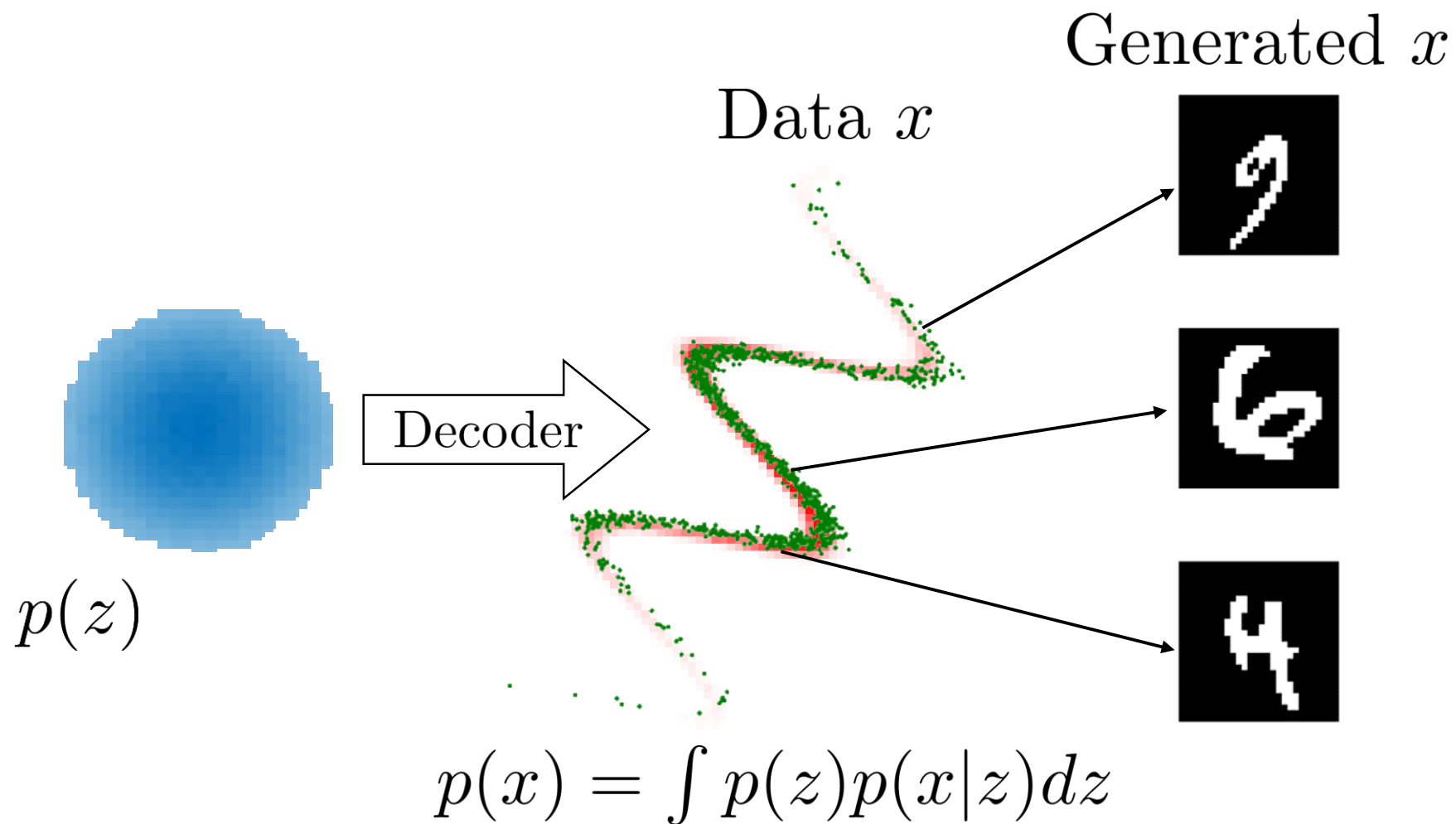


Measurements to Probabilistic Results: Conditional Variational Autoencoders

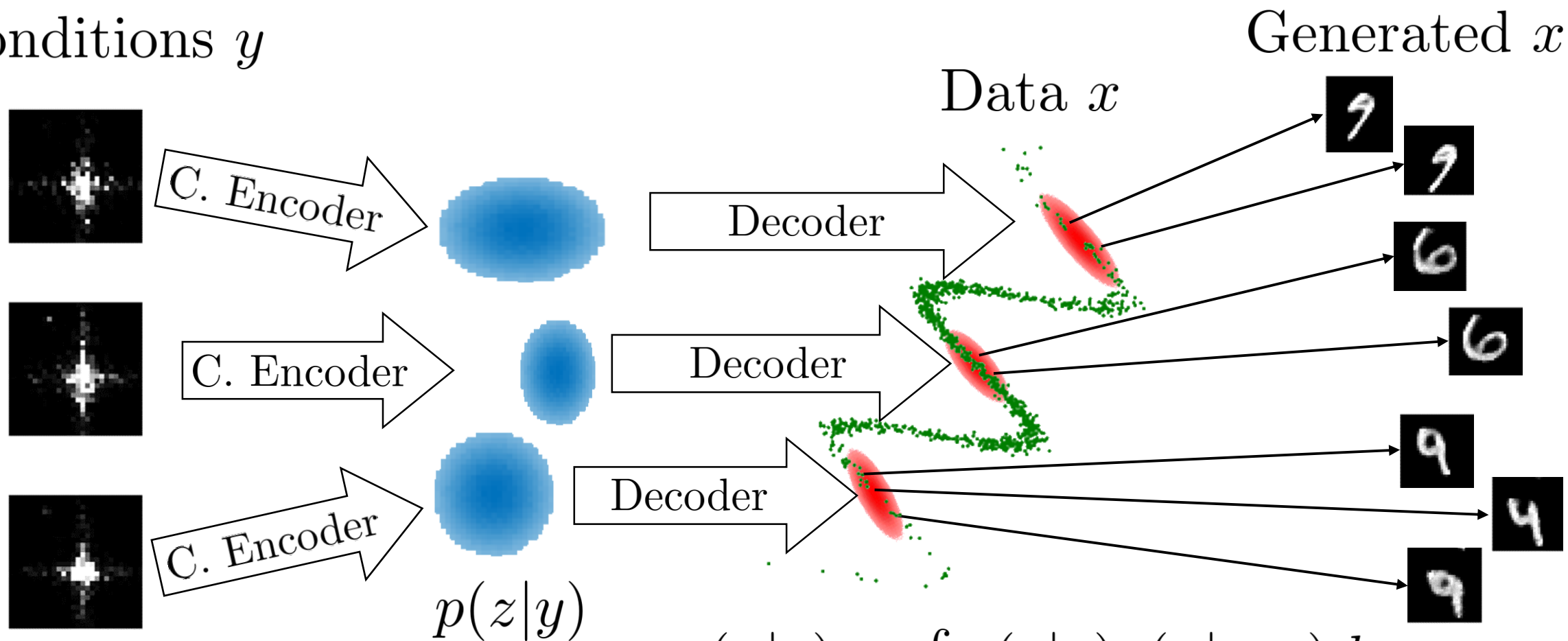
