

Machine Learning Foundations

Introduction, Terminology and Setup

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Outline

1.What is Machine Learning?

2.The Wonders of Machine Learning

3.Data, Models and ML Tasks

4.Supervised Learning

 1. Regression

 2. Classification

5. Unsupervised Learning

 1. Dimensionality Reduction

 2. Density Estimation

Machine Learning Definition

Machine learning (ML) is the study of computer algorithms that improve automatically through experience and by the use of data.

ML Tasks You (Might Have) Performed Today

Weather prediction



32

°C

°F

Precipitation: 0%
Humidity: 66%
Wind: 19 km/h

Andheri West, Mumbai,
Maharashtra

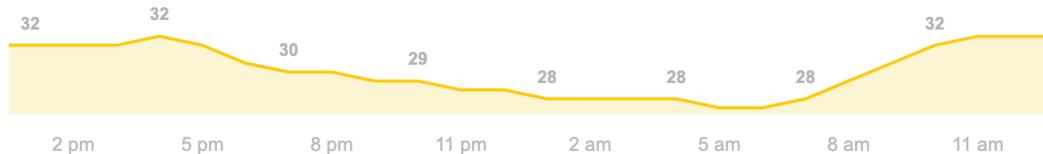
Monday

Mostly sunny

Temperature

Precipitation

Wind



Mon



32° 27°

Tue



33° 28°

Wed



33° 27°

Thu



33° 27°

Fri



34° 28°

Sat



33° 28°

Sun



34° 28°

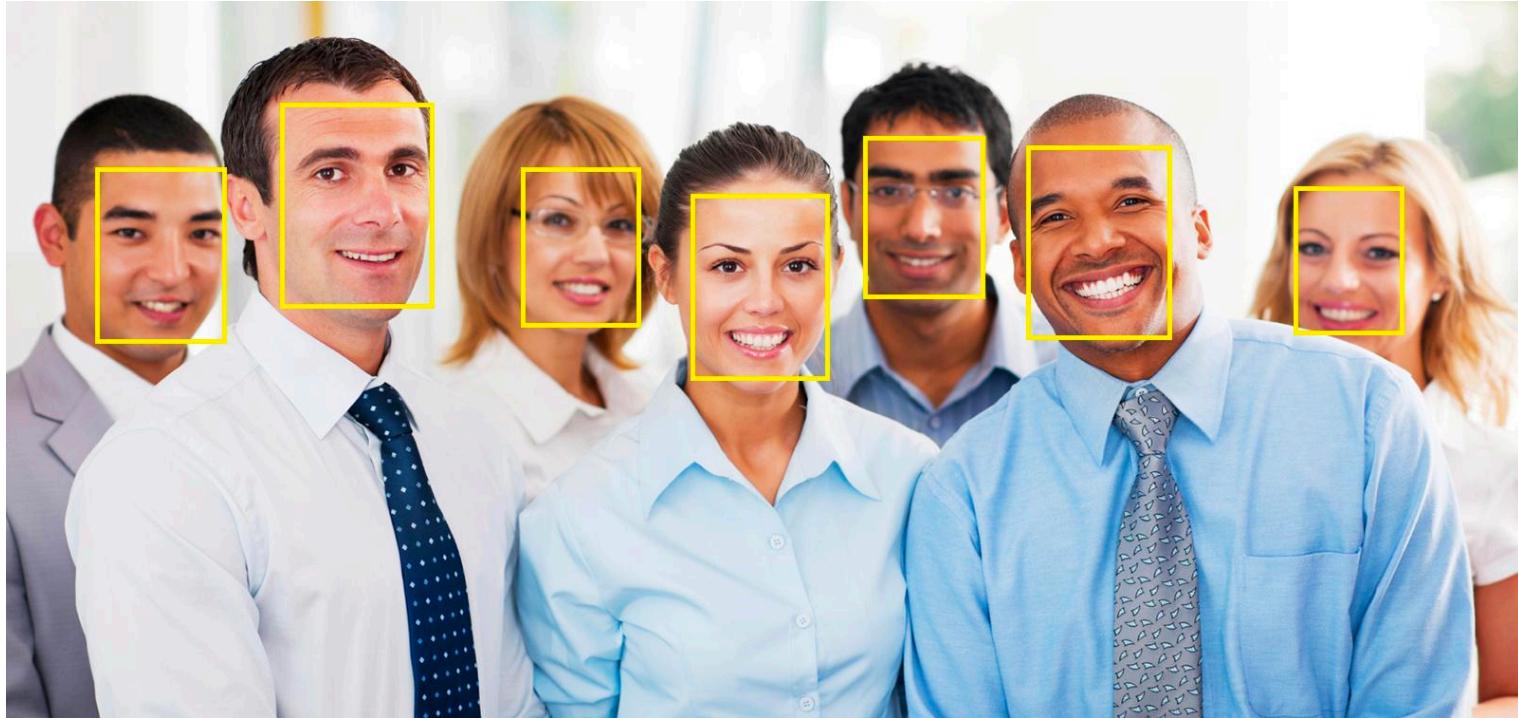
Mon



34° 28°

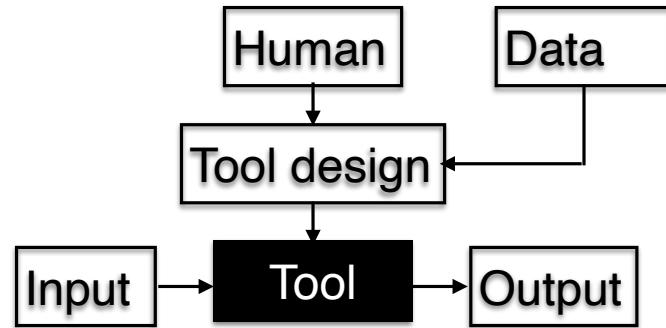
ML Tasks You (Might Have) Performed Today

Face Detection



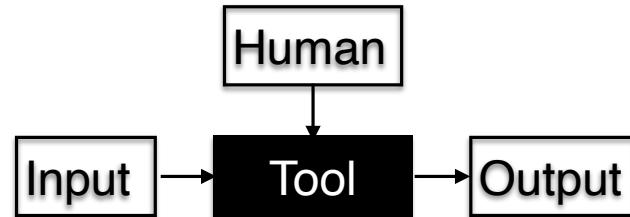
Task Hierarchy

Machine Learning



Programming

Tool usage



Manual Labour



Why and When Machine Learning?

1. Programming/Human Labour Fails

1. Scale/Speed/Cost of human labor
2. Inability to express rules using language.
3. Don't know the exact rules transforming input to output.

2. Machine Learning can succeed.

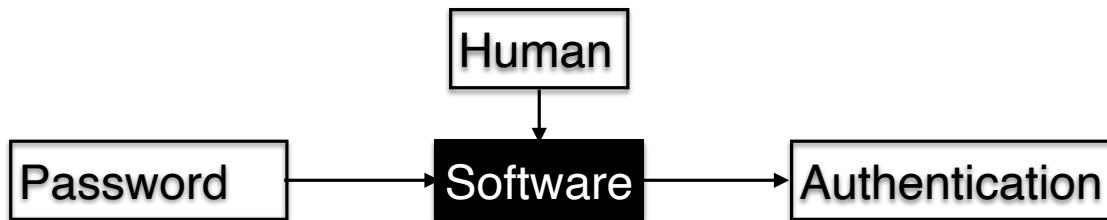
1. Have lots of example data
2. Have some structural idea on the rules

