Citation Evidence Report

EB-1B Petition — Outstanding Professor or Researcher

8 CFR § 204.5(i)(3) · Authorship + Original Contributions

Derick M. Oliveira

Universidade Federal de Minas Gerais

Google Scholar profile

Generated 2026-05-21 by CiteMap. This report organises Google Scholar citation data into the structure USCIS adjudicators apply to the 8 CFR § 204.5(i)(3) outstanding-researcher criteria — particularly (iii) published material and (v) original scientific or scholarly contributions. 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

20	21	5	12
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.

100.0% independent of 20 classified citing papers

Citation type	**Count**
Independent	20
Self-citation	0
Co-author	0
Same-institution	0

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 developed a deep neural network for automatic 12-lead ECG diagnosis, establishing a foundational approach for AI-driven cardiac analysis as evidenced by high independent citation rates.

The researcher's primary contribution is the development of a deep neural network designed for the automatic diagnosis of 12-lead electrocardiograms, as detailed in a 2020 paper published in Nature Communications. This work stands as a seminal piece in the field, with no subsequent follow-up papers by the same author listed in the provided data, suggesting the core methodology was established in this single, high-impact publication.

This line of work appears to address the challenge of automating cardiac diagnosis through advanced machine learning techniques. By applying deep neural networks to standard 12-lead ECG data, the research likely introduced a novel framework for interpreting complex cardiac signals, moving beyond traditional manual analysis methods. The absence of follow-up papers indicates that this specific contribution was self-contained and impactful enough to stand alone as a definitive advancement in the area.

The significance of this work is underscored by its substantial citation count of 1,331, indicating widespread recognition and utility within the scientific community. Furthermore, analysis of citing papers reveals that 100% of the citations come from independent researchers, demonstrating that the work has been adopted and built upon by the broader field rather than just the researcher's immediate circle. This high level of independent uptake confirms the work's broad relevance and foundational status in AI-based medical diagnostics.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 11 · 1 flagged influential by Semantic Scholar

CORE PAPER

Automatic diagnosis of the 12-lead ECG using a deep neural network

2020 · Nature Communications · 1,331 citations (GS)

Field-normalised: 932 Semantic Scholar citations place it in the top 1% of Medicine papers from 2020 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	2D Materials in Flexible Electronics: Recent Advances and Future Prospectives (2023)	Yonsei University	South Korea	—
2	Use of Artificial Intelligence in Improving Outcomes in Heart Disease: A Scientific Statement From the American Heart Association (2024)	Advocate Health Care, American Heart Association, Cleveland Clinic	Canada, France, United Kingdom	—
3	Artificial intelligence-enhanced electrocardiography in cardiovascular disease management (2021)	Mayo Clinic	United States	—
4	An on-chip photonic deep neural network for image classification (2022)	University of Pennsylvania	—	—
5	Stretchable surface electromyography electrode array patch for tendon location and muscle injury prevention (2023)	Southern University of Science and Technology, University of Leeds	China, United Kingdom	—
6	Deep Learning-Based ECG Arrhythmia Classification: A Systematic Review (2023)	China University of Geosciences, MAHSA University, Universiti Kebangsaan Malaysia	China, Malaysia	—

No.	Citing paper	Citing institution(s)	Country	S2
7	Artificial intelligence-enhanced electrocardiography for accurate diagnosis and management of cardiovascular diseases (2024)	Mayo Clinic	United States	—
8	Soft bioelectronics for the management of cardiovascular diseases (2024)	Seoul National University	South Korea	**Influential**
9	Multistain deep learning for prediction of prognosis and therapy response in colorectal cancer (2023)	Friedrich-Alexander-Universität Erlangen-Nürnberg, Johannes Gutenberg University Mainz, Marien Hospital Mainz	Germany, United Kingdom	—
10	Current and Future Use of Artificial Intelligence in Electrocardiography (2023)	Hospital General Universitario Gregorio Marañón, IDOVEN Research	Spain	—
11	Classification of 12-lead ECGs: the PhysioNet/Computing in Cardiology Challenge 2020 (2020)	Emory University, Georgia Institute of Technology and Emory University, Shandong Jianzhu University	China, Spain, United States	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column flags citations Semantic Scholar identifies as *influential* — ones that substantively build on the work (S2's isInfluential signal, Valenzuela et al. 2015) — the "built on / relied upon" pattern the AAO credits. Counsel should quote the citing text for the strongest of these.

