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Google Cloud

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New York Institute of Finance

Agenda

Objectives

- Early Reinforcement Learning (RL)
- Neural Network Based RL
- Develop and Optimize an RL-based Trading Portfolio
- Measure and Manage Risk in a Trading Portfolio

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Introduction to Reinforcement Learning

Danielle Detering
Machine Learning Solutions Engineer
Google Cloud

Learning Objectives

- Understand the goals of Reinforcement Learning
 - Differences from other ML Fields
 - Terms and Definitions
 - Accomplishments

Agenda

Differences from other ML Fields

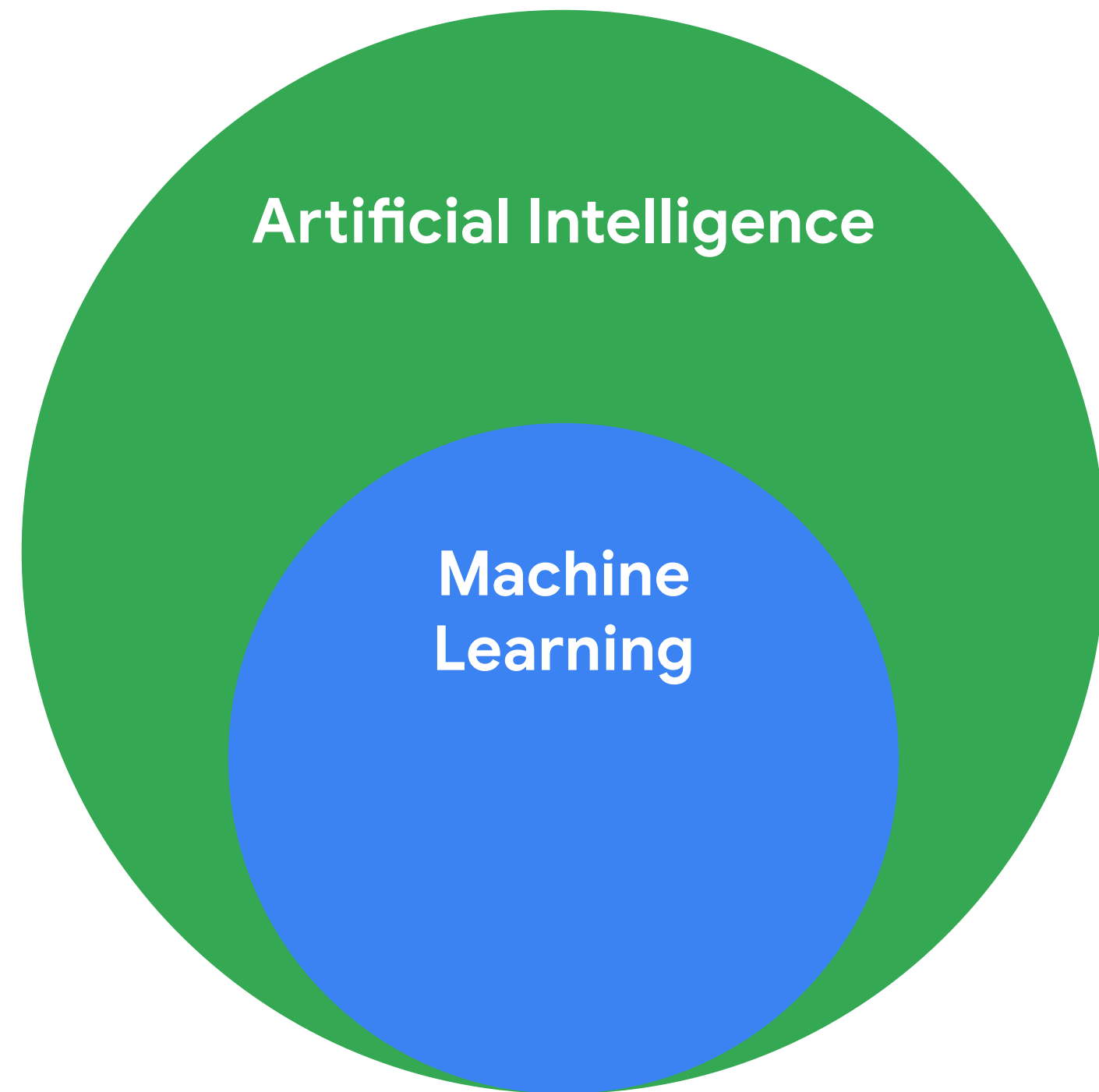
Terms and Definitions

Accomplishments

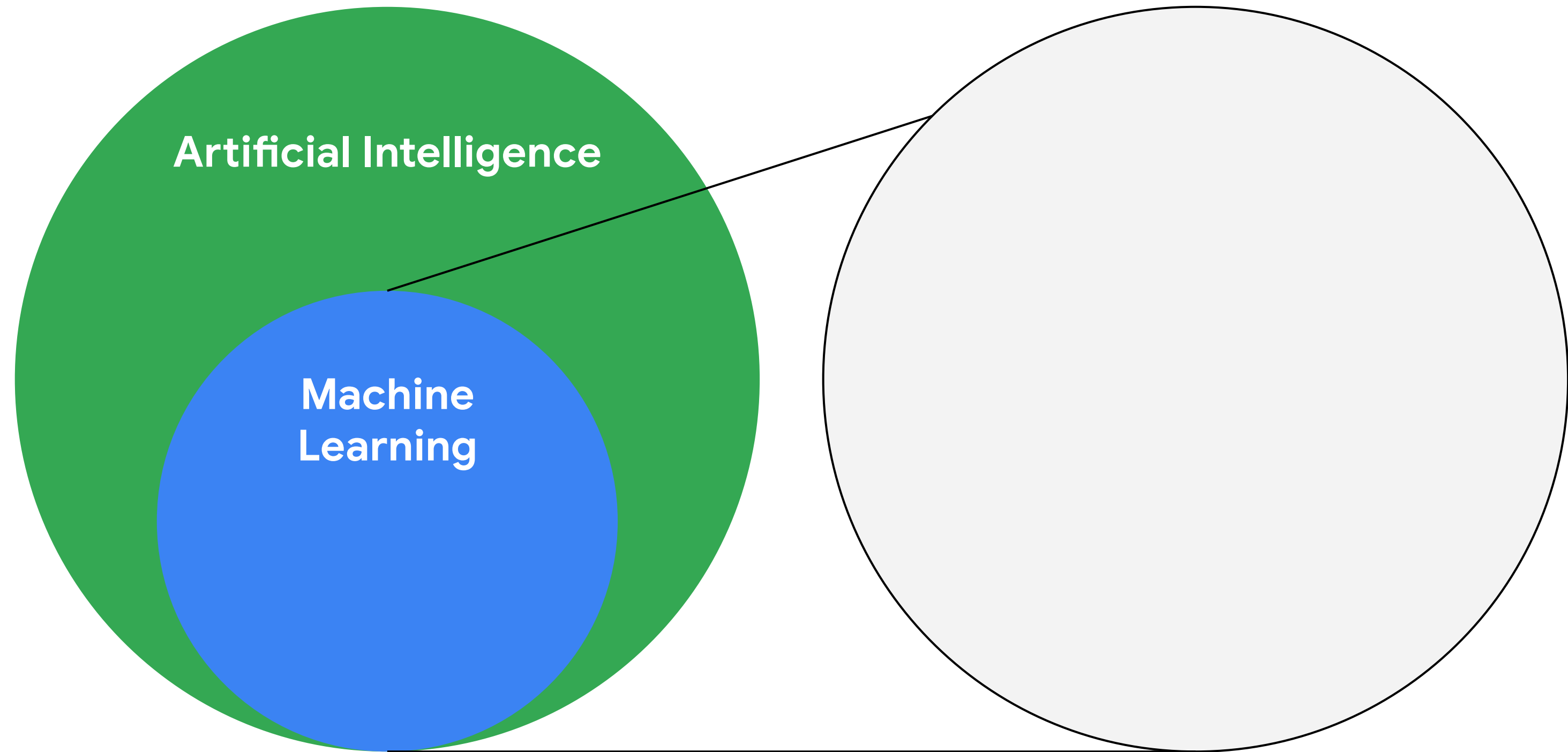
Fields of AI

Artificial Intelligence

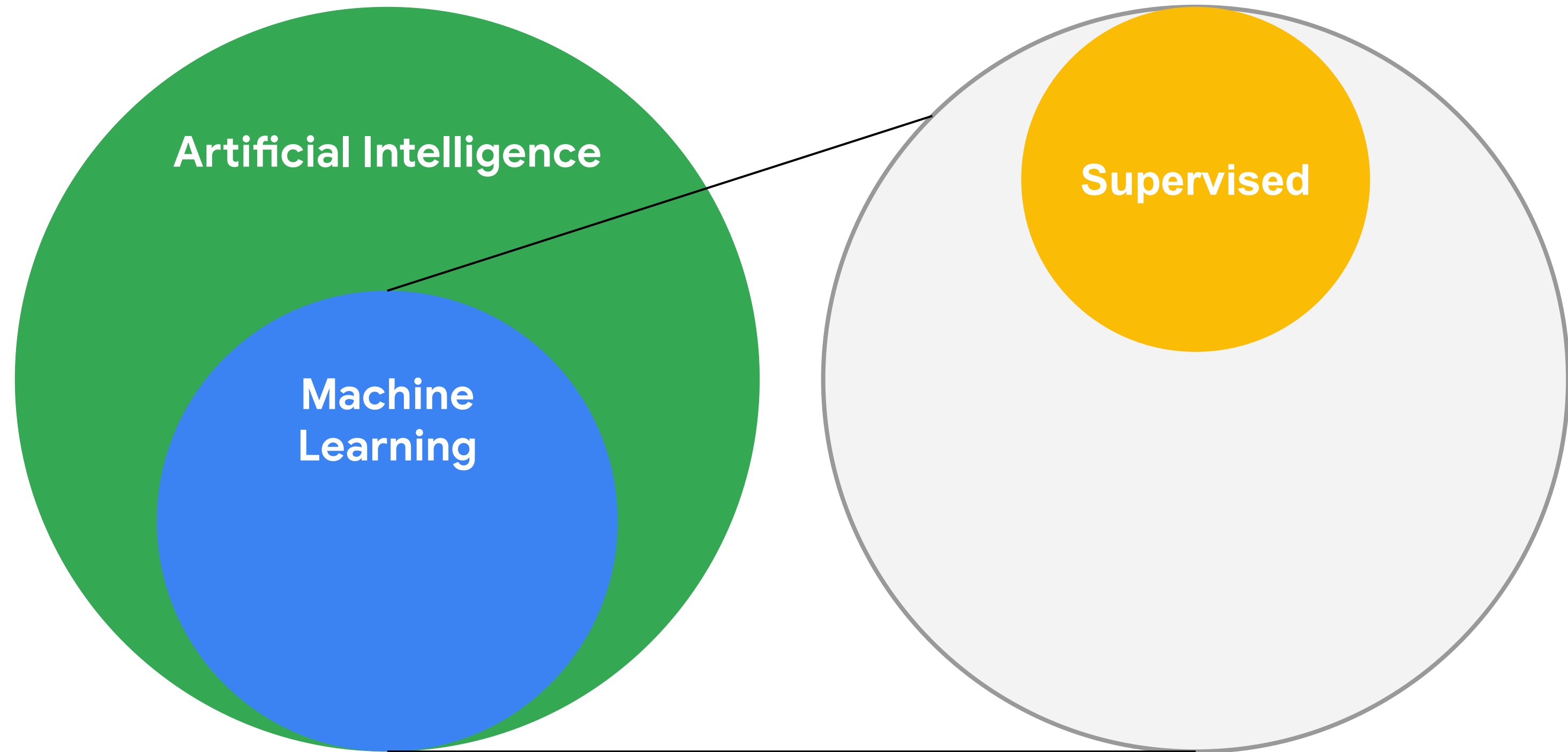
Fields of AI



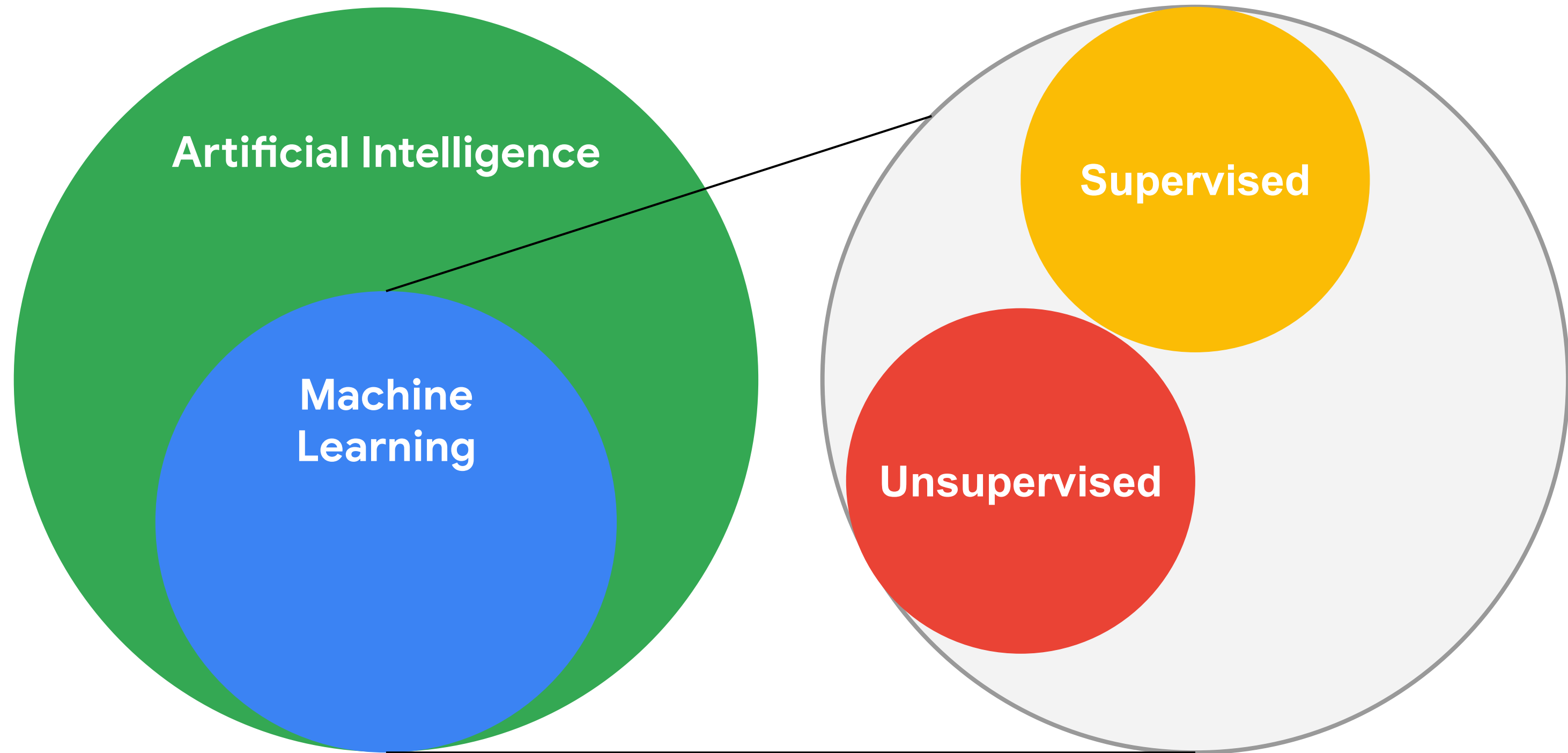
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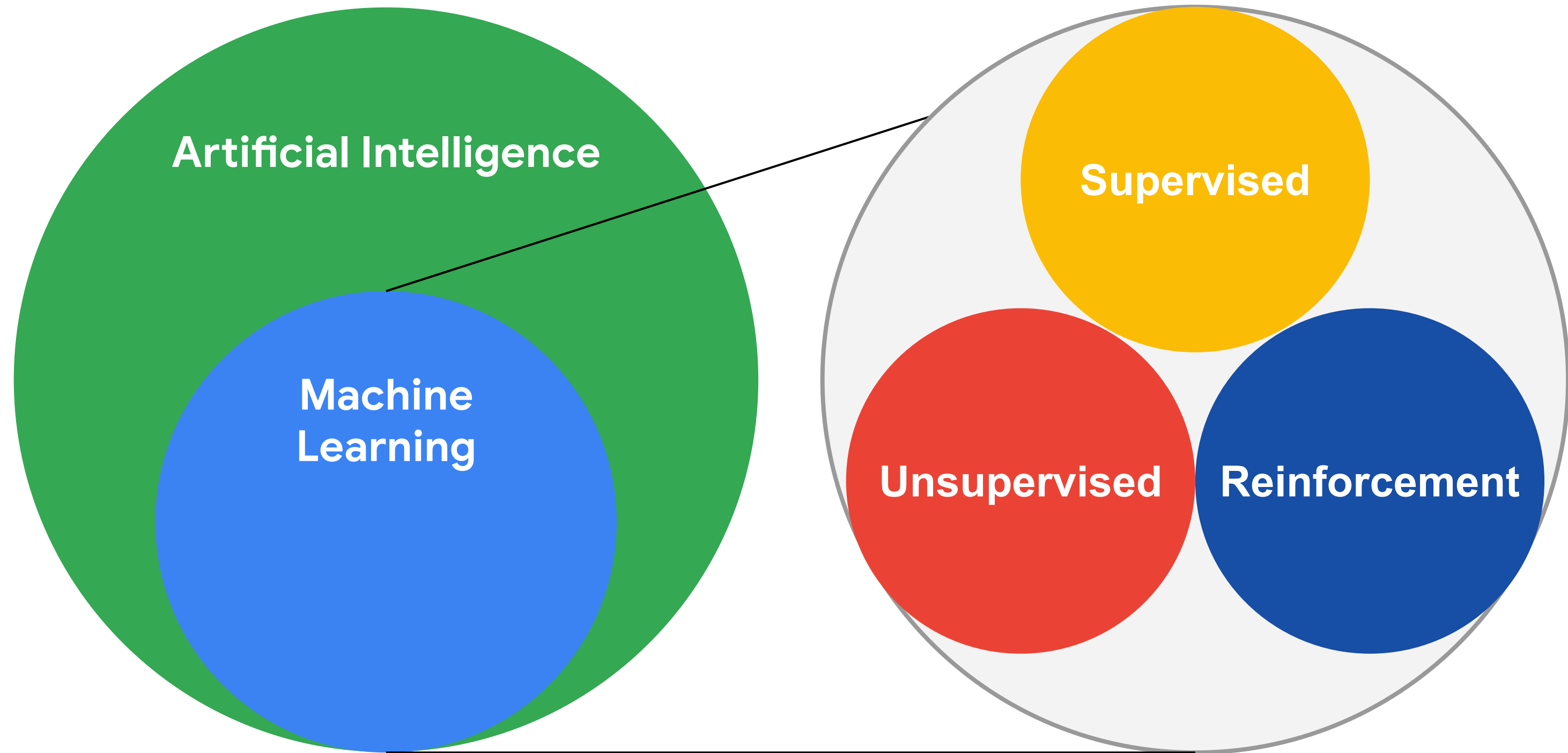
Fields of AI



