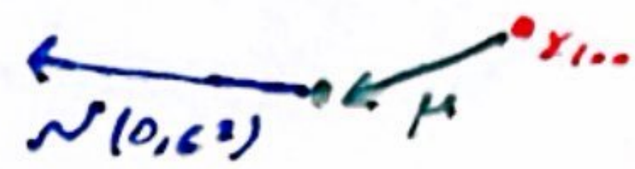
P-3 Vector Fields (gen AI models)

- in real life our points landing on the spiral would still mean a realistic img but less diverse and poor. But if the points are off the spiral distribution then its blurry and bad.

- But the point learns to point to the mean or avg of our dataset (hence why we add noise) conditioned on the input points and time t in our diffusion process. to prove this : the noise we add in our forward step is gaussian so for small step size in reverse process is also gaussian distribution where our model learns the mean of this distribution. since model predicts mean of Distribution to actually sample from this distribution we need to add zero mean gaussian noise to our predicted value which is what the DDPM does when we add random noise after each step and this prevents all our points from falling near the centre or avg of the dataset and instead fit the spiral distribution.

$P(x_{100} | x_{99}) = \mathcal{N}(0, \sigma^2)$



$P(x_{99} | x_{100}) = \mathcal{N}(\mu, \sigma^2)$

DDIM (I = implicit)

- Few months after DDPM Stanford / Google showed that its possible to generate high quality images without actually adding random noises during generation process significantly reducing number of steps.

- this is Deterministic and not probabilistic. - Does not change training process

- Wan 2.1 uses DDIM and also a version of DDIM called Flow matching

- in short DDIM using a different sampling equation that skips some steps like $x_{100} \rightarrow x_{90} \rightarrow x_{80}$ for ex this removes the randomness and makes the process more direct.