

Introduction to Machine Learning

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Agenda

What is machine learning?

Why is it important?

Applications of machine learning

Types of machine learning tasks

Machine learning approaches

What is ML?

[Machine Learning is the] field of study that gives computers the ability to learn without being explicitly programmed.

Arthur Samuel (1959). "Some Studies in Machine Learning Using the Game of Checkers". IBM Journal of Research and Development. 44: 206–226

What is ML?

A computer program is said to learn from experience E with respect to some task T and some performance measure P , if its performance on T , as measured by P , improves with experience E .

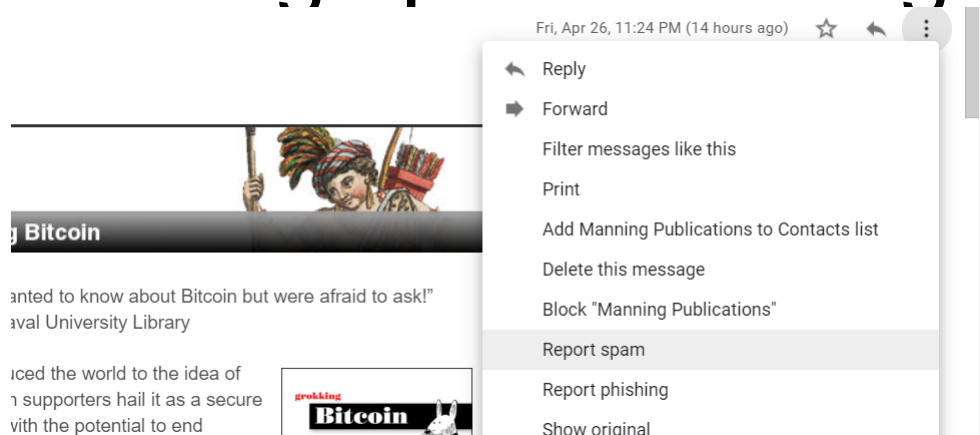
Tom Mitchell. Machine Learning, McGraw Hill, 1997. <http://www.cs.cmu.edu/~tom/mlbook.html>

Spam Filter

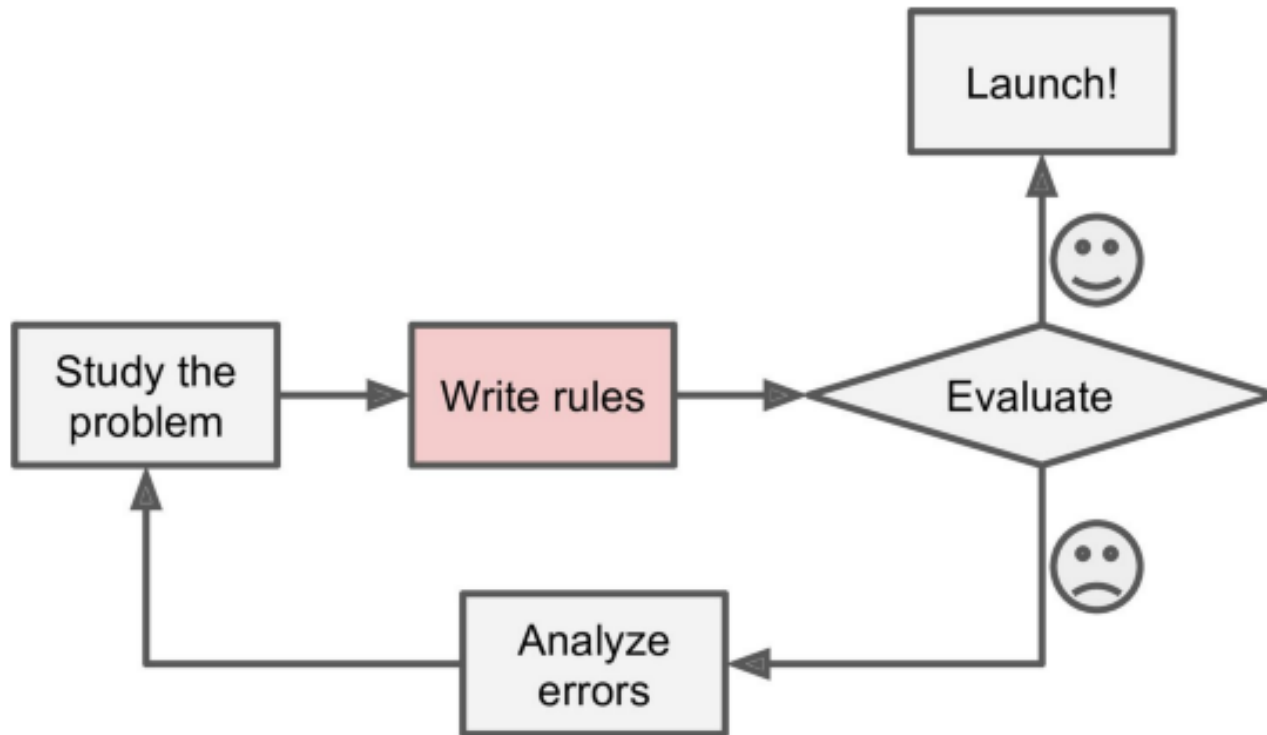
Task T: Classify email as spam or not spam.

