# Deep learning : generative models

Zoltan Miklos

University of Rennes 1

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# Uses of deep learning

- classification or regression (detect objects, classify)
- Creative tasks : generating text, sequences or images
- Reactive : driving a car

# How computers dream ? : image generated by google

# Artificial intelligence and creativity

- Creativity is a fundamental human capacity
- Cognitive scientists are very far from understanding its nature
- A big challenge for AI

# Text generation with neural networks

- Train a neural network (typically an RNN, for example, LSTM) to prediction
- For example, it should predict the next letter or word : "The cat is chasing the mous[?]" (what is the next character ?)
- Your (trained) network is a language model that for a given text, gives a distribution of next letter/word.
- Sample from this distribution

# Sampling strategy

- Greedy sampling : chose the next object that has the highest probability in the distribution. Unfortunately this strategy results uninteresing outputs (there is no surprise, you often get repetitions).
- Stochastic sampling : Sample from the resulting distribution with some randomness (for example, if the letter $t$ has 0.23 probability to be the next letter, chose it with the probability 0.23)
- Stochastic sampling : you can control the randomness of the process : more randomness, less predictable next char, more surprise

# Generative Adversarial networks (GANs)

- Image generation
  - *Generator network : Generate an image from a latent space representation (not from the original !)*
  - Discriminator network (adversary) : Tries to predict if the image was generated or original (from the training set)
- GAN is a powerful concept, it could be used in a broad range of domains (other than realistic image generation). It is a hot topic of research.