

# Lecture 9: Deep Variational Inference

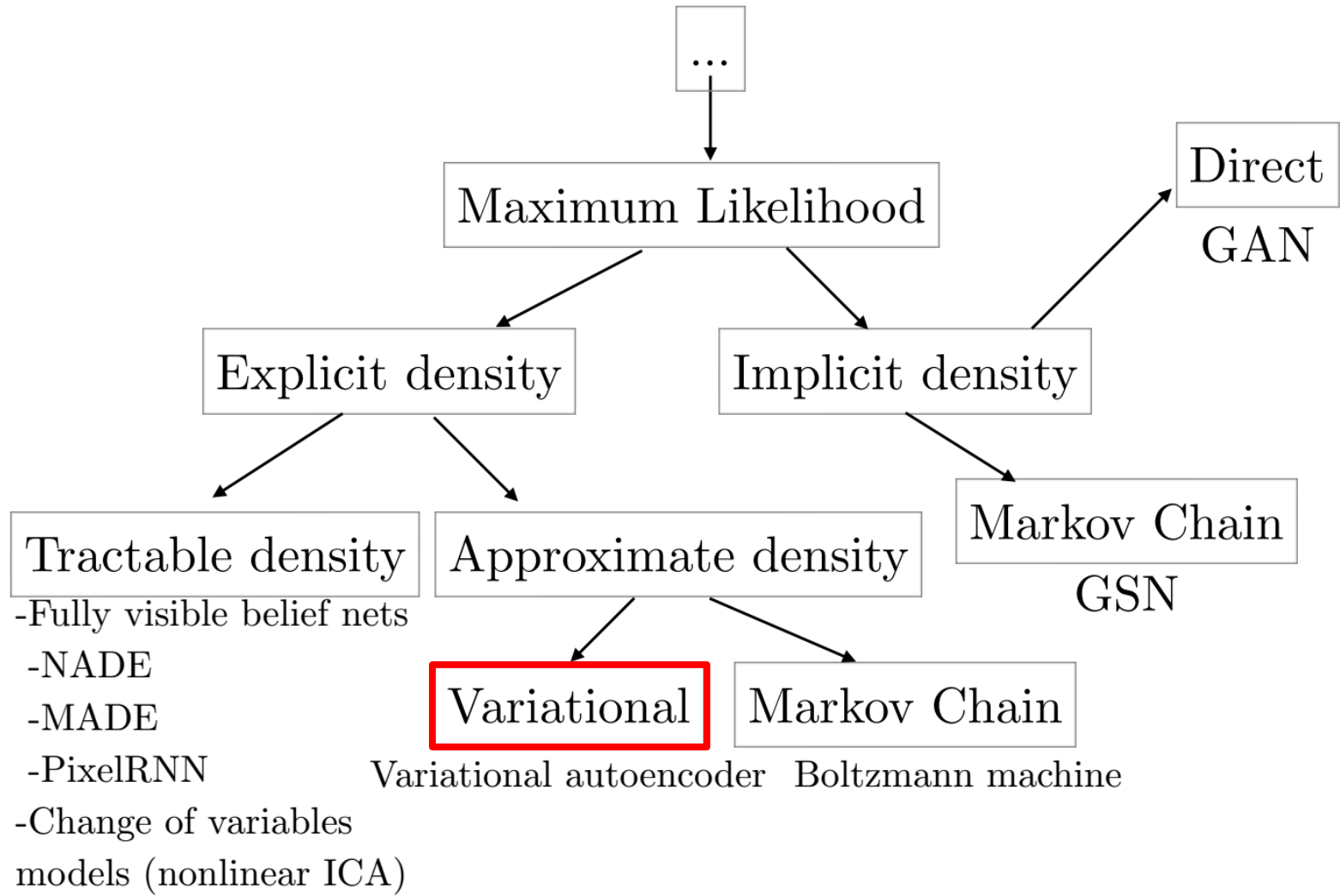
Efstratios Gavves

# Lecture overview

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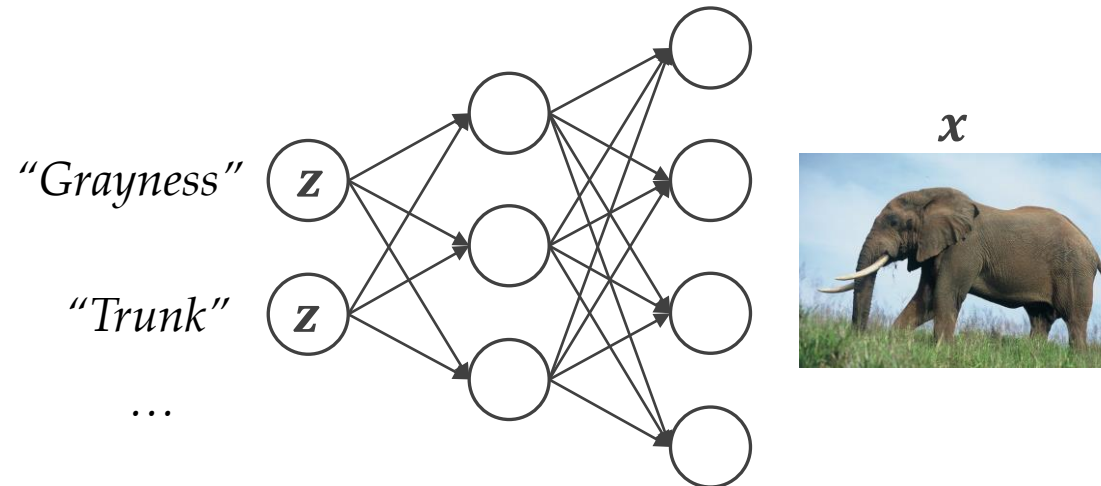
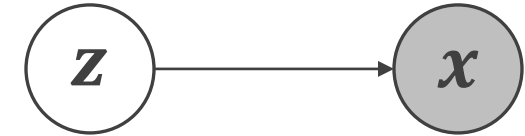
- Latent variable models
- Autoencoders
- Variational inference
- Variational autoencoders
