Singular spectrum analysis demo

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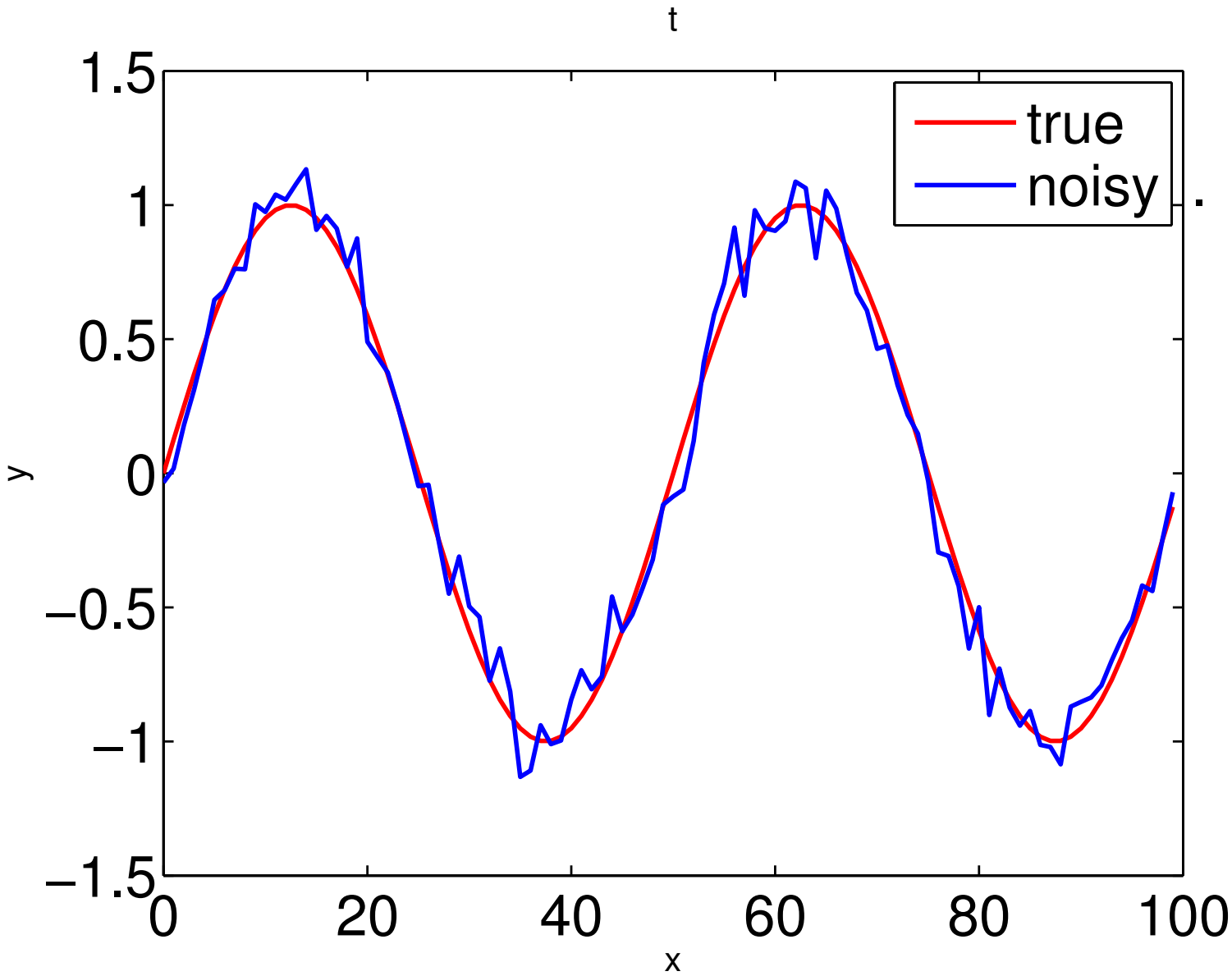
Data generation

```
T = 100; t = (0:T - 1)';
Y = [sin(4 * pi * t / T) randn(T, 1)];
y = Y * [1; 0.1]; y0 = Y * [1; 0];
```