Performance measure P: % of correctly classified emails

Experience E: users flag spam messages in email clients

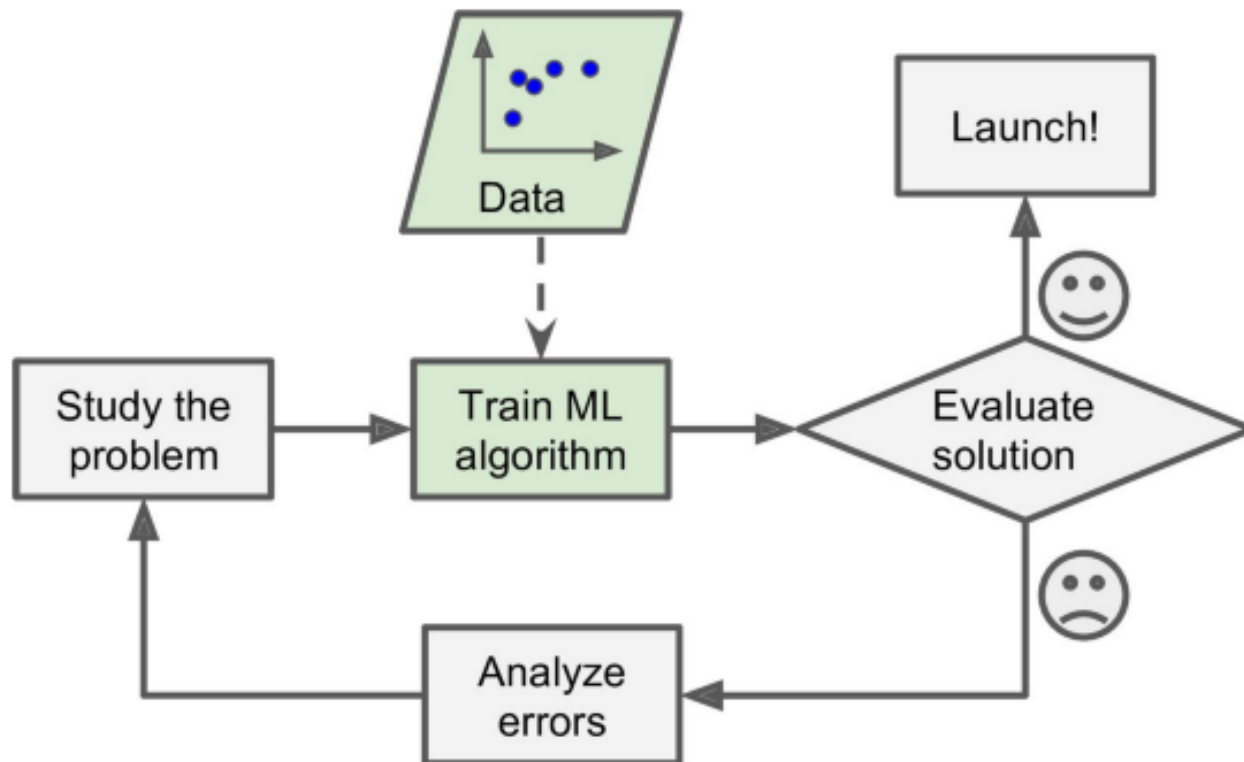


Traditional programming



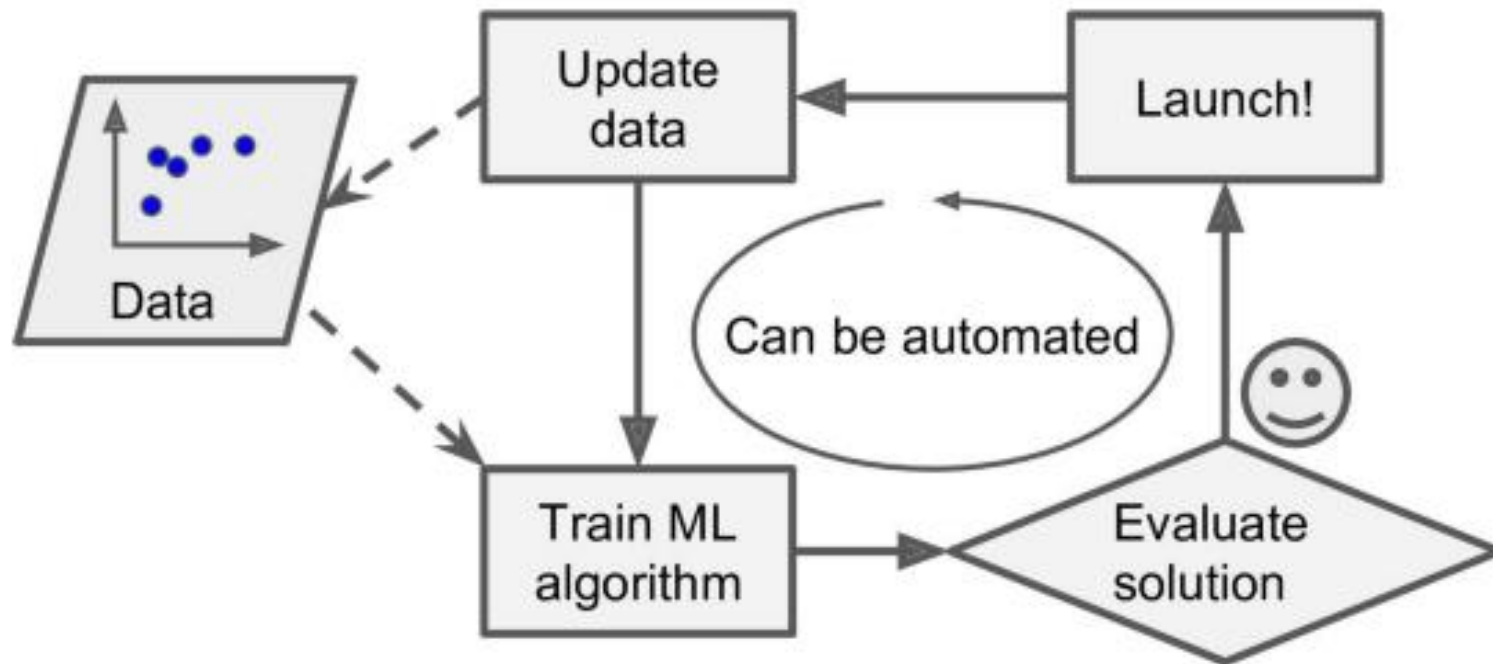
Source: Géron, Aurélien. Hands-On Machine Learning with Scikit-Learn and TensorFlow

ML approach



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Why learn ML?

Harvard
Business
Review

DATA

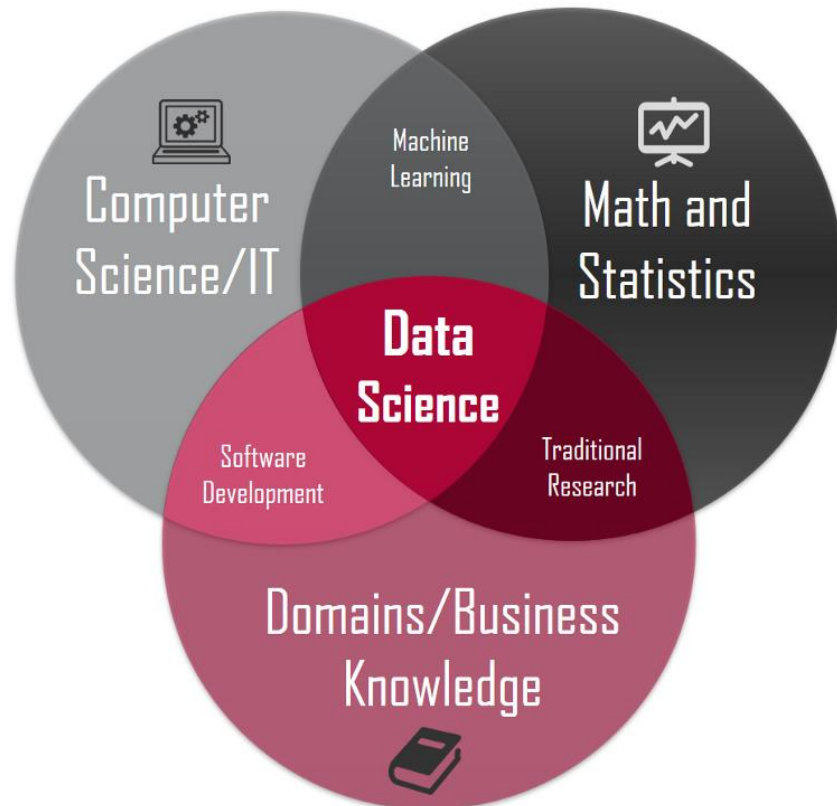
Data Scientist: The Sexiest Job of the 21st Century