- Reparameterization trick

# A map of generative models



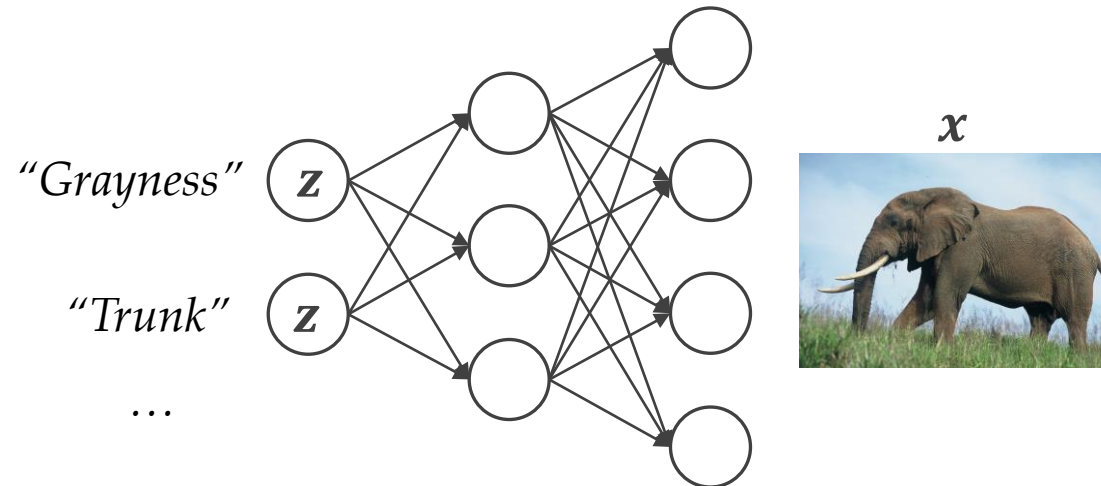
# Motivation behind latent variables

- Latent variables are high-level features
  - in combination they generate the data  $p(\mathbf{x}|\mathbf{z})$
- We want to model the inverse process
  - → Figure out what these latents are



