Supplementary Material

Identification of Near-Fault Impulsive Signals and Their Initiation and Termination Positions with Convolutional Neural Networks

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Identification of Impulsive Signals

Confusion matrices of methods for k^2 and Mavroeidis models for each fold are presented in the supplementary material.

k^2 Model

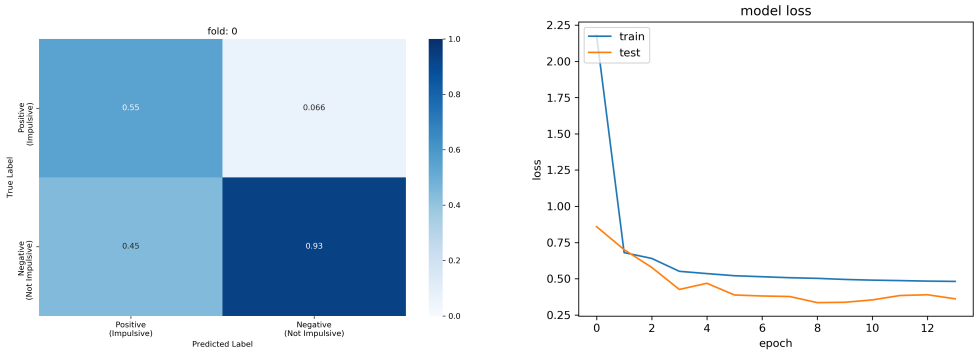

Figure S1: Confusion matrix (left) and loss function (right) of Fold 0

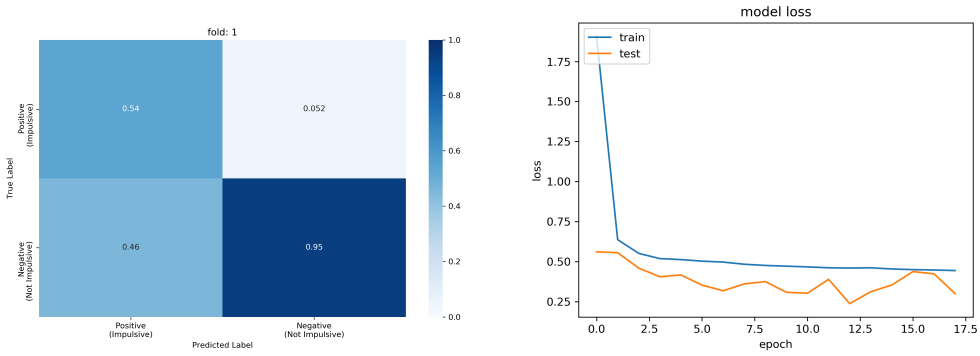

Figure S2: Confusion matrix (left) and loss function (right) of Fold 1

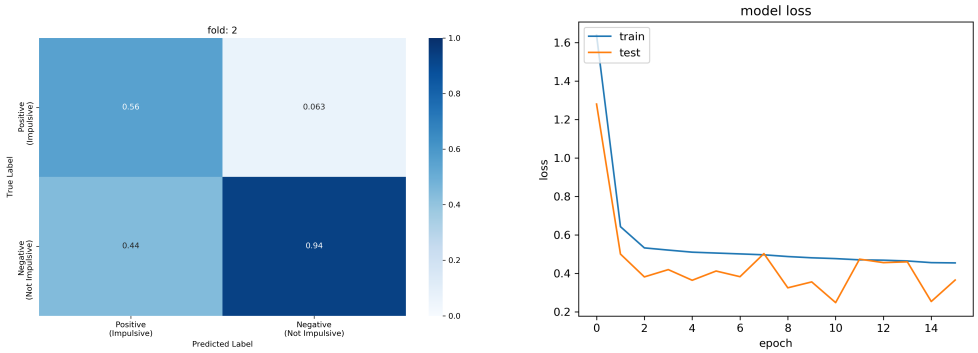

Figure S3: Confusion matrix (left) and loss function (right) of Fold 2

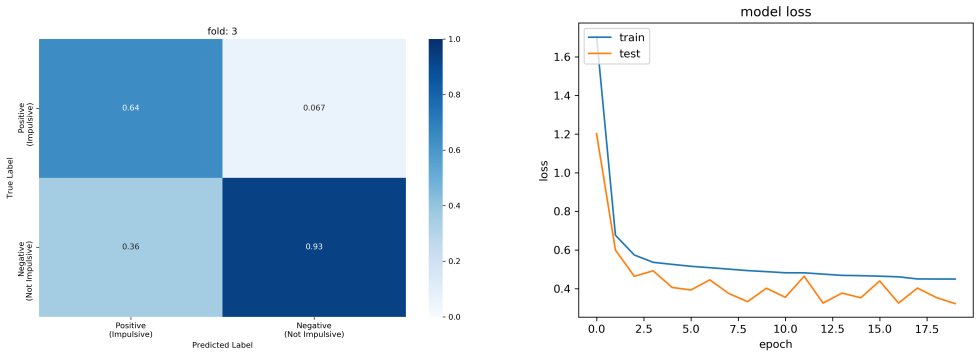

Figure S4: Confusion matrix (left) and loss function (right) of Fold 3

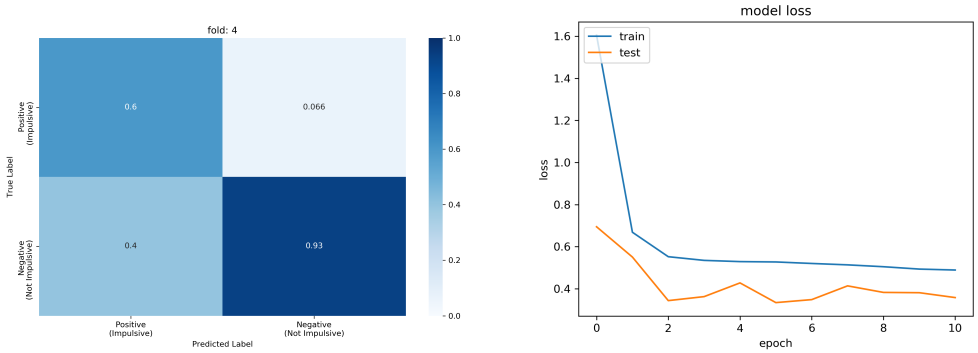

Figure S5: Confusion matrix (left) and loss function (right) of Fold 4

Mavroeidis Model