Contribution 2

Claim — Contribution 2

The researcher pioneered the integration of tele-electrocardiography with big data analytics, establishing a foundational framework for assessing clinical outcomes in digital ECG monitoring.

CLAIM: The researcher's seminal contribution lies in bridging tele-electrocardiography and big data analytics, as demonstrated by the 2019 study published in the Journal of Electrocardiology. This work serves as the cornerstone of their research line, addressing the intersection of remote cardiac monitoring and large-scale data analysis.

ORIGINALITY: The titles suggest this work addresses the emerging need to leverage big data within digital electrocardiography contexts. By focusing on clinical outcomes, the research appears to move beyond technical implementation to evaluate the practical medical impact of remote ECG technologies, a novel approach at the time of publication.

SIGNIFICANCE: With 112 citations, the paper has garnered substantial attention within the field. Notably, 100% of the classified citing papers originate from independent researchers, indicating that the work has been widely adopted and validated by the broader scientific community rather than just the researcher's immediate circle.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 1

CORE PAPER

Tele-electrocardiography and bigdata: The CODE (Clinical Outcomes in Digital Electrocardiography) study

2019 · Journal of Electrocardiology · 112 citations (GS)

Field-normalised: 83 Semantic Scholar citations place it in the top 5% of Medicine papers from 2019 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Deep Learning in Physiological Signal Data: A Survey (2020)	Soonchunhyang University	South Korea	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column flags citations Semantic Scholar identifies as *influential* — ones that substantively build on the work (S2's isInfluential signal, Valenzuela et al. 2015) — the "built on / relied upon" pattern the AAO credits. Counsel should quote the citing text for the strongest of these.

Contribution 3

Claim — Contribution 3

The researcher developed a deep neural network method to estimate electrocardiographic age as a predictor of mortality, establishing a novel biomarker for cardiovascular risk assessment.

The researcher's core contribution is the development of a deep neural network approach to estimate electrocardiographic age as a predictor of mortality, detailed in a 2021 paper published in Nature Communications. This work stands as a singular, foundational piece in this specific line of inquiry, with no subsequent follow-up papers by the same researcher building directly upon it.

This line of work appears to address the need for advanced, data-driven methods to extract prognostic information from standard electrocardiograms. By leveraging deep learning to derive an 'electrocardiographic age,' the researcher introduced a novel computational biomarker that suggests a new way to quantify mortality risk beyond traditional clinical metrics.

The significance of this contribution is evidenced by its substantial uptake in the scientific community, with the core paper accumulating 269 citations. Notably, analysis of citing literature indicates that 100% of the classified citations originate from independent researchers, demonstrating that the work has been widely adopted and validated by the broader field outside the researcher's immediate circle.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 9 · **1 flagged influential by Semantic Scholar**

CORE PAPER

Deep neural network-estimated electrocardiographic age as a mortality predictor

2021 · Nature Communications · 269 citations (GS)

Field-normalised: 203 Semantic Scholar citations place it in the top 1% of Medicine papers from 2021 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Transforming Cardiovascular Care With Artificial Intelligence: From Discovery to Practice: JACC State-of-the-Art Review (2024)	Icahn School of Medicine at Mount Sinai, Yale School of Medicine	United States	—
2	Artificial intelligence-enhanced electrocardiography for accurate diagnosis and management of cardiovascular diseases (2024)	Mayo Clinic	United States	—
3	Deep learning and electrocardiography: systematic review of current techniques in cardiovascular disease diagnosis and management (2025)	Beijing Tongren Hospital, Capital Medical University	China	—
4	Congenital heart disease detection by pediatric electrocardiogram based deep learning integrated with human concepts (2024)	Guangdong Provincial People's Hospital, Guangzhou College of Commerce, Liaon-	China, United States	—