Fields of AI



Fields of AI



The Environment



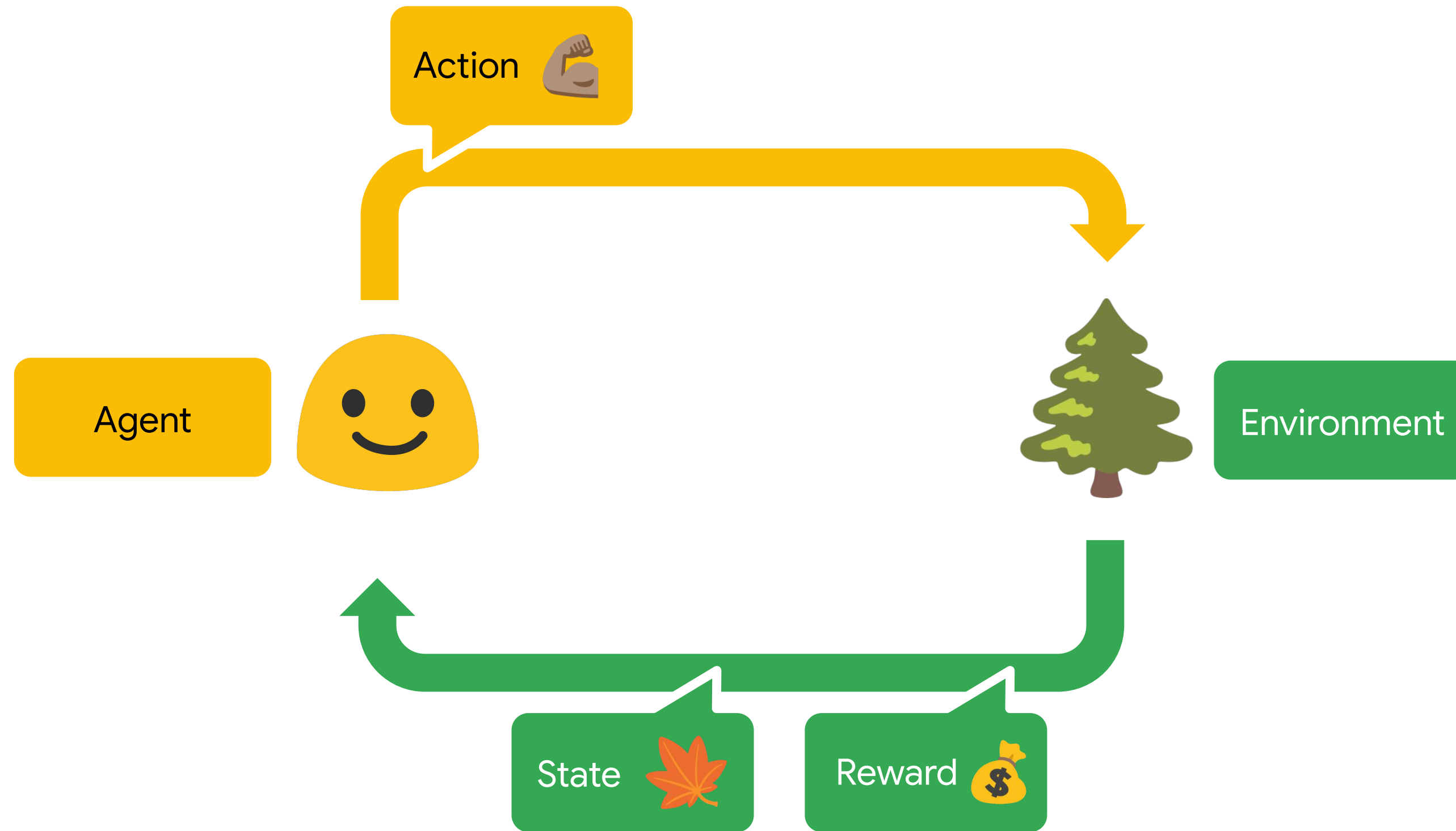
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Differences from other ML Fields