by Thomas H. Davenport and D.J. Patil

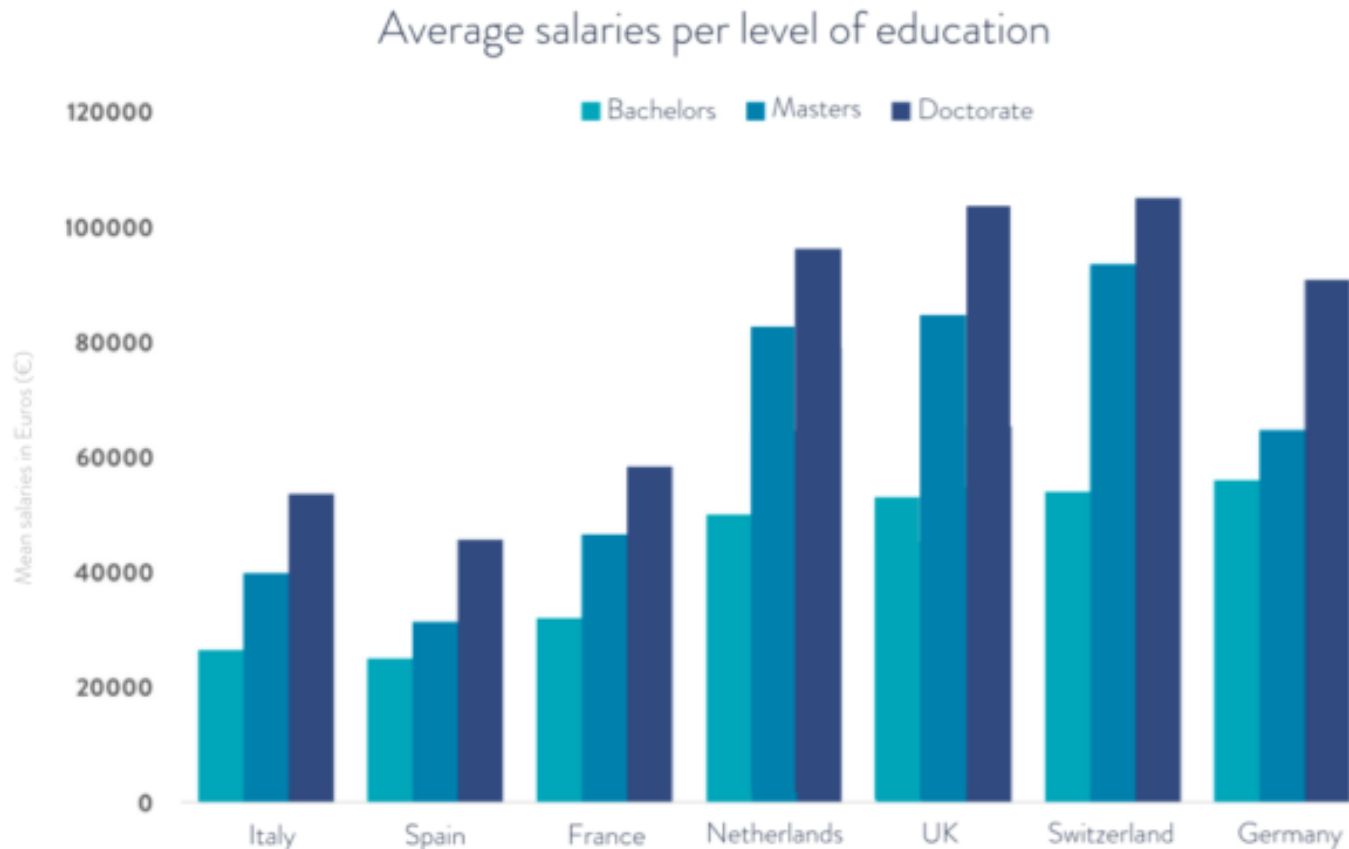
FROM THE OCTOBER 2012 ISSUE

Summary Save Share Comment 16 Text Size Print \$8.95 Buy Copies

When Jonathan Goldman arrived for work in June 2006 at LinkedIn, the business networking site, the place still felt like a start-up. The company had just under 8 million accounts, and the number was growing quickly as existing members invited their friends and colleagues to join. But users weren't seeking out connections with the people who were already on the site at the rate executives had expected. Something was apparently missing in the social experience. As one LinkedIn manager put it, "It was like arriving at a conference reception and realizing you don't know anyone. So you just stand in the corner sipping your drink—and you probably leave early." Goldman, a PhD in physics from Stanford, was intrigued by the linking he did see going on and by the richness of the user profiles. It all made for messy data and unwieldy analysis, but as he began exploring people's connections, he started to see



Data Scientists Salaries



Source: <https://dataconomy.com/2019/01/snapshot-data-scientist-salaries-and-jobs-in-europe/>

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What is machine learning?

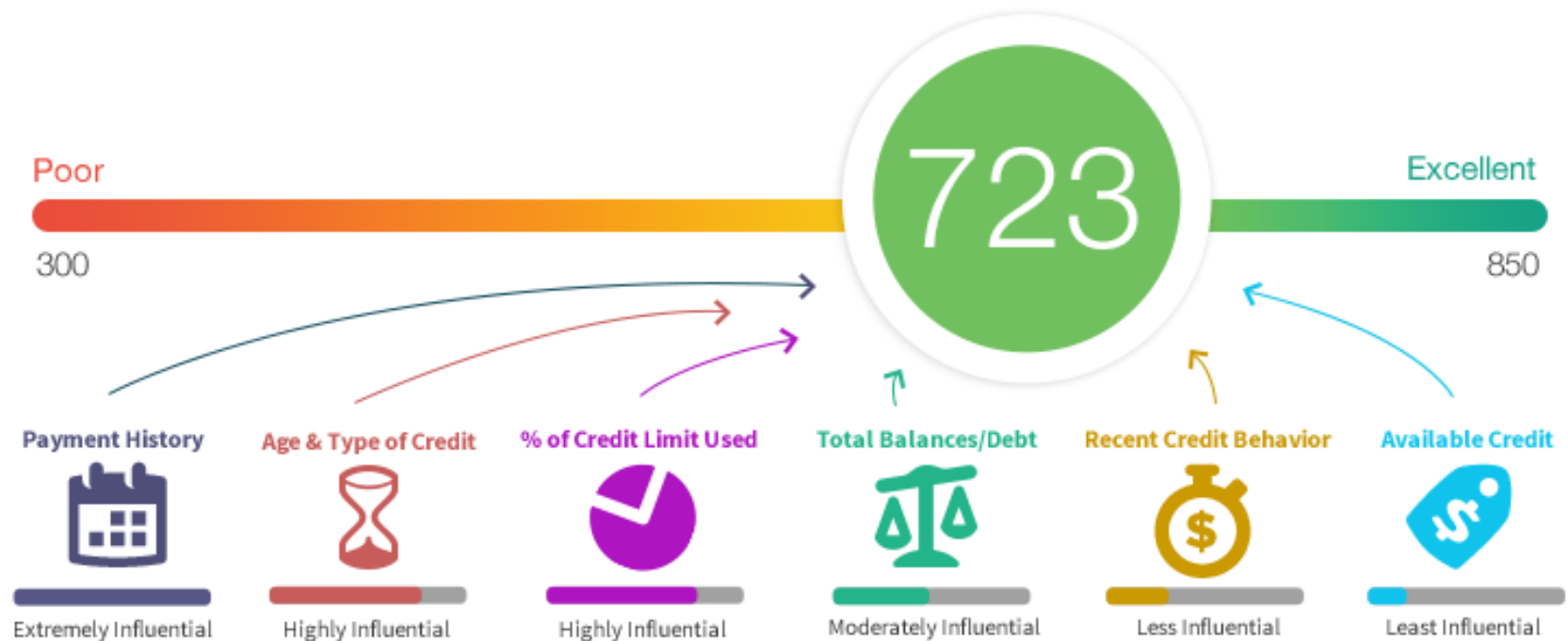
Why is it important?