Francesco Tonolini

Conditional Variational Autoencoders



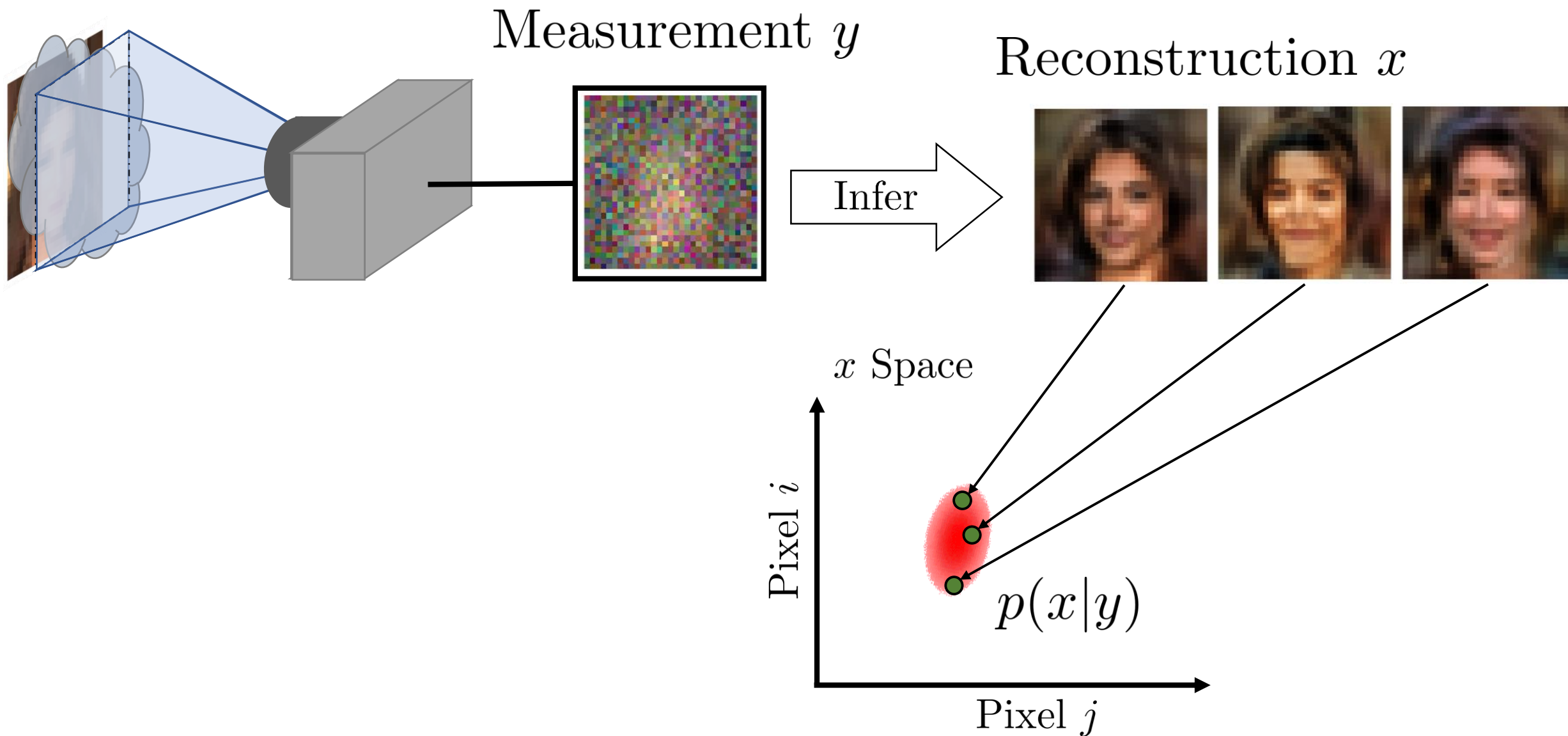
Conditional Variational Autoencoders

Conditions y