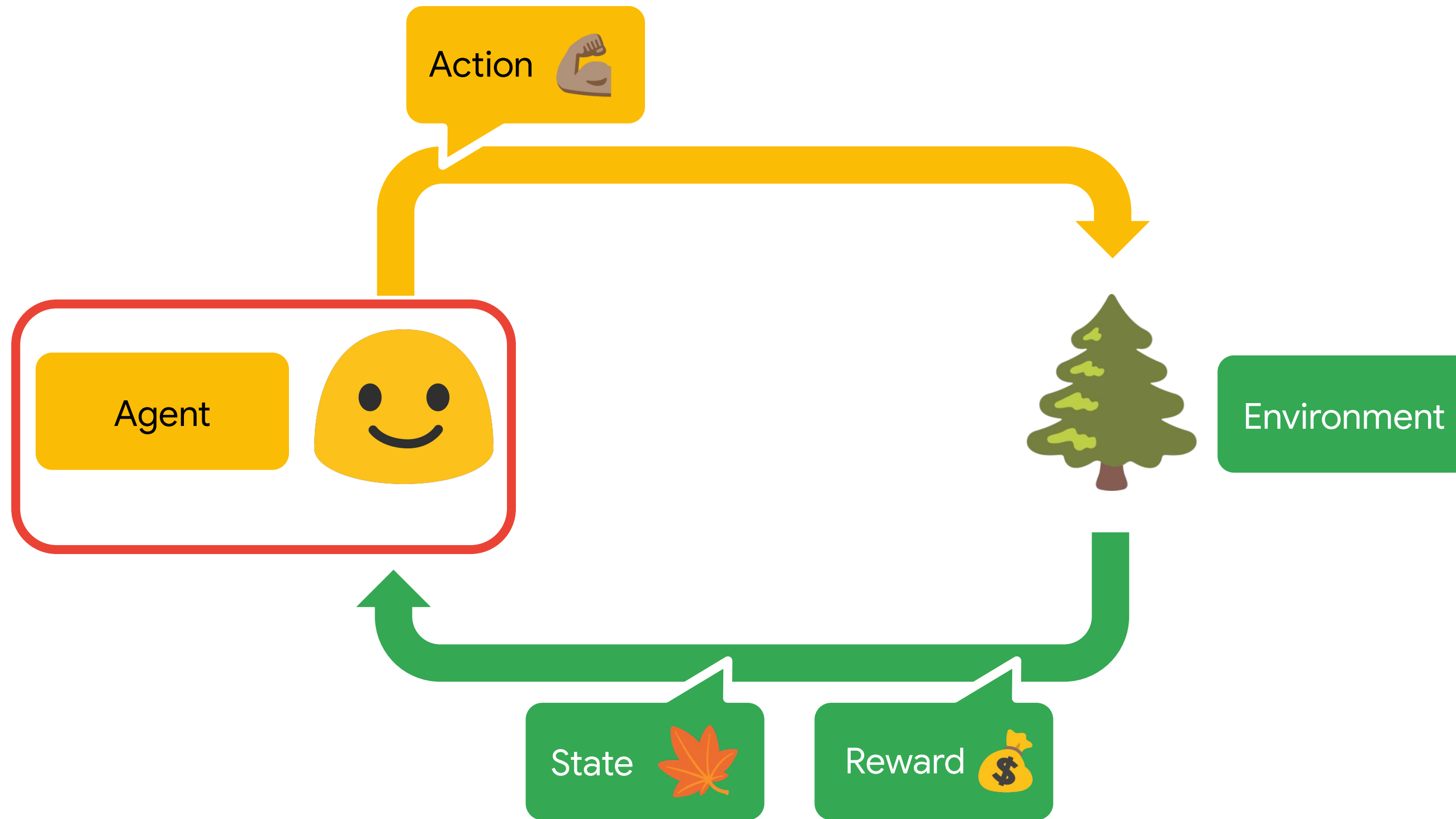
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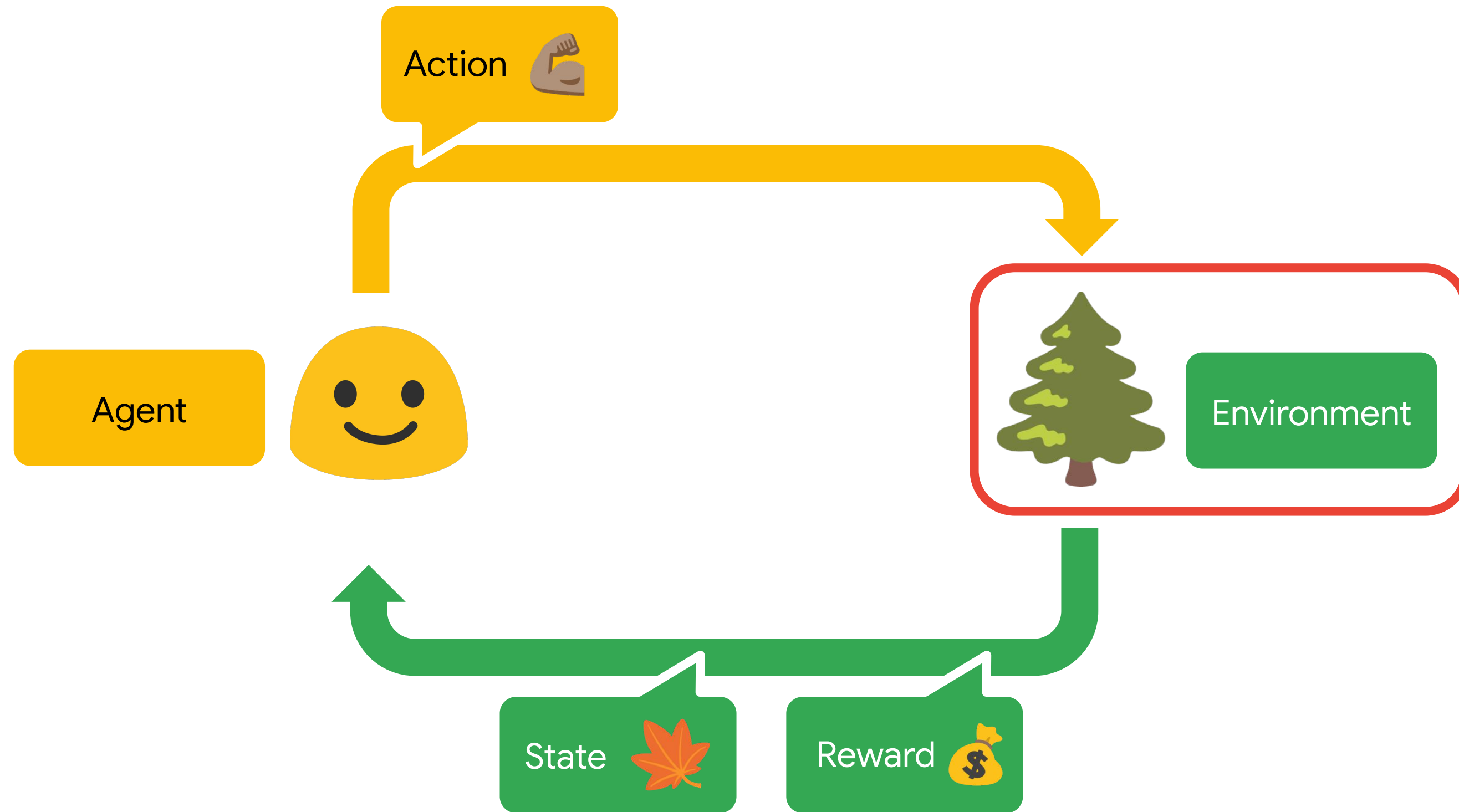
Reinforcement Learning Vocabulary



