

Deep Generative Models

A probabilistic view of how generative models represent distributions, learn from data, and produce samples.

COURSE CONTENT

Probabilistic foundations	Probability, information measures, Bayesian networks, maximum likelihood, and Monte Carlo estimation.
Autoregressive and latent models	Autoregressive factorization, variational inference, the ELBO, reparameterization, and variational autoencoders.
Normalizing flows	Change of variables, invertible transformations, coupling layers, and autoregressive flows.
Adversarial and energy models	GAN objectives, Wasserstein distance, energy-based learning, MCMC, and contrastive divergence.
Score and diffusion models	Score matching, Langevin dynamics, continuous and discrete diffusion, and conditional sampling.
Evaluation	Likelihood, sample quality and diversity, latent representations, and the limits of common metrics.
Extensions and connections	Hybrid model families, discrete latent variables, gradient estimators, and probabilistic reasoning.

LEARNING FOCUS

Derive learning objectives and sampling procedures, and compare the strengths and limitations of model families.

Lectures, paper presentations, and a project applying generative models to your research.