$$p(x|y) = \int p(z|y)p(x|z, y)dz$$

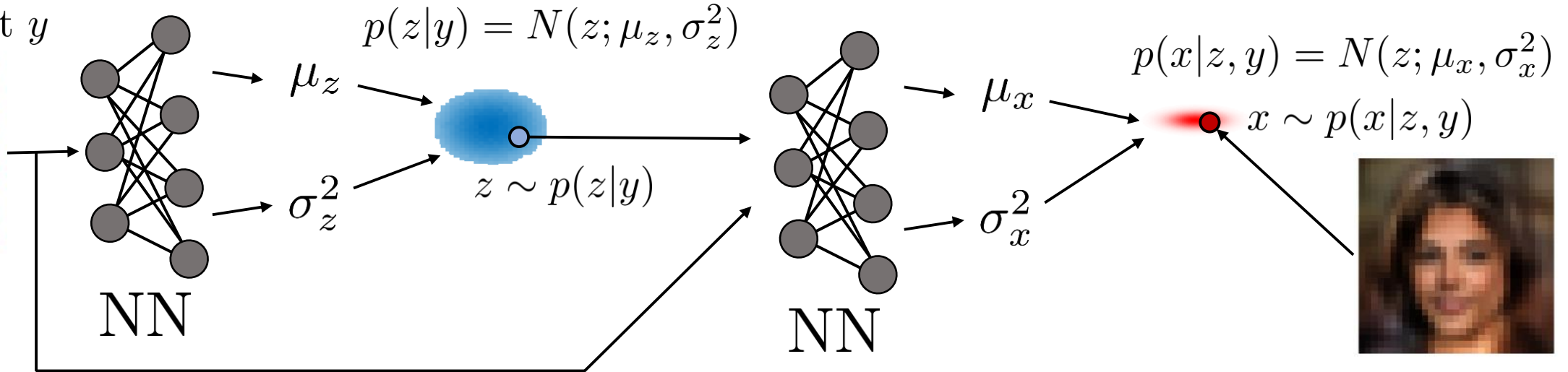
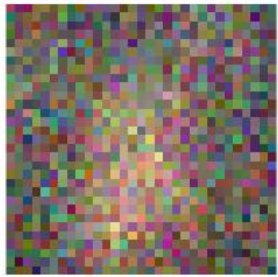
Why We Might Want $p(x|y)$



