

# Lecture 10: Generative Adversarial Networks

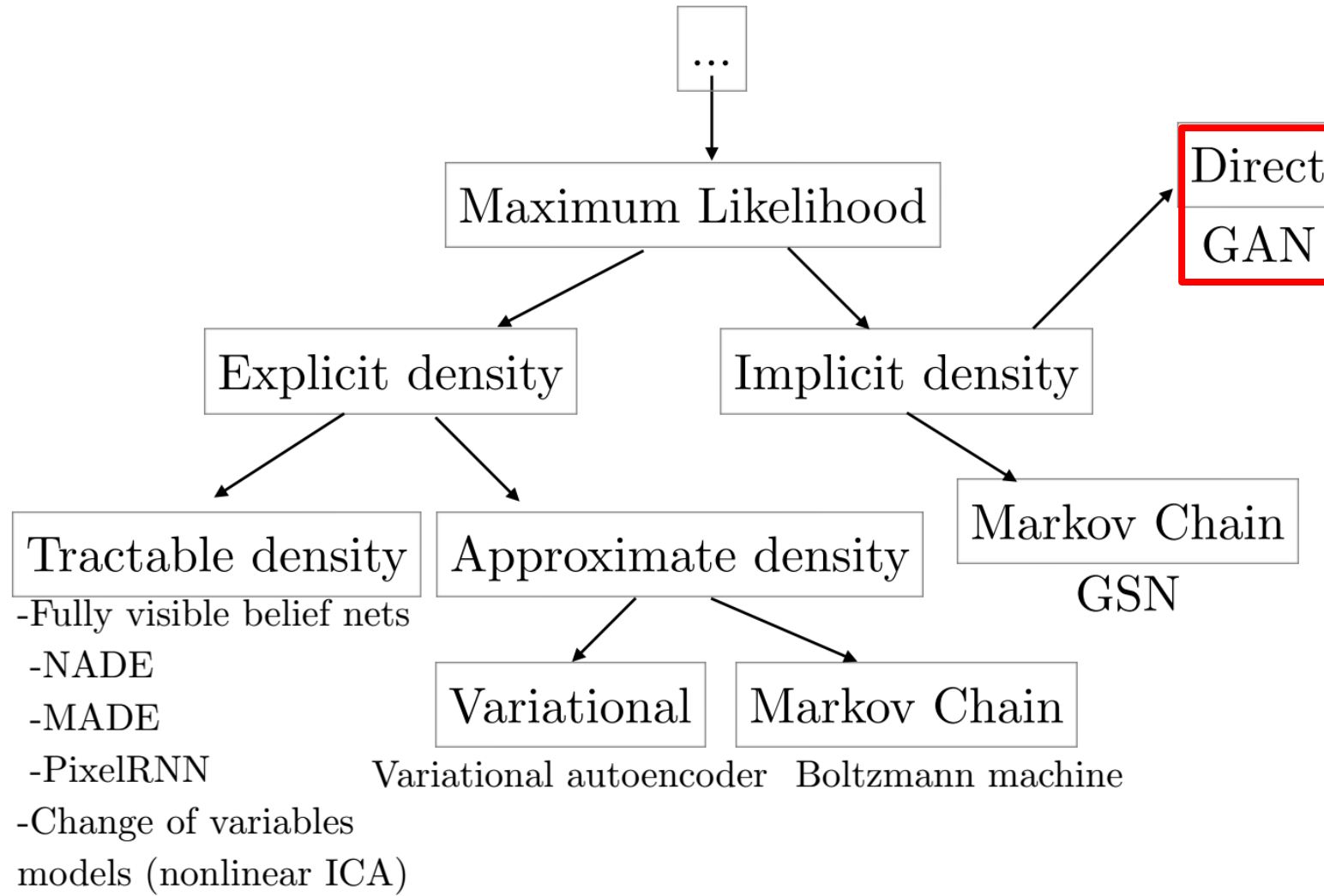
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# Lecture overview

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- Implicit density models: Motivation
- Generative adversarial networks
- Challenges
- GAN models

# A map of generative models



# Avoiding complex computations

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- In the generative models we have model explicitly our density functions
- Typically, the learning objective is intractable due to normalization constant
- Circumvent the problem with very intelligent approximations
  - Boltzmann machines via energy functions
  - Variational autoencoders via variational approximations
- What if skipped modelling the explicit density altogether?

# Learning an implicit density function

- We no longer try to directly optimize  $p(\mathbf{x})$  or  $p(\mathbf{x}, \mathbf{z})$
- Instead, learn evaluate directly if the generations are plausible
  - And return gradients when not
- What is a plausible generation?
  - Especially in an unsupervised setting with no guidance
- For generative adversarial networks plausible generation is one that cannot be easily recognized as such by a competing neural network



# Generations of high quality



[StyleGan](#)