Task Analysis : Password Verify

Manual labour



Programming



Task Analysis : Password Verify

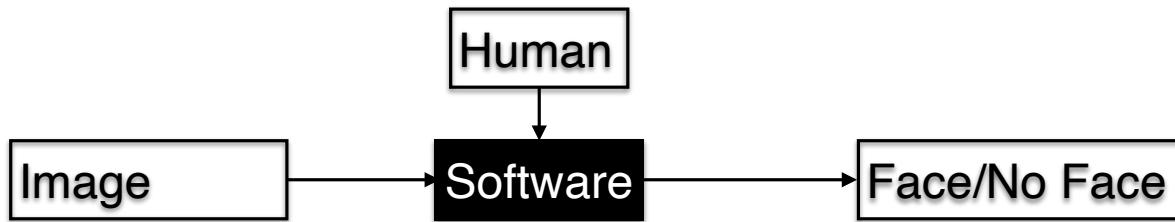
- Problems with Manual Labour
 - Scale: Having humans check login details of every login is impractical.
- Problems with programming
 - None.
- Machine Learning not required.

Task Analysis : Face Detection

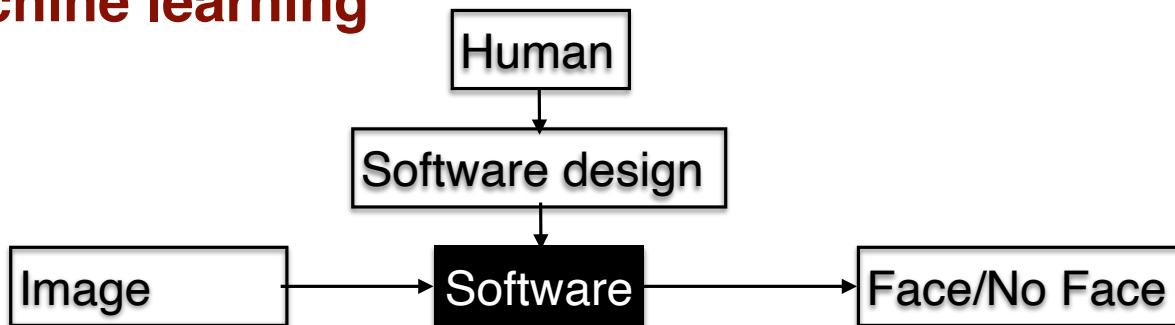
Manual labour



Programming



Machine learning



Task Analysis : Face Tagging

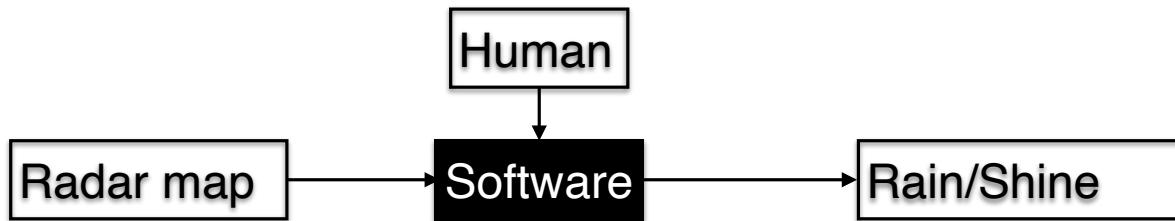
- Problems with Manual Labour
 - Scale: Having humans check all faces of every image is impractical.
- Problems with programming
 - Expressing face/not face in code is impossible.
- Case for Machine Learning
 - Lots of images available.