- sine function + zero mean white Gaussian noise

True and noisy signals



Singular spectrum analysis

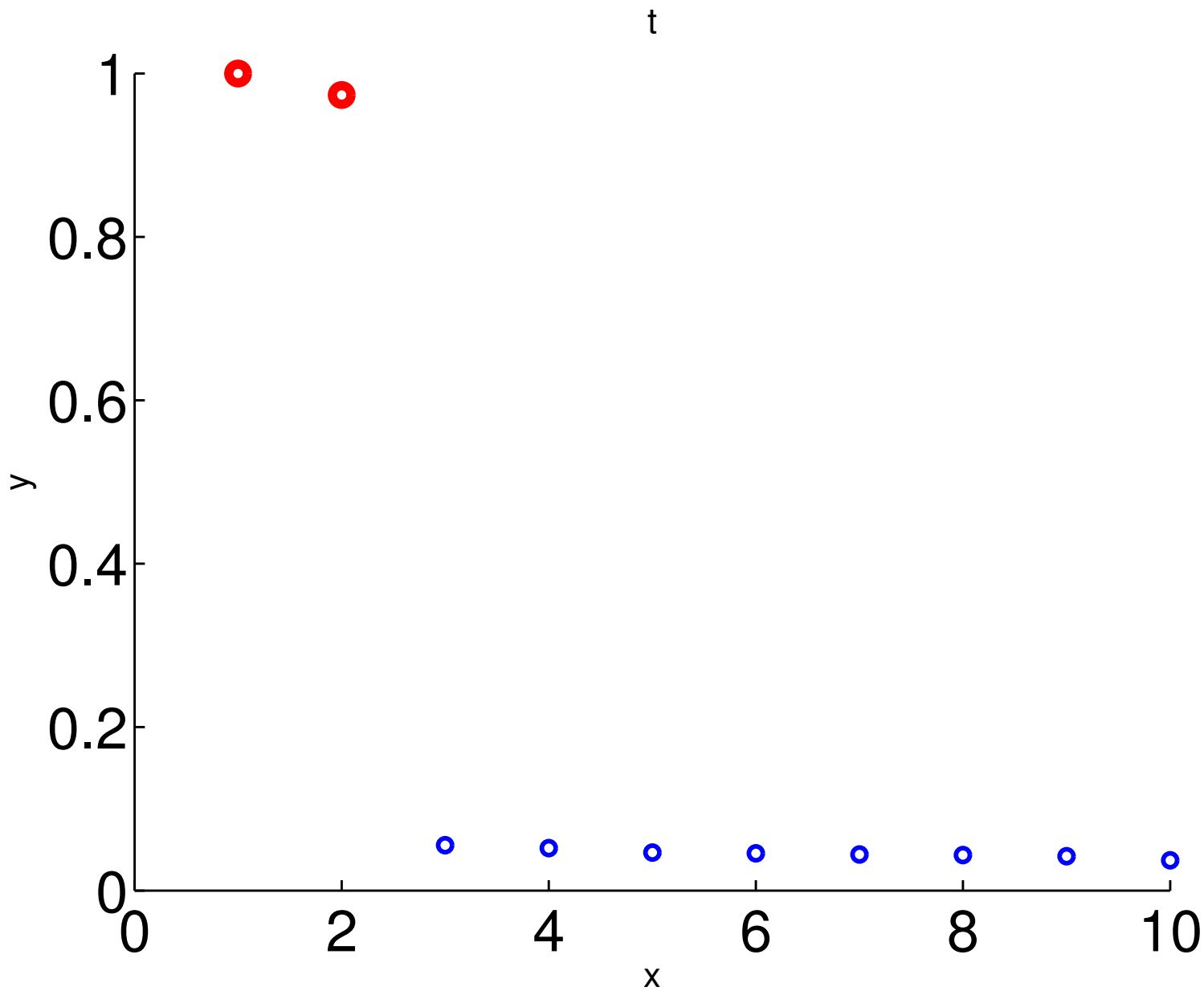
```
L = T / 2 + 1; H = blkhank(y, L);
[u, s, v] = svd(H);
```

- `blkhank(y,L)` $= \begin{bmatrix} y(1) & y(2) & \cdots & y(T-L+1) \\ y(2) & y(3) & \cdots & y(T-L+2) \\ \vdots & \vdots & & \vdots \\ y(L) & y(L+1) & \cdots & y(T) \end{bmatrix}$
- `svd(H)` — singular value decomposition

$$H = U\,\mathrm{diag}(\sigma_1, \ldots, \sigma_r)\,V^\top, \quad \text{where}$$

  - $\sigma_1 \geq \sigma_1 \geq \cdots \geq \sigma_r$ — (nonzero) singular values
  - $U = \begin{bmatrix} u_1 & \cdots & u_r \end{bmatrix}$, $U^\top U = I$ — left singular vectors
  - $V = \begin{bmatrix} v_1 & \cdots & v_r \end{bmatrix}$, $V^\top V = I$ — right singular vectors

Plot of the right singular values



Plot of the right singular vectors