# Other ML topics

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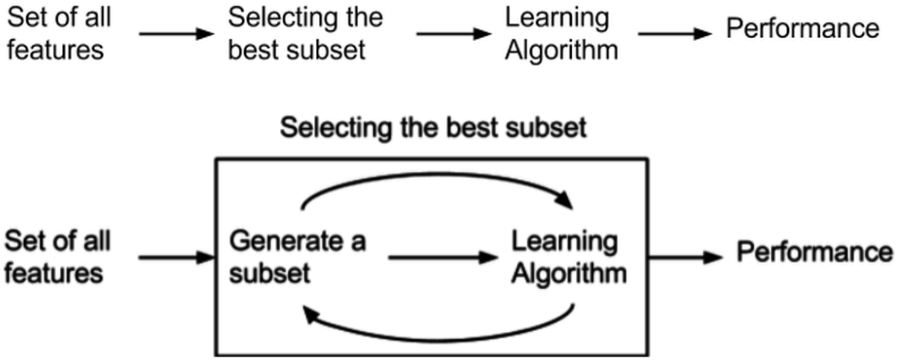
# Feature selection

Methods to select a subset of relevant features in order to:

- reduce the computational cost
- improve performance (redundancies, noise)




Sometimes, feature selection is integrated into the modeling algorithm (embedded feature selection)

# Text analysis

`'I love dancing, reading and creating models'`

Tokenization:

```
['i', 'love', 'dancing', ',', 'reading', 'and', 'creating', 'models']
```

Remove stopwords and punctuation:

```
['love', 'dancing', 'reading', 'creating', 'models']
```

Stemming:

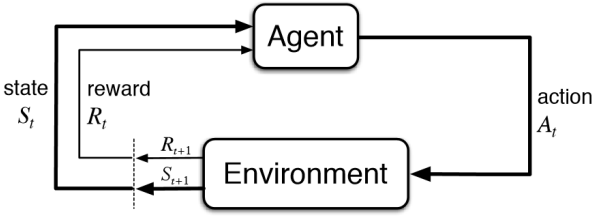
```
['love', 'danc', 'read', 'creat', 'model']
```

From all the tokens in the text, generate a frequency-based table and apply ML algorithms.

| love | danc | read | creat | model |
|---|---|---|---|---|
| 0.35230 | 0.0 | 0.1234 | 0.0 | 0.0 |
| 0.00000 | 0.12350 | 0.2359 | 0.0 | 0.0 |
| 0.14134 | 0.42342 | 0.0 | 0.5221 | 0.0 |

# Reinforcement learning

Involves software agents attempting to take actions or make moves to maximize some prioritized reward. It is an iterative feedback loop between an agent and its environment.



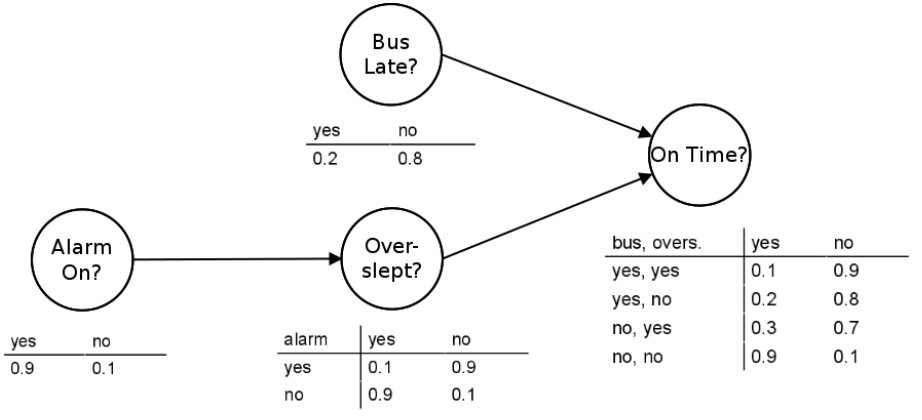

Applications:

- Robotics for Industrial Automation
- Text summarization engines, dialogue agents (text, speech), gameplays
- Autonomous Self Driving Cars
- AI for computer games