Task Analysis : Weather Prediction

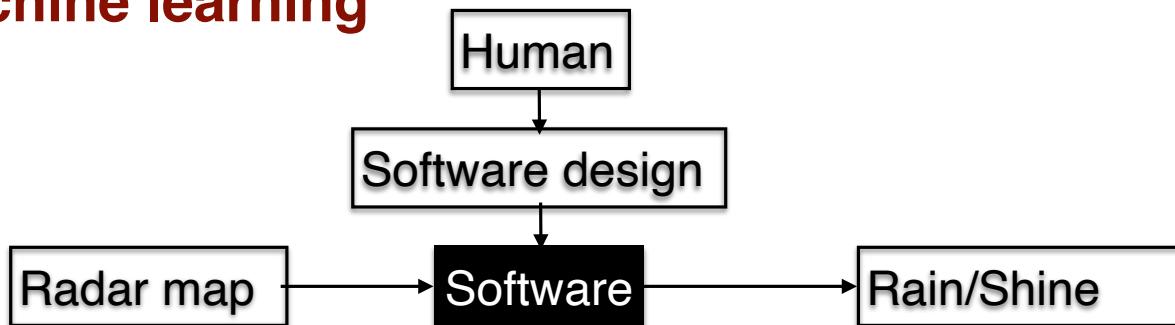
Manual labour



Programming



Machine learning



Task Analysis : Weather Prediction

- Problems with Manual Labour
 - Humans just do not know the full rules and can't process that much information.
- Problems with programming
 - Cannot code unknown rules.
- Case for Machine Learning
 - Lots of weather data available.

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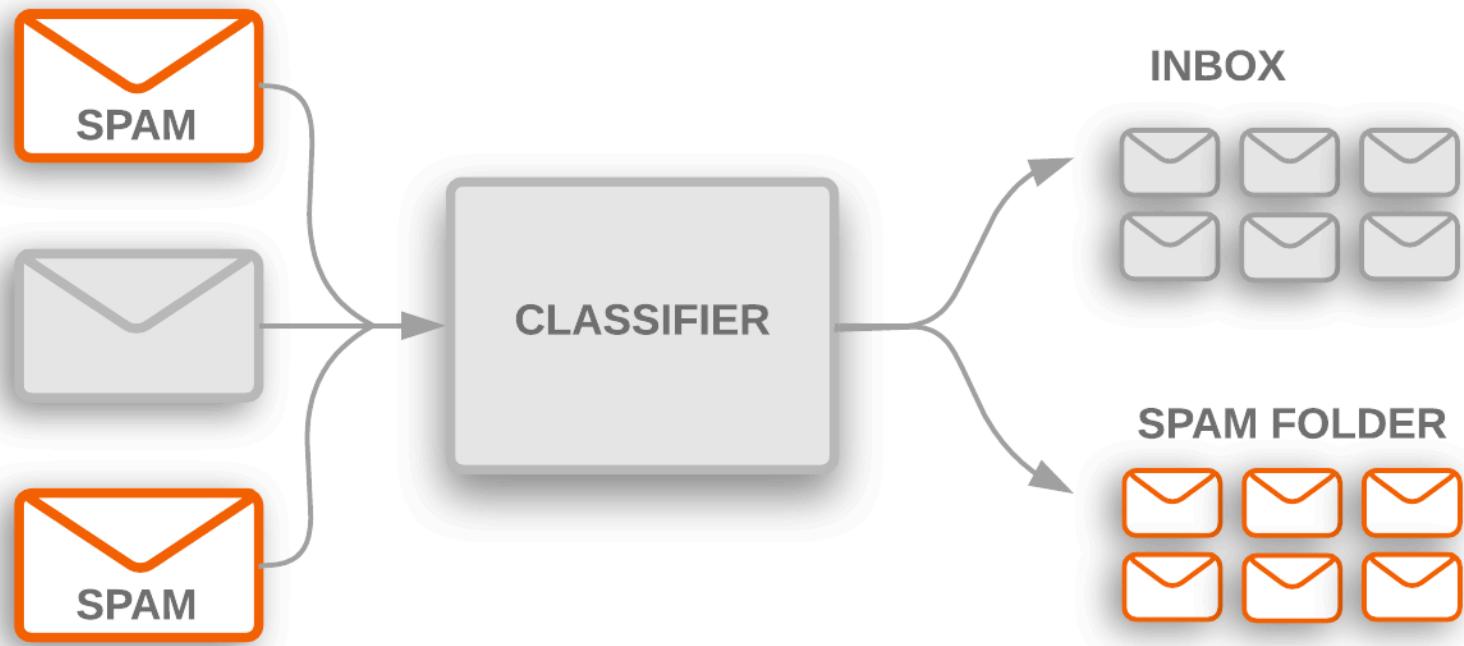
 2. Classification

5. Unsupervised Learning

 1. Dimensionality Reduction

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Machine Learning in your Inbox