Structure of CVAEs

$$p(x|y) = \int p(z|y)p(x|z, y)dz$$

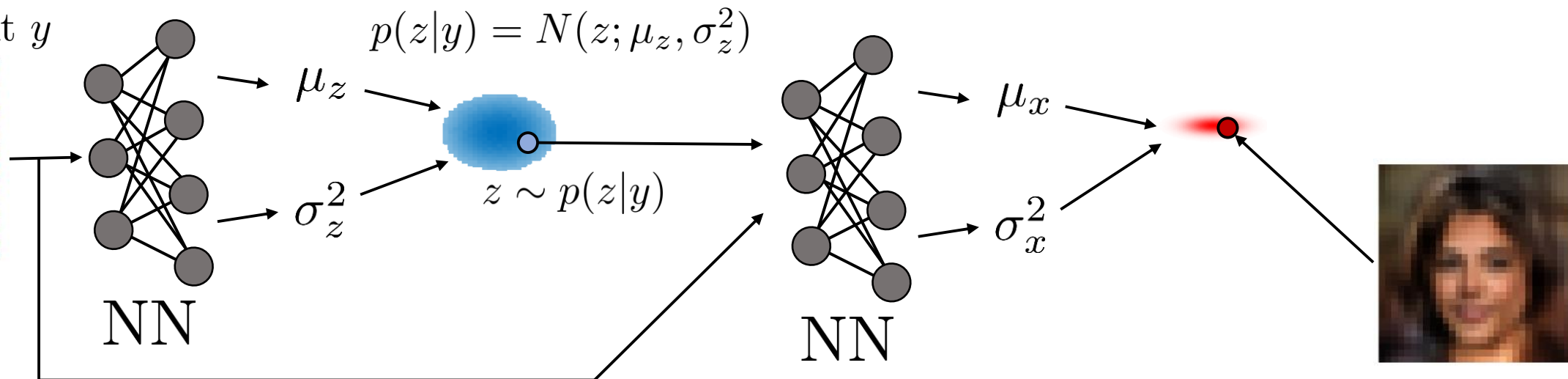
Measurement y



Structure of CVAEs

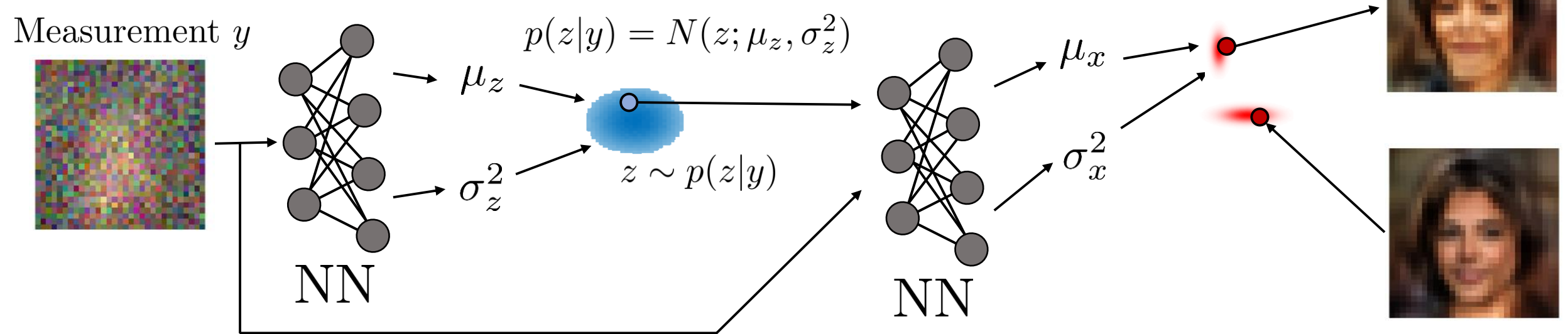
$$p(x|y) = \int p(z|y)p(x|z, y)dz$$

Measurement y



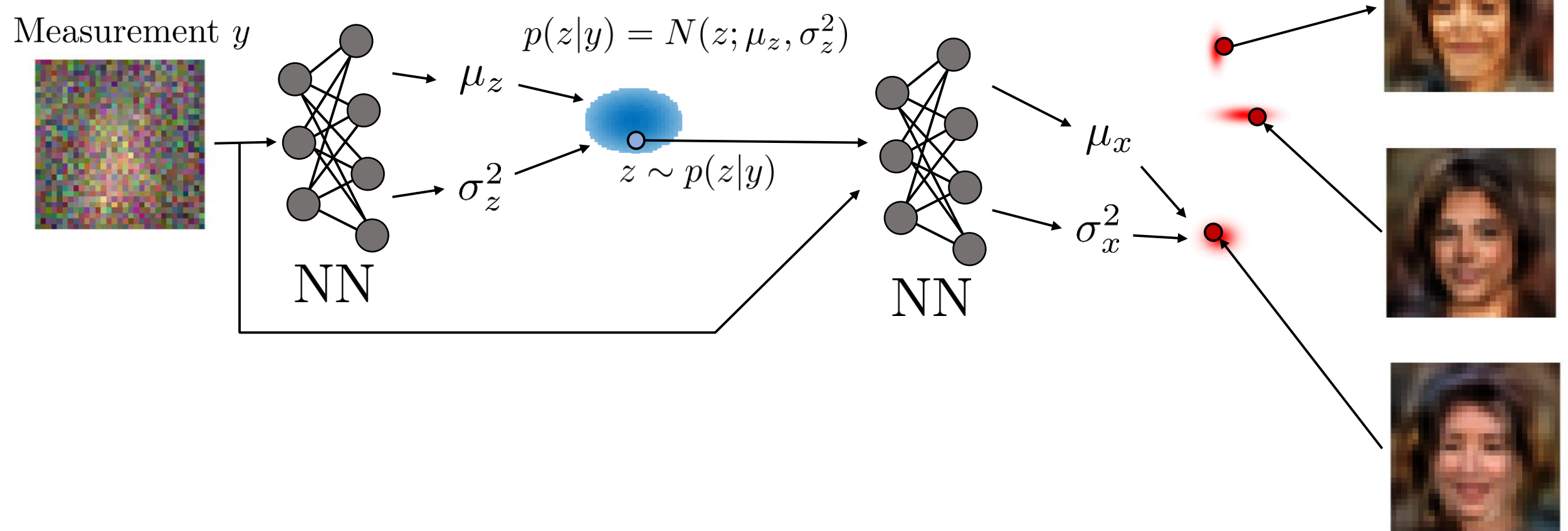
Structure of CVAEs

$$p(x|y) = \int p(z|y)p(x|z, y)dz$$

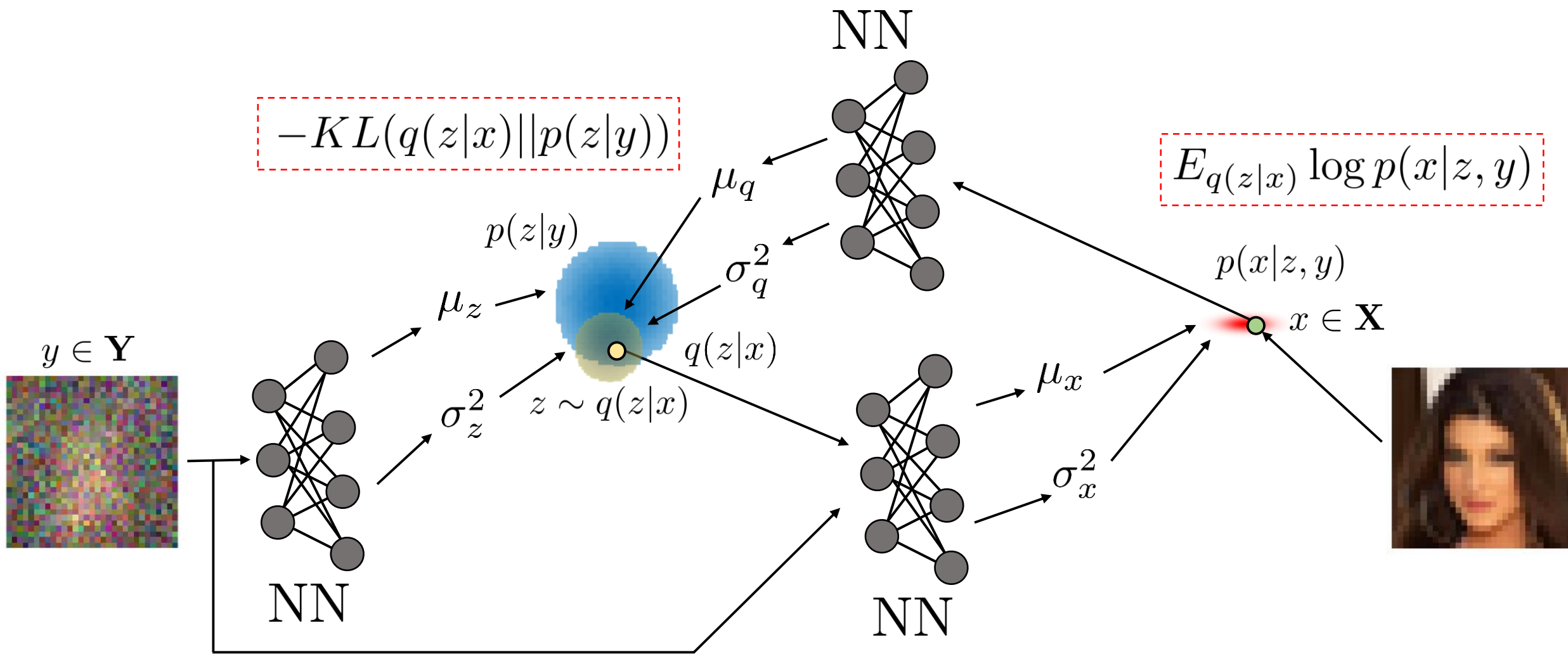


