



# Can We Train Dogs and Humans At The Same Time?

## GANs and Hidden Distributions

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### Research Question

Can an InfoGAN generate from a hidden distribution of a sparsely populated dataset?

### Observations: Faces

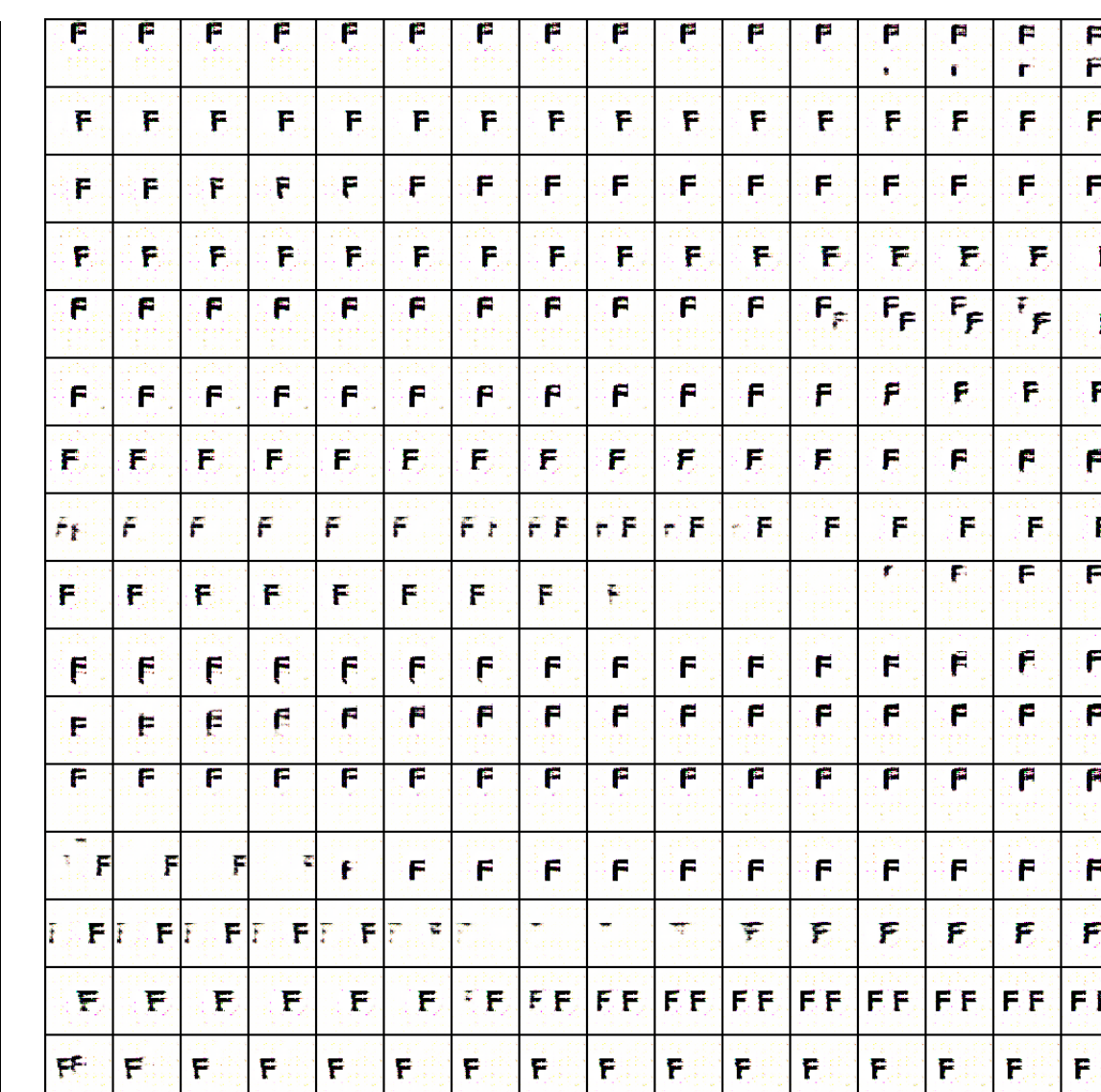
