Research Report on

theoretical expected-utility models of risk-averse transit routing under travel-time uncertainty

Full search query: I want to find theoretical and modelling studies on how to design urban public transport trip recommender systems that compute route suggestions under travel time and schedule uncertainty, where travellers' risk attitudes toward delays and arrival-time unreliability are explicitly modelled using expected utility theory with risk-averse utility functions in travel time and/or lateness

Summary

The search did not uncover any paper that directly implements an urban public transport trip recommender that computes route suggestions using *explicit risk averse expected utility*over travel time and/or lateness, but it identified strong building blocks in: (i) stochastic PT trip planning with reliability objectives [1,2], (ii) general risk averse EU routing and policies in abstract networks [4,5,6], and (iii) behavioural work on public transport uncertainty [7,3].

Overall Finding: No "Perfect Match" but Strong, Complementary Building Blocks

Most crucial point: None of the retrieved works simultaneously satisfies all three conditions:

1. **Urban public transport network** with timetables/headways and transfers,
1. **Algorithmic trip planner / recommender** that actually returns routes or policies,
1. **Objective = maximization of expected utility with a risk averse (nonlinear/concave) utility**defined over travel time and/or schedule deviation.

- The best **PT trip planners** under uncertainty, **DEPART** [2] and **PROTRIP** [1], model stochastic travel/waiting times (and in PROTRIP's case, correlations and real time updates), but**do not use an explicit concave expected utility formulation**; instead they combine expected time with reliability metrics (on time arrival probability, etc.).
- The most rigorous **risk averse EU routing theory**is in general network settings:
  - **Stochastic dominance and utility classes** [6],
  - **Entropic/CARA risk measures equivalent to EU** [5],
  - **General-utility, policy-based routing with approximate DP** [4];but these lack PT specific timetable/transfer modelling.
- Behavioural PT work on **waiting-time uncertainty and risk preference** [7,3] offers *inputs* for utility specification, but is not integrated into routing algorithms.

The implication is that your research space—**EU-based risk-averse trip recommender design for urban PT under schedule uncertainty**—is largely open, with clear conceptual and algorithmic ingredients already available but not yet assembled.

What the PT-Focused Routing Papers Contribute (and Where They Fall Short)

Stochastic PT trip planners with reliability objectives

DEPART (Ni et al., 2015) – stochastic time-dependent bus planner [2]

- **Context and strengths**
  - Citywide bus network; uses large-scale smart-card data to build **time-dependent random variables** for both in-vehicle and waiting times.
  - Constructs a **stochastic, time-dependent network** and enforces FIFO via linearization of stochastic step functions.
  - Returns routes that trade off **“speediness” (expected travel time)** and **“reliability”** of arrival.
- **Limitations relative to your goal**
  - Reliability is handled via **indices** (e.g., variability, reliability measures), not via an explicit **E[u(·)] with concave u**.
  - The planner computes recommended paths, but their “risk preference” is encoded in multi-objective tradeoffs, not **risk-averse utility functions** operating on random arrival times.
- **Use for your work**
  - Provides a **blueprint for stochastic PT network modelling** (travel and waiting distributions, time-of-day effects).
  - Shows how to implement a **city-scale stochastic PT planner**, which you could re-aim at EU-based objectives.

PROTRIP (Thangeda & Ornik, 2020) – online risk-aware transit planner [1]

- **Context and strengths**
  - Fixed-route bus system; given OD, travel-time budget, and “tolerance for uncertainty,” computes an **optimal online route choice**.
  - Explicitly models **spatial correlation** of edge travel times and exploits **real-time information** to update downstream distributions.
  - Objective balances **on-time arrival probability** vs **expected travel time**.
- **Limitations relative to your goal**
  - Risk attitude is captured through a **tradeoff parameter between mean and on-time probability**, not through a **concave utility in travel time or lateness**.
  - There is no explicit utility function u(·) over arrival time or schedule deviation; thus it does not qualify as risk-averse EU.
- **Use for your work**
  - Demonstrates **policy-based PT routing with recourse** under correlated uncertainty.
  - Offers a data and algorithmic structure you could adapt to **replace their objective** with a risk-averse **expected utility** (e.g., utility of arrival-time deviation from a deadline).

Behavioural PT uncertainty studies

- **Waiting-time uncertainty in PT** [7]:
  - Quantifies how travellers evaluate **uncertainty in waiting times** in public transport networks.
  - While the exact framework is not visible here, this kind of study is likely to provide **empirical curvature parameters** or weights for uncertain waiting time in utility.
- **Transit route choice with risk preference** [3]:
  - From the title, likely estimates **risk-preference parameters** for transit users.
  - Potentially uses expected utility or prospect-theoretic constructs; specifics are missing but could be crucial for **calibrating risk-averse utilities** in a PT context.

Bottom line for PT papers: You have **realistic stochastic PT planners** [1,2] and **behavioural estimates** on PT uncertainty [7,3], but **no paper closes the loop** by:

- embedding a **concave utility in travel time/schedule deviation** into the planner, and
- designing algorithms to **compute EU-optimal paths/policies** in a realistic PT network.

What the Risk-Averse Expected Utility Routing Literature Offers

General routing with explicit risk-averse EU

General utility-based routing policies (Hoy & Nikolova, 2015) [4]

- **Core contribution**
  - Considers routing where the goal is to **maximize E[u(T)]** for a **general monotone utility u**, focusing on arrival “around a given deadline.”
  - Decision object is a **routing policy** (adaptive decisions based on current time/position), not just a fixed path.
  - Tackles the key difficulty that **general u destroys additivity and separability**: dynamic programming doesn’t directly apply.

- **Algorithmic innovation**
  - Uses **adaptive discretization in utility space** to construct **µoptimal policies in polynomial time**.
  - The approach is agnostic to the specific form of u, as long as it is monotone—so **concave, risk-averse utilities over lateness are included**.
- **Relevance to your topic**
  - Provides **exactly the type of risk-averse EU decision problem** you care about: **arrival-time-related utility under uncertainty**, with **policy-based recourse**.
  - Needs to be combined with **PT-specific network models and schedule structures**, but offers a **ready-made algorithmic framework**.

Entropic risk and CARA expected utility with additivity (Cominetti & Torrico, 2013) [5]

- **Conceptual result**
  - Axiomatizes "reasonable" risk measures for routing and shows that **additive consistency** (adding an independent downstream random time to all options does not change relative preference) leads uniquely to **entropic risk**:
    [
    \rho(X) = \frac{1}{\beta}\ln E[e^{\beta X}],
    ]
    which is equivalent to having **CARA (exponential) utility** and minimizing the certainty equivalent.
- **Algorithmic implication**
  - Under **independent link travel times**, this risk measure is **additive over arcs**:(\rho(T_p) = \sum_{a\in p} \rho(\tau_a)), so you can use standard **shortest-path algorithms**.
- **Relevance to your topic**
  - Offers a **tractable, EU-consistent risk-averse model** that preserves optimal substructure.
  - Directly applicable if you can:
    - Model a generalized cost (including schedule-related components) as the random variable X, and
    - Accept (or approximate) **link independence**.
  - Could be a pragmatic choice for a **first EU-based PT planner** where tractability is key.

Stochastic dominance and classes of risk-averse utilities (Wu & Nie, 2011) [6]

- **Key idea**
  - Uses **stochastic dominance (FSD, SSD, TSD)** to represent travellers with different risk attitudes **within expected utility theory**:
    - SSD corresponds to all **risk-averse** utilities (increasing, concave), etc.
  - Defines **SD-admissible path sets**: sets of routes that are not dominated under a given SD order and therefore could be optimal for some utility in the corresponding class.
- **Algorithmic contribution**
  - Proposes **label-correcting algorithms** to generate FSD/SSD/TSD admissible paths without full path enumeration.
  - Shows that many reliability-based models (mean–variance, OTA probability, etc.) pick routes from within these admissible sets.
- **Relevance to your topic**
  - Provides a **general pruning mechanism** for risk-averse routing:
    - In a PT network, you could define dominance over **arrival-time distributions (including missed-transfer events)** and restrict explicit EU evaluation to SD-admissible paths.
  - Particularly valuable when **arrival-time distributions are complex** (multi-modal, heavy-tailed due to transfers and disruptions).

Heterogeneous risk aversion and time budgets (Lo et al., 2006) [8]

- Models **degradable networks** with travellers having **heterogeneous risk aversion** and travel-time budgets.
- While not PT-specific and lacking explicit functional forms in the excerpt, it:
  - Embeds risk aversion at the network equilibrium level.
  - Reinforces the idea of **time budgets/deadlines** interacting with risk preference.

Combined insight: The EU routing literature provides:

- **Behaviorally grounded models**: SD-based classes of risk-averse utilities [6], entropic/CARA EU [5].
- **Algorithmic strategies** for dealing with **non-additivity**:
  - Approximate DP via **utility discretization** [4],

- **SD-based pruning** of candidate paths [6],
- Recovery of additivity for special utility families [5].

These are highly relevant to designing **PT trip recommendations** that optimize **risk-averse expected utility**, especially once adapted to **timetable-based networks with transfers, waiting times, and schedule deviations**.

Non-EU Risk and Scheduling Models That Are Close but Not Quite EU

Several papers sit conceptually near risk averse EU routing but**fail the strict EU criterion**, yet they are useful to understand **problem structure** and **approximation ideas**.

Mean–variance and GMV-type routing (Wang et al., 2020) [10]

- Defines a **generalized mean–variance (GMV) metric** combining:
  - Expected travel time,
  - Variance,
  - Early/late arrival penalties,
  - On-time arrival probability constraints.
- Travellers minimize this deterministic composite metric; **no explicit utility u(X)** is given.
- Shows:
  - GMV is **non-additive**, requiring propagation of distribution/moment information.
  - Provides **dominance rules** and traffic-assignment algorithms under this non-additive cost.
- **Use for your work**
  - Structurally similar to EU-based routing: both involve **non-additivity**, schedule penalties, and distribution-aware routing.
  - Their dominance rules and equilibrium formulation may inspire **analogous constructs for true EU models**.

Deadline-based reliability routing (Lim et al., 2012) [9]

- Develops scalable algorithms for **stochastic shortest-path queries** like maximizing **probability of arriving before a deadline**.
- Uses edge distributions characterized by **mean and variance**, and pre-computed data structures for fast queries.
- **Use for your work**
  - Shows how to handle **deadline-oriented routing at city scale**.
  - Their methods could be adapted as **subroutines or approximations** inside an EU-based planner where **u** is strongly focused on lateness beyond a deadline.

Takeaway: These works show how to manage **non-additivity, deadlines, and distributional complexity** in large networks, even though their objectives are not formally **expected utility**. Their algorithmic structures are useful precedents for EU-based planner design.

Synthesis: What You Can Safely Conclude and Where the Open Space Is

1. No existing system meets your full specification

Based on the available abstracts and descriptions:

- There is **no documented system** that:
  - Operates on a **realistic urban PT network** with timetables/headways and transfers,
  - Computes **recommended routes or dynamic policies** for travellers,
  - And does so by **maximizing risk-averse expected utility** over **travel time and/or schedule deviation**.

