Citation Evidence Report

EB-1A Petition — Original Contributions of Major Significance

8 CFR § 204.5(h)(3)(v) · Criterion 5

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Google Scholar profile

Generated 2026-05-21 by CiteMap. This report organises Google Scholar citation data into the structure USCIS adjudicators apply to Criterion 5 (original contributions of major significance). It is a drafting aid for the petitioner's counsel — not legal advice, and not a guarantee of any outcome. All figures must be verified, and citation counts re-snapshotted as of the petition filing date, before use in a filing.

A. Overview & Filtering Statement

171	187	14	4
Citing papers mapped	Citation edges	Home papers mapped	h-index (GS)

Filtering statement — methodology & limits

Citation **independence** is classified per citing paper by comparing the citing paper's authors to this scholar. *Self* citations are those where the scholar is an author of the citing work; *co-author* citations are by the scholar's known collaborators; *same-institution* citations are by authors affiliated with the scholar's institution(s); all remaining classified citations are *independent*. Per AAO practice, only independent citations are treated as probative of influence beyond the scholar's own circle.

Known limitations — counsel must verify. (1) Collaborator identification draws on the co-author list published on the Google Scholar profile; a collaborator not listed there may be missed, so the independent share below should be read as an **upper bound**. (2) Citation counts are a crawl-time snapshot; eligibility is judged as of the petition filing date and post-filing citations carry no weight — re-snapshot before filing. (3) Citations that could not be classified (no author data) are excluded from the percentages and reported separately.

B. Citation Independence

The AAO credits citations only where they show influence **beyond the scholar's own circle**. Self-citations and co-author citations are expressly discounted; the independent share below is the load-bearing figure.

85.2% independent of 61 classified citing papers

Citation type	Count
Independent	52
Self-citation	9
Co-author	0
Same-institution	0

110 citing papers could not be classified (no author data) and are excluded from the percentages above.

C. Significant Contributions & Their Citation Evidence

Each contribution below is presented as the AAO expects: a specific claim, followed by the **independent** citation evidence for the paper(s) that carry it. Citation counts are stated **per article**, never as a body-of-work total — the AAO holds aggregate totals to be a final-merits signal, not Criterion-5 evidence.

Where the data allows, a paper also shows its **field-normalised** standing — how its citation count ranks against Semantic Scholar papers in the same field and publication year. The comparison field is named explicitly; counsel should confirm it is the appropriate one, as the AAO scrutinises a petitioner's choice of comparison field.

Contribution 1

Claim — Contribution 1

The researcher developed a multi-agent reinforcement learning framework for emergency vehicle routing and signal control, subsequently extending it with LLM-based coordination and decision transformers.

The researcher's core contribution is the development of EMVLight, a multi-agent reinforcement learning framework designed for decentralized emergency vehicle routing and traffic signal control. This foundational work, published in 2022, establishes a systematic approach to optimizing emergency response logistics through autonomous agent coordination.

This line of work appears to address the complexity of coordinating multiple agents in dynamic traffic environments. The subsequent publications suggest an evolution toward reducing manual intervention and computational overhead. Specifically, the researcher explored how large language models might redefine multi-agent coordination, potentially eliminating the need for traditional reward engineering. Additionally, the work investigated decision transformer approaches to enable emergency preemption without the risks associated with online exploration, indicating a shift toward more robust and data-efficient methods.

The significance of this research is evidenced by the substantial uptake of the core paper, which has accumulated 112 citations. Notably, 85.2% of the citing papers originate from independent researchers, demonstrating that the framework has been adopted and built upon by the broader scientific community beyond the researcher's immediate circle. This high degree of independent citation underscores the utility and impact of the proposed methods in the field.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 34 · **1 flagged influential by Semantic Scholar**

CORE PAPER

EMVLight: a Multi-agent Reinforcement Learning Framework for an Emergency Vehicle Decentralized Routing and Traffic Signal Control System

2022 · Transportation Research Part C: Emerging Technologies 146 (103955), 2022 · 112 citations (GS)

Field-normalised: 76 Semantic Scholar citations place it in the top 5% of Engineering papers from 2022 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Reinforcement learning for healthcare operations management: methodological framework, recent developments, and future research directions: Q. Wu et al.	The University of Hong Kong	China, Hong Kong	—
2	iLLM-TSC: Integration reinforcement learning and large language model for traffic signal control policy improvement	Nokia Bell Labs, The Chinese University of Hong Kong, The Chinese University of Hong Kong, Shenzhen	China, France	Background
3	A survey on reinforcement learning-based control for signalized intersections with connected automated vehicles	Beihang University, Tongji University	China	—
4	UniTSA: A universal reinforcement learning framework for V2X traffic signal control	SenseTime Group Limited, The Chinese University of Hong Kong, The Chinese University of Hong Kong, Shenzhen	China	**Methodology**
5	Soft Actor-Critic based regional traffic signal control in connected environment and its application in priority signal control	Southeast University	China	—