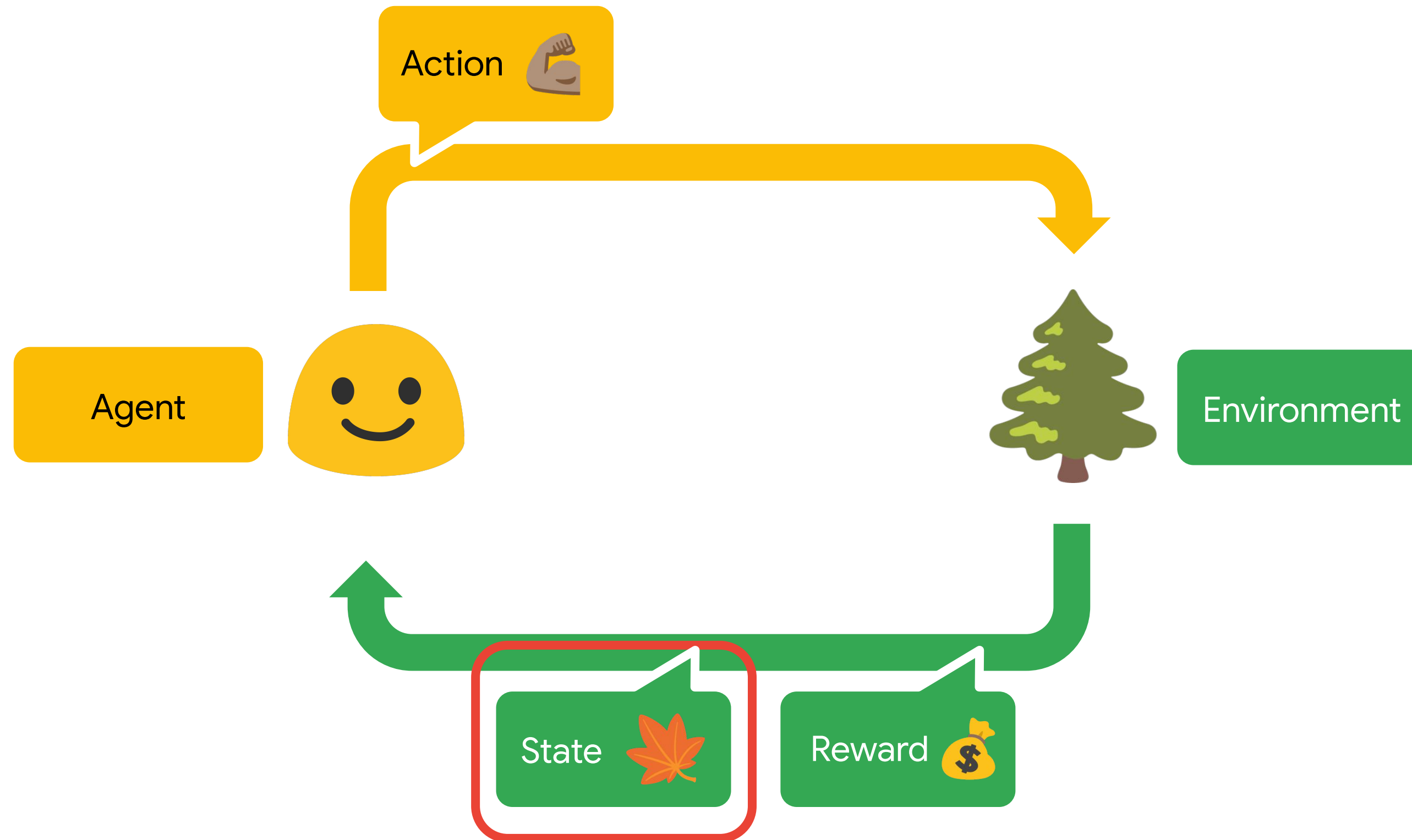
Reinforcement Learning Vocabulary



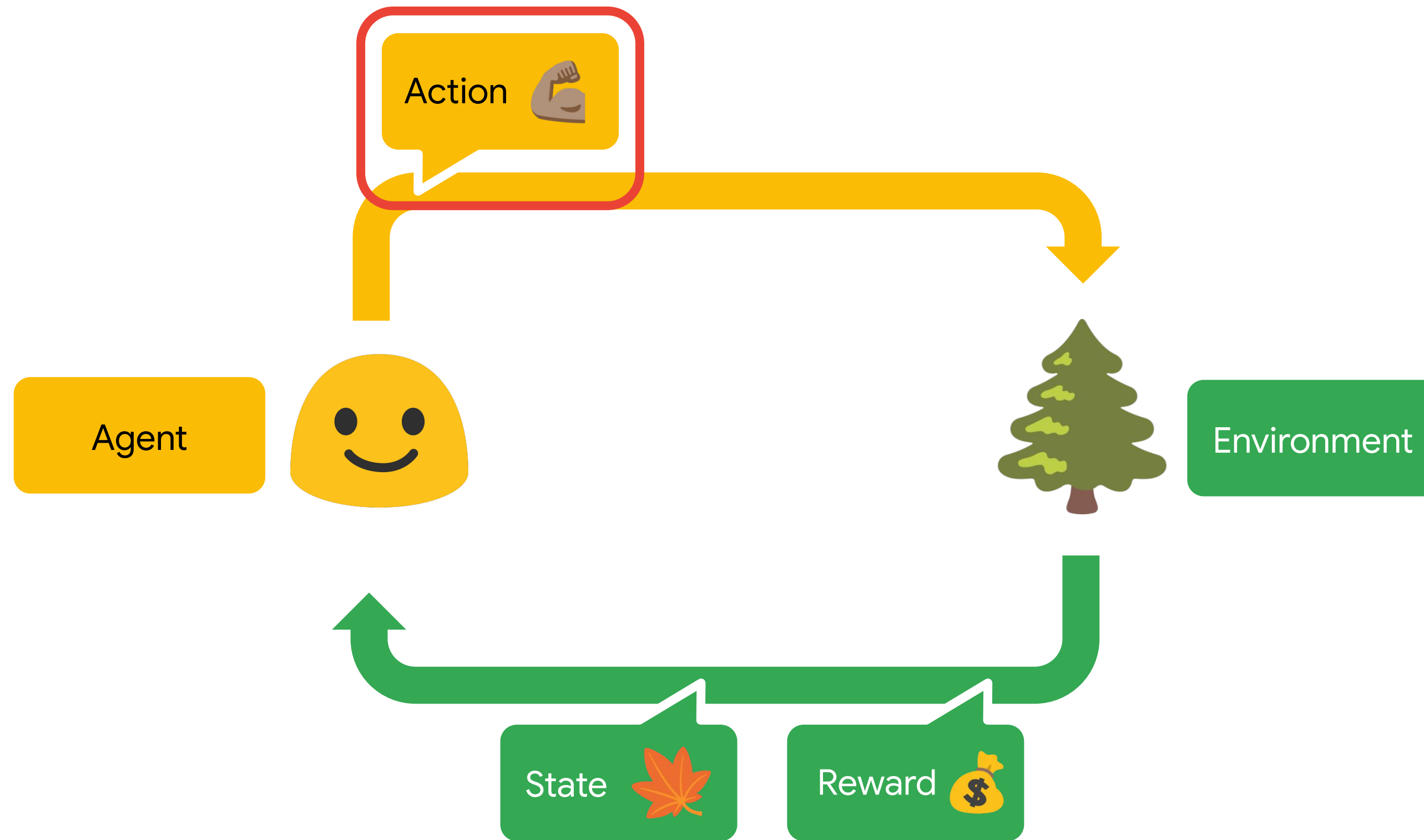
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