The closest are:

- **PROTRIP** [1] and **DEPART** [2] for **stochastic PT routing and policies**, but they use reliability metrics, not concave EU.
- **Hoy & Nikolova** [4], **Cominetti & Torrico** [5], **Wu & Nie** [6] for **risk-averse EU routing**, but in **abstract/general networks**, with no PT timetable/transfer modelling.

2. The core ingredients for your target system already exist in separate strands

To build a **risk-averse EU PT trip recommender**, the available literature provides:

- **Network and uncertainty representation**
  - Time-dependent stochastic models for bus travel and waiting times [2].
  - Handling of **correlated travel times** and **real-time updates** in PT [1].
- **Decision-theoretic foundation**
  - General **risk-averse EU policies** around deadlines with approximation algorithms [4].
  - **CARA/entropic risk** as an EU-consistent, path-additive risk measure [5].
  - **Stochastic dominance** frameworks that align with broad classes of concave utilities and support pruning [6].
- **Scheduling and behavioural inputs**
  - Empirical evaluation of **waiting time uncertainty** and likely scheduling preferences in PT [7].
  - Transit **route choice with risk preference**, presumably offering estimates of risk-attitude parameters [3].
  - Mean–variance–schedule formulations that clarify the structural interaction between **variance, lateness, and reliability constraints** [10].

3. Algorithmic challenges and design levers are clear

Key design choices and challenges for your research, informed by this literature:

- **Outcome and utility specification**
  - Decide whether utility is over:
    - **Total travel time**,
    - **Arrival time relative to a desired arrival/deadline**, or
    - A **multi-attribute generalized cost** (in-vehicle time, waiting, walking, schedule delay).
  - Use behavioural insights from [7,3] to choose **concave and asymmetric utility forms** for lateness and waiting.
- **Risk-averse EU structure**
  - **Option A (general utility):**
    - Use something like Hoy & Nikolova's **utility-space discretization** [4] to compute **μoptimal policies** in a PT network with state = (stop, time, maybe observed delays).
  - **Option B (special utility for tractability):**
    - Adopt **CARA/entropic risk** [5] over a generalized cost that incorporates schedule-delay penalties, leveraging additivity to use **shortest-path algorithms**, possibly with approximated independence.
  - **Option C (SD-guided pruning):**
    - Generate **SD-admissible route sets** [6] using arrival-time distributions (incorporating missed transfers), then maximize **E[u(·)]** over a manageable candidate set.
- **Handling non-additivity and distribution complexity**
  - Use distribution propagation techniques similar to **DEPART** [2] and **GMV path search** [10].
  - Exploit **dominance rules and pruning** (from SD [6] or GMV [10]) to keep the computation tractable.
- **Dynamic policies vs fixed paths**
  - DECIDE whether your recommender will:
    - Return **policies** that adapt to realized delays and vehicle arrivals (as in [1,4]), or
    - Focus on **ex ante fixed routes**.
  - Policy-based design aligns with **real-time information** and captures **recourse**, but heightens computational and modelling demands.

4. Positioning your contribution

Given the evident fragmentation:

- A natural and evidently *novel* research direction is to:
  - Take the **stochastic PT network and real-time framework** of PROTRIP/DEPART [1,2],
  - Embed a **risk-averse expected utility** over **arrival-time deviation** and possibly **time components** (waiting, in-vehicle) calibrated from [7,3],
  - And leverage algorithmic ideas from **general EU routing** [4,5,6] and **non-additive risk models** [10] to design a **computationally efficient planner**.

Your work would then clearly fill the current gap:

- From **risk-aware but non-EU PT planners** to

- **Fully EU-consistent, risk-averse urban PT trip recommender systems** that handle travel-time and schedule uncertainty with explicit user risk attitudes.

Categories

Comparative Overview of the Retrieved Literature

High level positioning of the papers

To orient the comparison, it is useful to group the papers along **two key axes**:

1. **Domain and application focus**
   - **Urban public transport routing / trip planning:** [1,2,3,7]
   - **Generic routing / road traffic (non-PT-specific):** [4,5,6,8,9,10]

1. **Treatment of risk and expected utility (EU)**
   - **Explicit EU with risk-averse utility (or entropic/CARA EU):** [4,5,6,8]
   - **Reliability / risk measures without explicit risk-averse EU:** [1,2,9,10]
   - **Unknown from the excerpts (could be EU but not demonstrable here):** [3,7]

From the perspective of **"urban public transport trip recommender systems using risk-averse expected utility"**, none of the available abstracts clearly satisfy **all** requirements simultaneously (PT + recommender + explicit risk-averse EU). Instead we see:

- **Closest on the PT + routing side:** [1,2] – sophisticated stochastic PT planners, but their risk treatment is via reliability metrics rather than clearly specified concave EU.
- **Closest on the risk-averse EU side:** [4,5,6,8] – rigorous risk-averse routing formulations (including general concave utility, CARA, and SD-based approaches), but **not specific to urban public transport routing with timetables and transfers**.

The tables below compare the papers along dimensions that matter for **designing PT trip recommender systems with risk-averse EU under schedule/travel-time uncertainty**.

Comparison by Modeling of Uncertainty and Public Transport Specificity

Table 1 – Network / mode context and stochastic modeling

Ref	Network / mode context	PT specific structures (timetables, headways, transfers)	Randomness representation	Correlation handling
[1] PROTRIP (2020)	Urban transit network (fixed route bus)	Yes – fixed-route bus network; trip planning in a PT system [1]	Stochastic travel times on edges; explicitly accounts for variable congestion and travel-time uncertainty [1]	Yes – spatial correlation in edge travel times; downstream distributions updated using upstream real time info [1]
[2] DEPART (2015)	Citywide bus network	Yes – public transit bus network; stochastic time dependent model [2]	Bus travel time and waiting time modeled as time dependent random variables; "stochastic step functions" linearized to enforce FIFO [2]	Not fully specified in excerpt; focus on time dependence rather than explicit correlation structures
[3] Darko & Park (2020)	Transit user route choice	Transit context by title, but no detail in provided text	Unknown – abstract not available	Unknown
[4] Hoy & Nikolova (2015)	Generic routing in networks	Not PT-specific; general routing policies under deadlines [4]	Travel time modeled as random variable over which utility of arrival around a deadline is defined [4]	Not specified; results are general and do not rely on network-specific correlation assumptions
[5] Cominetti & Torrico (2013)	Generic transport routing	Not PT-specific; applies to road or general networks [5]	Random link travel times with independence assumption; path travel time is sum of link times [5]	Assumes **independent** link travel times to obtain additive risk measure [5]
[6] Wu & Nie (2011)	Generic route choice under uncertainty	Not PT-specific; general road/transport setting [6]	Route travel times as random variables; used to derive SD admissible paths [6]	Not explicit in excerpt; SD framework can handle general distributions but independence is not essential to the conceptual results

[7] Shelat et al. (2021)	Public transport networks	Yes – evaluates waiting time uncertainty in PT networks [7]	Uncertainty in waiting times; details unknown from excerpt	Unknown
[8] Lo et al. (2006)	“Degradable” transport network	Generic transport network, not PT-specific; focus on travel time budget and risk aversion [8]	Network “degradability” leads to random link/path travel times; travellers have heterogeneous risk aversion [8]	Not specified in excerpt
[9] Lim et al. (2012)	Road network routing (traffic delays)	Not PT-specific; applies to road routing and delays [9]	Edge lengths represented via distributions characterized by mean and variance; stochastic shortest path queries (e.g. maximize on-time arrival probability) [9]	Not detailed; main result assumes variance + independence-like structure to allow efficient approximations [9]
[10] Wang et al. (2020)	Road network (traffic assignment)	Not PT-specific; static network equilibrium [10]	Uses expected travel time, variance, and schedule-deviation metrics; path travel time distributions summarized by moments and schedule-delay terms [10]	Correlation not discussed in provided excerpt; GMV’s non-additivity suggests path-level distribution propagation is needed [10]

Implications for PT recommender design:

- **Direct PT routing implementations** exist in [1] and [2]; these are the only papers clearly dealing with **network-level PT routing with realistic bus operations** and can inspire how to model **stochastic waiting, transfers, and downstream updates**.
- **EU/theoretical risk attitude machinery** is much richer in [4,5,6,8], but must be **transplanted** into a PT network context to satisfy the stated research goal.

Comparison by Risk Attitude and Expected Utility Formulation

Table 2 – Objective functions and treatment of risk / utility

Ref	Objective / criterion	Explicit expected utility?	Risk attitude representation	Schedule deviation / arrival-time modeling
[1] PROTRIP (2020)	Balance **on-time arrival probability** and **expected travel time** given a travel-time budget and “tolerance for uncertainty” [1]	No explicit EU specified in excerpt; risk is encoded through on time arrival probability and a “tolerance” parameter [1]	Risk modeled via weighting between reliability (OTA probability) and expected time; not clearly linked to concave utility over random travel time [1]	Deadline-oriented via travel-time budget and on-time arrival probability; no explicit schedule-penalty utility form described [1]
[2] DEPART (2015)	Optimize both “speediness” (travel time) and “reliability” of returned routes [2]	No explicit expected utility form given in excerpt	Reliability treated as a separate performance dimension; likely via reliability indices or tailored path ranking; not tied to a concave utility [2]	Focus on travel-time reliability; no explicit schedule-delay utility formulation reported in excerpt [2]
[3] Darko & Park (2020)	Transit user route-choice with “risk-preference” (title) [3]	Unknown – abstract unavailable	Could involve risk preference, but no visible EU specification from current information	Unknown
[4] Hoy & Nikolova (2015)	**Maximize expected utility of arrival around a deadline**, over adaptive routing policies [4]	Yes. General **monotone utility function** over arrival time (or possibly lateness) is explicitly used, and expected utility is maximized [4]	Arbitrary monotone utility (includes concave risk averse utilities); focus on general utility functions beyond linear/exponential, which are typically non-additive and nonlinear [4]	Directly considers arrival “around a given deadline” [4], so schedule-deviation enters via utility over early/late arrival; form is not constrained (could be asymmetric, concave, etc.)
[5] Cominetti & Torrico (2013)	Minimize a **risk measure ÁT(p)** satisfying additive consistency, shown to be equivalent to an **entropic risk measure** (CARA EU) [5]	Yes, at least equivalently. Entropic risk corresponds to **CARA expected-utility**: ÁX()=(1/^{2})ln E[e^{^{2}X}], under independence [5]	Risk aversion captured via **CARA** utility over travel time; parameter ^{2}>0encodes risk aversion level [5]	No explicit scheduling / lateness; treats total travel time as outcome. Focus is on general random travel time, not arrival-time deviation [5]
[6] Wu & Nie (2011)	Use **stochastic dominance admissible paths** to represent choices of travellers with different risk attitudes; link SD orders	Yes, conceptually. First-, second-, third-order SD are connected to classes of utility functions (insatiabili-	Risk attitudes represented via **utility classes** corresponding to dominance orders; the algorithm generates SD admissible paths that could be optimal for	No explicit schedule-delay utility; outcome is travel

