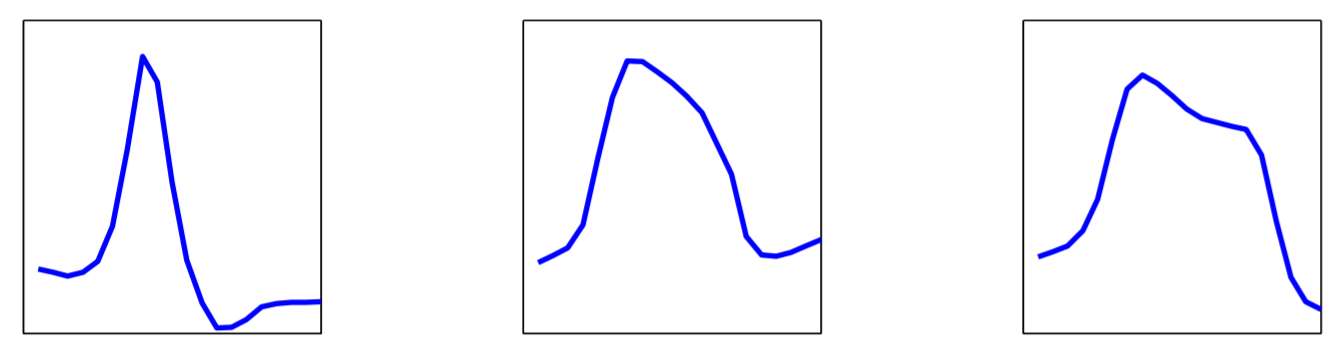


Acoustic Identification of Cardiomyocytes

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Problem description

- three types with unique acoustic signatures



atrial nodal ventricular

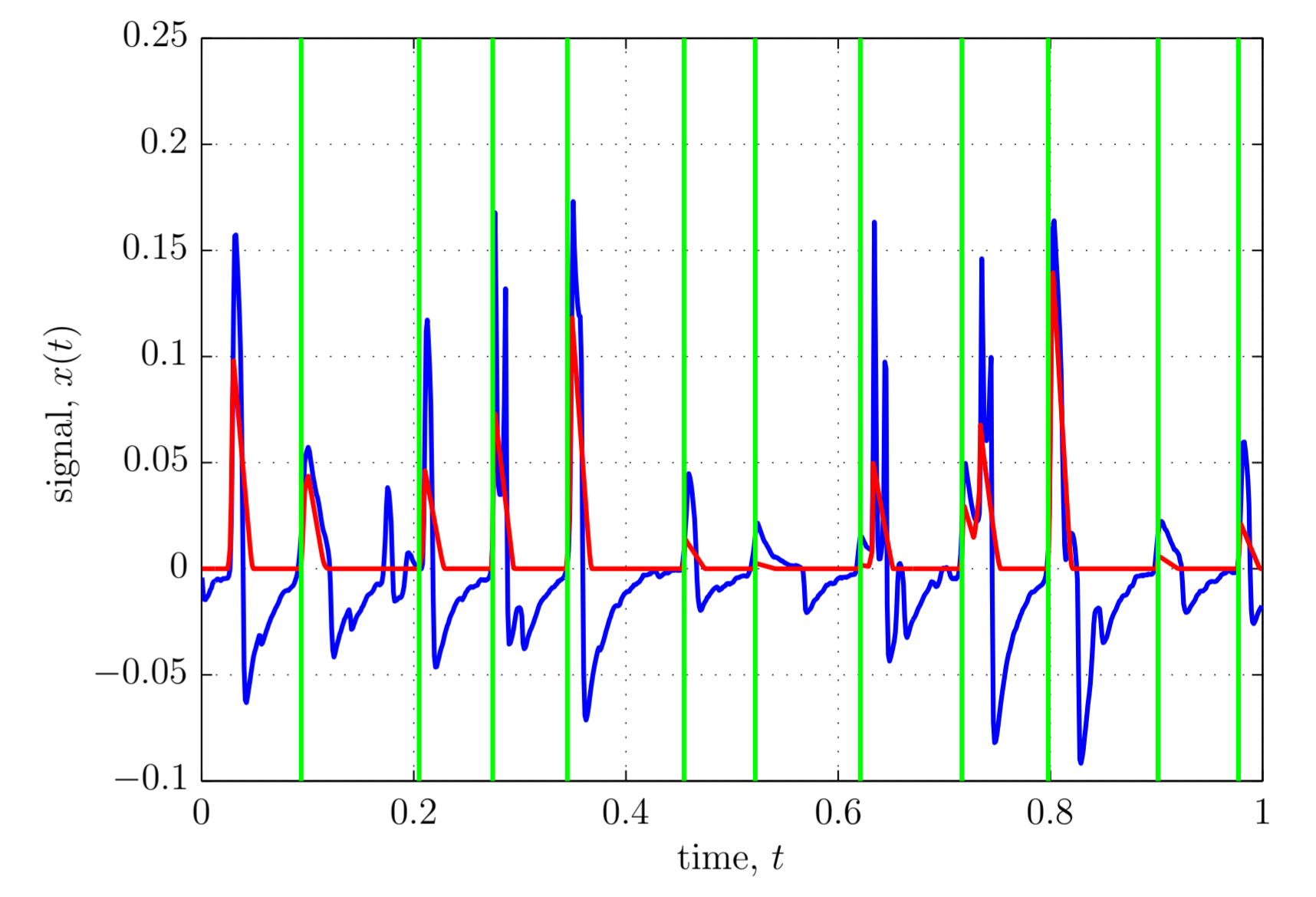
- noninvasive identification for stem-cell therapy

Preprocessing

- 5x downsampling from 10 kHz
- sparse nonnegative regression:

$$\begin{aligned} \text{minimize : } & \|x - \sum_{\tau} \alpha_{\tau} \phi_{\tau}\|_2^2 + \rho \|\alpha\|_1 \\ \text{subject to : } & \alpha \geq 0 \end{aligned}$$

ϕ_t is a triangular pulse starting at time t



Classification algorithms

	null	KNN	multinomial	SVM	tree	random forest
training error	0.6057	0.2648	0.3770	0.2902	0.3139	0.0008
CV error		0.3434	0.3939	0.3301	0.3593	0.2801
confusion matrix		$\begin{bmatrix} 396 & 69 & 16 \\ 117 & 240 & 48 \\ 35 & 38 & 261 \end{bmatrix}$	$\begin{bmatrix} 362 & 75 & 44 \\ 153 & 186 & 66 \\ 65 & 57 & 212 \end{bmatrix}$	$\begin{bmatrix} 417 & 42 & 22 \\ 139 & 183 & 83 \\ 34 & 34 & 266 \end{bmatrix}$	$\begin{bmatrix} 372 & 65 & 44 \\ 124 & 233 & 48 \\ 31 & 71 & 232 \end{bmatrix}$	$\begin{bmatrix} 481 & 0 & 0 \\ 0 & 405 & 0 \\ 0 & 1 & 333 \end{bmatrix}$

Cross-validation curves