Applications of machine learning

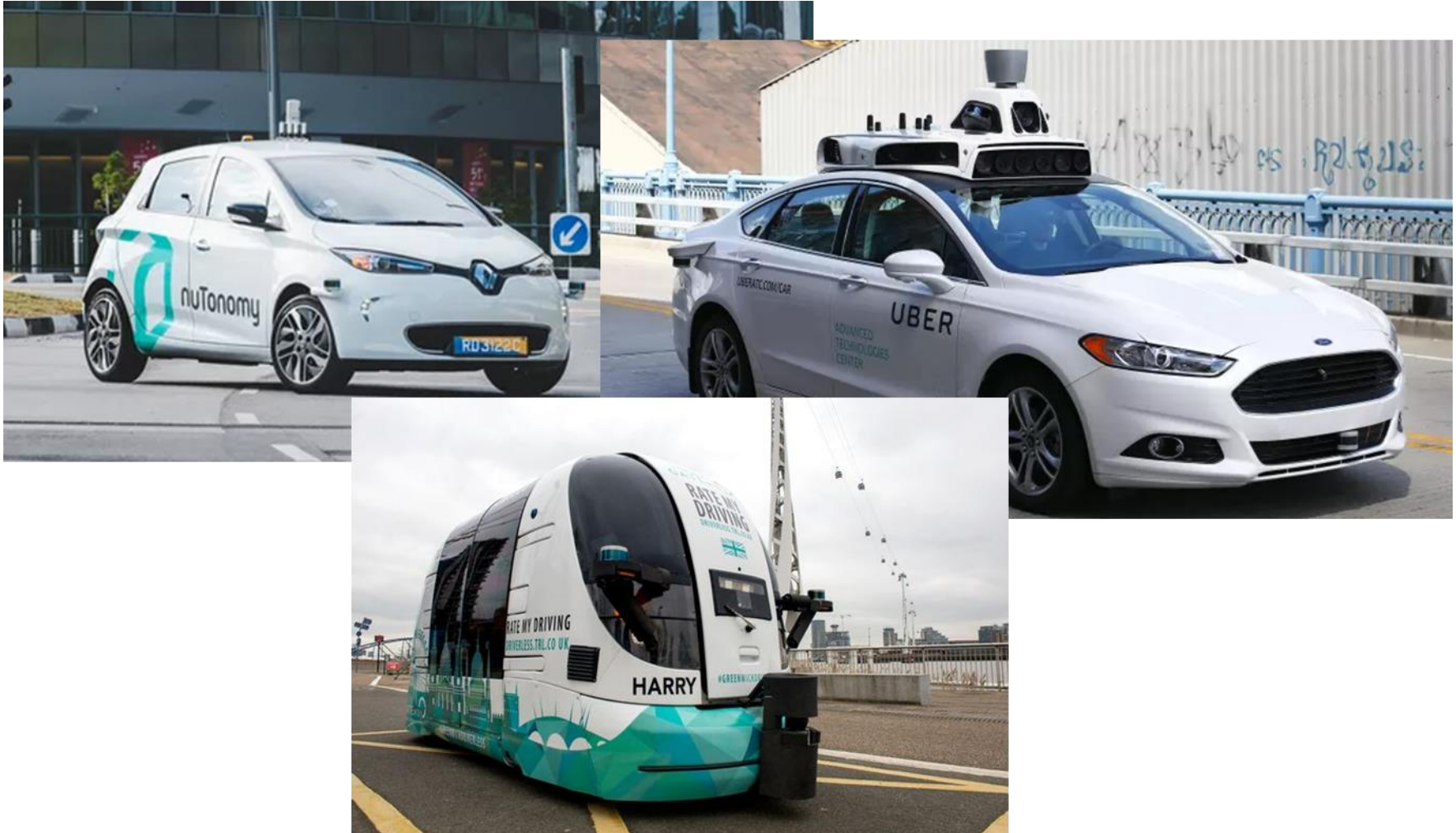
Types of machine learning tasks

Machine learning approaches

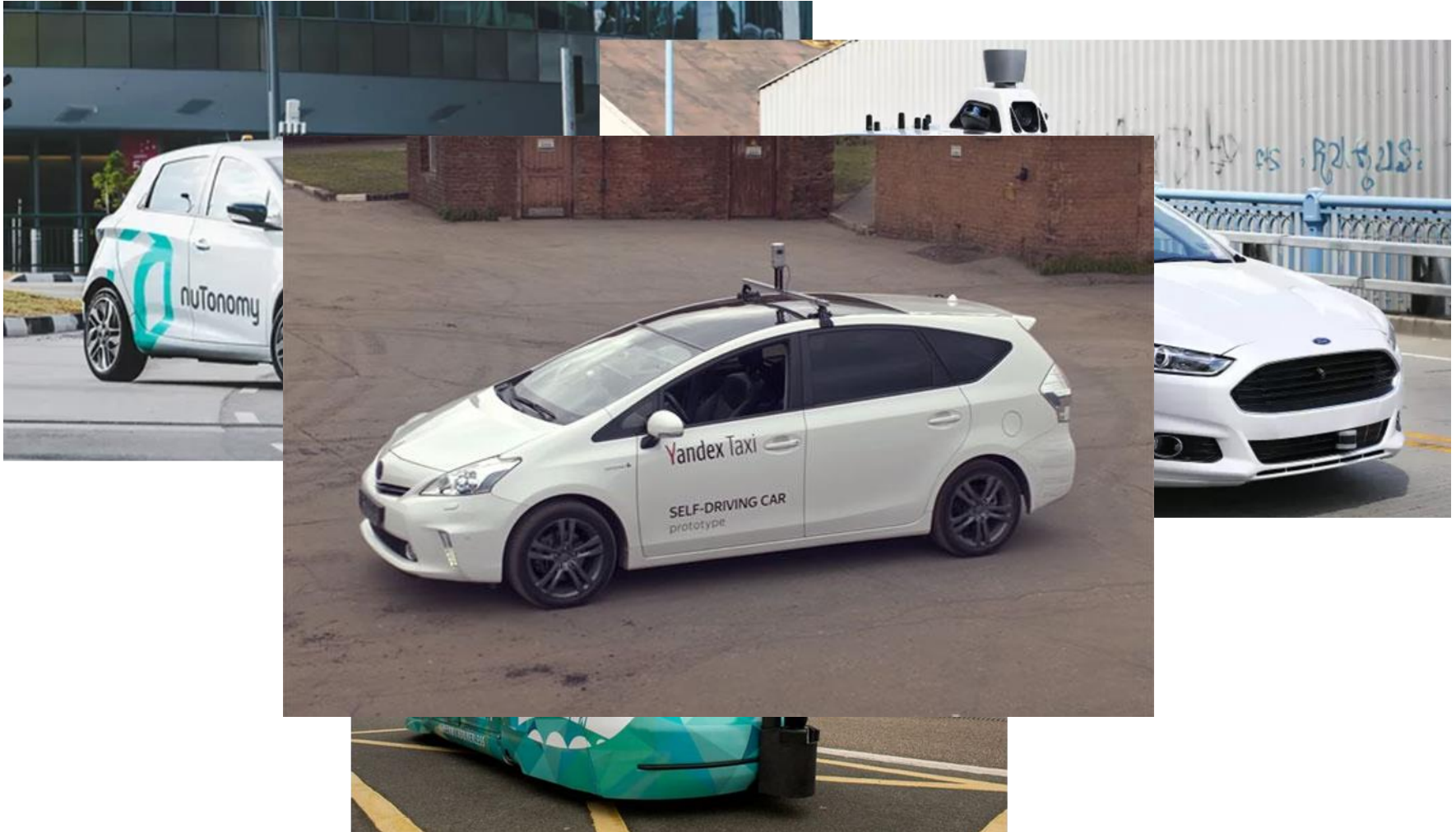
Applications of ML



Applications of ML



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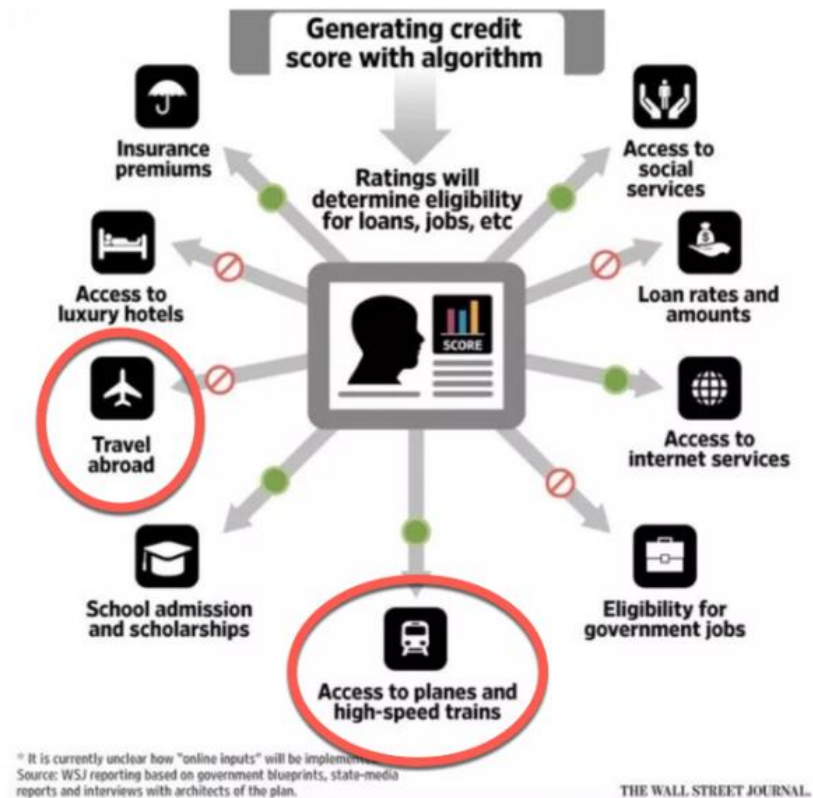
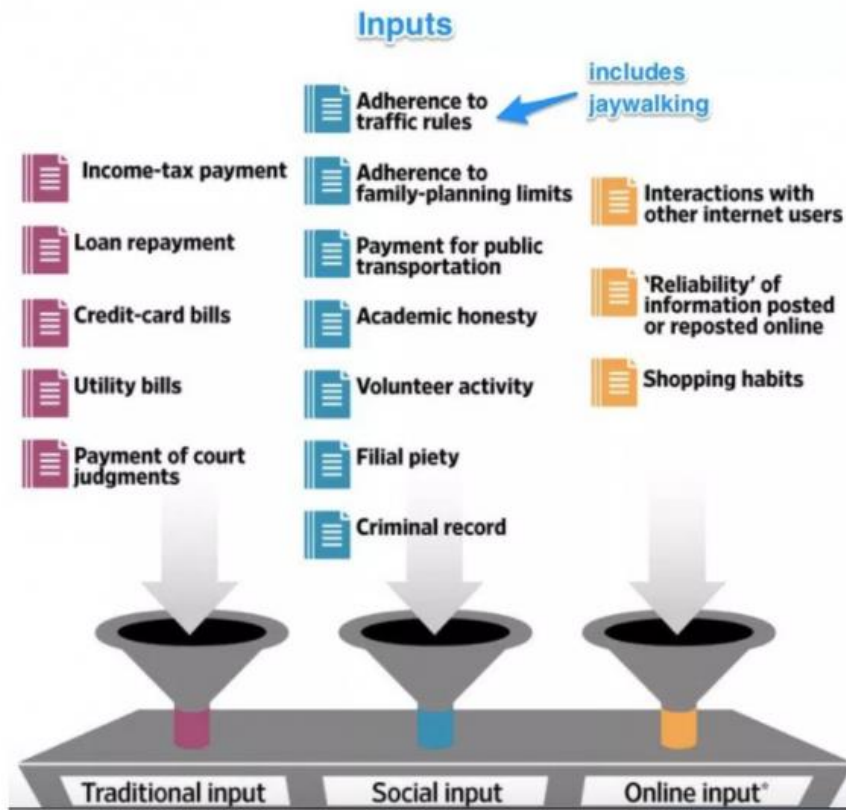
The collage consists of three overlapping images illustrating machine learning applications:

- Google Translate:** The top image shows the Google Translate interface. It features a text input box, a microphone icon, and a character count (0/5000). Below the input box is a prompt: "Type text or a website address or translate a document." An illustration of a hand writing on a document is also present. The interface includes language selection buttons for English, Russian, and Spanish, and a "Translate" button.
- Contact List:** The middle image shows a contact list from a mobile application. It lists contacts with their names, status (e.g., "Active", "Last seen 20 mins ago"), and a small circular icon next to each name. The contact "Miguel Silva" is highlighted with an orange circle and a red notification badge with the number "1".
- WhatsApp Chat:** The bottom image shows a WhatsApp chat interface. It displays a conversation with "Miguel Silva" (German). The chat includes a "Translator preview" section with a toggle switch and a list of languages: Chinese (Han (Traditional variant)), English, French, and German. The "Translator preview" section is highlighted with an orange circle and a red notification badge with the number "2". The chat also shows a "Miguel Silva" contact card with a red notification badge with the number "3".