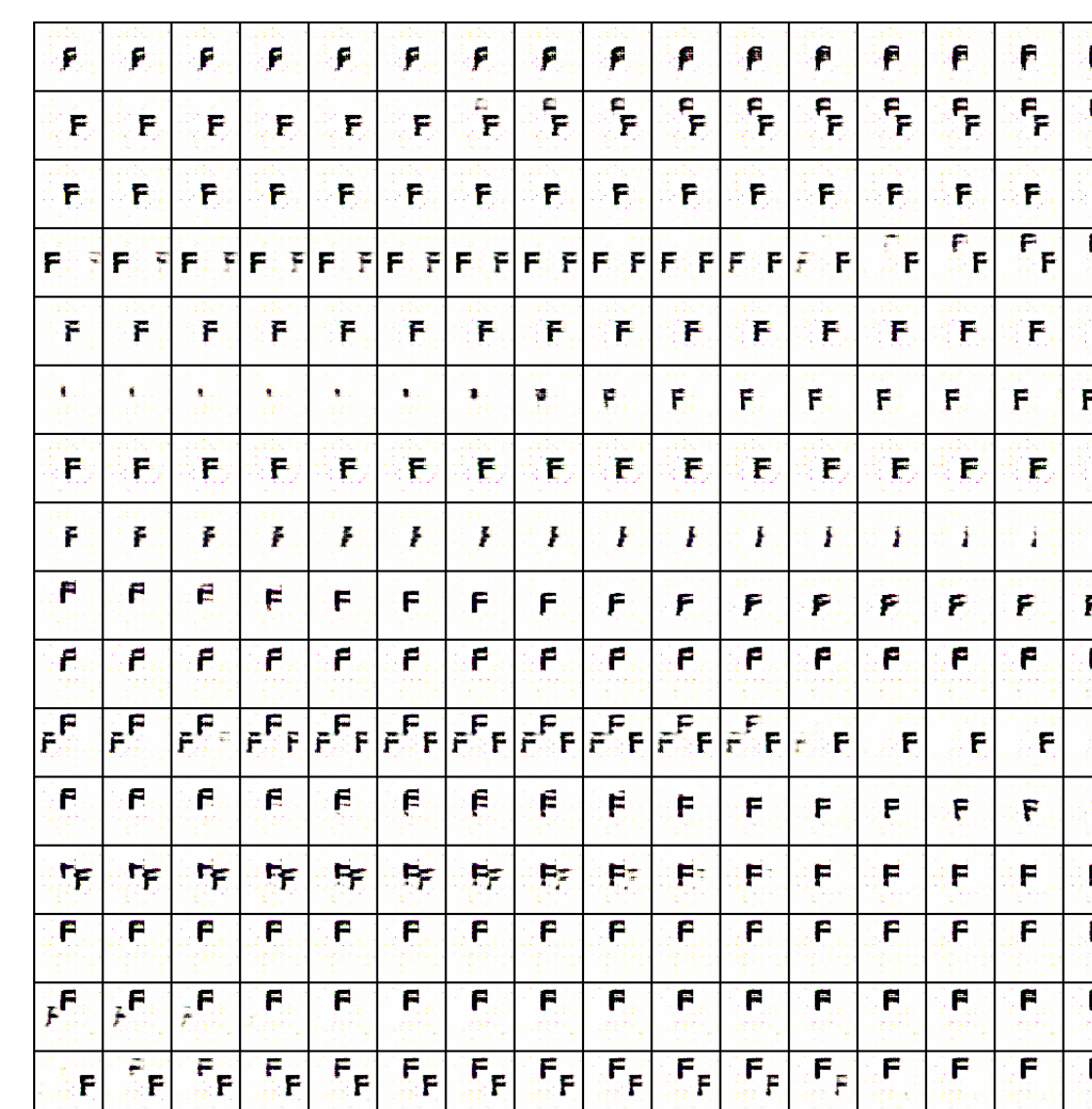
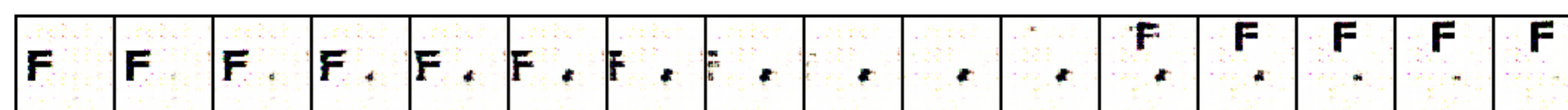
- Generalizes, but does not preserve facial features between humans and dogs
- Produces target input images imperfectly when back-solving
- Latent variable varies details, noise varies large-scale