Structure of CVAEs

$$p(x|y) = \int p(z|y)p(x|z, y)dz$$

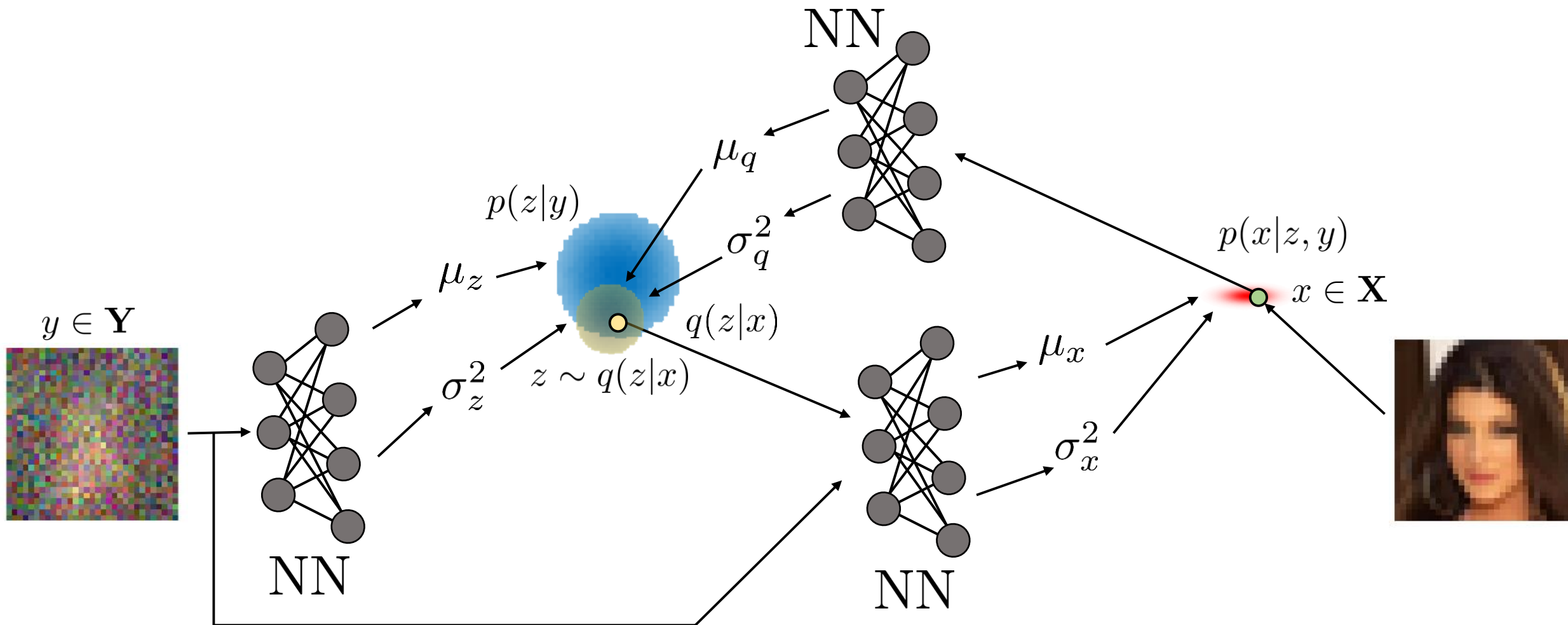


Training a CVAEs

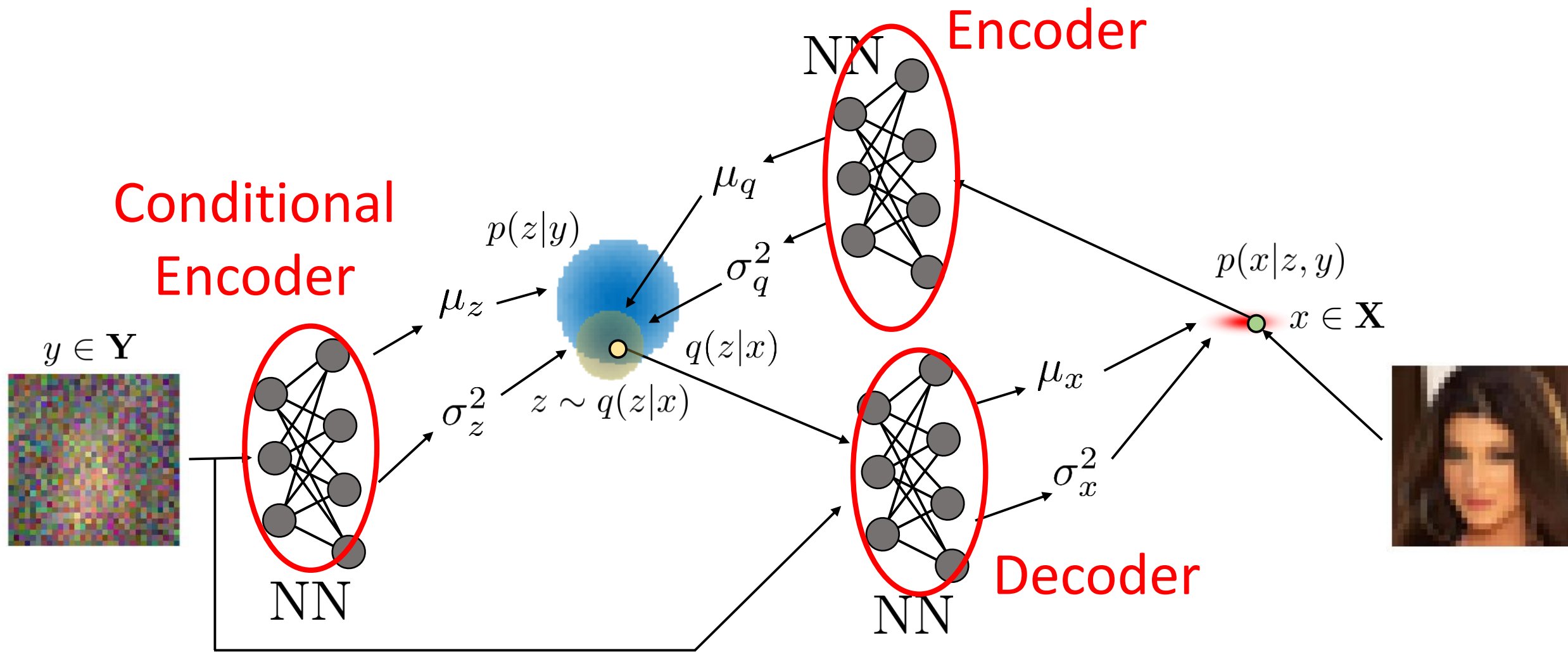


Training a CVAEs

$$\arg \max E_{q(z|x)} \log p(x|z, y) - KL(q(z|x) || p(z|y))$$

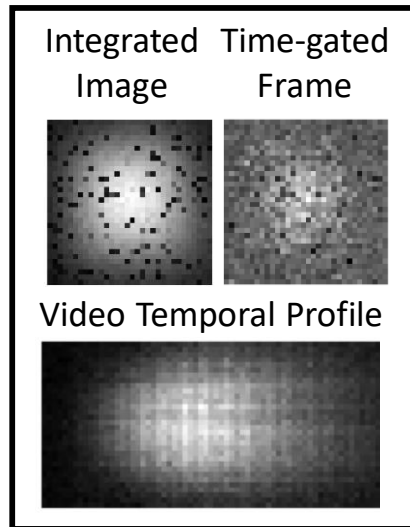


Training a CVAEs

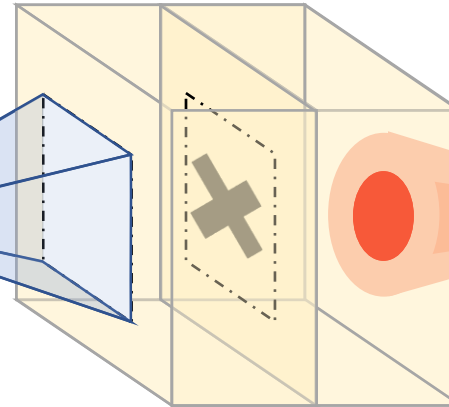


