

**Table 5**

Statistics on authors, powertrains, algorithms, and contributions of journal papers (Environmental Innovation).

Author (Year)	Powertrain	Algorithm	Contribution
Guo[294] (2019)	PHE Bus	Q Learning	Planning the reference SOC trajectory within 60s; the PMP-based EMS for determining the co-state by the RL agent;
Li[295] (2019)	Serial HEV	DDPG	History cumulative trip information to obtain the space-domain-indexed SOC trajectory; offline training and online application;
Wu[296] (2019)	HETV	Q Learning	Online correction predictive EMS; short-period future driving cycle prediction; DP-based the local policy; Q-learning and fuzzy logic for optimizing the policy;
Wu[297] (2019)	PHE Bus	DDPG	Serial parallel powertrain; a fixed bus line integrating with the traffic information and number of passengers;
Chen[298] (2020)	Power split PHEV	Q Learning	RL-based stochastic model predictive control as the controller; single-step and multi-step Markov speed predictor;
Liu[299] (2020)	HETV	Q Learning	A bidirectional long short-term memory-based parallel RL-based EMS; the upper lever owns a parallel system that includes a real powertrain and an artificial system for relieving the data lack and trains the LSTM for modeling the action state function; the lower lever gets the RL-based EMS;
Zhang[300] (2020)	PHE Bus	APO	Conditional entropy-based battery power reduction; Bayesian-based SOC shortage probability estimator; The Global Positioning System (GPS) information for the SOC planning;
Zhang[301] (2020)	Power split PHEV	Actor-Critic	Route planning and power management; Q-learning finds the minimum energy consumption route;
Cao[302] (2021)	PHEV	Q Learning	Variable scenario generated by a random combination of the selected driving cycle; energy conversion model determines the relationship between SOC and fuel economy and is applied to the definition of reward; RL-based SOC-consumption allocation strategy;
He[303] (2021)	HE Bus Power split HEV	DDPG	SUMO-based Multi-states of Traffic Information (the state of the surrounding vehicles and signal lights); transfer learning; the prior valid knowledge trained by HEB is transferred to Prius;
He[304] (2021)	Power split HEV	DDPG	Connected environment (the traffic rules, not overtaking, and road speed limit); rule-based speed planning and RL-based EMS;
Hu[305] (2021)	ICV	DQN	Edge computing; the curiosity-driven exploration; intelligent and connected vehicles; parallel training at the edge and updating at the cloud; the boost control of a diesel engine equipped with variable geometry turbocharger;
Li[306] (2021)	Power split HEV	DDPG	Connected traffic environment (distance headway, fuel consumption, and terrain); DDPG-based reference speed planning in the car following scenarios; a driver and A-ECMS-based EMS;
Li[307] (2021)	PEV	DDPG	Increases the electrical and thermal safety and minimizes the energy loss and aging cost; hybrid battery systems (high-energy and high-power cells); cloud server for training; processor-in-the-loop;
Wang[308] (2021)	Power split HEV	DDPG	YOLO V3-based visual information from onboard cameras (traffic light state and traffic flow); DDPG-based EMS with action noise;
Chang[309] (2022)	PHEV	DQN	Principal component analysis and fuzzy clustering to establish three kinds of conditions; learning vector quantization neural network achieves the rule-based condition identification; the action space includes engine torque and shift action of transmission;
Chen[310] (2022)	Parallel HEV	DQN	Five roads are collected (dry asphalt, wet asphalt, snow, dry cobblestone, and wet cobblestone); the time-varying driving environment (driving images, slope, speed, and the number of passengers.); the stereoscopic control network for the high-dimensional task (engine, transmission, motor);
Fang[311] (2022)	PHEV	SAC	Three soft actor-critic agents are trained for high, medium, and low-speed conditions; minimizing the energy cost and battery aging; learning vector quantization neural network-based driving cycle recognition and construction;
Han[312] (2022)	PHE Bus	Q Learning	The ability of practical application; a dynamic SOC design zone plan method at fixed locations based on the feedback SOC; hardware in loop simulation; the Q-learning-based controller of the co-state for the PMP-based EMS;
He[313]	Power split	DDPG	DDPG-based network for planning the SOC reference trajectory; real velocity