### Methodology

- Re-wrote PyTorch version of InfoGAN [1]
- Vertical and horizontal translations of F
- Mixture drawn from two dog faces (created using Stanford Dogs dataset) and human faces (CelebA)

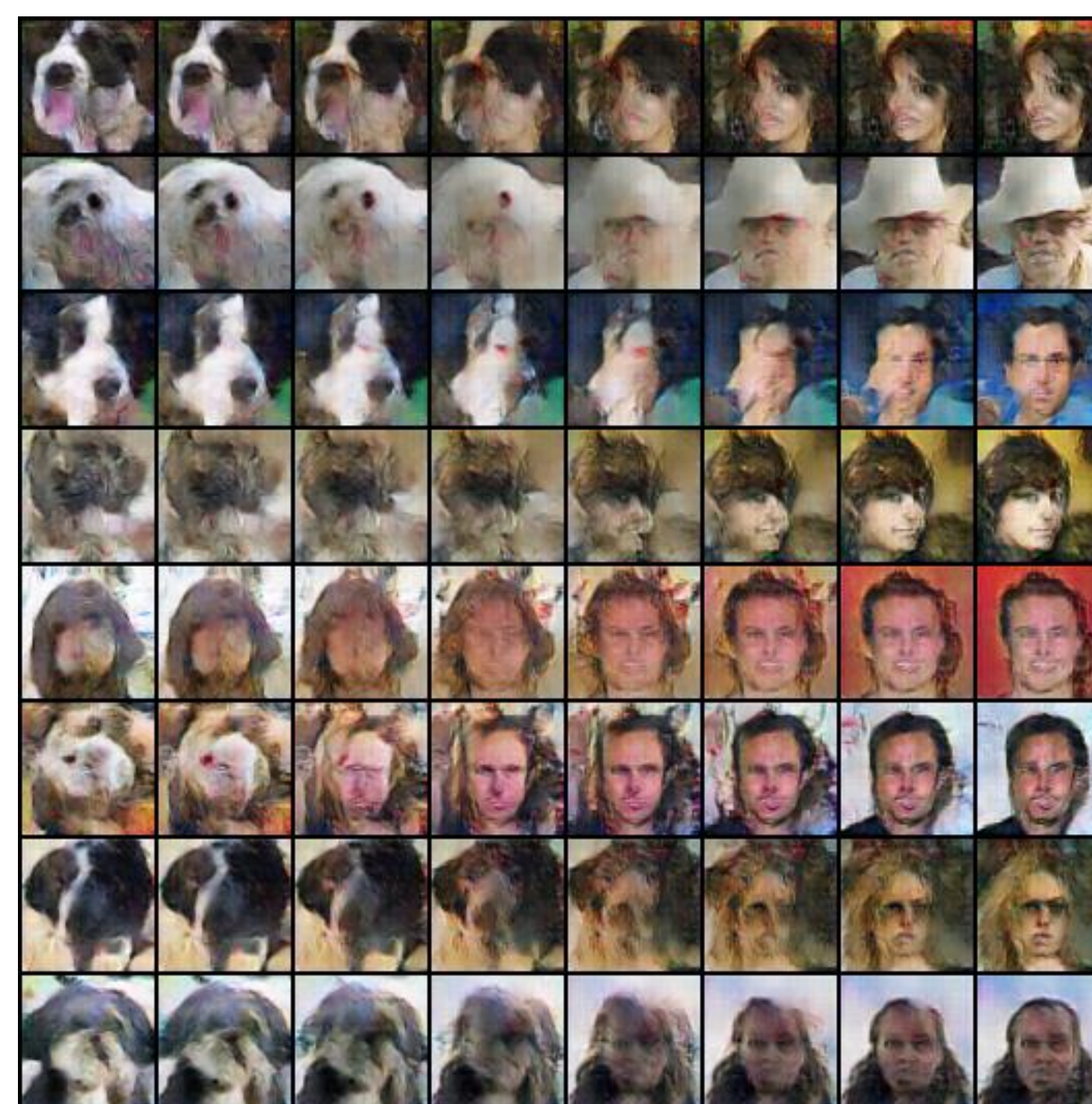
### Observations: Simple Translations

- Prefer memorizing rather than actual translation
- Generator treats latent variable and noise parameters no differently
- Unable to generate diagonal target diagonal F within input space bounds for latent variable, or without overtraining



Latent Variable Interpolation

Noise Interpolation



### Conclusion

Does not extrapolate between mixed distributions

### Implications

- InfoGAN disentangles representations, but there are limits to disentanglement
- Sparse datasets with biased gathering that do not represent some parts of the population cannot be re-created through InfoGAN
- How 'creative' are GANs, in the human sense, if they mix distributions without extrapolation, and generally do not 'imagine' something from hidden distributions?

[1] Xi Chen et al. "InfoGAN: Interpretable Representation Learning by Information Maximizing Generative Adversarial Nets." arXiv:1606.03657 [cs.LG]