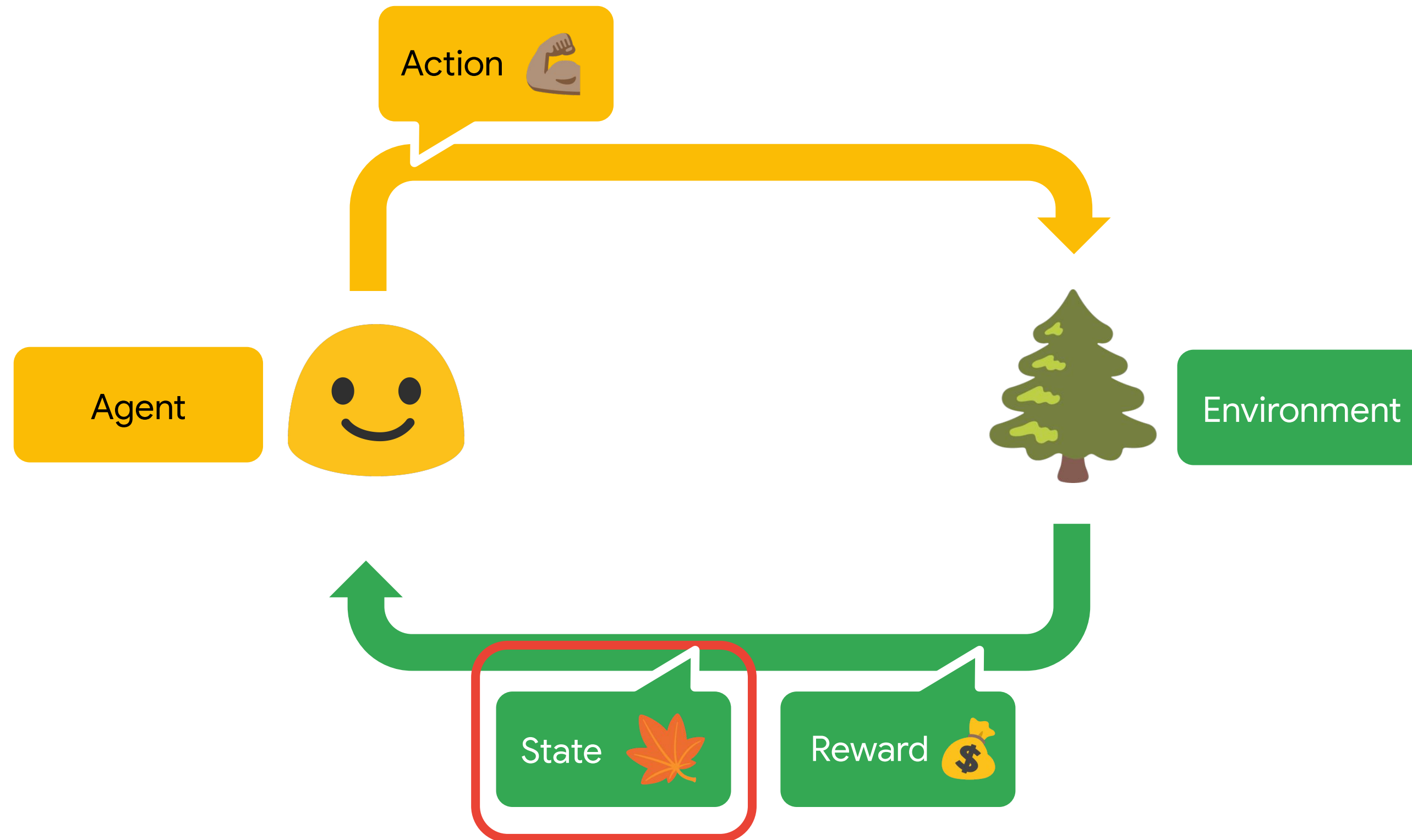
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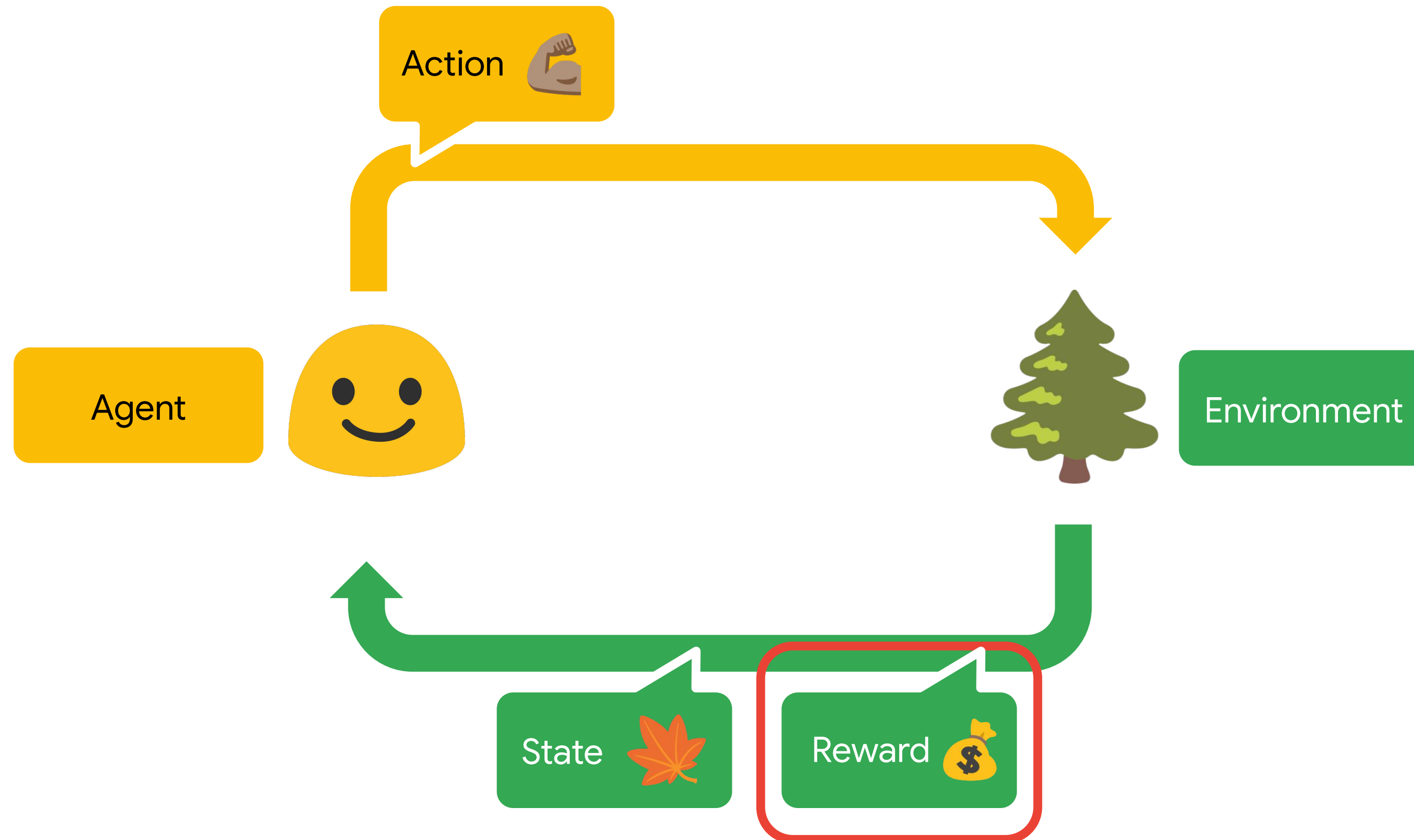
Reinforcement Learning Vocabulary



