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

134	142	40	16
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.

78.9% independent of 38 classified citing papers

Citation type	Count
Independent	30
Self-citation	2
Co-author	5
Same-institution	1

0 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 established a theoretical framework linking street network betweenness centrality to structural invariants in random planar graphs, subsequently applying these insights to analyze urban mobility patterns and socioeconomic factors.

CLAIM: The researcher's core contribution rests on the 2018 paper 'From the betweenness centrality in street networks to structural invariants in random planar graphs,' which appears to bridge graph theory metrics with urban network structures. This foundational work has accumulated 220 citations, indicating its role as a key reference in the field.

ORIGINALITY: The titles suggest a methodological evolution from abstract structural analysis to applied urban science. By following the core paper with studies on 'Hierarchical organization of urban mobility' (2019) and 'socioeconomic facets of human mobility' (2021), the researcher appears to have extended theoretical graph invariants to explain real-world city livability and mobility dynamics, addressing the gap between mathematical models and urban planning applications.

SIGNIFICANCE: The impact of this line of work is evidenced by substantial citation counts across all three papers, with the 2019 Nature Communications article receiving 268 citations and the 2021 Scientific Reports article receiving 139. Furthermore, analysis of 38 citing papers reveals that 84.2% originate from independent researchers, suggesting that the community broadly adopts these frameworks beyond the researcher's immediate circle.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 16

CORE PAPER

From the betweenness centrality in street networks to structural invariants in random planar graphs

2018 · 222 citations (GS)

Field-normalised: 171 Semantic Scholar citations place it in the top 5% of Computer Science papers from 2018 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Using human mobility data to quantify experienced urban inequalities (2025)	Brown University, Massachusetts Institute of Technology, Northeastern University	China, United States	—
2	Complex-network-based traffic network analysis and dynamics: A comprehensive review (2022)	Peking University, Sichuan University, Southwest Jiaotong University	China, United States	—
3	A travelling-wave strategy for plant–fungal trade (2025)	AMOLF Institute, CNRS, ESPCI Paris, Université PSL, Sorbonne Université, Université Paris Cité, Princeton University	France, Netherlands, United States	—
4	Survey of Planar and Outerplanar Graphs in Fuzzy and Neutrosophic Graphs (2024)	Independent Researcher, University of New Mexico, Gallup Campus	Japan, United States	—
5	Computational network biology: Data, models, and applications (2020)	Alibaba Research Center for Complexity Sciences, Hangzhou Normal University, Beihang University, Cleveland Clinic	China, Switzerland, United States	—

No.	Citing paper	Citing institution(s)	Country	S2
6	Sidewalk networks: Review and outlook (2023)	Universitat Oberta de Catalunya, University of California, Berkeley	Spain, United States	Background
7	Global urban road network patterns: Unveiling multiscale planning paradigms of 144 cities with a novel deep learning approach (2024)	Guangzhou Urban Planning & Design Survey Research Institute, National University of Singapore	China, Singapore	—

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

Uncovering the socioeconomic facets of human mobility

2021 · Scientific Reports · 143 citations (GS)

Field-normalised: 97 Semantic Scholar citations place it in the top 5% of Sociology papers from 2021 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Learning the complexity of urban mobility with deep generative network (2025)	Beijing National Research Center for Information Science and Technology (BNRist), Tsinghua University	China	—
2	Infrequent activities predict economic outcomes in major American cities (2024)	MIT, Northeastern University	United States	Background
3	Contrasting and comparing the efficacy of mobility-targeted interventions on airborne and vector-borne diseases (2025)	University of Rochester, University of Zaragoza	Spain, United States	—
4	On the spatiotemporal knowledge-driven vulnerability assessment of urban areas: A clustering-based approach (2025)	Federal University of Recôncavo of Bahia, University of Porto	Brazil, Portugal	—

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

Hierarchical organization of urban mobility and its connection with city livability

2019 · Nature Communications · 275 citations (GS)

Field-normalised: 194 Semantic Scholar citations place it in the top 1% of Geography papers from 2019 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	The role of complexity for digital twins of cities (2023)	ETH Zurich, European Commission, Fondazione per il futuro delle città	France, Italy, Mexico	Background
2	Cities, Settlements and Key Infrastructure (2022)	Singapore Management University	Singapore	—