	to underlying utility maximization [6]	ty, risk aversion, ruin aversion) [6]	some concave utility within each class [6]	time, with SD defined over travel-time distributions [6]
[7] Shelat et al. (2021)	**Quantify evaluation of waiting time uncertainty** in PT networks [7]	Unknown from excerpt	Likely elicits valuation of uncertainty; but we cannot confirm EU-based or risk-averse specification	May involve schedule reliability or waiting-time distribution, but not visible in provided text
[8] Lo et al. (2006)	Travellers with **heterogeneous risk aversion** choose routes and travel time budgets in a degradable network [8]	Very likely EU-based risk aversion (given terminology), but the excerpt does not spell out the exact functional form	Risk aversion is explicitly modeled and heterogeneous [8]; usually interpreted via concave utility in such work, but we cannot assert the exact specification	Travel-time budget is central; may implicitly represent reliability/arrival constraints, but no explicit schedule-delay utility is visible in excerpt
[9] Lim et al. (2012)	Approximate **stochastic shortest paths** such as those that **maximize probability of arriving before a deadline** [9]	No explicit EU formulation; the focus is on probability constraints and mean/variance-based models [9]	Risk treated via **on-time arrival probability** and possibly variance-based objectives; not framed as concave EU [9]	On-time arrival (relative to a deadline) is key performance metric [9], but only via probability, not schedule-delay utility
[10] Wang et al. (2020)	Minimize a **generalized mean–variance (GMV)** metric combining expected travel time, variance, schedule delay, and reliability constraints [10]	No. The GMV metric is a deterministic composite of mean, variance, and schedule penalties, not derived from a concave utility [10]	Risk attitude expressed via weights on variance and schedule-deviation terms; conceptually similar to mean–variance preferences but not tied to EU except under strong approximations [10]	Explicit **earliness/lateness penalties** and on-time arrival probability constraints [10]; but penalties are additive/linear within GMV, not necessarily nonlinear EU over random lateness

Key contrasts:

- **True risk-averse EU:**
  - [4] is the most general and explicit: any monotone utility, policies optimized for **expected utility of arrival around a deadline**, including adaptive decisions.
  - [5] gives a **CARA/EU-based risk measure** that is path-additive under independence, permitting classical shortest-path formulations.
  - [6] anchors risk attitudes in SD which is equivalent to classes of concave utility functions (risk-averse or ruin-averse).
  - [8] clearly addresses heterogeneous risk aversion, very likely within an EU framework, though we lack precise functional forms.
- **Reliability / risk metrics without explicit EU:**
  - [1,2,9,10] implement risk-aware routing or assignment (on-time arrival, reliability, GMV), but they **do not explicitly state concave utilities over random outcomes**.
- **Schedule-delay modeling:**
  - Explicit deadlines and schedule effects appear in [1,4,9,10].
  - Among these, **only [4] clearly uses a utility function of arrival relative to the deadline**; [9] is probability-of-on-time-arrival; [10] is a deterministic GMV metric; [1] combines expected time with on-time arrival probability.

Comparison by Algorithmic Approach and Suitability for PT Trip Recommenders

Table 3 – Algorithmic structure, object of optimization, and relevance to recommender design

Ref	Object of optimization (path vs policy)	Algorithmic approach	Additivity / dynamic programming structure	Direct applicability to PT recommender with risk-averse EU
[1] PROTRIP (2020)	**Online route choice / policy** in PT network, given real-time info [1]	Uses stochastic modeling with correlation; computes "optimal online route choice" that trades off ETA and OTA probability [1]	Balances two objectives; not expressed as additive EU; uses real-time updating of distributions [1]	Very high in PT-system realism and online routing; however, **risk is not framed as EU**. Could be adapted by replacing their objective with an EU-based one.
[2] DEPART (2015)	Route planning – likely fixed recommended paths rather than policies [2]	Stochastic time-dependent model; linearization of stochastic step functions; multi-objective (speediness + reliability) [2]	Arrival-time distributions propagated over network; dominance rules likely based on reliability/expected time, not concave EU [2]	Strong for PT network modeling; **needs an EU re-specification** to meet the target (risk-averse utility).
[3] Darko & Park (2020)		Unknown	Unknown	Unknown; might provide behavioral EU/risk parameters for PT, but we can-

	Transit users' route choices (behavioral) [3]			not see algorithmic planner content.
[4] Hoy & Nikolova (2015)	**Routing policies** (adaptive decisions) [4]	Adaptive discretization variant of successive approximation; polynomial-time **μoptimal policies** for general monotone utilities [4]	Deals with **non-additive utility** by discretizing in utility space; overcomes non-separability that normally blocks DP [4]	Theoretically **very close to the desired framework** (risk-averse EU under uncertainty, policies, deadlines). Needs extension to PT-specific network and schedule structure.
[5] Cominetti & Torrico (2013)	Path choice & network equilibrium under risk-averse measure [5]	Shows that entropic risk with independent links yields path-additive cost Á(-Tp)=£aÁ(Ä then uses standard shortest-path and traffic assignment techniques [5]	Fully additive under independence; dynamic programming / shortest-path algorithms apply directly [5]	Highly useful as a **tractable EU-based risk model** that preserves optimal substructure. Needs adaptation for PT: link independence may fail; schedule delay not modeled.
[6] Wu & Nie (2011)	Set of SD-admissible paths; these cover optimal routes for a wide class of utilities [6]	General label-correcting algorithm to generate FSD-, SSD-, TSD-admissible path sets; avoids enumerating all paths [6]	Uses **stochastic dominance** for pruning; does not require a specific utility but ensures coverage of optimal paths under corresponding utility classes [6]	Provides a powerful **pruning mechanism** for risk-averse path search. To use in PT EU routing, one must define dominance over arrival-time distributions (including missed transfers) and then optimize EU within SD-admissible set.
[7] Shelat et al. (2021)	Likely behavioral valuation of waiting-time uncertainty [7]	Not specified	Not specified	Potential **input for utility calibration** (e.g., curvature or weights for waiting-time risk) in PT; not a routing algorithm.
[8] Lo et al. (2006)	Traveler route choice and travel-time budgets with heterogeneous risk aversion [8]	Network modeling of degradable (capacity-loss) links; equilibrium with heterogeneous risk attitudes [8]	Likely non-additive; details unknown; focuses more on equilibrium than algorithmic path search efficiency [8]	Conceptually useful for risk-averse behavior and travel-time budgets; not directly a trip recommender or PT-focused.
[9] Lim et al. (2012)	Stochastic shortest path **queries** (path recommendation) [9]	Preprocessing to build data structures; approximate queries in poly-log time; uses mean/variance-based representations [9]	Works with distributions characterized by mean and variance; requires additivity assumptions compatible with their stochastic model [9]	Algorithmically relevant for **fast stochastic routing**, especially with deadlines; but **objective is OTA probability or similar**, not risk-averse EU.
[10] Wang et al. (2020)	Path choice and user equilibrium under GMV [10]	Variational-inequality formulation; solution algorithm without explicit path enumeration; dominance rules for pruning candidate paths [10]	GMV is non-additive; requires propagation of moments and schedule penalties; dominance conditions exploit structure of GMV [10]	Provides methodology for non-additive path costs with scheduling/risk; could inspire EU-based algorithms, but is not an EU model and not PT-specific.

Notable algorithmic insights for EU-based PT recommenders:

- **Policy-based routing under general utility** – [4] provides a blueprint: discretize in **utility space** to deal with non-additivity and compute μoptimal policies. This is exactly the technical obstacle in risk-averse EU PT routing with complex arrival-time distributions.
- **Additivity via special utility** – [5] shows that **CARA/entropic risk** yields additivity under independence, permitting Dijkstra-like algorithms. If PT link times can be approximated as independent and if schedule delay can be embedded into a CARA-like generalized cost, this could be a tractable route.
- **Dominance-based pruning** – [6] suggests using **stochastic dominance** to heavily prune path sets before evaluating EU. This is highly relevant when propagating complex arrival-time distributions in PT networks.
- **Stochastic PT network modeling** – [1,2] provide concrete methods to:
  - build realistic stochastic models for bus travel and waiting times from smart-card or operational data [2];
  - handle **correlation and real-time information** in a PT network [1].

Synthesis: How These Works Map onto the Target Research Problem

What the existing literature already provides

- **PT-specific stochastic routing frameworks:**
  - [1] and [2] offer **direct prototypes of stochastic PT trip planners**, including:
    - representation of **waiting times, dwell times, and travel times** as random variables [2];

    - accounting for **correlated delays and real-time updates** [1].
  - These are ideal starting points for **network and stochastic process modeling**, including time-expanded/time-dependent networks for PT.

- **Rigorous risk-averse EU machinery:**
  - [4] gives a **general algorithmic framework** to compute routing policies under general risk-averse utilities over arrival time relative to deadlines.
  - [5] and [6] connect **risk-averse EU** with:
    - computational tractability via **entropic/CARA risk** [5];
    - **stochastic dominance sets** as a unified container for optimal paths under broad classes of utility functions [6].

- **Scheduling and reliability preferences in non-EU form:**
  - [10] blends **mean, variance, and schedule-delay** into a single generalized cost; despite not being EU, its non-additive nature and dominance rules are structurally similar to what EU-based planners will face.
  - [9] shows how to do **deadline-constrained stochastic routing** at scale, emphasizing **on-time arrival probability**.

- **Behavioral grounding for PT reliability preferences:**
  - [7] (waiting time uncertainty) and potentially [3] (transit user risk preference) are likely to provide **parameterization and functional insights** for concave utility or schedule-delay penalties in PT contexts, though details are missing here.

Where the gap remains

Given the criteria set for “precisely relevant” papers, none of the retrieved works:

- simultaneously handle a **multi-leg urban PT network** with timetables/headways and transfers,
- compute **route recommendations or policies**,
- and **explicitly** formulate and optimize over a **risk-averse expected utility** with concave utility in travel time and/or schedule deviation.

The closest combination one can construct from the existing literature is **conceptual and modular**, by combining:

- **PT network & uncertainty modeling** from [1,2];
- **general risk-averse EU routing and policies** from [4];
- **tractability guarantees via special utilities** ([5]) or **dominance-based pruning** ([6]);
- **schedule-delay and reliability components** from [9,10];
- **PT-specific valuations of waiting-time uncertainty** from [7] (and possibly risk preference structures from [3,8]).

In other words, **the building blocks exist**, but they have not yet been **integrated into a single PT trip recommender system** with explicit risk-averse EU as the decision criterion.

Brief Topic-Oriented Cross-Reference

To aid quick lookup, the table below maps key topics to the references that contribute most strongly.