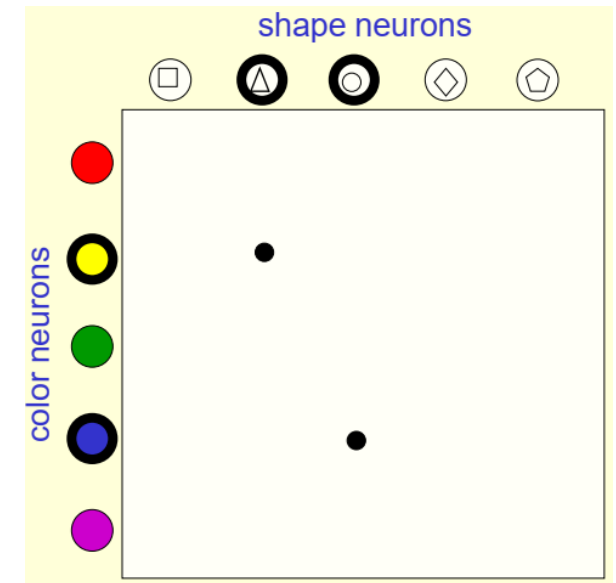
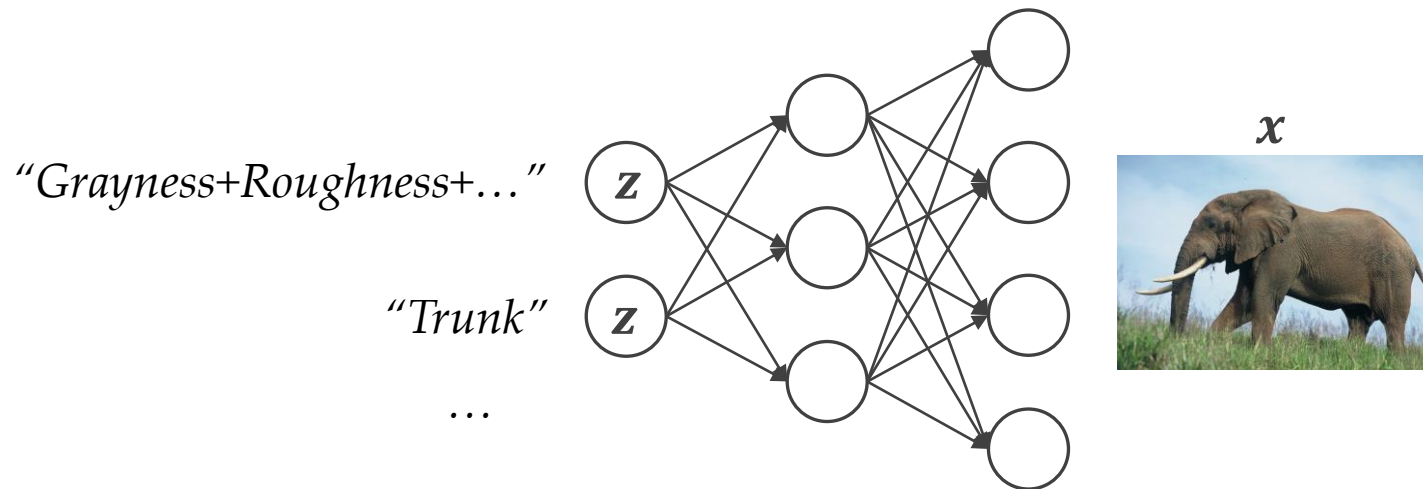
# Why bother?

- By making convenient choices for latents
  - We can model much more complex  $x$
- Without latents we can have exploding number of parameters
  - → intractability
  - Remember (regular) Boltzmann machines



# Distributed representations

- Distribute the ‘representation’ of our data over multiple neurons
- And each neuron models a distribution of concepts
- The latent layer learns to encode combinations of patterns for efficiency



Hinton, CSC321: 2011 Introduction to Neural Networks and Machine Learning