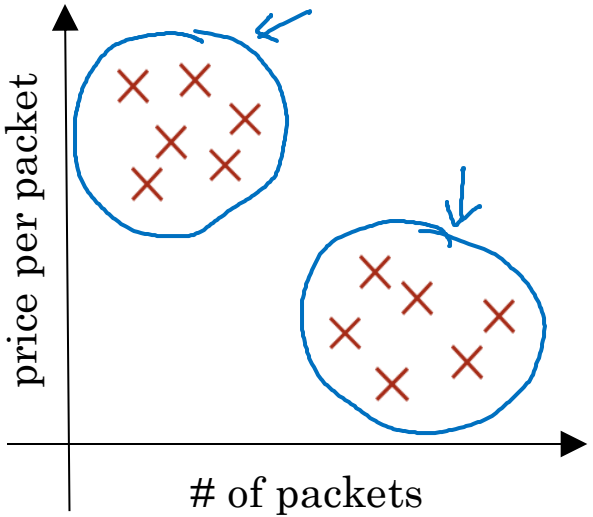
Unsupervised learning

A → B

Clustering
Potato chip sales



Given data (without any specific desired output labels), find something interesting about the data

Finding cats from unlabeled YouTube videos

Transfer learning

Car detection

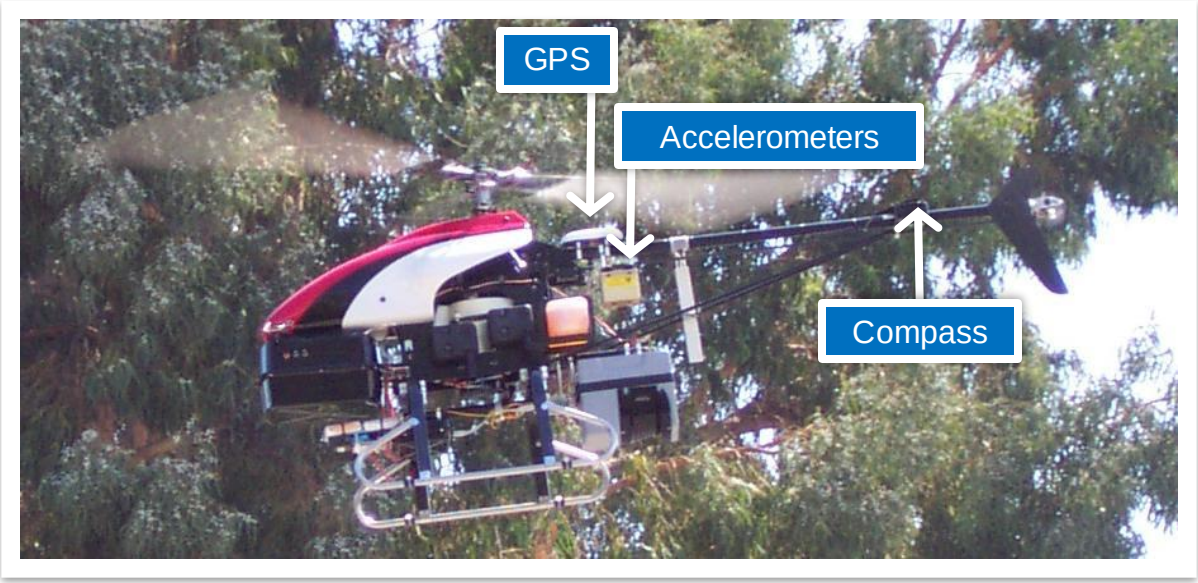
100,000 images

Golf cart detection

100 images

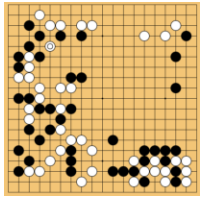
Learn from task A, and use knowledge to help on task B

Reinforcement learning



Use a “reward signal” to tell the AI when it is doing well or poorly. It automatically learns to maximize its rewards.

Reinforcement learning



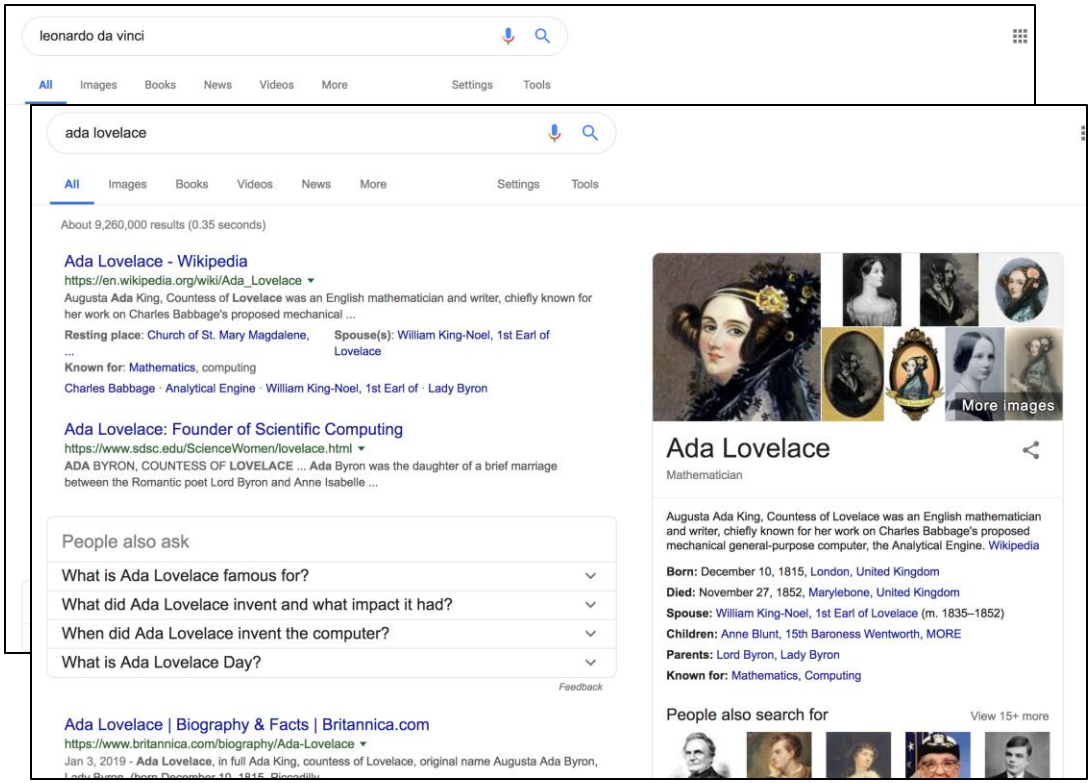
Use a “reward signal” to tell the AI when it is doing well or poorly. It automatically learns to maximize its rewards.

GANs (Generative Adversarial Network)

Synthesize new images from scratch

[Source: Karras et al. (2018). Progressive Growing of GANs for Improved Quality, Stability, and Variation]

Knowledge Graph



Ada Lovelace	
Born	Dec 10, 1815
Died	Nov 27, 1852
Bio	English mathematician and writer...

Northern Rooster Hotel	
Address	45 Rooster St, LA
Phone	(650) 555-3992
Wifi	yes
Pool	no