Table 4 – Topic-to-reference mapping

Topic / organizing principle	Strongly related references	Notes
Urban PT stochastic trip planning / routing	[1,2]	Direct PT trip planners with stochastic travel and waiting times; reliability and real-time features but no explicit risk-averse EU.
Risk-averse expected-utility routing (general networks)	[4,5,6,8]	[4]: general utilities & policies; [5]: entropic/CARA with additivity; [6]: SD + utility classes; [8]: heterogeneous risk aversion under network degradation.
Arrival-time / schedule-delay modeling	[1,4,9,10]	[4]: utility over arrival around deadlines; [1,9]: on-time arrival probability; [10]: explicit early/late penalties in GMV.
Stochastic dominance as behavioral risk framework	[6]	Links FSD, SSD, TSD to insatiability, risk aversion, and ruin aversion, with algorithms for admissible path sets.
Additive risk-averse cost enabling standard shortest-path	[5]	Entropic risk under independent link times; equivalent to CARA EU, path cost additive.
	[10]	

Non-additive generalized cost / dominance in reliable paths		GMV metric makes costs non-additive; dominance rules developed for reliable shortest paths and equilibrium.
Large-scale stochastic routing with deadlines (non-EU)	[9]	Efficient approximate data structures for OTA-maximizing queries in stochastic road networks.
PT-specific valuation of uncertainty (behavioral)	[7], [3?]	[7]: evaluation of waiting-time uncertainty in PT; [3] likely route choice with risk preference in transit.
Correlation and real-time info in PT routing	[1]	Explicitly models spatial correlation of travel times and real-time updates for “online” optimal route choice.
Heterogeneous risk aversion & travel-time budget	[8]	Degradable network with travelers’ heterogeneous risk aversion and travel-time budgets.

These comparisons should support the subsequent steps in your project: selecting which **modeling elements** and **algorithmic ideas** to import into a unified risk-averse EU-based PT trip recommender, and identifying where **new theoretical or computational developments** are needed.

Timeline

Early Foundations: Reliability and Risk in Stochastic Travel-Time Networks (2006–2012)

From deterministic shortest paths to stochastic reliability

- **Lo et al. (2006)** introduced the **degradable transport network** model, where links fail or degrade probabilistically and travelers have **travel time budgets** with heterogeneous risk attitudes [8].
  - Focus: network performance and assignment under degradation, not yet explicit expected-utility (EU) routing for individuals.
  - Milestone: shifted attention from deterministic shortest paths toward **stochastic network performance** and **risk-aversion** in travel time budgets.

- **Wu & Nie (2011)** provided a crucial conceptual bridge by casting route choice under travel-time uncertainty in terms of **stochastic dominance (SD)** [6].
  - They linked:
    - **First-order SD ”insatiability**,
    - **Second-order SD ”risk aversion**,
    - **Third-order SD ”ruin aversion**,within an EU framework.
  - They proposed algorithms to generate **FSD/SSD/TSD-admissible path sets** via label-correcting dynamic programming, showing that many “reliability-based” route choice criteria used in practice (on-time arrival, variance, etc.) select paths within these SD sets [6].
  - Milestone: offered a **utility-theoretic interpretation of risk-taking behavior** without committing to a specific utility function and opened a computational route for handling broad classes of **risk-averse preferences**.

- **Lim et al. (2012)** developed **stochastic shortest-path query** algorithms for road networks, focusing on maximizing on-time arrival probability or related reliability measures using precomputed data structures [9].
  - They built travel-time distributions from GPS traces and provided **scalable algorithms for city-scale stochastic routing** [9].
  - Conceptually, the work is still largely **risk-neutral or reliability-index-based**, rather than EU risk-averse, but it marked a shift towards **implementable stochastic routing systems**.

Trend (2006–2012): The field moved from **network-level robustness and budgets** [8] to **individual-level stochastic dominance and reliability-aware path search** [6,9].

- Risk was acknowledged and partially formalized,
- But explicit **risk-averse EU models** and their algorithmic implications were only beginning to be articulated.

Formal EU-Based Risk-Averse Routing Theory (2011–2015)

Axiomatizing risk measures and linking to EU

- **Cominetti & Torrico (2013)** gave an axiomatic characterization of **risk measures for routing** and identified **entropic risk** as essentially the only measure satisfying a plausible **additive consistency** property for random travel times [5].
  - Additive consistency: if you add an **independent** downstream random time to all alternatives, their **preference ordering should not change**.

- They proved that, under standard axioms, this implies that the route cost is an **entropic risk measure**
$$\rho_{\text{ent},\beta}(X) = \frac{1}{\beta}\ln E[e^{\beta X}],$$
which is exactly the **certainty equivalent** of a **CARA (exponential) utility** under standard EU theory [5].
- Under independent link times, this risk measure becomes **additive over arcs**, enabling use of classic shortest-path algorithms.
- Milestone: **formally tied risk-averse routing to CARA EU**, providing both behavioral justification and algorithmic tractability.

General risk-averse utilities and routing policies

- **Hoy & Nikolova (2015)** studied **risk-averse routing policies** (not just fixed paths) for **general monotone utility functions** and a deadline-type objective [4].
  - They consider maximizing **E[u(T)]** where u is general (not just linear/exponential) and arrival around a deadline is the key criterion [4].
  - The core difficulty: for general u, the problem loses **separability** and cannot directly leverage dynamic programming; policies are **time-adaptive** and the state includes the remaining travel time budget.
  - Contribution: an **adaptive discretization algorithm** that delivers an **μoptimal policy in polynomial time**, with discretization in **utility space** rather than time space [4].
  - Milestone: showed that **risk-averse EU routing policies with general utilities are algorithmically tractable with approximation**, bringing theory closer to realistic risk-attitude models.

Trend (2011–2015):

- The focus shifted from heuristic reliability indices and SD-compatibility [6] to **explicit EU representations**:
  - Entropic/CARA utility with elegant additivity and shortest-path reduction [5].
  - General monotone utilities in an MDP/policy framework with approximation algorithms [4].
- This period establishes the **theoretical backbone** for risk-averse EU routing, though mostly in **road networks** and without explicit public-transport scheduling structures.

Emergence of Stochastic and Reliability-Aware Public Transport Planners (2015–2020)

Stochastic time-dependent bus network modelling

- **DEPART (Ni et al., 2015)** introduced a **dynamic route planner** for a **stochastic time-dependent bus network** using smart-card data [2].
  - They model both **bus travel times** and **waiting times** as **time-dependent random variables**, and construct a stochastic network model intended to obey FIFO [2].
  - DEPART returns routes optimized for both **speediness** (expected travel time) and **reliability**, with performance evaluated against real-world data.
  - The paper explicitly references stochastic routing work (Loui, Nikolova, Wu & Nie, Lim et al.) and recognizes challenges of **non-additivity and dynamic information** [2].
  - However, the decision criterion is not formulated as maximizing **expected utility with a concave u**; "reliability" is handled more in terms of **on-time probabilities / variability** rather than a **risk-averse EU** specification.
  - Milestone: **first realistic, city-scale stochastic PT trip planner** in this list, but still **not EU-based risk-averse** in a strict sense.

Public transport-focused but algorithm-driven

- This phase is characterized by:
  - Richer **stochastic models of PT operations** (time-dependent bus travel and waiting, correlations, FIFO enforcement) [2].
  - A clear aim to **deploy route planners**, not just theoretical models.
  - But **risk attitudes** are encoded via **reliability metrics** and multi-criteria tradeoffs, not via explicit **concave utility functions**.

Trend (2015):A bridge begins to form between:

- The **theoretical risk-averse EU literature** [4,5], and
- **Operational public transport trip planners** [2].

The **full integration** of risk-averse EU into trip recommender design, particularly with schedule-deviation utilities, is **not yet realized** at this stage.

Recent Moves Toward Explicit Risk Preferences in Public Transport and Routing (2020–2021)

PROTRIP: A probabilistic risk-aware transit planner

- **PROTRIP (Thangeda & Ornik, 2020)** proposes a **probabilistic risk-aware optimal transit planner** for a fixed-route bus network [1].
  - Objective: for a given OD, time budget, and passenger's "tolerance for uncertainty", compute an **optimal online route choice** that balances:
    - **Maximizing on-time arrival probability**, and
    - **Minimizing expected travel time** [1].
  - It incorporates **correlations between edge travel times** and **updates downstream distributions** using upstream real-time information [1].
  - Conceptually close to **policy-based stochastic shortest paths** with real-time updates (stochastic MDP-style).
  - However, based on the description, the risk preference is represented as a **tradeoff between mean and on-time probability**, not as a **concave utility function in travel time or lateness**.
  - Milestone: advanced, realistic **risk-aware PT planner** with **online recourse** and **correlated travel times**, but still short of an explicit **risk-averse EU** structure.

Transit route choice with risk preference

- **Darko & Park (2020)** (title: *Transit user route-choice modeling with risk-preference*) [3]
  - From the title, this appears to be a **behavioural route-choice model** for transit users with **risk preferences**; details are not available in the provided material.
  - Likely focuses on **estimation and behavioural characterization** rather than algorithmic routing, but this is speculative due to missing abstract.
  - Potential role: provides **empirical grounding** for risk-preference parameters relevant to EU-based models.

Generalized mean–variance routing under uncertainty

- **Wang et al. (2020)** propose a **generalized mean–variance (GMV) route cost metric** under travel time uncertainty [10].
  - The GMV metric combines:
    - Expected travel time,
    - Variance,
    - Expected early/late arrival penalties,with an on-time probability constraint [10].
  - Travelers minimize this GMV; the model is **non-additive** and requires distribution propagation and specialized dominance rules [10].
  - However, GMV is essentially a **risk measure + scheduling penalty**, not explicitly derived from **E[u(·)]** with concave u.
  - It is also developed for **road traffic assignment**, not public transport.
  - Milestone: advanced **distribution-sensitive routing and assignment** with scheduling penalties and risk, but **not explicitly EU-based**.

Valuation of waiting-time uncertainty in PT

- **Shelat et al. (2021)** quantify how travelers evaluate **waiting time uncertainty in public transport networks** [7].
  - Though the abstract is not provided, the topic suggests **behavioural valuation of waiting time variability**, likely with some reference to utility and reliability preferences.
  - Such work is crucial as it provides **inputs for utility functions** (e.g., curvature with respect to waiting time) that a risk-averse EU-based route planner would need.
  - Milestone: adds **fine-grained behavioural evidence** on how PT users value **uncertain waiting times**, which is a key component of schedule unreliability.

Trend (2020–2021):

- Emergence of **risk-aware PT planners** with sophisticated stochastic models [1].
- Increasing emphasis on **traveler risk preferences** and **waiting-time uncertainty** in PT behaviour [3,7].
- Yet, even the most advanced planners (PROTRIP) still **do not fully embed risk-averse EU** with concave u over total travel time / lateness; instead, they use **mean–probability tradeoffs** or **risk indices**.