Applications of ML



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Classification



Regression

Apple Inc. (AAPL) ☆

NasdaqGS - NasdaqGS Real Time Price. Currency in USD

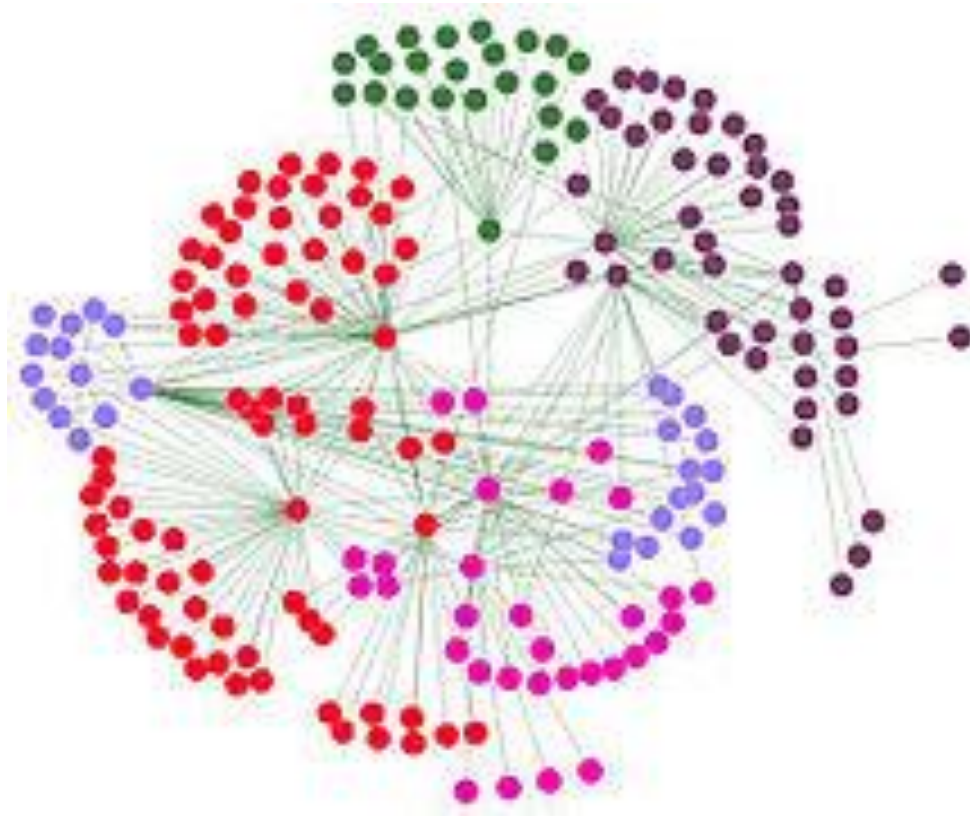
204.30 -0.98 (-0.48%)