Author (Year)	Powertrain	Algorithm	Contribution
(2022)	PHE Bus		data-based velocity predictor; MPC-DP-based EMS;
Hu[314] (2022)	Power split HEV	DDPG	Fuzzy clustering-based driver experience of traffic congestion level is embedded into the DRL-based EMS;
Huang[315] (2022)	HE Bus	TD3	The principal component analysis, improved particle swarm optimization, and k-means clustering-based specific driving cycle is constructed by naturalistic data; the degradation of the onboard lithium-ion battery system;
Kim[316] (2022)	FCV	SAC	Fuel cell, battery, and supercapacitor; the attention-based LSTM-based velocity and load power predictor by standard and real driving cycles;
Lin[317] (2022)	Power split PHEV	SAC	The automated on-ramp merging considering the vehicle powertrain and dynamics; the upper-level DRL-based merging controller, the lower-level DRL-based EMS; co-optimization and sequential approaches;
Tang[318] (2022)	Parallel HEV	DQN	Processor-in-the-loop; YOLO V3-based distance measurement in the car-following scene; DRL-based car-following control (acceleration) and DRL-based EMS (engine and transmission);
Tang[319] (2022)	Power split HEV	DDPG	The K-means and principal component analysis-based specific driving cycle is constructed by naturalistic data; expert-assisted EMS with brake-specific fuel consumption curve; battery aging model;
Yan[320] (2022)	FC Bus	DQN	Launch control integrating traffic information; DRL-based launch control to select the appropriate start time; selects the start time; reducing frequent starting and stopping through the traffic light intersection; MPC-based EMS;
Yang[321] (2022)	FCV	Double Q Learning	The probabilistic neural network is trained to identify the driving patterns; the multi-step Markov-based velocity predictor; the economics and durability of fuel cells; the real-time reference path of power allocation;
Chen[322] (2023)	Parallel HEV	DDPG DQN	Processor-in-the-loop; lane-level high-definition map-driven integrated control; Map modeling by Google Earth and Google map; the comparison of driving costs and infrastructure among four typical powertrains; the velocity and steering of the vehicle layer and EMS of the powertrain;
Chen[323] (2023)	PHEV	Double Delayed Q Learning	Gaussian process model and desired acceleration-based velocity planning by a trained extreme learning machine with the external traffic disturbance and powertrain characteristics; traffic-in-the-loop simulator under various urban driving scenarios;
Cui[324] (2023)	PHEV	TD3	Co-recognition for traffic condition and driving style; traffic condition (fuzzy C-means, simulated annealing-genetic algorithm), driving style (calm, moderate, aggressive);
Guo[325] (2023)	Power split HEV	DDPG	Connected HEVs; model predictive control-based speed control for maintaining a safe distance and ensuring riding comfort; prioritized experience replay; the expert knowledge-based EMS;
Huang[326] (2023)	Power split HEV	SAC	The K-means and PCA-based specific driving cycle are constructed by naturalistic data; multi-objective optimization among fuel, emission, and SOC; prioritized experience replay and DP-based global optimal experience replay;
Liu[327] (2023)	PEV	TD3	Battery and supercapacitor; learning vector quantization neural networks-based driving condition recognition (urban, suburban, and highway); parallel training;
Liu[328] (2023)	Power split HEV	TD3	The rule-based controller and DP-based knowledge are used to enhance the convergence speed; long short-term memory recurrent-based speed predictor; 2D control (engine speed and torque);
Mei[329] (2023)	Power split HEV	DDPG DQN	Connected information (traffic signal timing), model predictive control-based speed optimizer; mathematical model of speed variation in connected and unconnected states is analyze the effect;
Peng[330] (2023)	Serial HEV	MADDPG	Ecological driving in the car following scenario in SUMO; Heterogeneous Multi-Agent DRL; MADDPG-based adaptive cruise control and EMS; prioritized experience replay;
Peng[331] (2023)	Power split HEV	DDPG	Collaborative optimization of energy management strategy and adaptive cruise control; the noise on the action space (Ornstein-Uhlenbeck action noise and soft-max action noise);
Sun[332] (2023)	FCV	DQN	Fuel cell, battery, and supercapacitor; PMP-based behavior recognizer for getting the equivalent factor to the A-ECMS-based EMS; driving behavior recognition, space division, and soft learning; proportional-prioritization-based

Author (Year)	Powertrain	Algorithm	Contribution
Wang[333] (2023)	PEV	Q Learning	sampling; adaptive exploration policy; Batteries and supercapacitor; Markov chain-based speed predictor;
Wang[334] (2023)	PHEV	SAC	Multi-agent reinforcement learning (independent soft actor-critic); eco-driving behaviors in the car-following scene and energy management strategy;
Wu[335] (2023)	Power split HEV	TD3	Connected and Automated HEV; hierarchical DRL-based eco-driving strategy; TD3-based speed optimizer; the Adaptive ECMS-based EMS; a rule-based competition-decision model for satisfying the constraints of the traffic light rules. (the road speed limit, the car-following scenario, and the signalized intersections);
Yang[336] (2023)	Power split HEV	Q Learning	Long short-term memory-based velocity predictor (the driver behavior); model-based RL (the prediction model and the velocity predictor as the environment) in the MPC; Hardware in the loop;
Zhang[337] (2023)	PHEV	Actor-Critic	Ecological car-following process; Hierarchical RL-based adaptive cruise control and energy management system; planning SOC and time-headway trajectories;
Zhang[338] (2023)	E Bus	DDPG	Dual-motor electric bus; a specific driving cycle is constructed based on recorded vehicle data; DDPG-based EMS;

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