Identifying Dendritic Processing
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Problem Setting

[Filter]-[Ideal IAF] Neural Circuit

Kernel and Its Projection

Kernel Recovery
SIMO TEM Interpretation of the Identification Problem & the Neuron Identification Machine

\[ (\mathcal{P} h)(t) = \sum_{j=1}^{N} \sum_{k \in \mathbb{Z}} c_k^j \psi_k^j(t). \]

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Identifying the [Filter]-[Ideal IAF] Neural Circuit

Input Stimulus Bandwidth $\Omega = 2\pi \cdot 25 \text{ rad/s}$

(a) Input signal $u(t)$
(b) Output of the [Filter]-[Ideal IAF] neural circuit
(c) Original filter vs. the identified filter

(d) Periodogram Power Spectrum Estimate of $u(t)$
(e) Periodogram Power Spectrum Estimate of $h(t)$
(f) Periodogram Power Spectrum Estimate of $v(t)$

$\text{supp}(\mathcal{F} u) = [-\Omega, \Omega]$
$\text{supp}(\mathcal{F} h) \supset [-\Omega, \Omega]$
$\text{supp}(\mathcal{F} v) = [-\Omega, \Omega]$

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The Filter Identification Error
Versus the Number of Temporal Windows and Input Signal Bandwidth

(a) $\text{MSE}(\hat{h}, \mathcal{P}h)$ vs. the number of temporal windows

(b) $\text{MSE}(\hat{h}, h)$ vs. the input signal bandwidth

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