EEG potentials predict upcoming emergency brakings during simulated driving: Supplement

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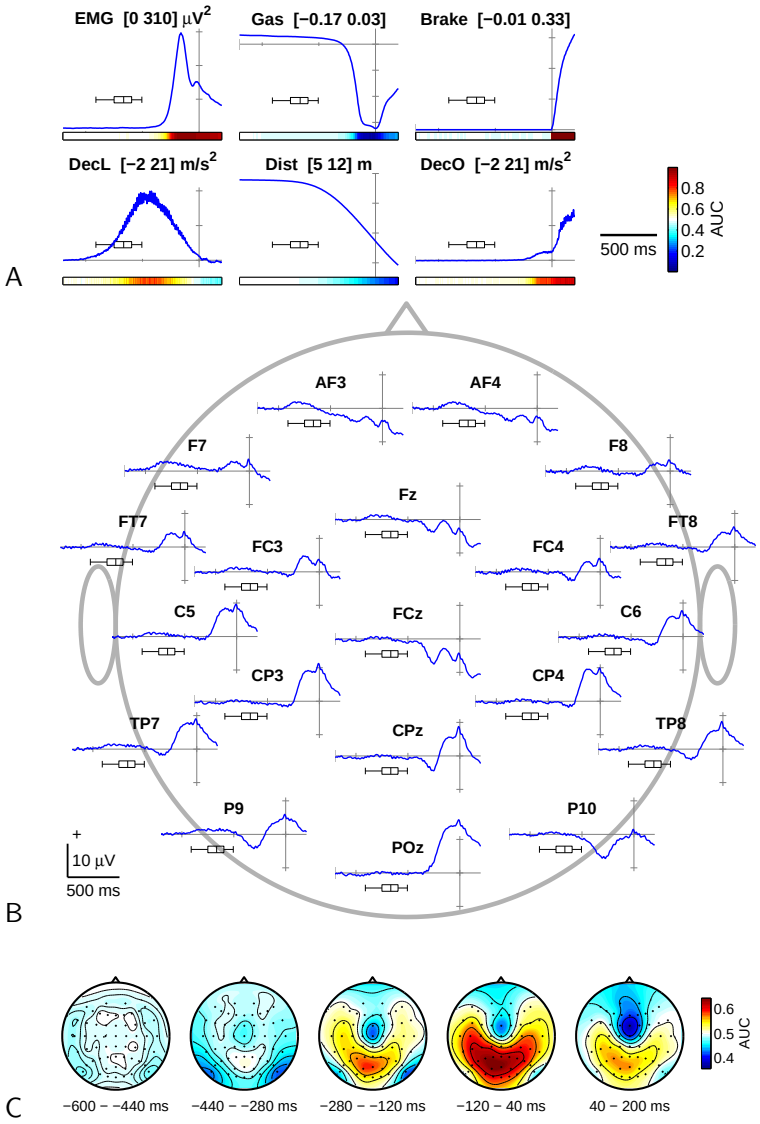

Figure S1. Grand-average response-aligned signals before and during emergency braking. RESP denotes the onset of the first notable braking pedal deflection. A) Technical, behavioral and electromyographical channels. Upper part: electromyography (EMG) at the Tibialis Anterior muscle, gas and brake pedal deflections. Lower part: deceleration of the lead vehicle (DecL) and the driver's own vehicle (DecO), and distance between vehicles. Color-coded bars depict grand-average area under the curve (AUC) scores measuring differences in feature values between target (critical) and non-target (normal driving) situations. Yellow and red color (AUC ¿ 0.5) indicates that a feature attains higher values in targets than in non-targets, while cyan and blue color (AUC ¡ 0.5) indicates the opposite case. The distribution of pooled braking response times is indicated by box plots showing 5th, 25th, 50th (median), 75th and 95th percentile. B) Grand-average event-related potentials (ERP) curves. C) Topographical maps of grand-average AUC scores calculated from mean EEG activity (ERP) in five temporal intervals.