Research Clusters and Key Contributors

Risk-averse routing and stochastic dominance (Wu, Nie, Cominetti, Torrico)

- **Wu & Nie** [6] and **Cominetti & Torrico** [5] form an early core around **risk-averse routing theory**:
  - Wu & Nie: SD-based admissible path sets, linking risk-averse behavior to SD orders and unifying many reliability models [6].
  - Cominetti & Torrico: axiomatization of risk measures leading to **entropic/CARA utility**, restoring additivity and allowing standard shortest-path algorithms [5].
- Influence:
  - DEPART cites Wu & Nie and uses **stochastic dominance notions** in the background [2].
  - These works are a key conceptual resource for anyone seeking **EU-consistent yet algorithmically tractable** risk-averse routing.

Risk-averse policies and algorithmics (Nikolova and collaborators)

- **Hoy & Nikolova** [4] contribute to the **policy-based routing** direction, focusing on:
  - Dynamic routing,
  - General monotone utilities,
  - Approximation via adaptive discretization in utility space.
- This line connects back to earlier stochastic routing work (e.g., Nikolova on stochastic road networks cited by DEPART [2]) and is conceptually aligned with **policy-based PT planners** like PROTRIP [1].
- Influence:
  - Provides **general algorithmic tools** that could be adapted to **transit networks** with schedule uncertainty and risk-averse utilities.

Stochastic route planning systems (Lim, Rus; Aydt; Ornik)

- **Lim et al.** [9] and later **Ni et al. (DEPART)** [2] and **Thangeda & Ornik (PROTRIP)** [1] represent a cluster focused on **deployable routing systems**:
  - Lim et al.: city-scale road-network stochastic routing with on-time arrival-oriented queries [9].
  - DEPART: citywide bus planner with stochastic travel and waiting times, focusing on time and reliability [2].
  - PROTRIP: policy-based transit planner with correlated travel times and online updates [1].
- Influence:
  - Demonstrate **feasibility of large-scale stochastic routing**,
  - But still largely operate with **risk-neutral / reliability index-based objectives**, not full risk-averse EU.

Behavioural risk preferences in PT (Shelat, Darko & Park)

- **Shelat et al.** [7] and **Darko & Park** [3] represent a behavioural cluster:
  - Focus on **empirically quantifying** how PT users value uncertainty (waiting time, schedule unreliability, risk preference).
- Influence:
  - Provide **parameter and functional-form inputs** for EU models (e.g., curvature, scheduling asymmetry), but do not yet feed directly into **implemented planners**.

Overall Trends and Implications for Future EU-Based, Risk-Averse PT Recommenders

1. Increasing realism in uncertainty modelling

- Over time, models evolved from:
  - **Abstract random travel times / network degradation** [8],
  - To **distribution-based road networks with GPS-derived travel times** [9],
  - To **time-dependent stochastic bus networks with smart-card data** [2],
  - And **correlated, real-time updated PT travel times** [1].
- This progression shows that **rich stochastic models** for PT are now operationally feasible.

2. Gradual but incomplete integration of EU and risk aversion

- The **theoretical side** has solid EU-based risk-averse routing tools:
  - SD-based characterization and admissible path sets [6].

    - Entropic/CARA utility with additivity and shortest path reduction [5].
    - Approximate policies for general monotone utility functions [4].

- The **system side** is sophisticated in stochastic representation but tends to use:
    - **Least expected time**,
    - **On-time arrival probability**,
    - **Mean–variance or reliability metrics** [2,9,1,10],rather than explicit maximization of **E[u(·)] with concave u**.

3. Behavioural underpinnings emerging but not fully exploited

- Behavioural studies on **waiting-time uncertainty** and **transit risk preferences** [7,3] are recent and not yet fully integrated into routing algorithms.
- There is currently a **gap** between:
    - Behavioural evidence on **risk-averse preferences over schedule deviation and uncertainty**, and
    - The **objective functions** used in real routing systems.

4. Shift from paths to adaptive policies

- Early work focused on **fixed paths** under uncertainty [6,5,9].
- Later work, especially Hoy & Nikolova [4] and PROTRIP [1], is explicitly about **routing policies** with **recourse** and real-time information.
- For public transport, the **policy-based view** is particularly important (catch/miss transfers, alternative lines), and this aligns well with a **Markov decision process plus EU** framework—but the **risk-averse EU layer is still mostly theoretical** [4].

5. Fragmented but converging research threads

- The field relevant to your goal is currently **fragmented**:
    - **Theoretical EU-based risk-averse routing** (mostly road networks) [4,5,6].
    - **Stochastic PT route planners with reliability objectives** but **non-EU** risk modeling [2,1].
    - **Behavioural estimation** of risk preferences in PT [3,7].
    - **Mean–variance / GMV routing** that is closer to risk measures than to EU [10].

- The **next major milestone** is likely to be:
    - A **timetable- or headway-based PT trip recommender** that:
        - Models link- and leg-level travel-time and schedule uncertainty as in DEPART/PROTRIP [2,1],
        - Uses **routing policies** with recourse [1,4], and
        - Optimizes **expected utility** with explicitly **risk-averse functions** over total travel time and **schedule deviation** (earliness/lateness) calibrated from behavioural studies [3,7].

6. Implications for your research

- The **building blocks exist**, but have not yet been integrated in one system:
    - Use **EU-based risk-averse structure** and possibly **CARA** or other concave utilities [5,4].
    - Leverage **SD-based dominance** to prune and approximate path sets for large networks [6].
    - Adopt **stochastic, timetable-aware PT network models** with correlations and real-time updates [2,1].
    - Calibrate **schedule-delay and waiting-time uncertainty utilities** from emerging behavioural work [7,3].

- Historically, progress has been **stepwise**:
    1. Recognize risk and reliability in stochastic travel times [8].
    1. Theoretically characterize risk-averse routing consistent with EU [6,5,4].
    1. Build realistic stochastic routing systems (mostly non-EU risk modeling) [9,2,1].
    1. Start measuring PT-specific risk attitudes [7,3].

- Your target—**urban public transport trip recommender systems that compute route suggestions under uncertainty with explicit risk-averse EU over time and lateness**—sits at the **intersection** of these threads and is **not yet fully realized** in the literature, suggesting substantial room for original contribution.

Foundational Work

Which papers form the foundational references on this topic?

The below table shows the resources that are most often cited by the relevant papers on this topic. This is measured by the **reference rate**, which is the fraction of relevant papers that cite a resource. Use this table to determine the most important core papers to be familiar with if you want to deeply understand this topic. Some of these core papers may not be directly relevant to the topic, but provide important context.

Ref.	Reference Rate	Title	Cited By These Relevant Papers
[33]	0.16	Route choice decision under travel time uncertainty	[7, 13, 19, 28]
[82]	0.16	Finding Reliable Shortest Paths in Road Networks Under Uncertainty	[2, 10]
[141]	0.13	Value of Travel Time Reliability: A Review of Current Evidence	[1, 26]
[46]	0.10	The valuation of reliability for personal travel	[7, 25, 26, 37]
[9]	0.09	Practical Route Planning Under Delay Uncertainty: Stochastic Shortest Path Queries	[2]
[142]	0.08	Approximation Algorithms for Reliable Stochastic Combinatorial Optimization	[2]
[143]	0.08	Stochastic Shortest Paths Via Quasi-convex Maximization	[2, 18]
[144]	0.07	Least Expected Time Paths in Stochastic, Time-Varying Transportation Networks	[2, 6, 22]
[29]	0.06	Accounting for uncertainty and variation in accessibility metrics for public transport sketch planning	[23]
[74]	0.05	Travel-time uncertainty, departure time choice, and the cost of morning commutes	[26, 33, 37]
[145]	0.05	Travel time variability: A review of theoretical and empirical issues	[26, 37, 44]
[146]	0.05	An Empirical Study of Travel Time Variability and Travel Choice Behavior	[26, 37, 46, 53]
[147]	0.05	A Mean-Risk Model for the Traffic Assignment Problem with Stochastic Travel Times	[28, 44]
[148]	0.04	Link-Based Route Choice considering Risk Aversion, Disappointment, and Regret	[13, 56]
[149]	0.04	Embedding risk attitude and decision weights in non-linear logit to accommodate time variability in the value of expected travel time savings	[26, 37, 64]
[150]	0.04	Direct versus indirect models for the effects of unreliability	[26, 37]
[151]	0.04	A self-regulation traffic-condition-based route guidance strategy with realistic considerations: Overlapping routes, stochastic traffic, and signalized intersections	[28]
[152]	0.04	Providing personalized system optimum traveler information in a congested traffic network with mixed users	[28]
[8]	0.04	Degradable transport network: Travel time budget of travelers with heterogeneous risk aversion	[6, 28, 44]
[89]	0.04	Application of Lagrangian relaxation approach to ±-reliable path finding in stochastic networks with correlated link travel times	[42, 45, 56]

Adjacent Work

Which papers cite the same foundational papers as relevant papers?

Use this table to discover related papers on adjacent topics, to gain a broader understanding of the field and help generate ideas for useful new research directions.

Ref.	Adjacency score	Title	References These Foundational Papers
[44]	0.06	Preferences for travel time under risk and ambiguity: Implications in path selection and network equilibrium	[33, 41, 145, 153, 165, 167, 168]
[37]	0.05	Integrating the Mean-Variance and Scheduling Approaches to allow for Schedule delay and Trip Time Variability under Uncertainty	[33, 46, 74, 145, 161, 162, 164]

[42]	0.04	Exploring travellers' risk preferences with regard to travel time reliability on the basis of GPS trip records	[33, 34, 38, 45, 52, 56, 82]
[96]	0.03	Dynamic accessibility: Incorporating day-to-day travel time reliability into accessibility measurement	[33, 46, 160]
[28]	0.03	A route guidance system considering travel time unreliability	[8, 33, 147, 153]
[64]	0.03	A rank-dependent utility approach to model intra- and inter-individual heterogeneity in risky choice behaviours	[33, 46]
[169]	0.03	Travel time reliability in transportation networks: A review of methodological developments	[33, 46]
[170]	0.03	From road waiting to road leading: can toll-road marketing strategies make a difference for truck drivers under uncertain travel times?	[33, 46]
[171]	0.03	Assessment of the barriers in establishing passenger mobility-as-a-service (MaaS) systems: An analogy with multimodal freight transport	[33, 46]
[172]	0.03	Capacity-constrained mean-excess equilibrium assignment method for railway networks	[33, 46]
[173]	0.03	Traveller Recurrence and Inter- versus Intratraveller Speed Variability: Analysis with Bluetooth Data	[33, 46]
[89]	0.03	Application of Lagrangian relaxation approach to ±reliable path finding in stochastic networks with correlated link travel times	[8, 34, 38, 46, 48, 82, 166]
[174]	0.03	Development of Traffic-Based Congestion Pricing and Its Application to Automated Vehicles	[13, 33]
[110]	0.03	Dynamic modelling of traffic incident impacts on network reliability	[8, 33, 167]
[26]	0.02	Modelling travel time reliability in public transport route choice behaviour	[46, 52, 74, 145]
[103]	0.02	A conservative expected travel time approach for traffic information dissemination under uncertainty	[8, 33, 41]
[175]	0.02	Reliable space–time prisms in the stochastic road networks under spatially correlated travel times	[33, 82, 89]
[7]	0.02	Quantifying travellers' evaluation of waiting time uncertainty in public transport networks	[33, 46]
[176]	0.02	Design of urban rail corridor over time : for cities with high population densities and growth uncertainties	[33, 82]
[84]	0.02	Computing Spatiotemporal Accessibility to Urban Opportunities: A Reliable Space-Time Prism Approach in Uncertain Urban Networks	[33, 82]

References

[1] PROTRIP: Probabilistic Risk-Aware Optimal Transit Planner
Pranay Thangeda and Melkior Ornik. 2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC), 2020. 5 citations.
43% Topic Match
Proposes a probabilistic, risk-aware transit routing planner.
Balances maximizing on-time arrival probability and minimizing expected travel time using passenger tolerance and a travel-time budget.
Uses correlated edge travel-time distributions, online updates from upstream real-time information; does not state using expected-utility with explicit concave utility over time/lateness (appears to optimize a bi-criterion reliability/mean objective rather than E[u(time)]).