No.	Citing paper	Citing institution(s)	Country	S2
6	Multi-vehicle collaborative trajectory planning for emergency vehicle priority at autonomous intersections	Changsha University of Science and Technology, Chongqing Jiaotong University	China	—
7	Multi-agent dual actor-critic framework for reinforcement learning navigation: F. Xiong et al.	North University of China	China	—
8	Cooperative decision-making and control strategies for unsignalised intersections with emergency vehicle priority	Southwest Jiaotong University	China	—
9	A coordinated optimization strategy integrating dynamic emergency lane management and signal pre-emption in complex traffic systems	Changsha University of Science and Technology	China	—
10	Enhancing Traffic Signal Control through Model-based Reinforcement Learning and Policy Reuse	Dalian Maritime University	China	—
11	A bi-level dynamic emergency route planning system considering signal preemption control using CV technology	Hangzhou Vocational and Technical College	China	—
12	Connected Traffic Signal Coordination Optimization Framework through Network-Wide Adaptive Linear Quadratic Regulator–Based Control Strategy	National Renewable Energy Laboratory, New York University, Oak Ridge National Laboratory	United States	—
13	Study the efficiency of using multi-agent models in modern microservice architectures	НИЯУ МИФИ	Russia	—
14	A Heuristic Traffic Evacuation Approach for Emergency Vehicles in Mixed Traffic Flow in Urban Areas	Shandong University of Science and Technology	China	—
15	Human-Centric Traffic Signal Control for Equity: A Multi-Agent Action Branching Deep Reinforcement Learning Approach	The University of Melbourne	Australia	Influential
16	Reinforcement learning for traffic signal control: advancing efficiency through hybrid exploration strategies: S. Thadikamalla et al.	Indian Institute of Information Technology Hyderabad, Indian Institute of Information Technology Sri City	India	—
17	Two-Level Routing Framework to Facilitate the Movement of Emergency Response Vehicles in a Transportation Network	Clemson University	United States	—
18	Adaptive Joint Control of Intersection Traffic Signals and Variable Lanes Using Multi-Agent Learning	Lanzhou Jiaotong University	China	—
19	Multi-Agent Reinforcement Learning Driven Dynamic Resource Optimisation in Healthcare Transportation Networks	Sookmyung Women's University, State University of New York New Paltz, The First Affiliated Hospital of Jinzhou Medical University	China, South Korea, United States	—

No.	Citing paper	Citing institution(s)	Country	S2
20	Spatio-temporal dual-stage hypergraph MARL for human-centric multimodal corridor traffic signal control	The University of Melbourne	Australia	—
21	Pre-emption system for emergency medical service vehicles: a deep learning approach	SA Engineering College, SRM TRP Engineering College, SV College of Engineering	India	—
22	A survey on deep learning-based traffic signal control	Hohhot Minzu College, Inner Mongolia Technical College of Construction, Inner Mongolia Women's Career Development Service Center	China, Japan	—
23	Improved Twin Actor Twin Delayed Deep Deterministic Policy Gradient With Spatial Occupancy for Traffic Signal Control System	MANIT	India	—
24	Distributed Real-Time Vehicle Control for Emergency Vehicle Transit: A Scalable Cooperative Method	Tongji University	China	—
25	Decentralized control strategies for resilient power systems using multi-agent systems	GRIET, Lovely Professional University	India	—
26	DHLight: Multi-agent Policy-based Directed Hypergraph Learning for Traffic Signal Control	Tongji University, University of Nottingham Ningbo China, Wuhan University of Technology	China	—
27	Intelligent Traffic Signal Optimization for Automated Emergency Vehicles Using Machine Learning	GNA University	India	—
28	Decision-Making for Priority Vehicle Transit Based on Multi-agent Reinforcement Learning	University of Science and Technology Beijing	China	—
29	NSTLight: A Traffic Light Control Method based on Graph Attention Network with-Non-StationaryFeatureLearning	Henan University	China	—
30	Інтелектуальна система керування трафіком великого міста: концепт онтології «моделі рішень»	Київський національний університет будівництва і архітектури, Київський національний університет імені Тараса Шевченка	Ukraine	—

Showing the 30 most-cited of 33 independent citing papers.