Machine Learning in your Shopping Cart

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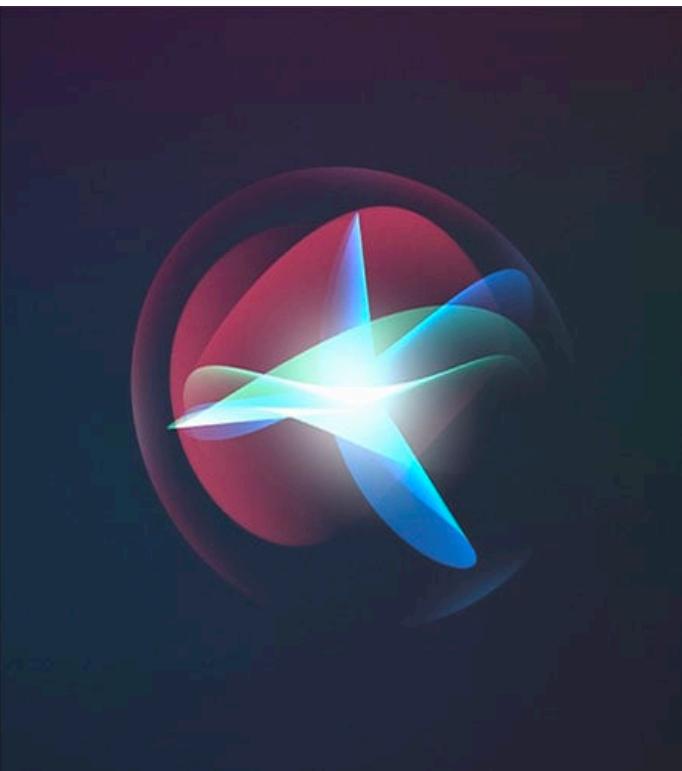
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