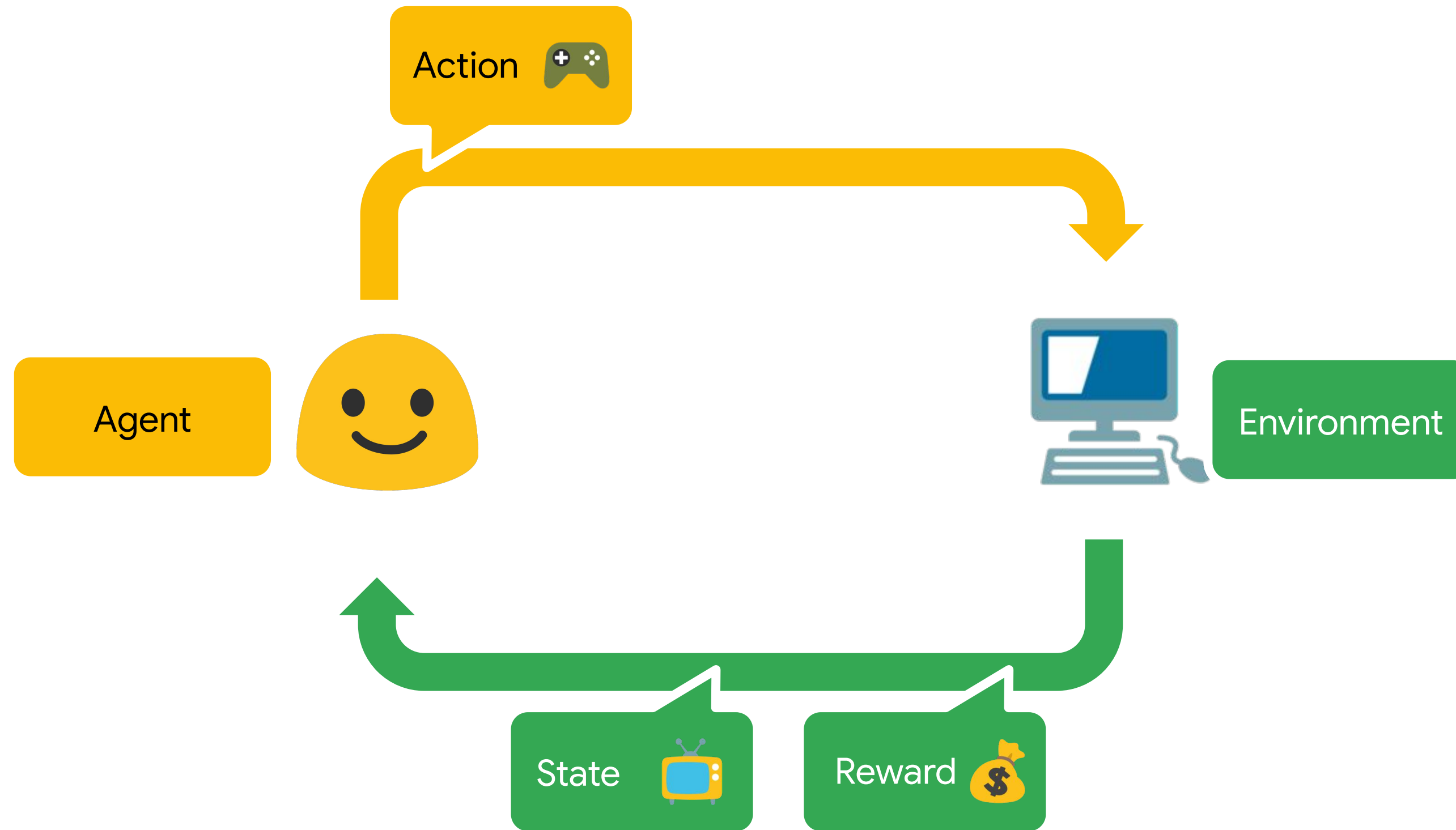
Reinforcement Learning Vocabulary



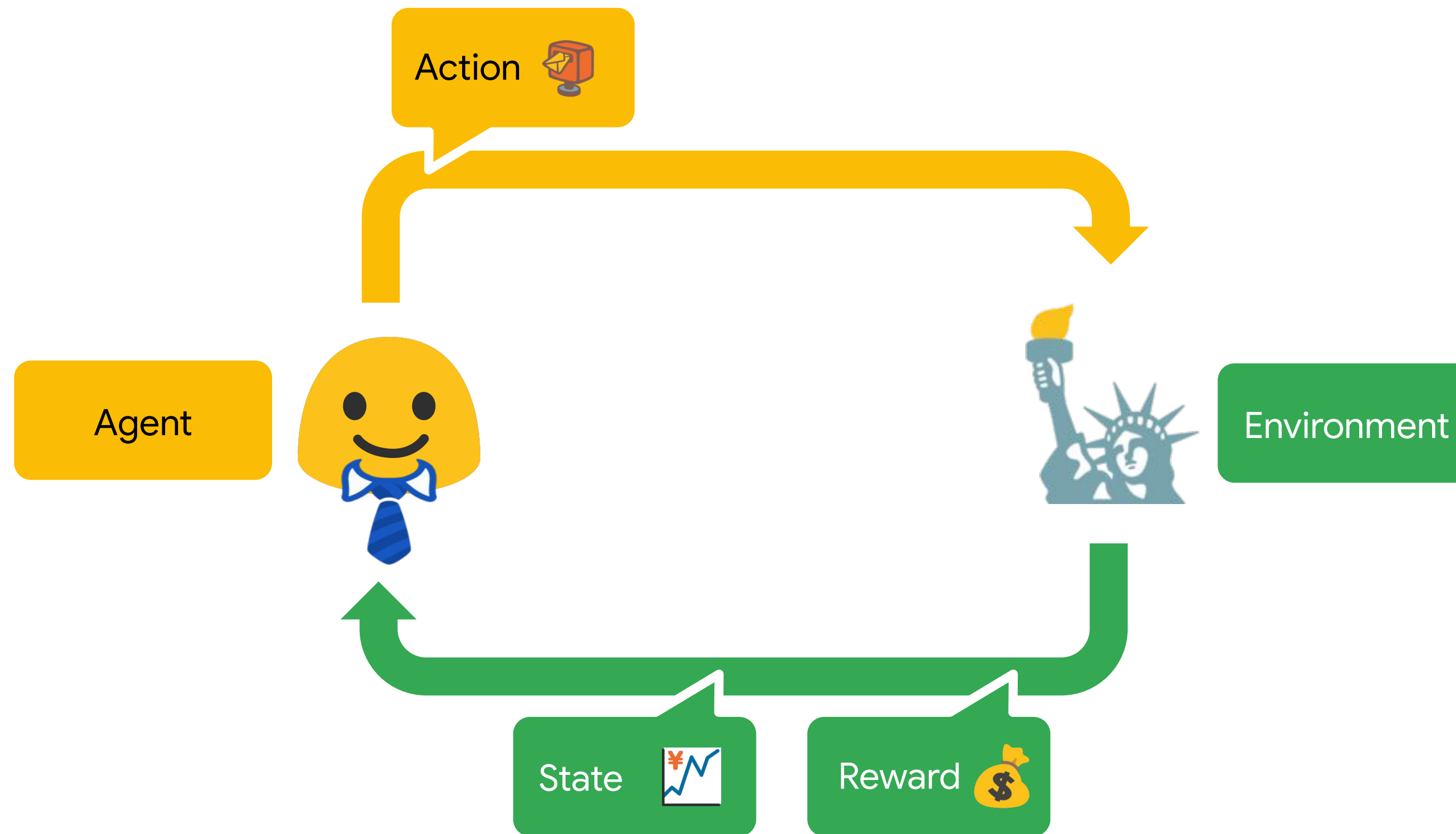
Reinforcement Learning Vocabulary



Reinforcement Learning Vocabulary (Video Game)



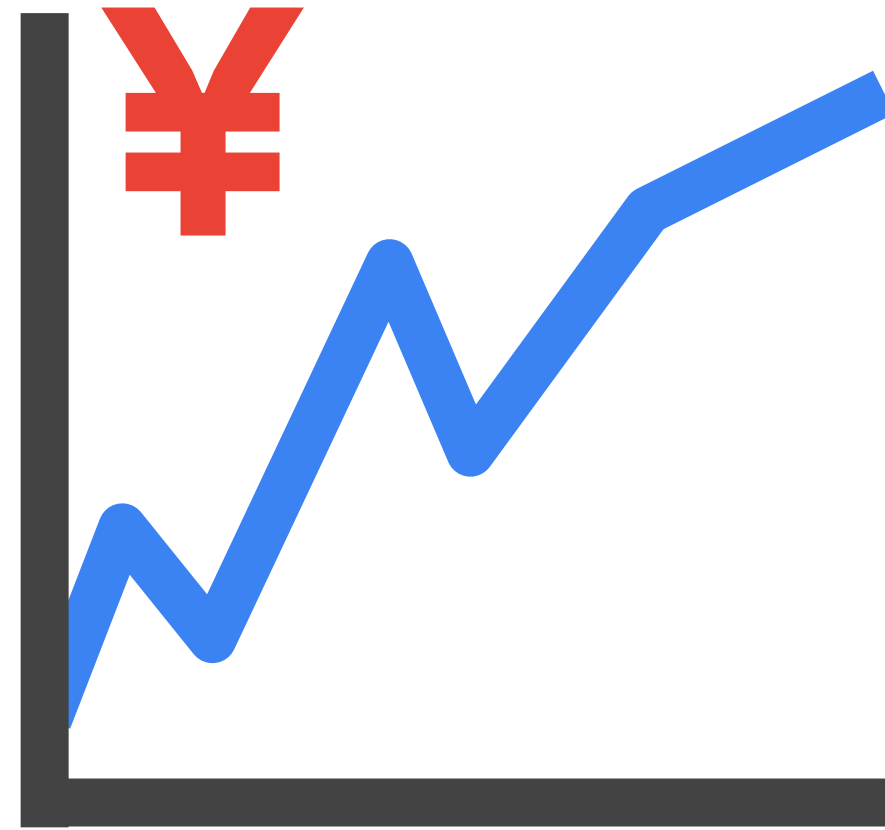
Reinforcement Learning Vocabulary (Trading)



Symbology

Symbol	Name	Definition	Example
	agent	An intelligence that can act and transition between states	A stock trader
s	state	The environmental parameters describing where the agent is	Yesterday's Highs and Lows
a	action	What the agent can do within a state	Go long or short
t	time / step	One transition between states	Moving from today to tomorrow
r R(s, a)	reward	Value gained or lost transitioning between states through an action	R(Battle, Kill Monster) = 100XP

Sequence Modeling vs Reinforcement Learning



Agenda

Differences from other ML Fields

Terms and Definitions

Accomplishments

Intelligence?

Supervised Learning Components



Decision Making

Intelligence?

Reinforcement Learning Components



Decision Making



Curiosity



Reactivity



Memory

Learning About Learning

- If at first you don't succeed, try try again

Learning About Learning

- If at first you don't succeed, try try again
- Do one thing everyday that scares you

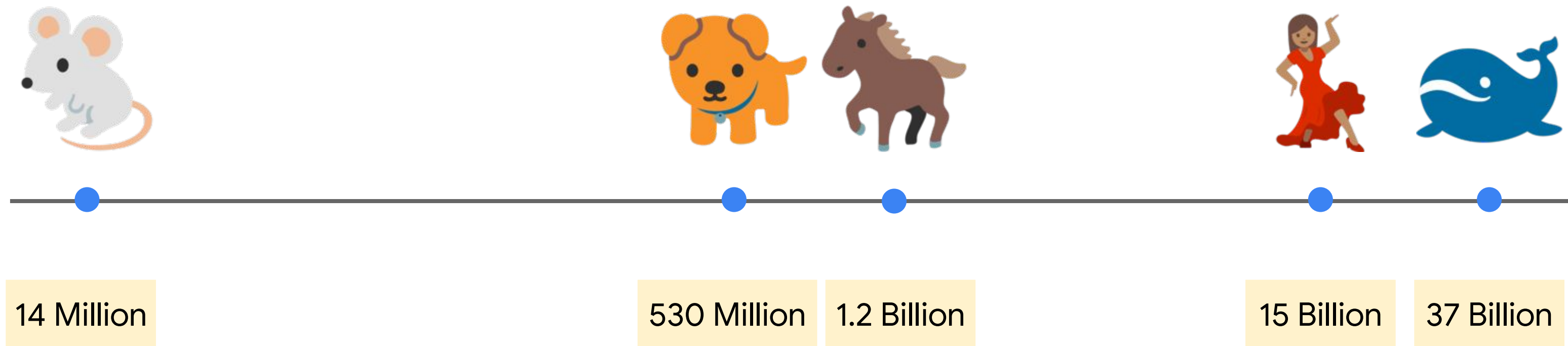
Learning About Learning

- If at first you don't succeed, try try again
- Do one thing everyday that scares you
- Practice makes perfect

