

$$P = \begin{bmatrix} \varphi(|\chi(t_1) - \mathbf{c}_1|) & \dots & \varphi(|\chi(t_1) - \mathbf{c}_M|) \\ & \vdots & \\ \varphi(|\chi(t_N) - \mathbf{c}_1|) & \dots & \varphi(|\chi(t_N) - \mathbf{c}_M|) \end{bmatrix}$$

$$w_k = (b_1, \dots, b_M)^{\text{T}},$$

$$\mathbf{c}_i = \chi(ci \mod N), \quad c \in \mathbb{Z},$$

$$y_k = (\chi_k(t_1 + p), \dots, \chi_k(t_N + p))^{\text{T}}$$

$$Pw_k = y_k$$