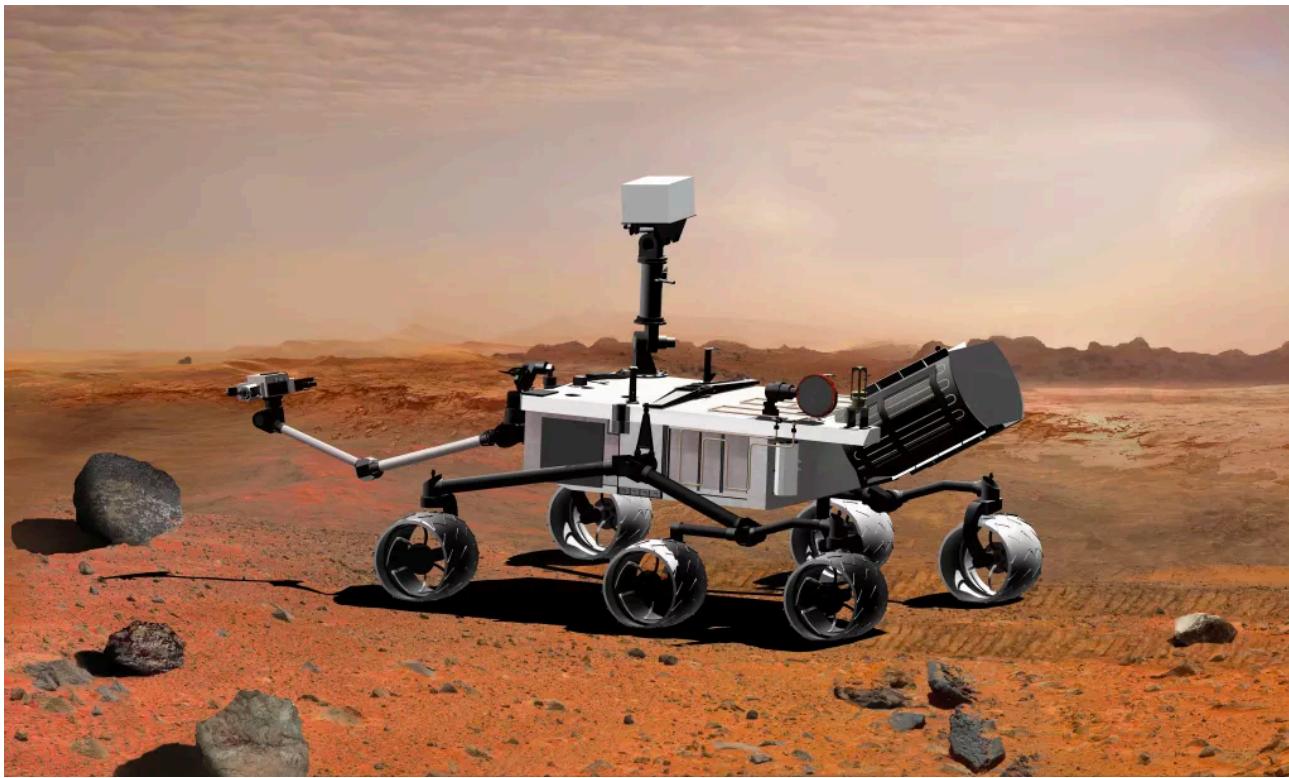
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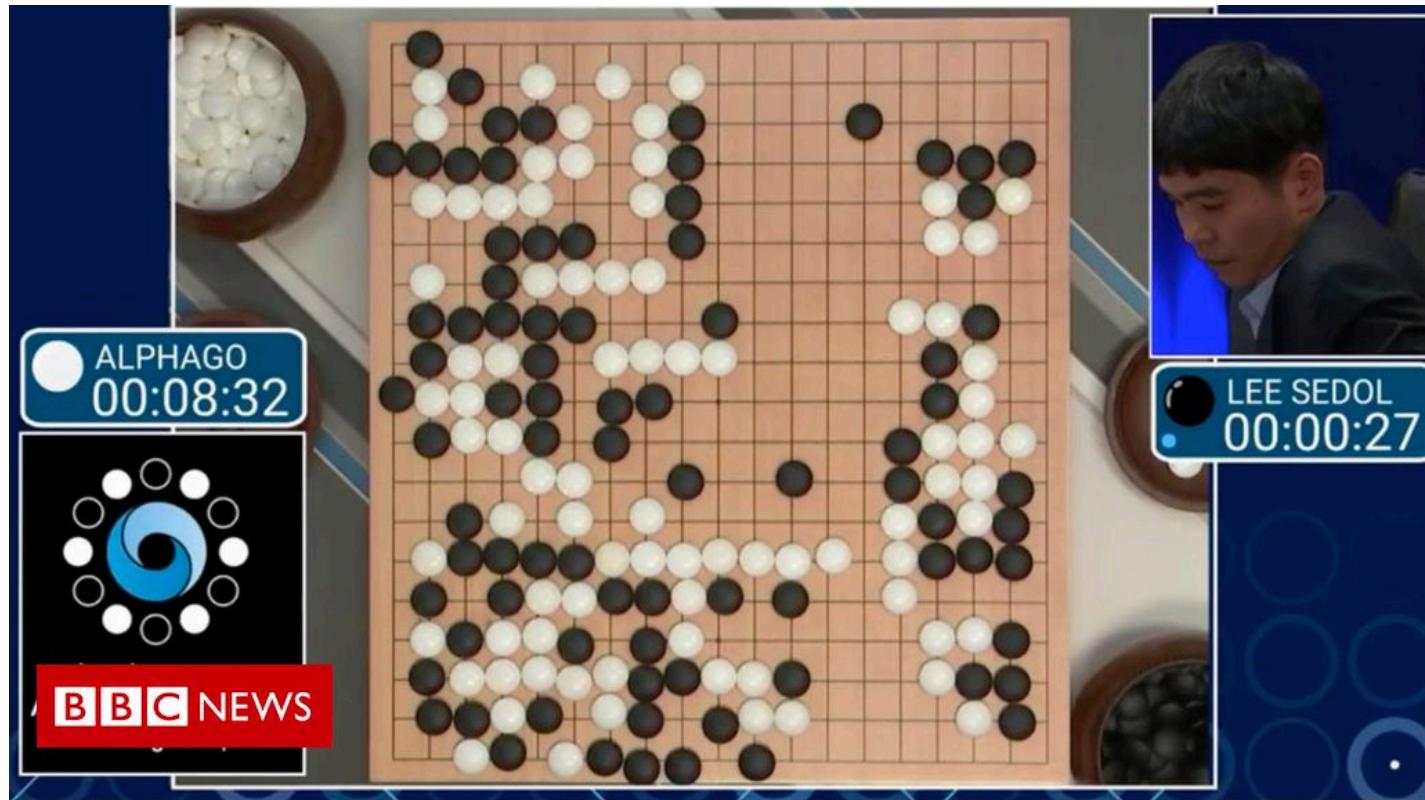
Machine Learning in your Smart Assistant