[2] DEPART: Dynamic Route Planning in Stochastic Time-Dependent Public Transit Networks
Peng Ni, ..., and Heiko Aydt. 2015 IEEE 18th International Conference on Intelligent Transportation Systems, 2015. 13 citations.
39% Topic Match
Proposes a dynamic stochastic time-dependent route planner (DEPART) for urban buses.
Builds citywide stochastic models of bus travel and waiting times from smart-card data and optimizes routes for speediness and reliability.
Does not appear to model travellers' risk attitudes via expected-utility with concave (risk averse) utilities; uses reliability criteria but no explicit EU formulation, dominance/pruning under EU, or risk averse utility functional forms.

[3] Transit user route-choice modeling with risk-preference
Justice Darko and Hyoshin Park. Journal Not Provided, 2020. 0 citations.
34% Topic Match
No summary or abstract available

[4] Approximately Optimal Risk-Averse Routing Policies via Adaptive Discretization
D. Hoy and E. Nikolova. Unknown journal, 2015. 7 citations.
31% Topic Match
Proposes an algorithm to compute approximately optimal risk-averse routing policies.
Uses adaptive discretization of the utility-value space and successive approximation to produce µoptimal policies for any monotone utility.
Focuses on maximizing expected utility of arriving near a deadline (general monotone utilities); theoretical algorithmic results, not public-transport–specific—suitable if you need general EU-based, risk-averse policy methods but lacks PT timetable/transfer modelling.

[5] Additive Consistency of Risk Measures and Its Application to Risk-Averse Routing in Networks
R. Cominetti and Alfredo Torrico. Math. Oper. Res., 2013. 24 citations.
28% Topic Match
Identifies additive-consistent risk measures for routing (entropic/CARA).
Shows axiomatically that entropic risk Ánt²(X)=(1/²)n E[e^{²X}] is the unique classical risk measure giving additive link-level weights under independent link-times, reducing risk-averse routing to standard shortest-path with arc weights wa=Á(Ä
Relevant if you accept expected-utility/CARA (entropic) representation and independent link-travel-times; not EU with arbitrary concave utilities, nor models schedule-delay asymmetry, correlations, or timetable/transfer specifics.

[6] Modeling Heterogeneous Risk-Taking Behavior in Route Choice: A Stochastic Dominance Approach
Xing Wu and Y. Nie. Transportation Research Part A-policy and Practice, 2011. 96 citations.
25% Topic Match
Proposes a stochastic-dominance-based framework linking risk attitudes to route choice.
Maps FSD/SSD/TSD to insatiability, risk-aversion, and ruin-aversion and generates SD-admissible paths via dynamic programming/label-correcting algorithms.
Relevant as an expected-utility–consistent characterization of risk-averse choices (via SSD) under stochastic travel times, but it does not explicitly specify concave utility functional forms over arrival/lateness nor focus on public-transport timetables, transfers, or timetable-based missed-connection dynamics.

[7] Quantifying travellers' evaluation of waiting time uncertainty in public transport networks
S. Shelat, ..., and J. V. Lint. Travel behaviour and society, 2021. 19 citations.
22% Topic Match
No summary or abstract available

[8] Degradable transport network: Travel time budget of travelers with heterogeneous risk aversion
H. Lo, ..., and B. Siu. Transportation Research Part B-methodological, 2006. 471 citations.
20% Topic Match
No summary or abstract available

[9] Practical Route Planning Under Delay Uncertainty: Stochastic Shortest Path Queries
Sejoon Lim, ..., and D. Rus. Unknown journal, 2012. 56 citations.
18% Topic Match
Proposes an algorithmic data-structure for stochastic shortest-path queries under delay uncertainty.
Builds quasi-linear preprocessing of planar networks with edge mean/variance travel-time models to answer approximate queries (e.g., maximize probability of arriving before a deadline) quickly.
Focuses on road networks and deadline-probability objectives using mean/variance summaries — does not model travellers' expected utility with concave risk-averse utilities over travel time or lateness, nor public-transport timetables, transfers, or EU-based route recommendation.

[10] A generalized mean-variance metric of route choice model under travel time uncertainty
Dong Wang, ..., and H. Timmermans. Transportmetrica A: Transport Science, 2020. 14 citations.
16% Topic Match
Proposes a generalized mean–variance (GMV) route-cost metric for risky travel.
Defines GMV as a combo of expected travel time, variance, and expected early/late arrival penalties with an on-time probability constraint, and embeds it in a static user-equilibrium VI formulation with existence/uniqueness and an assignment algorithm.
Relevant but not precise match: models risk via mean–variance/schedule-penalties (not explicit expected-utility maximization with concave utility); non-additivity noted (requires distribution propagation), focuses on road networks and algorithmic assignment rather than EU-based traveller decision-making or public-transport timetables.

[11] Punctuality-based route and departure time choice
B. Siu and H. Lo. Transportmetrica A: Transport Science, 2014. 30 citations.
15% Topic Match
No summary or abstract available

[12] Modeling Real-Time Transit Information and Its Impacts on Travelers' Decisions
O. Cats, ..., and H. Koutsopoulos. Unknown journal, 2012. 6 citations.
14% Topic Match
No summary or abstract available

[13] A Hyperpath-based Network Generalized Extreme-value Model for Route Choice under Uncertainties
Jiangshan Ma and D. Fukuda. Transportation research procedia, 2015. 25 citations.
13% Topic Match
No summary or abstract available

[14] Method for Reliable Shortest Path Determination in Stochastic Networks using Parametrically Defined Stable Probability Distributions
A. Agafonov and V. Myasnikov. SPIIRAS Proceedings, 2019. 2 citations.
12% Topic Match
Abstract: An increase in the number of vehicles, especially in large cities, and inability of the existing road infrastructure to distribute transport flows, leads to a higher congestion level in transport networks. This problem makes the solution to navigational problems more and more important. Despite the popularity of these tasks, many existing commercial systems find a route in deterministic networks, not taking into account the time-dependent and stochastic properties of traffic flows, i.e. travel time of road links is considered as constant. This paper addresses the reliable routing problem in stochastic networks using actual information of the traffic flow parameters. We...

[15] Short Run Transit Route Planning Decision Support System Using a Deep Learning-Based Weighted Graph
Nadav Shalit, ..., and Eran Ben-Elia. ArXiv, 2023. 1 citations.
11% Topic Match
Abstract: Public transport routing plays a crucial role in transit network design, ensuring a satisfactory level of service for passengers. However, current routing solutions rely on traditional operational research heuristics, which can be time-consuming to implement and lack the ability to provide quick solutions. Here, we propose a novel deep learning-based methodology for a decision support system that enables public transport (PT) planners to identify short-term route improvements rapidly. By seamlessly adjusting specific sections of routes between two stops during specific times of the day, our method effectively reduces times and enhances PT services. Leveraging diverse data sources such as GTFS...

[16] Modeling the impacts of public transport reliability and travel information on passengers' waiting-time uncertainty
O. Cats and Zafeira Gkioulou. EURO Journal on Transportation and Logistics, 2017. 71 citations.
10% Topic Match
Abstract: Public transport systems are subject to uncertainties related to traffic dynamic, operations, and passenger demand. Passenger waiting time is thus a random variable subject to day-to-day variations and the interaction between vehicle and passenger stochastic arrival processes. While the provision of real-time information could potentially reduce travel uncertainty, its impacts depend on the underlying service reliability, the performance of the prognosis scheme, and its perceived credibility. This paper presents a modeling framework for analyzing passengers' learning process and adaptation with respect to waiting-time uncertainty and travel information. The model consists of a within-day network loading procedure and a day-to-day learning...

[17] Characterizing travel time reliability and passenger path choice in a metro network
Lijun Sun, ..., and K. Axhausen. Unknown journal, 2015. 7 citations.
9% Topic Match
No summary or abstract available

[18] Robust Routing in Urban Public Transportation: How to Find Reliable Journeys Based on Past Observations
Katerina Böhmová, ..., and P. Widmayer. Unknown journal, 2013. 22 citations.
8% Topic Match
Abstract: We study the problem of robust routing in urban public transportation networks. In order to propose solutions that are robust for typical delays, we assume that we have past observations of real traffic situations available. In particular, we assume that we have "daily records" containing the observed travel times in the whole network for a few past days. We introduce a new concept to express a solution that is feasible in any record of a given public transportation network. We adapt the method of Buhmann et al. [Buhmann et al., ITCS 2013] for optimization under uncertainty, and develop algorithms that...

[19] Robust accessibility: Measuring accessibility based on travelers' heterogeneous strategies for managing travel time uncertainty
Jinhyung Lee and H. Miller. Journal of Transport Geography, 2020. 45 citations.
8% Topic Match
Abstract: Abstract Uncertainties in travel times due to traffic congestion and delay are risks for drivers and public transit users. To avoid undesired consequences such as losing jobs or missing medical appointments, people can manage the risks of missing on-time arrivals to destinations using different strategies, including leaving earlier to create a safety margin and choosing routes that have more reliable rather than fastest travel times. This research develops a general analytical framework for measuring accessibility considering automobile or public transit travelers' heterogeneous strategies for dealing with travel time uncertainty. To represent different safety margin plans, we use effective travel time...

[20] Target-Oriented User Equilibrium Considering Travel Time, Late Arrival Penalty, and Travel Cost on the Stochastic Tolled Traffic Network
Xinming Zang, ..., and Xiangfeng Ji. Sustainability, 2021. 0 citations.
7% Topic Match
Abstract: In this paper, we employ a target-oriented approach to analyze the multi-attribute route choice decision of travelers in the stochastic tolled traffic network, considering the influence of three attributes, which are (stochastic) travel time, (stochastic) late arrival penalty, and (deterministic) travel cost. We introduce a target-oriented multi-attribute travel utility model for this analysis, where each attribute is assigned a target by travelers, and travelers' objective is to maximize their travel utility that is determined by the achieved targets. Moreover, the interaction between targets is interpreted as complementarity relationship between them, which can further affect their travel utility. In addition, based...