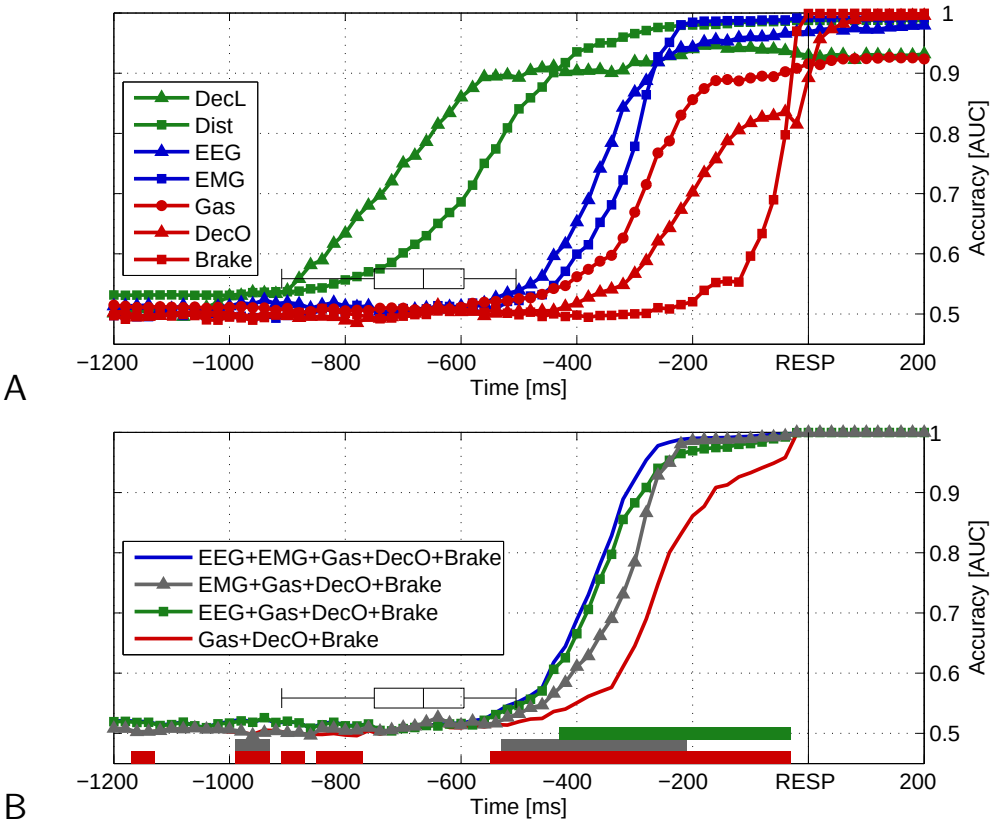

Figure S2. Grand-average area under the curve (AUC) scores calculated from the outputs of linear classifiers that were optimized to distinguish normal driving intervals from response-aligned target intervals representing different stages of emergency braking situations. RESP denotes the onset of the first notable braking pedal deflection. The distribution of pooled braking response times is indicated by box plots showing 5th, 25th, 50th (median), 75th and 95th percentile. Classification was based on (spatio-) temporal features observed prior to the respective decision points. A) Performance of single input channels. Green curves (traffic-related channels): deceleration of the lead vehicle (triangle markers), distance between vehicles (square markers). Blue curves (physiological channels): electroencephalography (triangle markers), electromyography (square markers). Red curves (behavior-related channels): gas pedal deflection (circle markers), deceleration of the driver's own vehicle (triangle markers), brake pedal deflection (square markers). B) Performance of different combinations of input channels. Blue: EEG+EMG+Gas+DecO+Brake (all driver-intent-related features). Gray, triangle markers: EMG+Gas+DecO+Brake (no EEG). Green, square markers: EEG+Gas+DecO+Brake (no MEG). Red: Gas+DecO+Brake (no physiology at all).

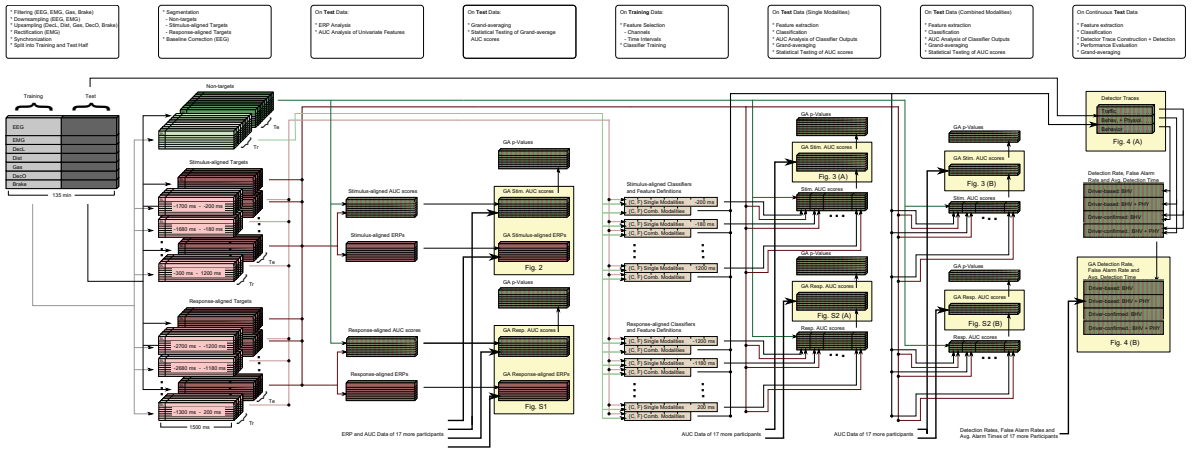

Figure S3. Schematic representation of the data analysis conducted in this study. Gray boxes depict continuous sensor readings. Green boxes depict (statistics derived from) non-target intervals, while red boxes stand for target intervals recorded during emergency situations and statistics derived thereof. Color-transitions from red to green are used for boxes that represent statistical quantities that are derived from both target and non-target intervals (such as AUC scores). Light colors are used for training data (taken from the first half of driving), while dark colors are used for test data (taken from the second half of driving). The flow of data is indicated by arrows. Black circles at arrow intersections are used to indicate that different data are collected from different senders and distributed to their corresponding receivers. Yellow boxes link the the various processed data to the figures they are presented in.