Supplementary Material to Whitening-Free Least-Squares Non-Gaussian Component Analysis

Detail of Artificial Datasets

Here, we describe the detail of the artificial datasets used in Section 4.2. The noise components $\boldsymbol{n}$ are generated as follows:

1. The $\boldsymbol{n}$ is sampled from the centered Gaussian distribution with covariance matrix $\mathrm{diag}(10^{-2r}, 10^{-2r+4r/7}, 10^{-2r+8r/7}, \ldots, 10^{2r})$, where $\mathrm{diag}(\cdot)$ denotes the diagonal matrix.

2. The sampled $\boldsymbol{n}$ is rotated as $\boldsymbol{n}'' \in \mathbb{R}^8$by applying the following rotation matrix $\boldsymbol{R}^{(i,j)}$ for all $i, j = 3, \ldots, 10$ such that $i < j$:

$$
\begin{aligned}
R^{(i,j)}_{i,i} &= \cos(\pi/4), \quad R^{(i,j)}_{i,j} = -\sin(\pi/4), \\
R^{(i,j)}_{j,i} &= \sin(\pi/4), \quad R^{(i,j)}_{j,j} = \cos(\pi/4), \\
R^{(i,j)}_{k,k} &= 1 \ (k \neq i, k \neq j), \quad R^{(i,j)}_{k,l} = 0 \ (\text{otherwise}).
\end{aligned}
$$

3. The rotated $\boldsymbol{n}$ is normalized for each dimension.

By this construction, increasing r corresponds to increasing the *condition number* of the data covariance matrix (see Figure 4). Thus, the larger r is, the more ill-posed the data covariance matrix is.

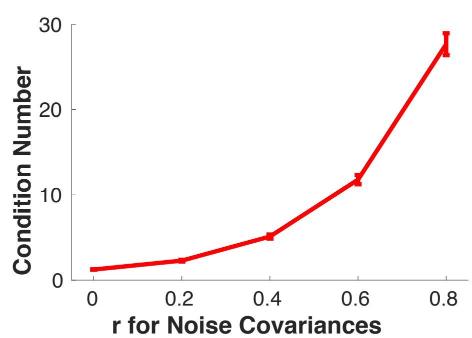

Figure 4: Condition number of the data covariance matrix as a function of experiment parameter r (with non-Gaussian components generated from the Gaussian mixture).