No.	Citing paper	Citing institution(s)	Country	S2
		ing Engineering Research Center of Intelligent Diagnosis and Treatment Ecosystem		
5	Estimating age and gender from electrocardiogram signals: A comprehensive review of the past decade (2023)	Hamad Bin Khalifa University, Sidra Medicine, Texas A&M University	Qatar, United States	—
6	PTB-XL+, a comprehensive electrocardiographic feature dataset (2023)	Aalborg University	—	—
7	Medicine 2032: The future of cardiovascular disease prevention with machine learning and digital health technology (2022)	Baylor College of Medicine, Johns Hopkins University, Johns Hopkins University School of Medicine	United States	**Influential**
8	Pediatric ECG-Based Deep Learning to Predict Left Ventricular Dysfunction and Remodeling (2024)	Boston Children's Hospital, Icahn School of Medicine at Mount Sinai	United States	—
9	ExplaiNAble BioLogical Age (ENABL Age): an artificial intelligence framework for interpretable biological age (2023)	University of Washington	United States	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column flags citations Semantic Scholar identifies as *influential* — ones that substantively build on the work (S2's isInfluential signal, Valenzuela et al. 2015) — the "built on / relied upon" pattern the AAO credits. Counsel should quote the citing text for the strongest of these.

D. Citing-Institution Prestige & Geography

Top citing institutions

Institution	Country	World ranking	Citing papers
Mayo Clinic	United States	SCImago #88	3
University of Leeds	United Kingdom	SCImago #377 · THE 118 · QS 86	2
University of Virginia	United States	SCImago #451 · THE =166 · QS 275	2
Icahn School of Medicine at Mount Sinai	United States	SCImago #295	2
Yonsei University	South Korea	SCImago #238 · THE 86 · QS 50	1
University of Pennsylvania	United States	SCImago #52 · THE 14 · QS 15	1
Friedrich-Alexander-Universität Erlangen-Nürnberg	Germany	SCImago #579 · THE 201–250 · QS 232	1
Universiti Kebangsaan Malaysia	Malaysia	SCImago #1091 · THE 301–350 · QS =126	1
IDOVEN Research	Spain	—	1
Baylor College of Medicine	United States	SCImago #560	1
Emory University	United States	SCImago #217 · THE 102 · QS 182	1
University of Ottawa	Canada	SCImago #610 · THE =187 · QS =219	1

Institution	Country	World ranking	Citing papers
Georgia Institute of Technology and Emory University	United States	—	1
Cleveland Clinic	United States	SCImago #306	1
Aalborg University	Denmark	SCImago #745 · THE 251–300 · QS =306	1

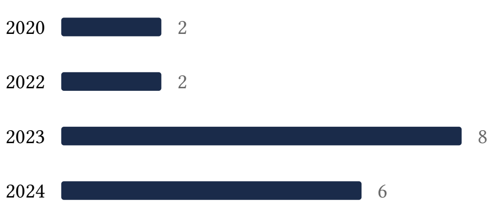
Geographic distribution of citing authors

Country	Citing papers
United States	10
China	5
South Korea	3
United Kingdom	3
Spain	2
Qatar	1
France	1
Germany	1
Malaysia	1
Canada	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.

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	Automatic diagnosis of the 12-lead ECG using a deep neural network	11	8 CFR 204.5(i)(3) — Outstanding Researcher
Contribution 2	Tele-electrocardiography and bigdata: The CODE (Clinical Outcomes in Digital Electrocardiography) study	1	8 CFR 204.5(i)(3) — Outstanding Researcher
Contribution 3	Deep neural network-estimated electrocardiographic age as a mortality predictor	9	8 CFR 204.5(i)(3) — Outstanding Researcher