# Bayesian compressive principal component analysis

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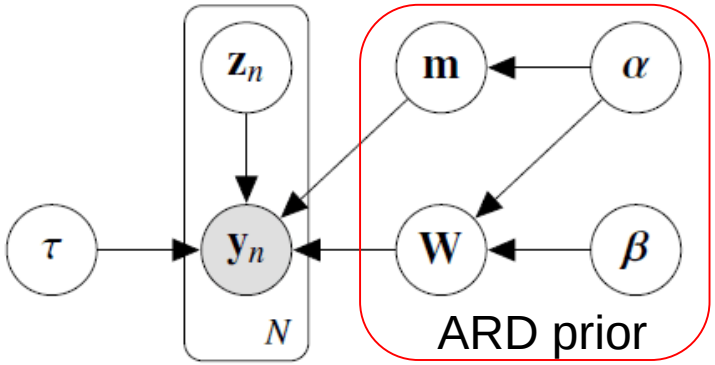
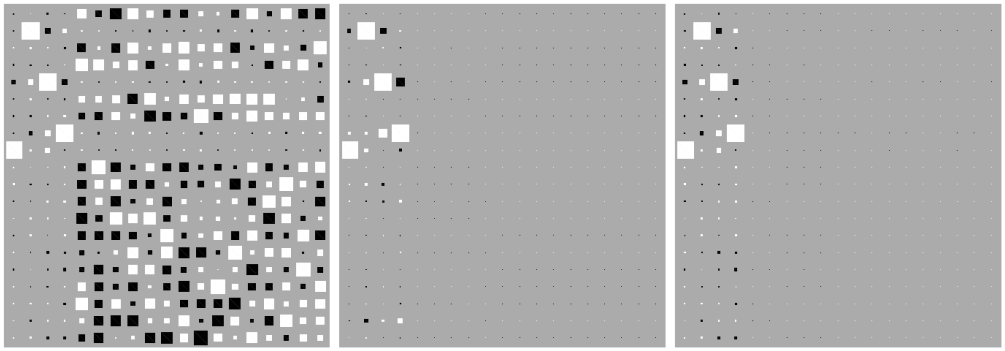
# Problems & Ideas

- Problems of principal component analysis on compressed sensing measurements
  - Most existing methods suffer from storage burden due to multiple measurement matrices.
  - Pre-specified dimensionality of latent space leads to less compact data representation or poorer data reconstruction quality.
- Ideas: Exploit the structure information of the original data
  - Using only a single measurement matrix to reduce the storage burden.
  - Utilizing the ARD prior to impose the sparsity of the original data in both latent space and feature space.



# Main Contributions

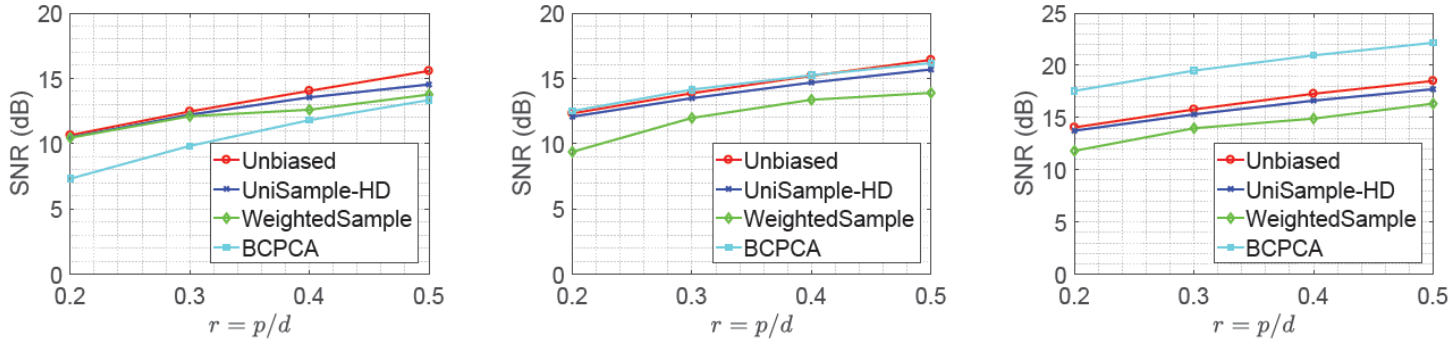
- **Our method can model the structure of the original data.**



(a) PPCA (b) BPCA (c) BCPCA

**Fig. 3**: Hinton diagrams of projection matrix $\mathbf{W}$ for PPCA and BPCA on original data set and BCPCA on compressed data set. The corresponding reconstruction error in terms of NMSE using the first 4 projection vectors are 0.0294, 0.0295 and 0.0815 respectively. The subspace angles between the first 4 projection vectors of BCPCA and PPCA, BPCA are both $\theta = 0.0905$ (in radians).

- **Our method achieves better performance on high-dimensional small sample size problem (Umist Face dataset).**




(a) MNIST (b) extended YaleB (c) Umist Face

**Fig. 5**: Plots of the average SNR of the reconstructed images.