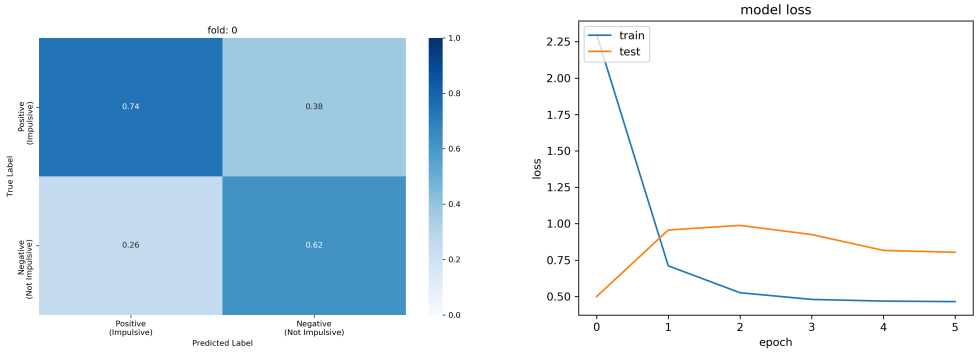

Figure S6: Confusion matrix (left) and loss function (right) of Fold 0

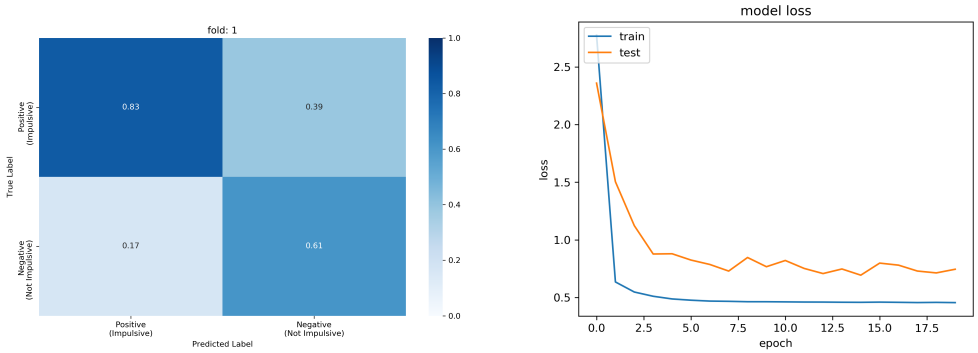

Figure S7: Confusion matrix (left) and loss function (right) of Fold 1

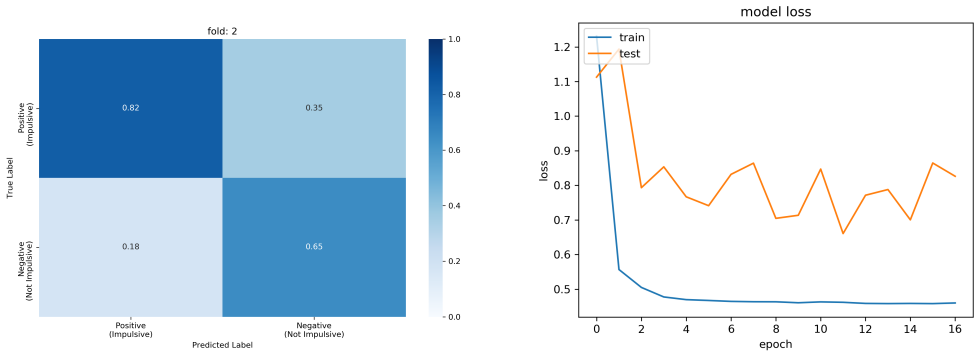

Figure S8: Confusion matrix (left) and loss function (right) of Fold 2

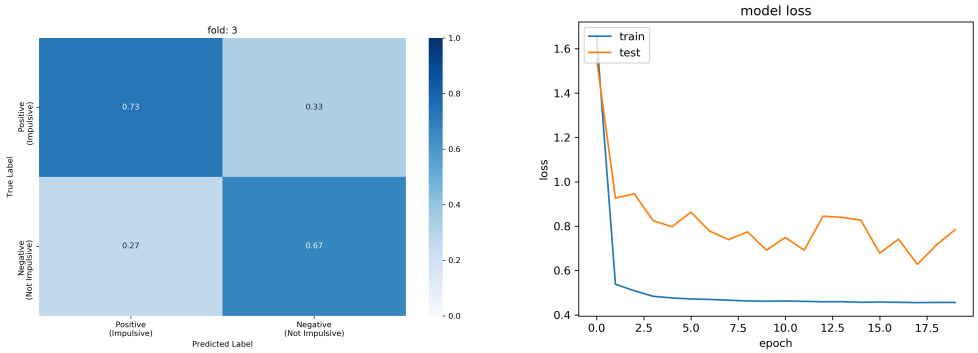

Figure S9: Confusion matrix (left) and loss function (right) of Fold 3

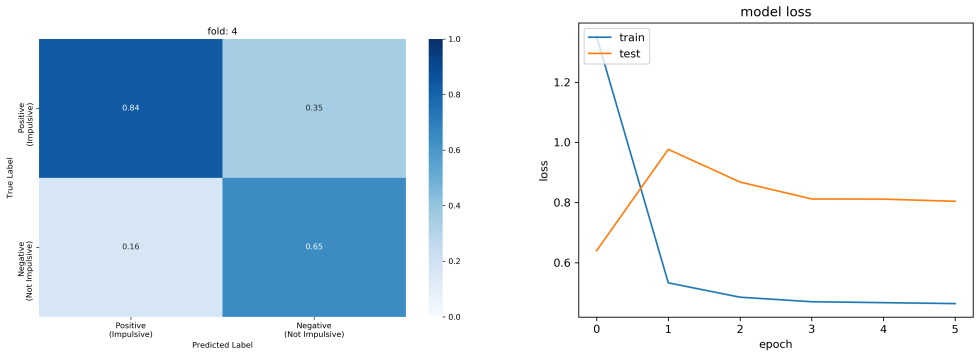

Figure S10: Confusion matrix (left) and loss function (right) of Fold 4

Determination of Initiation and Termination Positions of Impulsive Signals

In order to assess the architecture of our proposal, we repeated all the experiments removing some components of the neural network. In particular, we perform an experiment removing the additional input $\arg\max(\vec{w})$ and $\arg\min(\vec{w})$ for evaluating the contribution of these two elements ("NO-RARG" experiment). As reported in Table 1, results are always slightly worse without these two inputs. Moreover, we investigated whether the contribution of these two inputs alone was sufficient to estimate initiation and

termination positions. We performed an experiment with a very simple fully connected neural network (without the convolutional part) which takes as input only the vector $\langle \max(\vec{w}), \min(\vec{w}), \arg\max(\vec{w}), \arg\min(\vec{w}) \rangle$ ("NOCONV" experiment). Despite the results being surprisingly good, they are always worse than compared with the CNN, which confirms that the whole architecture is necessary to achieve better results.

Table S1: Comparison of all the method variations averaged among 5-fold cross-validation

	R^2			MAE			MSE		
Method	s	e	μ	s	e	μ	s	e	μ
CNN	**0.97**	**0.97**	**0.97**	**17.51**	**22.53**	**20.03**	**610.23**	**1057.47**	**833.85**
NOARG	0.82	0.92	0.87	25.05	24.77	24.91	1290.32	1063.34	1176.83
NOCONV	0.83	0.86	0.85	21.67	28.29	24.98	1017.89	1782.13	1400.01