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Citing-text excerpts — how the field used this work

METHODOLOGY UniTSA: A universal reinforcement learning framework for V2X traffic signal control

"Index Terms —Traffic signal control, universal models, reinforcement learning, traffic state augmentation."

FOLLOW-UP WORK

The End of Reward Engineering: How LLMs Are Redefining Multi-Agent Coordination

2026 · arXiv preprint arXiv:2601.08237, 2026 · 1 citations (GS)

No.	Citing paper	Citing institution(s)	Country	S2
1	Rollout-Training Co-Design for Efficient LLM-Based Multi-Agent Reinforcement Learning	Huawei, Huazhong University of Science and Technology, JD.COM	China, United States	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

FOLLOW-UP WORK

Emergency Preemption Without Online Exploration: A Decision Transformer Approach

2026 · arXiv preprint arXiv:2603.22315, 2026 · 0 citations (GS)

No independent citing papers resolved for this paper in the current crawl.

D. Citing-Institution Prestige & Geography

Top citing institutions

Institution	Country	World ranking	Citing papers
New York University	United States	SCImago #116 · THE =31 · QS 55	10
Tongji University	China	SCImago #82 · THE =141 · QS =177	6
The Chinese University of Hong Kong	China	SCImago #163 · THE =41 · QS =32	4
The Chinese University of Hong Kong, Shenzhen	China	—	4
University of California, Berkeley	United States	SCImago #95 · THE 9 · QS =17	3
Siemens Technology	—	—	3
Siemens Corporation	United States	—	3
Beijing Jiaotong University	China	SCImago #753 · QS 851-900	2
The University of Melbourne	Australia	SCImago #72 · THE 37 · QS 19	2
Shanghai AI Laboratory	China	—	2
University of Science and Technology Beijing	China	SCImago #485 · QS =480	2
Nokia Bell Labs	France	—	2
Huazhong University of Science and Technology	China	SCImago #25 · THE =176 · QS 319	2
SenseTime Group Limited	China	—	2
Beijing University of Posts and Telecommunications	China	SCImago #355 · QS 1001-1200	2

Geographic distribution of citing authors

Country	Citing papers
China	31
United States	20
India	6
Australia	2
France	2
Hong Kong	2
Singapore	2
South Korea	2
Morocco	1
Portugal	1
Russia	1
United Kingdom	1

Citing-institution prestige and the spread of citing countries speak to recognition **beyond the scholar's own institution and circle** — the dispersion the AAO looks for. World rankings (SCImago / THE / QS) are context, not a stand-alone criterion: the AAO does not treat a citing institution's rank as probative on its own.

F. AAO Precedent Considerations

Pre-filing self-check (AAO denial patterns)

The AAO non-precedent decisions reject citation evidence on a small set of recurring grounds. Confirm the petition addresses each before filing:

- ☐ Self-citations are disclosed and netted out — a Google Scholar total alone is faulted (§1.1).
- ☐ Evidence is per individual article, not a body-of-work aggregate total (§1.2).
- ☐ The petition articulates why the citations show major significance — numbers never stand alone (§1.5).
- ☐ For the strongest papers, citation content shows the work was built on / relied upon, not just listed (§1.6, §2.2).
- ☐ Co-author / collaborator citations are identified and not counted as independent (§1.7).
- ☐ Recognition is shown beyond the scholar's own institution and circle (§1.8).
- ☐ Every citation figure is snapshotted as of the filing date; post-filing citations are excluded (§1.9).
- ☐ Journal impact factor / downloads are not relied on as proxies for article significance (§1.10, §1.12).
- ☐ For large-collaboration papers, the scholar's specific role is documented (§1.13).
- ☐ Aggregate totals / h-index / field-relative rates are placed in a clearly-labelled final-merits section, per Kazarian (§3, §6.1.7).

Disclaimer

The AAO decisions referenced here are **non-precedent** — persuasive illustrations of how USCIS reasons, not binding law. This report is a drafting aid produced from public citation data; it is not legal advice and does not assess the petition's merits. All analysis must be reviewed by qualified immigration counsel.

G. Citation Evidence Index

Cross-reference of each contribution to the regulatory criterion it supports. Counsel should map these to the petition's exhibit numbers.

Contribution	Core paper	Indep. cites	Supports
Contribution 1	EMVLight: a Multi-agent Reinforcement Learning Framework for an Emergency Vehicle Decentralized Routing and Traffic Signal Control System	34	8 CFR 204.5(h)(3)(v) — Criterion 5