A Practical Example: Diffuse Imaging

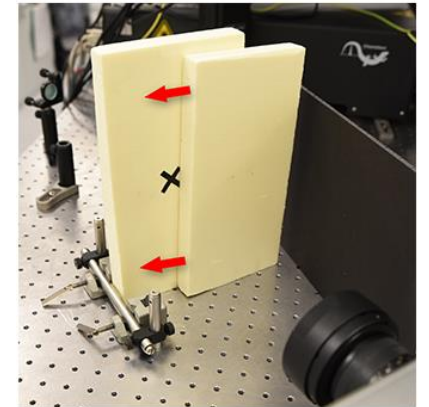
ToF Video



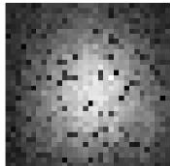
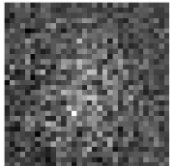
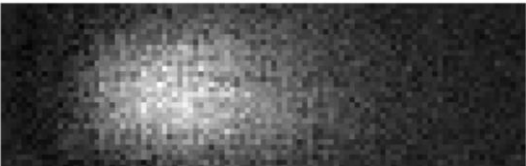

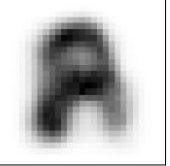
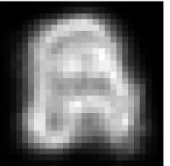
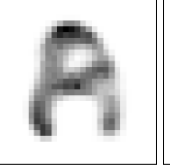
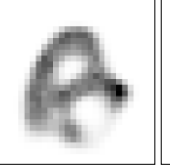
