

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

$$Q = \begin{bmatrix} \ddot{\varphi}(|\chi(t_1) - \mathbf{c}_1|) + (d-1) \frac{\dot{\varphi}(|\chi(t_1) - \mathbf{c}_1|)}{|\chi(t_1) - \mathbf{c}_1|} & \dots & \ddot{\varphi}(|\chi(t_1) - \mathbf{c}_{m_b}|) + (d-1) \frac{\dot{\varphi}(|\chi(t_1) - \mathbf{c}_{m_b}|)}{|\chi(t_1) - \mathbf{c}_{m_b}|} \\ & \ddots & \\ \ddot{\varphi}(|\chi(t_N) - \mathbf{c}_1|) + (d-1) \frac{\dot{\varphi}(|\chi(t_N) - \mathbf{c}_1|)}{|\chi(t_N) - \mathbf{c}_1|} & \dots & \ddot{\varphi}(|\chi(t_N) - \mathbf{c}_{m_b}|) + (d-1) \frac{\dot{\varphi}(|\chi(t_N) - \mathbf{c}_{m_b}|)}{|\chi(t_N) - \mathbf{c}_{m_b}|} \end{bmatrix}$$

$$w_k = (a_0, a_1, \dots, a_{m_a}, b_1, \dots, b_{m_b})^T,$$

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

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

$$\left(P^T P + \frac{\mu}{N} Q^T Q\right) w_k = P^T y_k$$