

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title page; Abstract line 6-7 ("This systematic literature review...")
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 1, lines 1-22. Structured abstract includes: background (lines 2-5), objectives (lines 5-7), methods including databases and eligibility (lines 6-8), results (lines 8-15), limitations (lines 15-17), conclusions (lines 17-20), and implications (lines 18-22)
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 2, lines 39-44: Identifies gaps in comprehensive analyses tracing complete technological evolution from traditional ML to LLMs; lines 45-53: Lists specific gaps in existing literature
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 2, lines 54-66: States four primary objectives; Page 4, Table 1: Six research questions (RQ1-RQ6) with justifications
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 6, lines 156-166: Detailed inclusion criteria (7 items) and exclusion criteria (6 items); Page 6-7, Table 2: PICO framework defining Population, Intervention, Comparison, and Outcome
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 6, lines 167-173: Four databases specified (IEEE Xplore, ScienceDirect, SpringerLink, ACM Digital Library); Lines 177-179: Search conducted in October 2024, covering publications from January 2014 through September 2024



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Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 6, lines 174-179: Complete Boolean search query with operators (AND, OR) including traffic parameters, prediction/forecasting terms, ML/DL/LLM terms, and application domains
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 5, Figure 1: PRISMA flow diagram showing four-stage process; Page 6, lines 180-184: Four distinct phases described; Page 7, lines 244-246: Two independent reviewers screened records; Inter-rater reliability Cohen's $\kappa = 0.84$
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 8, lines 221-229: Systematic data extraction using standardized template; 20% sample independently extracted by two reviewers; Cohen's $\kappa = 0.91$ indicating near-perfect agreement
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 8, lines 221-229: Comprehensive list of extracted data categories including: Publication Metadata, Methodological Approach, Technical Details, Application Context, Data Characteristics, Temporal Scope, Performance Metrics (Accuracy, MAE, RMSE, MAPE), Implementation Details, Limitations and Challenges
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 8, lines 221-229: Additional variables extracted include hyperparameter configurations, model complexity metrics, road type, vehicle type, geographical location, congestion type, dataset size and duration, computational requirements, deployment scenarios, software frameworks
Study risk of bias	11	Specify the methods used to assess risk of bias in the	Page 6, lines 185-189 and Page 8, Section 3.7: Quality assessment

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assessment		included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	using multiple criteria: (1) Publication Quality - SCImago Journal Rank (Q1-Q4), CORE rankings (A,B,C), citation impact; (2) Methodological Rigor; (3) Reporting Standards. Results: 87% Q1 journals, 9% Q2, 4% A-ranked conferences
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 9-10, lines 250-262: Performance metrics include Accuracy (%), MAE (Mean Absolute Error), RMSE (Root Mean Square Error), MAPE (Mean Absolute Percentage Error), Precision, Recall, F1-score, ROC/AUC; Page 10, Table 7: Performance comparison showing ranges for each methodology
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 8, lines 221-229: Mixed-methods approach including quantitative analysis of performance metrics, qualitative assessment of methodologies, chronological analysis to discern trends, comparative analysis of AI techniques, and thematic analysis of limitations
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 6-7, lines 200-220: Taxonomy development as structured vocabulary for systematically analyzing papers; Classification facilitated data analysis using mixed-methods approach
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Multiple tables throughout: Tables 4-6 (taxonomies), Tables 7-21 (performance comparisons and analyses); Multiple figures: Figures 2-11 (trends, distributions, comparisons, evolution diagrams)
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 8, lines 221-229: Narrative synthesis using mixed-methods approach combining quantitative and qualitative analyses. No statistical meta-analysis performed due to heterogeneity of methods and metrics; comparative analysis approach more appropriate for technological evolution review
	13e	Describe any methods used to explore possible causes of	Page 12-15, Section 5: Comparative analysis by model type; Page