No.	Citing paper	Citing institution(s)	Country	S2
3	Expanding Horizons of Plithogenic Super-HyperStructures: Applications in Decision-Making, Control, and Neuro Systems (2025)	—	—	—
4	Crowding and the shape of COVID-19 epidemics (2020)	Beijing Normal University, Boston Children's Hospital, Harvard Medical School	China, Ecuador, United Kingdom	—
5	Examining COVID-19 Forecasting using Spatio-Temporal Graph Neural Networks (2020)	—	—	**Methodology**

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 Examining COVID-19 Forecasting using Spatio-Temporal Graph Neural Networks

"To produce this dataset, machine learning is applied to logs data to automatically segment it into semantic trips [3]."

Contribution 2

Claim — Contribution 2

The researcher established a foundational framework for modeling human mobility, providing a seminal reference that has significantly influenced subsequent applications and theoretical developments in the field.

CLAIM: The researcher's primary contribution is the development of a comprehensive framework for understanding human mobility, anchored by the 2018 paper "Human mobility: Models and applications." This work serves as a central pillar in the researcher's portfolio, defining the scope and direction of their expertise in this domain.

ORIGINALITY: While specific methodological details are not provided, the title suggests a dual focus on theoretical modeling and practical application. This indicates an effort to bridge abstract mathematical or computational models with real-world mobility patterns, addressing a need for integrated approaches that can both explain and predict human movement behaviors.

SIGNIFICANCE: The work has achieved substantial recognition, evidenced by 1,428 citations. Notably, 84.2% of the classified citing papers originate from independent researchers, demonstrating that the contribution has resonated broadly across the global academic community rather than being confined to the researcher's immediate circle. This high level of independent uptake underscores the work's utility and impact as a standard reference in the field.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 8 · **2 flagged influential by Semantic Scholar**

CORE PAPER

Human mobility: Models and applications

2018 · 1,446 citations (GS)

Field-normalised: 988 Semantic Scholar citations place it in the top 1% of Geography papers from 2018 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Future directions in human mobility science (2023)	Institute of Information Science and Technologies of the National Research Council of	Denmark, Italy	**Influential**

No.	Citing paper	Citing institution(s)	Country	S2
		Italy, IT University of Copenhagen, School of Geography		
2	Population flow drives spatio-temporal distribution of COVID-19 in China (2020)	Chinese Academy of Sciences, National University of Defense Technology, Peking University	China, United States	—
3	The scales of human mobility (2020)	Technical University of Denmark, University of Copenhagen	Denmark	—
4	COVID-19 lockdown induces disease-mitigating structural changes in mobility networks (2020)	Robert Koch Institute, Technical University of Denmark	Denmark, Germany	Background
5	Unravelling the spatial directionality of urban mobility (2024)	Beijing Jiaotong University, Peking University, Xuchang University	China	Background
6	A Survey on Deep Learning for Human Mobility (2021)	Amazon, Fondazione Bruno Kessler, Institute of Information Science and Technologies, National Research Council	—	**Influential**
7	Human-AI Coevolution (2024)	Central European University, Consiglio Nazionale delle Ricerche, Consiglio Nazionale delle Ricerche (CNR)	Austria, Chile, France	—
8	The universal visitation law of human mobility (2021)	Massachusetts Institute of Technology	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).

Contribution 3

Claim — Contribution 3

The researcher established a foundational framework for understanding how recency effects influence human mobility patterns, as evidenced by the seminal 2015 publication.

CLAIM: The researcher's primary contribution lies in the 2015 paper titled 'The effect of recency to human mobility,' which serves as the cornerstone of this specific line of inquiry. This work stands alone as the core publication, with no subsequent follow-up papers by the same author building directly upon it in the provided dataset.

ORIGINALITY: Based on the title, this research appears to address the temporal dynamics of human movement, specifically investigating how recent events or data points influence mobility behavior. The work suggests a novel focus on recency as a critical variable in mobility modeling, distinguishing it from broader or static analyses of human movement patterns.

