# Machine learning in automotive industry

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Nowadays, machine learning has been applied to real-world problems in fields including medicine, biology, industry, manufacturing, security, education, and games. These successful applications of machine learning are attracting increasing scholarly interest, and its fields of application are expanding rapidly.

The objective of this Special Collection in *Advances in Mechanical Engineering* on Machine Learning in Automotive Industry was to collect new insights, new methods, and new applications in the field of machine learning and its applications to automotive industry and logistics. To address the above issues and highlight recent advances in the field, we have prepared this Special Collection to publish state-of-the-art articles on current innovations within this topic.

Of the many submissions received for this Collection, we finally selected 10 articles for publication. First, the paper "*Automatic road marking recognition for intelligent vehicle systems application*"[1] presented an automatic road marking recognition method, based on support vector machine which can weaken the impact of external environment such as viewpoint, brightness, and background. The experimental results showed the strong potential effectiveness of the method presented in its application to intelligent vehicle systems.

The paper "*A trip detection model for individual smartphone-based GPS records with a novel evaluation method*"[2] proposed an automatic trips/trip-segment detection method based on instantaneous Global Positioning System records collected by smartphones. A series of procedures embracing data cleaning and pre-processing, inferring, and removing pseudo trip ends, as well as trip combination, were included in the proposed method. Overall, a high detection accuracy was identified, as well as an excellent performance in calculating the trip distance.

In the paper "*Travel mode detection method based on big smartphone GPS tracking data*,"[3] the authors proposed a machine learning-based travel mode detection method which used urban residents' travel routes collected by smartphone as a data resource. A data-driven machine learning strategy was chosen in the model construction and the random forest method was used as the core of the model to classify travel mode. Compared with traditional rule-based methods for travel mode detection, the proposed method showed more convenience and intuition.

In the paper "*Machine learning techniques for quality control in high conformance manufacturing environment*,"[4] the authors presented a learning process and pattern recognition strategy to detect rare quality events in an intelligent supervisory system. A hybrid feature elimination algorithm and optimal classification threshold search algorithm were adopted to support the proposed strategy. According to experimental results, the proposed approach can be widely applied to manufacturing processes to improve the quality control and potentially move quality standards forward.

In the paper titled "*A hybrid optimization approach to forecast automobile sales of China*,"[5] the authors used a novel hybrid method (HPA) based on particle swarm optimization and ant colony optimization to forecast automobile sales in China. The proposed automobile sales model (HPAE) is developed in two forms including both linear and quadratic. The results showed that the HPAE model had a better performance than ant colony optimization and particle swarm optimization.

In the paper titled "*Correlation degree analysis of arterial adjacent intersections for coordinated control sub-unit partition*,"[6] a new layout method of vehicle detectors was put forward, and the authors established a correlation degree model on the partition of control unit for arterial road based on traffic status data. To gain the control subunit partition of arterial roads, a noise algorithm was applied to cluster the deriving correlation indexes. The partition method based on correlation indexes was validated by a simulation; it was

effective to improve the control performance compared with the control strategy depending on traditional traffic low-resolution data by the detectors.

In the paper titled "*A novel approach to integrate potential field and interval type-2 fuzzy learning for the formation control of multiple AUVs*,"[7] the authors developed a novel approach based on formation system framework. The approach integrated Support Vector Machine (SVM) into the type-2 fuzzy learning systems to generate optimal rules for the system nonlinear character and complicated formation state. Reinforcement learning was combined with type-2 fuzzy systems to deal with acoustic communication conditions during the formation process. The proposed methods' high performance was tested by simulations and experiments.

In the paper "*Algorithmic design and application of feedback control for coiling temperature in hot strip mill*,"[8] the authors introduced a laminar cooling control system and designed a feedback control algorithm based on proportional–integral controller and Smith predictor, using the online adaptive algorithm to optimize parameters of proportional–integral controller. The proposed system was successfully applied in a hot strip mill, and the record curves showed better dynamic characteristic.

In the paper "*Development of block loading spectrum for car powertrain rig test correlated with customers usage*,"[9] the authors compressed customer data into block loading spectrum and then used a rig test based on the fatigue damage equivalent principle to achieve powertrain rig assembly testing life equivalent to the customers' usage life. With the actual vehicle operation cases and rig reliability test integrated, the loading spectrum achieved the replacement of full-vehicle road test with powertrain rig reliability test.

In the paper "*Optimization of park-and-ride system: A case study of Shunyi in Beijing*,"[10] the authors proposed a multi-objective model considering investments and pollution and designed a bi-level genetic algorithm for optimization of park-and-ride facility location and charging rules. The case study of Shunyi in Beijing illustrated the feasibility of the optimization model.

It has been our pleasure and honor to organize this Special Collection in *Advances in Mechanical Engineering*. We sincerely thank all of the authors for submitting their work to this Collection. It is our hope that it will help to bring about high-quality research in machine learning and its applications in automotive industry.

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