At close: 4:00PM EDT



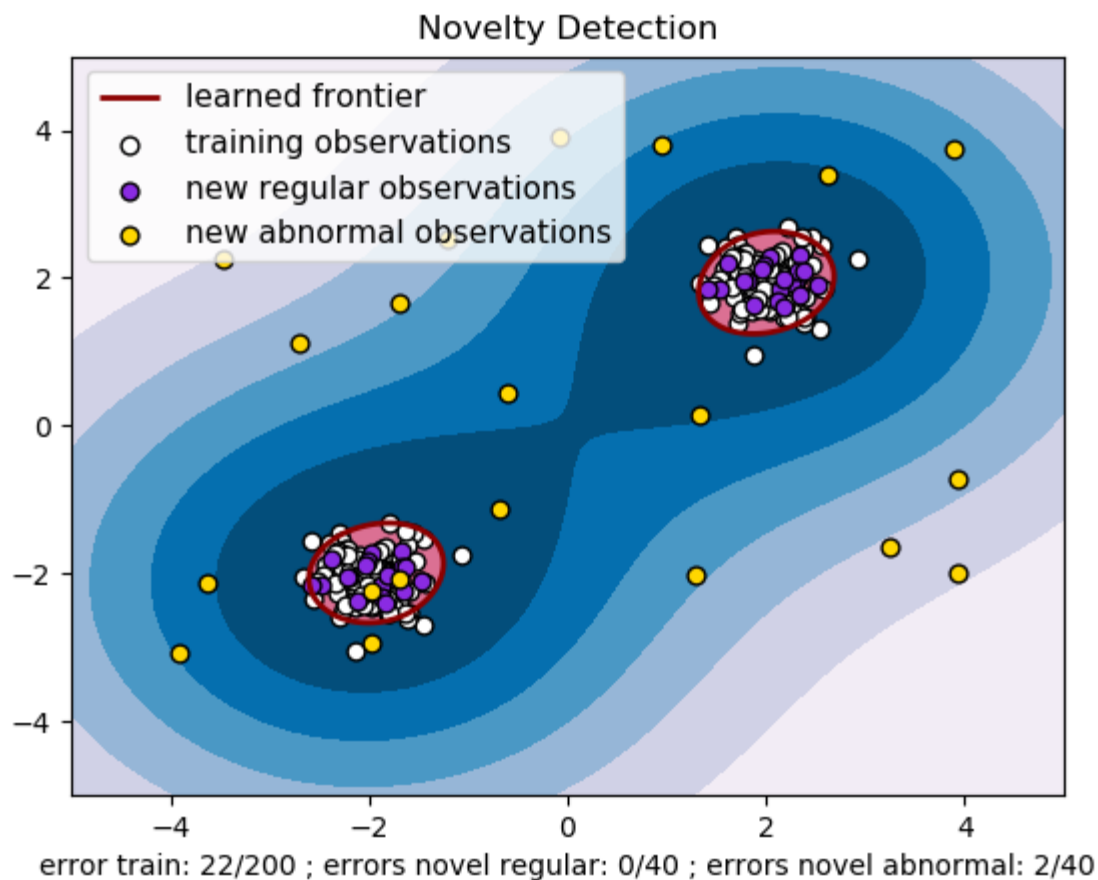
Source: finance.yahoo.com

Clustering



Source: en.wikipedia.org/wiki/Social_network

Anomaly Detection



Source: scikit-learn.org/stable/modules/outlier_detection.html

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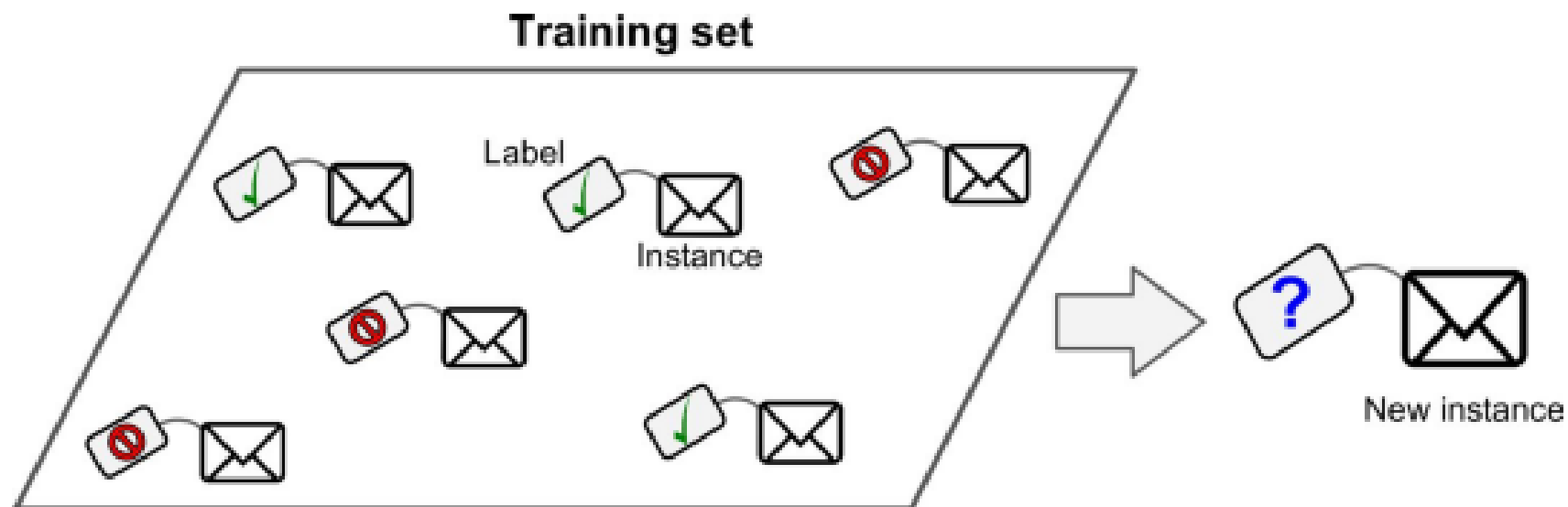
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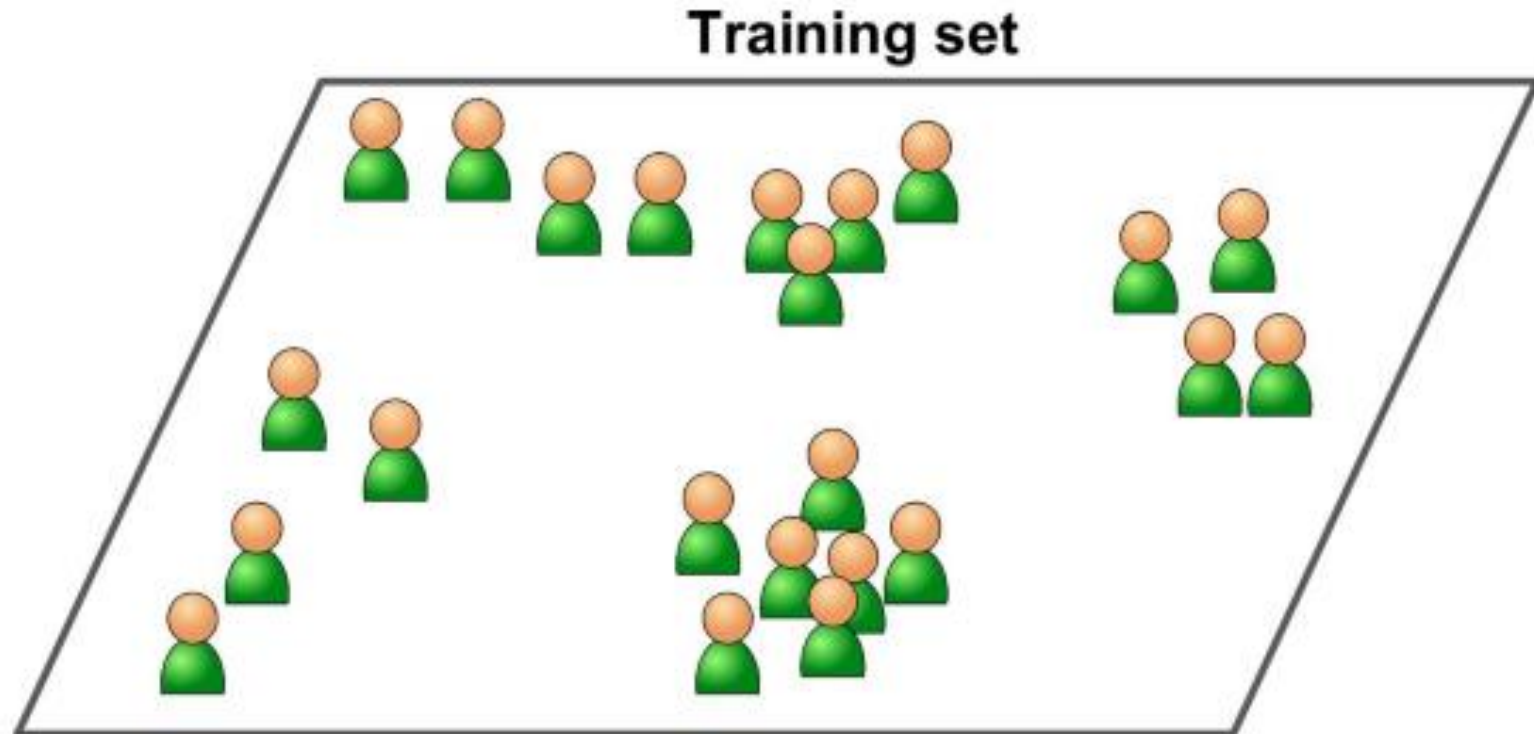
Machine learning approaches

Supervised Learning



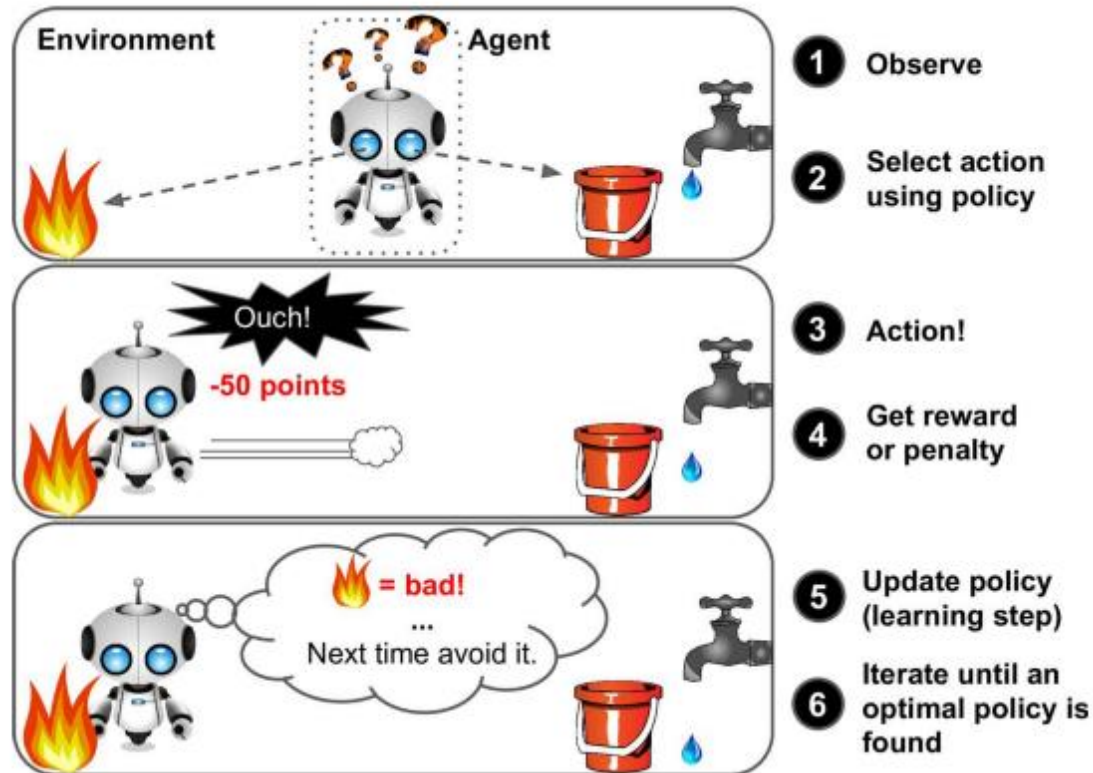
Source: Géron, Aurélien. Hands-On Machine Learning with Scikit-Learn and TensorFlow