# Bayesian Networks

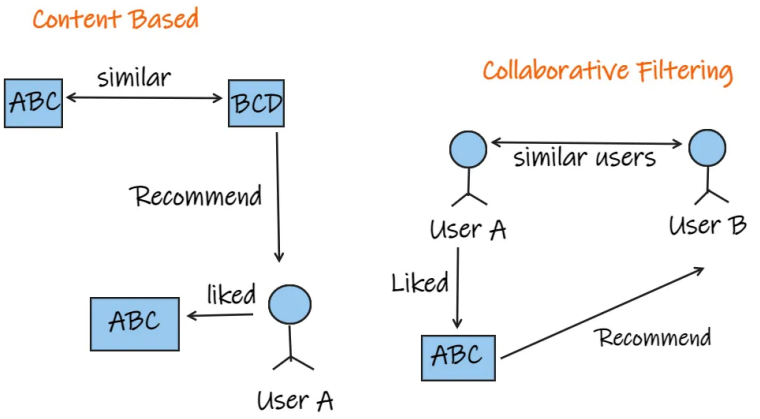
Probabilistic graphical model that represents a set of random variables and their conditional dependencies. Both, the structure and the conditional probabilities can be given by experts or learnt. Once completed, the BN can make inferences.

They have applications in reasoning, causal modeling or decision making under uncertainty.



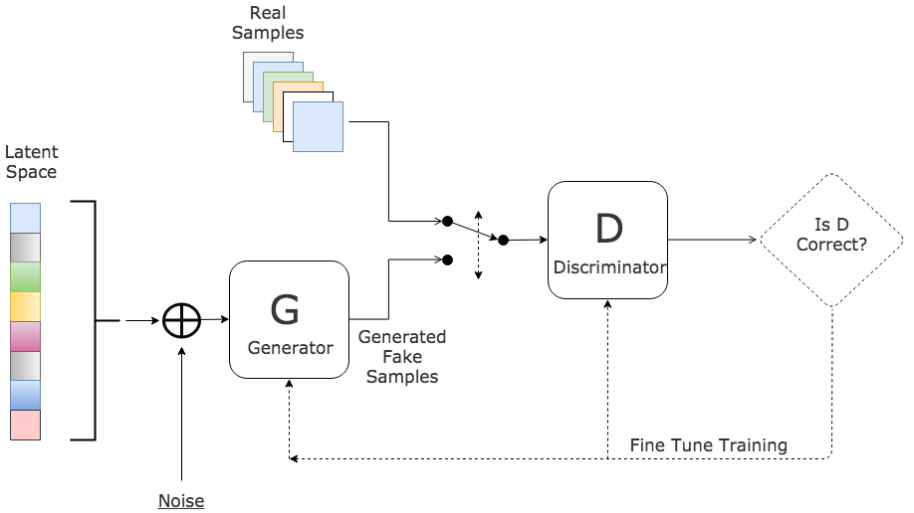
# Recommender systems

A field of Machine Learning that uses user behavior and demographic data and product data to find relevant items to users: movies to watch, songs to listen, products to buy, news to read...



# Generative Adversarial Networks (GAN)

Training is iterative. The generator generates samples and the discriminator learns to distinguish between real samples and "fake" samples. The generator is then trained using the classification results as the objective and new, improved, samples are generated.



# Privacy, transparency, accountability

## Privacy

ML often rely on large amounts of personal data. It is important to ensure that sensitive data is protected and used in a responsible and ethical manner.

## Transparency

Understand how models work and how they make predictions. Important for building trust with the users and audit the model.

The downside: Black box models usually perform better!

## Accountability

Someone has to be responsible when AI systems make the wrong decisions. Individuals, organizations, managers, developers...?

# Bias

A phenomenon that occurs when an algorithm produces results that are systemically prejudiced due to erroneous assumptions in the machine learning process, possibly because built-in prejudices in training data.

An example:

> *An algorithm used on more than 200 million people in US hospitals to predict which patients would likely need extra medical care heavily favored white patients over black patients.*
>
> *Race was not included in the model but another variable was: healthcare cost history. The rationale was that cost summarizes how many healthcare needs a particular person has.*
>
> *Black patients incurred lower health-care costs than white patients with the same conditions on average.*