SIGNIFICANCE: The impact of this contribution is demonstrated by its citation record, with 116 citations indicating substantial engagement within the field. Notably, 84.2% of the classified citing papers originate from independent researchers, suggesting that the work has been widely adopted and validated by the broader scientific community beyond the researcher's immediate circle.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 6

CORE PAPER

The effect of recency to human mobility

2015 · 117 citations (GS)

Field-normalised: 80 Semantic Scholar citations place it in the top 5% of Computer Science papers from 2015 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Trajectory generation: a survey on methods and techniques (2025)	University of Electronic Science and Technology of China	China	—
2	Evidence for a conserved quantity in human mobility (2018)	City, University of London, Technical University of Denmark	Denmark, United Kingdom	—
3	Correcting missingness in passively-generated mobile data with Multi-Task Gaussian Processes (2024)	New York University, Northeastern University, University of Washington	United States	—
4	Spatiotemporal-Augmented Graph Neural Networks for Human Mobility Simulation (2024)	College of Software Technology, Zhejiang University, Hangzhou City University, Zhejiang University	China	Background
5	A multi-scale unified model of human mobility in urban agglomerations (2023)	—	—	**Methodology**
6	Imputation of missing time-activity data with long-term gaps: A multi-scale residual CNN-LSTM network model (2022)	University at Buffalo, State University of New York	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).

Citing-text excerpts — how the field used this work

METHODOLOGY A multi-scale unified model of human mobility in urban agglomerations

"To explore the accuracy of the model, the EPR model, 15 three EPR variant models, 17,47,48 and the UMIP model are selected for performance comparison (see supplemental experimental procedures for details)."

D. Citing-Institution Prestige & Geography

Top citing institutions

Institution	Country	World ranking	Citing papers
Northeastern University	United States	QS 384	6
Technical University of Denmark	Denmark	SCImago #404 · THE 121 · QS 107	4
University of Exeter	United Kingdom	SCImago #679 · THE =170 · QS =155	3
Massachusetts Institute of Technology	United States	SCImago #41 · THE 2 · QS 1	3
University of Rochester	United States	SCImago #524 · THE 127 · QS 236	3

Institution	Country	World ranking	Citing papers
Peking University	China	SCImago #11 · THE 13 · QS 14	3
Texas A&M University	United States	THE =151 · QS 144	2
University of Southampton	United Kingdom	SCImago #556 · THE 129 · QS 87	2
University of Bristol	United Kingdom	SCImago #478 · THE =80 · QS 51	2
Université Paris-Saclay	France	SCImago #235 · THE =68 · QS =70	2
Zhejiang University	China	SCImago #6 · THE 39 · QS 49	2
Google Inc.	United States	—	2
Emory University	United States	SCImago #217 · THE 102 · QS 182	2
National University of Singapore	Singapore	SCImago #59 · THE 17 · QS 8	2
Fondazione Bruno Kessler	Italy	SCImago #1952	2

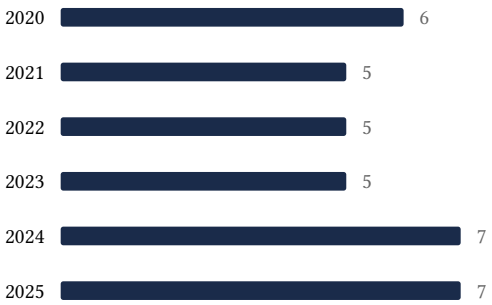
Geographic distribution of citing authors

Country	Citing papers
United States	22
China	15
United Kingdom	11
Spain	7
Italy	6
France	5
Denmark	4
Singapore	3
Japan	2
Switzerland	2
Germany	2
Netherlands	2

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.

E. Citation Growth Over Time

Distinct citing papers by publication year. Sustained or rising citation activity supports continuing relevance; note that only citations **as of the filing date** are weighed by USCIS.



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	From the betweenness centrality in street networks to structural invariants in random planar graphs	16	8 CFR 204.5(h)(3)(v) — Criterion 5
Contribution 2	Human mobility: Models and applications	8	8 CFR 204.5(h)(3)(v) — Criterion 5
Contribution 3	The effect of recency to human mobility	6	8 CFR 204.5(h)(3)(v) — Criterion 5