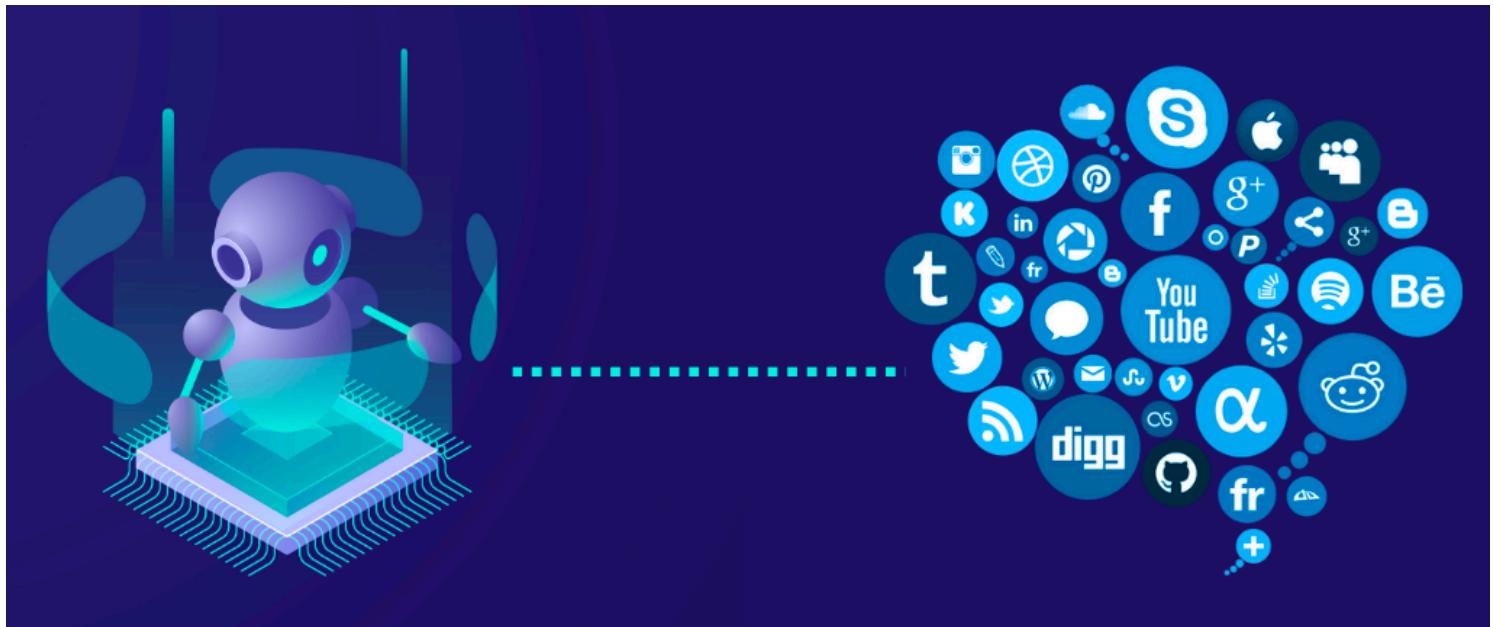
Machine Learning in Robot AIs



Machine Learning in Games



Machine Learning in Marketing



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