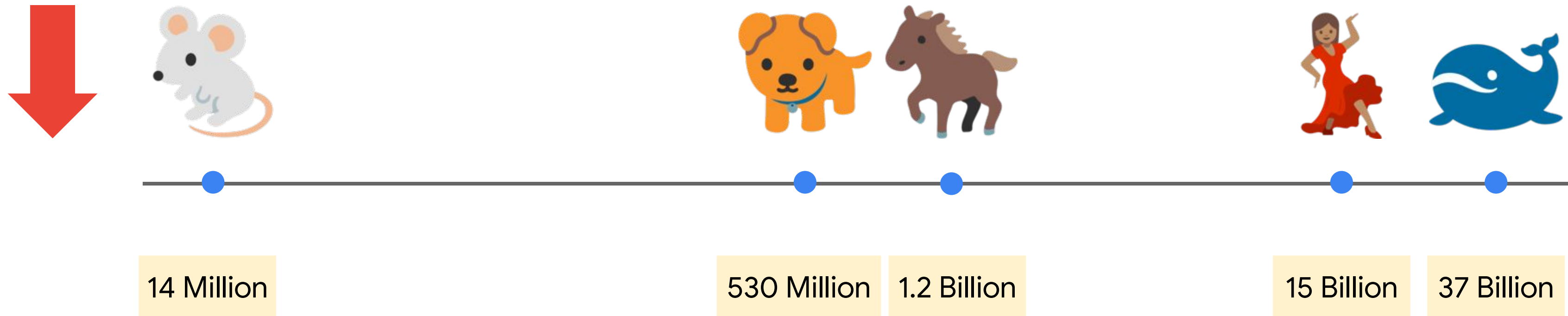
Learning About Learning

- If at first you don't succeed, try try again
- Do one thing everyday that scares you
- Practice makes perfect
- Why do we fall? So that we can learn to pick ourselves up

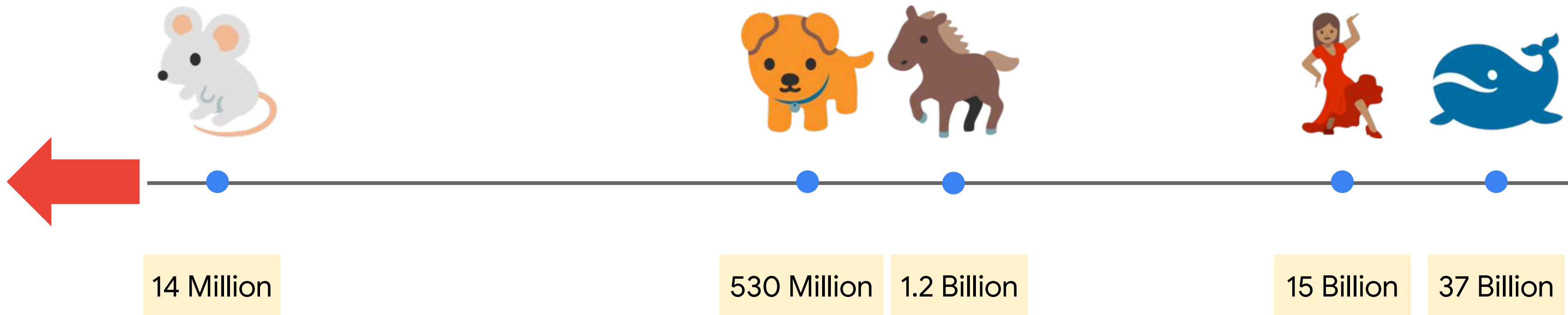
Forebrain Neurons by Animal



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Reinforcement Learning Successes

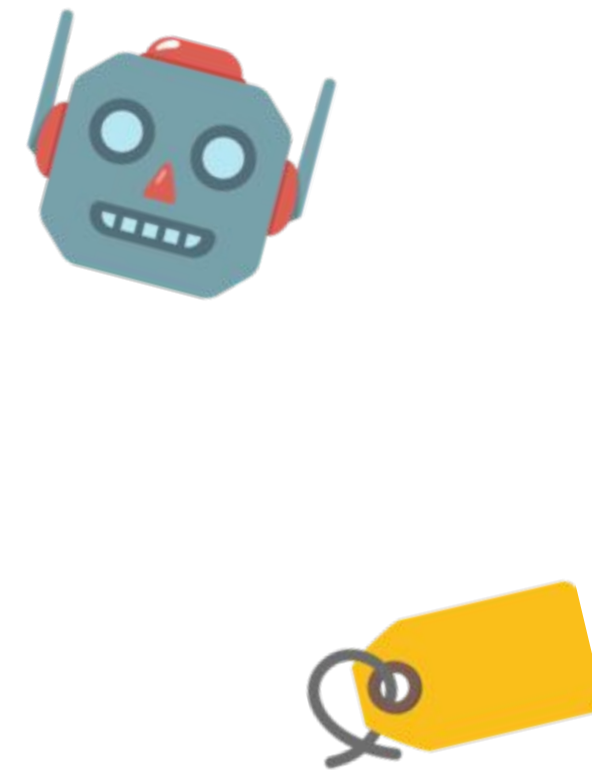
Games



Finance



Other



Reinforcement Learning Successes

Games



Finance



Other



Reinforcement Learning Successes

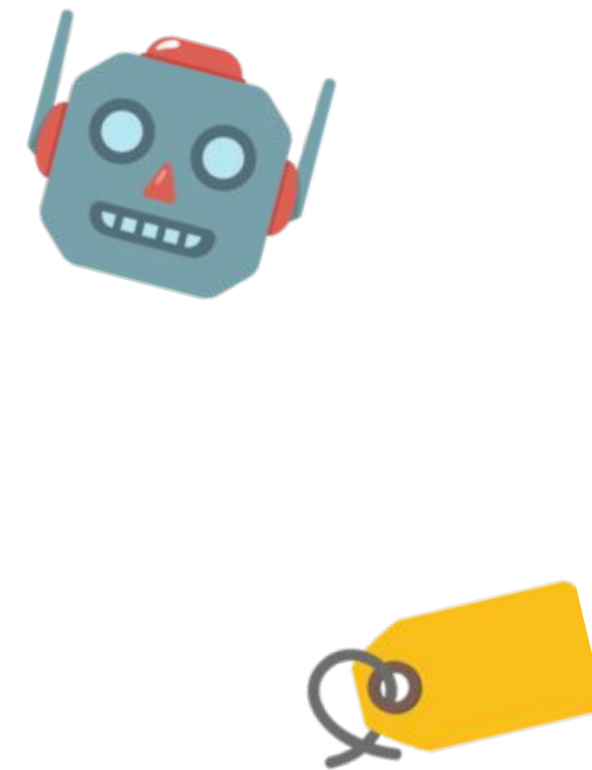
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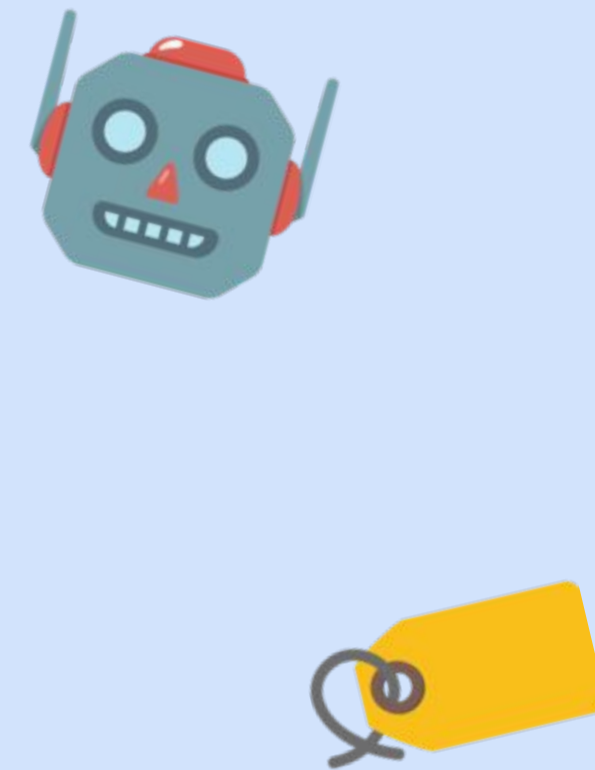
Games



Finance



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Reinforcement Learning Successes

Games



Finance



Other