Unsupervised Learning



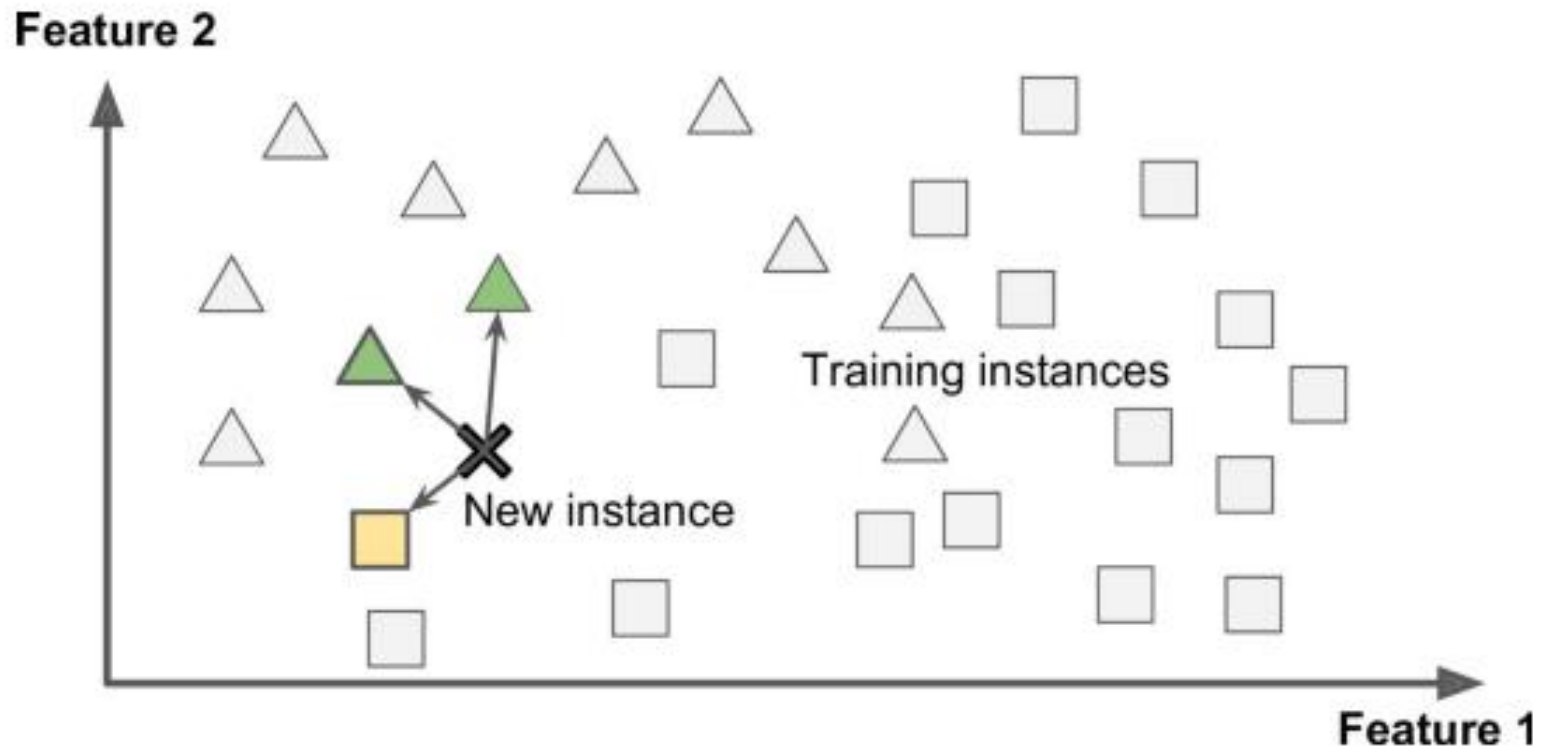
Source: Géron, Aurélien. Hands-On Machine Learning with Scikit-Learn and TensorFlow

Reinforcement Learning



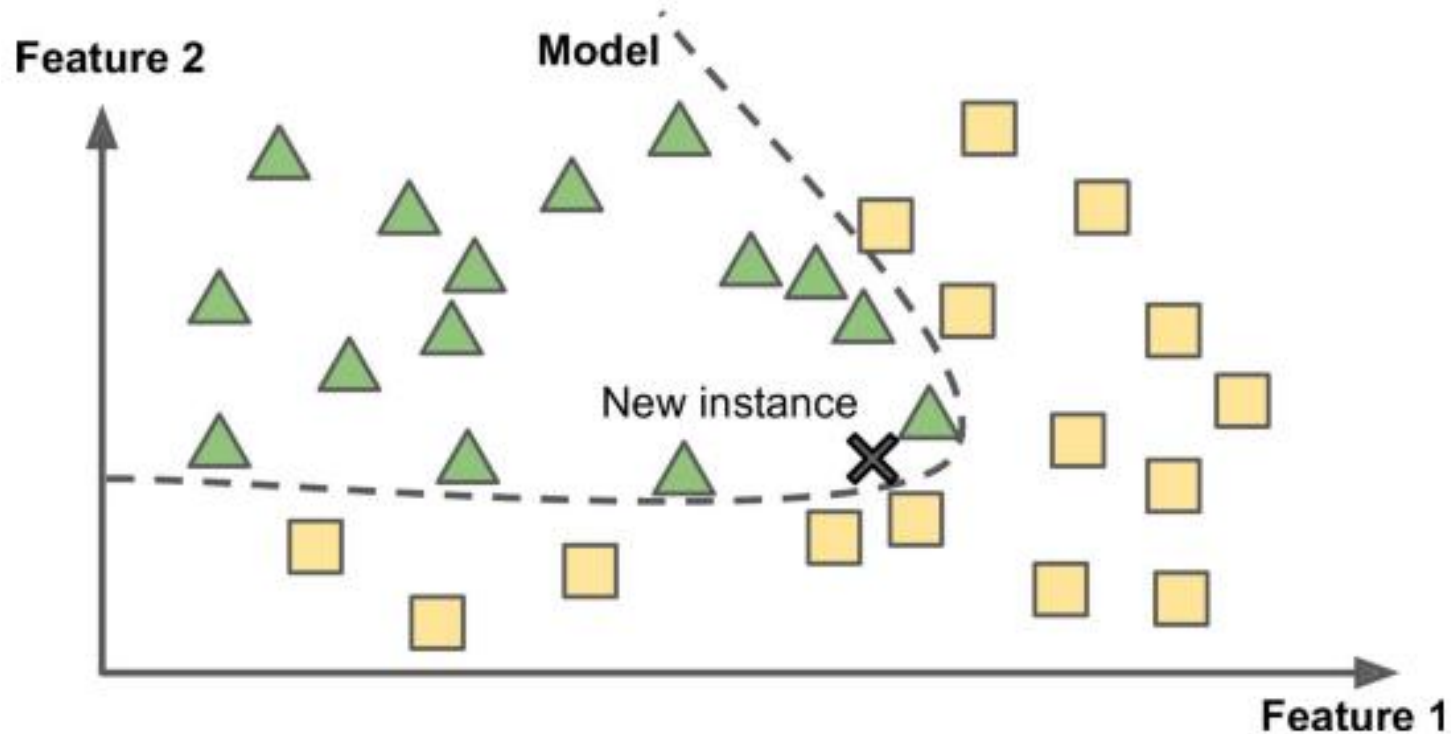
Source: Géron, Aurélien. Hands-On Machine Learning with Scikit-Learn and TensorFlow

Instance-based learning



Source: Géron, Aurélien. Hands-On Machine Learning with Scikit-Learn and TensorFlow

Model-based learning



Source: Géron, Aurélien. Hands-On Machine Learning with Scikit-Learn and TensorFlow

Thank you!