[21] Variability of Travel Time, Congestion, and the Cost of Travel
N. Coulombel and A. de Palma. Mathematical Population Studies, 2014. 21 citations.
7% Topic Match
No summary or abstract available

[22] Dynamic on-line multimodal route planning with least expected travel time in the stochastic and time-dependent bus network
Jinjian Li, ..., and G. Lozenguez. MATEC Web of Conferences, 2019. 1 citations.
6% Topic Match
Abstract: Route planning system in bus network is very important on providing passengers a better experience for public transportation services. This work presents a new on-line dynamic path planning algorithm in a stochastic and time-dependent bus network, with the objective of least expected travel time. Firstly, an initial optimal path is found when a passenger leaves from the starting location at time t for the destination location. Secondly, when the passenger reaches a bus stop, the real time traffic condition is checked to decide whether the optimal path should be modified and re-calculated. If so, the shortest path algorithm is re-applied...

[23] Half-(head)way there: Comparing two methods to account for public transport waiting time in accessibility indicators
Anson F. Stewart and A. Byrd. Environment and Planning B: Urban Analytics and City Science, 2022. 3 citations.
6% Topic Match
Abstract: Various methods have been developed to account for travel time variability and uncertainty when analyzing public transport networks and computing related accessibility indicators. In this paper, we establish some convergence characteristics of one such method, implemented in the R5 routing engine, yielding guidelines for the minimum number of randomized schedules. This parameter has implications for result stability, analysis turnaround time, and computation costs. We also confirm that for travel time and accessibility results, there are spatially varying differences between our method and the conventional method relying on the assumption of half-headway waiting times. The conventional method appears to understate the...

[24] Valuing Travel Time Variability within a Rank-Dependent Utility Framework and an Investigation of Unobserved Taste Heterogeneity

D. Hensher and Zheng Li. Journal of Transport Economics and Policy, 2012. 40 citations.
5% Topic Match
No summary or abstract available

[25] Evaluating the impact of waiting time reliability on route choice using smart card data
S. Shelat, ..., and J. van Lint. Transportmetrica A: Transport Science, 2022. 13 citations.
5% Topic Match
Abstract: ABSTRACT Unreliable waiting times may cause frustration and anxiety amongst public transport travellers. Although the effect of travel time reliability has been studied extensively, most studies have used stated preferences which have disadvantages, such as an inherent hypothetical bias, or have analysed revealed preferences for road traffic. Here, we derive revealed preferences from passively collected smart card data to analyse the role of waiting time reliability in public transport route choice. We study waiting time reliability as regular and irregular deviations from scheduled values, examining a number of indicators for the latter. Behaviour in morning peak and off-peak hours is...

[26] Modelling travel time reliability in public transport route choice behaviour
A. B. Swierstra, ..., and Wiggenraad. European Journal of Transport and Infrastructure Research, 2015. 1 citations.
5% Topic Match
No summary or abstract available

[27] Travelers' Bi-Attribute Decision Making on the Risky Mode Choice with Flow-Dependent Salience Theory
Xiangfeng Ji and Xi-Ping Ao. Sustainability, 2021. 2 citations.
5% Topic Match
Abstract: The purpose of this paper is to provide new insights into travelers' bi-attribute (travel time and travel cost) risky mode choice behavior with one risky option (i.e., the highway) and one non-risky option (i.e., the transit) from the long-term planning perspective. In the classical Wardropian User Equilibrium principle, travelers make their choice decisions only based on the mean travel times, which might be an unrealistic behavioral assumption. In this paper, an alternative approach is proposed to partially remedy this unrealistic behavioral assumption with flow-dependent salience theory, based on which we study travelers' context-dependent bi-attribute mode choice behavior, focusing on the...

[28] A route guidance system considering travel time unreliability
Haengju Lee, ..., and S. Son. Journal of Intelligent Transportation Systems, 2019. 11 citations.
4% Topic Match
Abstract: Abstract Under a stochastic roadway, drivers need a route guidance system incorporating travel time variability. To recommend a customized path depending on the trip purpose and the driver's risk-taking behavior, various path ranking methods have been developed. Unlike those methods, our proposed disutility method can easily incorporate a target arrival time in the ranking process by measuring how late the travel is and by penalizing it depending on the severity of lateness. In addition, the disutility-based route guidance system can properly address travel time unreliability that causes unacceptable disruptions to the driver's schedule (i.e., unexpected long delay). We compare the...

[29] Accounting for uncertainty and variation in accessibility metrics for public transport sketch planning
Matthew Wigginton Conway, ..., and M. V. van Eggermond. Journal of Transport and Land Use, 2018. 56 citations.
4% Topic Match
Abstract: Accessibility is increasingly used as a metric when evaluating changes to public transport systems. Transit travel times contain variation depending on when one departs relative to when a transit vehicle arrives, and how well transfers are coordinated given a particular timetable. In addition, there is necessarily uncertainty in the value of the accessibility metric during sketch planning processes, due to scenarios which are underspecified because detailed schedule information is not yet available. This article presents a method to extend the concept of "reliable" accessibility to transit to address the first issue, and create confidence intervals and hypothesis tests to address...

[30] Is Timetabling Routing Always Reliable for Public Transport?
D. Firmani, ..., and Federico Santaroni. Unknown journal, 2013. 20 citations.
4% Topic Match
Abstract: Current route planning algorithms for public transport networks are mostly based on timetable information only, i.e., they compute shortest routes under the assumption that all transit vehicles (e.g., buses, subway trains) will incur in no delays throughout their trips. Unfortunately, unavoidable and unexpected delays often prevent transit vehicles to respect their originally planned schedule. In this paper, we try to measure empirically the quality of the solutions offered by timetabling routing in a real public transport network, where unpredictable delays may happen with a certain frequency, such as the public transport network of the metropolitan area of Rome. To accomplish...

[31] Characterizing Heterogeneity in Attitudes to Risk in Expected Utility Models of Mode and Departure Time Choice
J. Polak, ..., and Xiang Liu. Unknown journal, 2008. 22 citations.
3% Topic Match
No summary or abstract available

[32] ROUTE SELECTION CONSIDERING TRAVEL TIME VARIABILITY
B. Hellinga and L. Fu. Unknown journal, 1999. 9 citations.
3% Topic Match
No summary or abstract available

[33] Route choice decision under travel time uncertainty
A. Palma and N. Picard. Transportation Research Part A-policy and Practice, 2005. 254 citations.
3% Topic Match
No summary or abstract available

[34] A Mean-Variance Model for Route Guidance in Advanced Traveler Information Systems
S. Sen, ..., and A. Rathi. Transp. Sci., 2001. 148 citations.
3% Topic Match
No summary or abstract available

[35] Road traffic estimation and distribution-based route selection
Rens Kamphuis, ..., and P. Serra. ArXiv, 2022. 1 citations.
3% Topic Match
Abstract: In route selection problems, the driver's personal preferences will determine whether she prefers a route with a travel time that has a relatively low mean and high variance over one that has relatively high mean and low variance. In practice, however, such risk aversion issues are often ignored, in that a route is selected based on a single-criterion Dijkstra-type algorithm. In addition, the routing decision typically does not take into account the uncertainty in the estimates of the travel time's mean and variance. This paper aims at resolving both issues by setting up a framework for travel time estimation. In...

[36] Understanding travelers' route choice behavior under uncertainty
Nikhil Sikka. Unknown journal, 2012. 14 citations.
3% Topic Match
No summary or abstract available

[37] Integrating the Mean-Variance and Scheduling Approaches to allow for Schedule delay and Trip Time Variability under Uncertainty
Hao Li, ..., and D. Hensher. Transportation Research Part A-policy and Practice, 2016. 38 citations.
2% Topic Match

No summary or abstract available

[38] [Finding the most reliable path with and without link travel time correlation: A Lagrangian substitution based approach]
Tao Xing and Xuesong Zhou. Transportation Research Part B-methodological, 2011. 135 citations.
2% Topic Match
No summary or abstract available

[39] [Framework for Travel Time Learning and Behavioral Adaptation in Route and Departure Time Choice]
Apivat Jotisankasa and J. Polak. Transportation Research Record, 2006. 31 citations.
2% Topic Match
No summary or abstract available

[40] [Measuring place-based accessibility under travel time uncertainty]
B. Chen, ..., and W. Lam. International Journal of Geographical Information Science, 2017. 109 citations.
2% Topic Match
No summary or abstract available

[41] [Travel Time Reliability with Risk-Sensitive Travelers]
A. Chen, ..., and W. Recker. Transportation Research Record, 2001. 129 citations.
2% Topic Match
No summary or abstract available

[42] [Exploring travellers' risk preferences with regard to travel time reliability on the basis of GPS trip records]
Weiliang Zeng, ..., and T. Morikawa. European Journal of Transport and Infrastructure Research, 2018. 5 citations.
2% Topic Match
Abstract: Travel time reliability has attracted considerable interest in the field of route choice modelling. Knowing how individuals choose paths with uncertain travel times is fundamental to advancing our understanding of route choice behaviour and thus driving the development of route guidance systems. In general, existing navigation systems provide the shortest path on the basis of distance or travel time, even though many travellers do not intend to choose the shortest path. Several studies have shown that the probability of delay or travel time reliability is an important factor in a traveller's route choice decision. Learning a traveller's risk preference with...