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		heterogeneity among study results (e.g. subgroup analysis, meta-regression).	16-19, Section 6: Analysis by infrastructure type (Table 15), congestion type (Table 16), prediction timeframe (Table 17), traffic parameters (Tables 18-19)
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Page 14-15, Figure 9 and Section 5.6: Performance-complexity trade-off analysis; Page 14, Table 10: Application suitability analysis showing recommended vs. alternative vs. avoid approaches for different scenarios
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 6, lines 185-189: Citation impact assessment (minimum 5 citations for papers >2 years old); Focus on peer-reviewed high-quality outlets (Q1 journals, A-conferences) to minimize reporting bias
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 6, lines 185-189 and Page 8, Section 3.7: Multi-criteria quality assessment including publication venue ranking, citation impact, methodological rigor, validation approaches, and reporting standards
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 5, Figure 1: PRISMA flow diagram showing: 315 initial records, 42 duplicates removed, 273 after duplicates, 158 screened, 115 excluded after title/abstract, 158 assessed for eligibility, 58 excluded, 100 included. Page 6-7, lines 242-257: Detailed description of each phase
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 6-7, lines 247-254: Exclusion reasons: 2,918 records (not congestion-focused: 1,654; not utilizing ML/AI: 892; review papers: 372); 412 studies (insufficient detail: 178; no validation: 121; quality concerns: 87; unavailable: 26)
Study	17	Cite each included study and present its characteristics.	Page 8, lines 231-232: All 100 papers cited [2-58, 61-71, 74-77,

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characteristics			80, 83-90, 93, 94, 96, 99-106, 108-114]; Tables 11-13 (pages 15-16): Representative studies with year, method, dataset, limitations, performance, findings
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 8, Section 3.7: Quality results: 87% Q1 journals, 9% Q2, 4% A-ranked conferences; Tables 11-13: Limitations column documents potential biases for each study
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Tables 11-13 (pages 15-16): Individual study results with performance metrics; Page 10, Figure 5: Distribution of metrics; Page 10, Table 7: Performance ranges by methodology
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 10, Table 7: Performance summary across methodologies; Page 12-15, Section 5: Comparative analysis of Traditional ML, Deep Learning, LLM, and Hybrid approaches
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Page 10, Table 7: Performance ranges (Traditional ML: 75-85%, Deep Learning: 85-92%, LLM: 90-95%, Hybrid: 92-96%); Page 13, Figure 8: Comparative accuracy; Page 15, Figure 9: Performance-complexity trade-off
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Page 16-17, Tables 15-16: Performance by infrastructure and congestion type; Page 17, Table 17: Performance by timeframe; Page 18-19, Tables 18-20: Impact of parameters and architectures
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Page 14-15, Section 5.6-5.7: Performance-complexity trade-off and application suitability showing robustness; Page 13-14, Tables 8-10: Cross-methodology comparisons
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis	Page 10-11, Figure 6 and lines 264-279: Common limitations (66% cite data issues, 50% accuracy limitations); Limitations

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		assessed.	section discusses potential publication bias
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Page 10, Table 7: Clear performance ranges; Page 8: 87% Q1 journals indicates high certainty; Page 12-15: Consistent patterns increase confidence; Page 19-21, Table 21: Performance-cost trade-offs
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 19-21, Section 7.1-7.2: Temporal evolution and performance in context of field development; Page 16-17, Section 6.1: Impact of ML to LLM evolution
	23b	Discuss any limitations of the evidence included in the review.	Page 10-11, lines 264-279: Primary challenges (data issues 66%, accuracy limitations 50%, performance constraints 36%); Section 7.4.2: LLM implementation challenges; Conclusion acknowledges persistent challenges
	23c	Discuss any limitations of the review processes used.	Page 4, lines 180-181 and limitations section: Three-database focus, English-only, excluded grey literature, 2014-2024 timeframe limitations acknowledged
	23d	Discuss implications of the results for practice, policy, and future research.	Page 22-24, Section 7.5: Comprehensive recommendations for: (1) Methodological approaches (hybrid models, pre-training, optimization, XAI, multimodal fusion); (2) Data needs (benchmarks, augmentation, privacy, metrics, deployment); (3) Application-specific implementations
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 4, lines 180-181: "No protocol was registered as this review provides a research landscape overview rather than intervention effect assessment"

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	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 4, lines 180-181: Protocol was not prepared (justified as methodological landscape overview consistent with PRISMA 2020 guidance)
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/A - No protocol registered; all methodological decisions documented in Methods section
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 24, line 597: "This research received no external funding"
Competing interests	26	Declare any competing interests of review authors.	Page 25, line 606: "The authors declare no conflicts of interest"
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Page 24-25, lines 600-603: "The data supporting this systematic review are available from the corresponding author upon reasonable request. Complete search strategies, screening decisions, data extraction spreadsheets, quality assessment criteria, and analysis code are available upon request to mehdi.attioui@enscasa.ma"

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

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