Algorithm 1: Mean Embedding Test

Result: The test-statistic, $nW_n\Sigma_n^{-1}W_n$, and associated p-value

x $\leftarrow \mathbf{X} \in \mathbb{R}^{n\times m}$; y $\leftarrow \mathbf{Y} \in \mathbb{R}^{n\times m}$;

freq$\leftarrow r \in \mathbb{R}$; dim$\leftarrow m$;

points$\leftarrow \mathbf{Z} \in \mathbb{R}^{r\times m}$ where $\mathbf{Z}_{ij}$ are sampled from a normal distribution;

a$\leftarrow$ zeros $\in \mathbb{R}^{r\times n}$;

for $j = 1 : r$ **do**

  zx$\leftarrow \exp\left(\frac{\|x-points[j]\|_2^2}{2}\right) \in \mathbb{R}^n$;

  zy$\leftarrow \exp\left(\frac{\|y-points[j]\|_2^2}{2}\right) \in \mathbb{R}^n$;

  dist$\leftarrow$ zx $-$ zy $\in \mathbb{R}^n$, the distance in mean embeddings;

  a$[j] \leftarrow$ dist;

end

obs $\leftarrow$ a^T; sigma $\leftarrow \frac{1}{n}\cdot$ aa$^T \in \mathbb{R}^{r\times r}$, the covariance matrix, Σ_n;

mu $\leftarrow \frac{1}{n}\cdot\sum_i^n$ obs$[i] \in \mathbb{R}^r, W_n$;

stat $\leftarrow nW_n\Sigma_n^{-1}W_n$, the desired test-statistic;