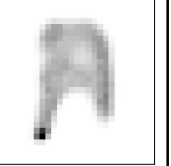
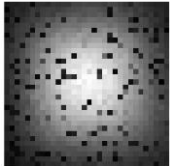
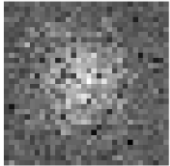
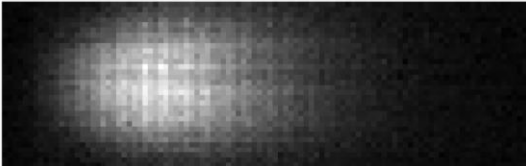
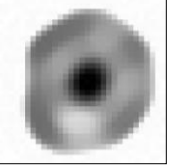
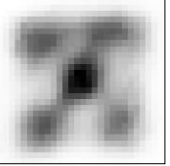
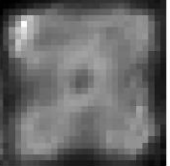
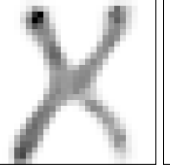

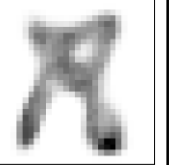
ToF Camera



Pulsed Laser
Illumination



A Practical Example: Diffuse Imaging

Signal	Observations			Previous	Proposed Variational Method				
Hidden Object	Integrated Image	Time-gated Frame	Video Temporal Profile	MAP with ℓ_1 +TV	Recovered Mean	Standard Deviation	Draws from the Approximate Posterior		
A									
X									
L	