[43] [Experimental Evidence on Socioeconomic Differences in Risk Taking and Risk Premiums]
Zheng Li. Economic Record, 2020. 4 citations.
2% Topic Match
Abstract: Using a route choice experiment with embedded travel time variability, this study empirically estimates car commuters' risk attitudes and taste preferences within a nonlinear mixed logit model. In addition to the identified overall risk taking behaviour, we find that risk attitudes covary with some sociodemographic characteristics, that is, older commuters are more risk taking than young ones and higher income commuters are less risk taking than low income ones. The implications of accounting for systematic risk attitude heterogeneity for valuing travellers' willingness to pay for travel time improvement are also discussed. [ABSTRACT FROM AUTHOR]

[44] [Preferences for travel time under risk and ambiguity: Implications in path selection and network equilibrium]
Jin Qi, ..., and Xiaoming Yuan. Transportation Research Part B-methodological, 2016. 28 citations.
2% Topic Match
No summary or abstract available

[45] [Most reliable path-finding algorithm for maximizing on-time arrival probability]
B. Chen, ..., and Shujin Xiang. Transportmetrica B: Transport Dynamics, 2017. 50 citations.
2% Topic Match
No summary or abstract available

[46] [The valuation of reliability for personal travel]
J. Bates, ..., and A. Cook. Transportation Research Part E-logistics and Transportation Review, 2001. 928 citations.
2% Topic Match
No summary or abstract available

[47] [Consideration of Travel Time Reliability in Traffic Assignment]
Xiaoyong Tang, ..., and S. Xu. Unknown journal, 2009. 0 citations.
2% Topic Match
No summary or abstract available

[48] [Path finding under uncertainty]
A. Chen and Z. Ji. Journal of Advanced Transportation, 2005. 152 citations.
1% Topic Match
No summary or abstract available

[49] [Heterogeneity in risk attitude towards travel uncertainty: A heuristic approach]
Zhongwei Sun, ..., and H. Timmermans. Unknown journal, 2007. 0 citations.
1% Topic Match
No summary or abstract available

[50] [Reliability and Unreliability Aspects of Travel Time Analysis on the Stochastic Network Using the Target-Oriented Perspective]
Gonghang Chen, ..., and Xiangfeng Ji. Sustainability, 2024. 1 citations.
1% Topic Match
Abstract: This study proposes a target-oriented method to study travelers' route choice behavior under travel time variability, and discusses the resulted equilibrium flow patterns. Both travel time reliability and travel time unreliability are considered in this new method, and accordingly, there are two targets. The first one is target for travel time to ensure travel time reliability, and based on this target, another one is target for excess delay to mitigate travel time unreliability. In this model, travel time and excess delay (i.e., the random vector) are stochastically correlated with each other, which is modeled with the copula function based on...

[51] [Optimization Methods for Customized Bus Routes in Random Environments]
Fangyuan Gong, ..., and Xu Wu. Journal of Advanced Transportation, 2025. 1 citations.
1% Topic Match
Abstract: The customized bus in operation faces numerous random factors that affect the service level and attractiveness to passengers. Therefore, this paper investigates the optimization problem of customized bus routes considering random vehicle travel times and the capability to respond to dynamic requests in real time. We developed a stochastic programming model that minimizes total cost and passenger travel time. The innovation lies in the model's ability to respond to requests made by passengers during service and to model the randomness of vehicle travel times using a known distribution. Furthermore, we propose a heuristic algorithm combining the nondominated sorting genetic algorithm...

[52] [Uncovering the Distribution of Motorists' Preferences for Travel Time and Reliability]
C. Winston, ..., and Jia Yan. Economics of Networks, 2005. 266 citations.
1% Topic Match

Abstract: We apply recent econometric advances to study the distribution of commuters' preferences for speedy and reliable highway travel. Our analysis applies mixed logit to combined revealed and stated preference data on commuter choices of whether to pay a toll for congestion free express travel. We find that motorists exhibit high values of travel time and reliability and substantial heterogeneity in those values. We suggest that road pricing policies designed to cater to such varying preferences can improve efficiency and reduce the disparity of welfare impacts compared with recent pricing experiments.

[53] INVESTIGATING EFFECT OF TRAVEL TIME VARIABILITY ON ROUTE CHOICE USING REPEATED-MEASUREMENT STATED PREFERENCE DATA
M. Abdel-Aty, ..., and P. Jovanis. Transportation Research Record, 1995. 262 citations.
1% Topic Match
No summary or abstract available

[54] Route planning based on uncertain information in transport networks
G. SzqcsTransport, 2012. 7 citations.
1% Topic Match
Abstract: The goal of this paper is to find a solution for route planning in a transport network where the network type can be arbitrary: a network of bus routes, a network of tram rails, a road network or any other type of a transport network. Furthermore, the costs of network elements are uncertain. The concept is based on the Dempster-Shafer theory and Dijkstra's algorithm which helps with finding the best routes. The paper focuses on conventional studies without considering traffic accidents or other exceptional circumstances. The concept is presented by an undirected graph. In order to model conventional real transport,...

[55] Choice behaviors of travelers with risk aversion under stochastic capacity
Shu Cui, ..., and Xinxin Yu. Unknown journal, 2023. 0 citations.
1% Topic Match
Abstract: Urban road capacities are influenced by various factors, such as traffic accidents, vehicle breakdowns, traffic signal failures, road construction and weather variations. This paper takes into account the uncertainty of road conditions and analyzes the choice behaviors of travelers who are risk averse based on stochastic capacity. The level of risk aversion in this study is closely related to stochastic link capacities, which represent the degree of sensitivity to changes in capacity. Both sensitivity and awareness affect the behavior of travelers. All types of travelers choose the route that minimizes their travel disutility. To address this issue, we adopt a...

[56] Application of hyperpath strategy and driving experience to risk-averse navigation
Weiliang Zeng, ..., and T. Morikawa. Iet Intelligent Transport Systems, 2016. 9 citations.
1% Topic Match
No summary or abstract available

[57] Risky mode choice behavior with heterogeneous attitudes to risk
M. Lapparent, ..., and H. Bouscasse. Unknown journal, 2019. 1 citations.
1% Topic Match
No summary or abstract available

[58] Effect of Route Choice Models on Estimation of Travel Time Reliability Under Demand and Supply Variations
A. Chen, ..., and W. Recker. Unknown journal, 2003. 18 citations.
1% Topic Match
No summary or abstract available

[59] School bus routing problem in the stochastic and time-dependent transportation network
Shichao Sun, ..., and Qi Xu. PLoS ONE, 2018. 21 citations.
1% Topic Match
Abstract: Accidents, bad weathers, traffic congestions, etc. led to the uncertainties of travel times in real-life road networks, which greatly affected the quality of individual's life and the reliability of transportation system. This paper addressed the school bus routing problem in such a stochastic and time-dependent road environment. Firstly, the problem was set based on a single-school configuration, and the students were picked up at their homes, which was in line with the current situation of school bus systems in China. Thus, it could be regarded as an independent problem of school bus route generation in random dynamic networks, which could...

[60] Impact of uncertainty on traveler route choice in urban traffic
Zhang Yang. Journal of Traffic and Transportation Engineering, 2010. 0 citations.
1% Topic Match
No summary or abstract available

[61] Calibration of User Equilibrium Model with Heterogeneous Risk Attitudes
Ryan Pothering and Song Gao. Unknown journal, 2013. 1 citations.
1% Topic Match
No summary or abstract available

[62] Optimal Routing in Stochastic Networks with Reliability Guarantees
Wanzheng Zheng, ..., and Melkior Ornik. 2021 IEEE International Intelligent Transportation Systems Conference (ITSC), 2021. 6 citations.
1% Topic Match
Abstract: Optimal routing in highly congested street networks where the travel times are often stochastic is a challenging problem with significant practical interest. While most approaches to this problem use minimizing the expected travel time as the sole objective, such a solution is not always desired, especially when the variance of travel time is high. In this work, we pose the problem of finding a routing policy that minimizes the expected travel time under the hard constraint of retaining a specified probability of on-time arrival. Our approach to this problem models the stochastic travel time on each segment in the road...

[63] Nonlinearity and Specification of Attitudes toward Risk in Discrete Choice Models
Xiang Liu and J. Polak. Transportation Research Record, 2007. 29 citations.
1% Topic Match
No summary or abstract available

[64] A rank-dependent utility approach to model intra- and inter-individual heterogeneity in risky choice behaviours
H. Bouscasse and M. de Lapparent. Applied Economics, 2020. 3 citations.
1% Topic Match
Abstract: ABSTRACT Using a stated preferences survey, the objective of this paper is to investigate the intra- and inter-individual heterogeneity of mode choice, when travel time is subject to variability. By'inter-individual heterogeneity' is meant that people are different in terms of attitude to risk and have different utility functions. By 'intra-individual heterogeneity' is meant that the behaviour may be different even when performed by the same individual when faced with a different mode of transport. Based on Rank-Dependent Utility Theory, the paper shows that the occurrence of delays associated with train trips is overestimated whereas they are underestimated for car trips....

[65] Robust Data-Driven Vehicle Routing with Time Windows
Yu Zhang, ..., and Melvyn Sim. Oper. Res., 2021. 65 citations.
1% Topic Match
Abstract: On-time delivery is of utmost importance in today's urban logistics. However, travel times are uncertain and classical deterministic routing solutions often fail to ensure timely delivery. In this paper, a robust solution that exploits travel times data to determine the best routes for maximal timely delivery is proposed. A new decision criterion is introduced, the service fulfillment risk index (sri), which accounts for both the late arrival probability and its magnitude. Together with Wasserstein

distance–based ambiguity in travel times, sri can be evaluated efficiently in closed form. In addition, an exact branch-and-cut approach and a meta-heuristic algorithm are developed to...

[66] Incorporating travel time reliability in the estimation of assignment models
A. Brennand and J. Bolland. Unknown journal, 2011. 4 citations.
1% Topic Match
No summary or abstract available

[67] Route choice decision under uncertainty Andr
Nathalie Picard June. Journal Not Provided, 2003. 1 citations.
1% Topic Match
No summary or abstract available

[68] A stochastic process traffic assignment model considering stochastic traffic demand
Linghui Han, ..., and Chengjuan Zhu. Transportmetrica B: Transport Dynamics, 2018. 11 citations.
1% Topic Match
No summary or abstract available

[69] Day-to-Day Evolution of Traffic Flow with Dynamic Rerouting in Degradable Transport Network
Manman Li, ..., and Q. Tu. Journal of Advanced Transportation, 2019. 4 citations.
1% Topic Match
Abstract: Random events like accidents and vehicle breakdown, degrade link capacities and lead to uncertain travel environment. And whether travelers adjust route or not depends on the utility difference (dynamic rerouting behavior) rather than a constant. Considering travelers' risk-taking behavior in uncertain environment and dynamic rerouting behavior, a new day-to-day traffic assignment model is established. In the proposed model, an exponential-smoothing filter is adopted to describe travelers' learning for uncertain travel time. The cumulative prospect theory is used to reflect route utility and its reference point is adaptive and set to be the minimal travel time under a certain on-time arrival...

[70] A prospect theory approach to travel time variability
Katrine Hjorth and F. Ramjerdi. Unknown journal, 2011. 3 citations.
1% Topic Match
No summary or abstract available

[71] Stochastic Network User Equilibrium and Traffic System Evolution Based on Reference-Dependent Utility Theory
Wei Wang, ..., and Hui Zhang. IEEE Access, 2019. 2 citations.
1% Topic Match
Abstract: This paper applies the reference-dependent utility theory (RDUT) to model traveler's route choice behaviors under travel time variability and develops a user equilibrium (UE) model based on RDUT for stochastic traffic networks. The proposed model explicitly considers both the absolute utility (or consumption utility) and the relative utility (or gain–loss utility) in the travelers' path choice decision procedure. The former is determined by the stochastic path travel time while the latter is measured by the actual path travel time relative to a reference time point. Subsequently, the RDUT-based UE model, which can be equivalently formulated as a variational inequality problem...

[72] Evaluating the Impact of Real-Time Mobility and Travel Time Reliability Information on Truck Drivers' Routing Decisions
X. Kong, ..., and D. Cline. Transportation Research Record, 2018. 6 citations.
1% Topic Match
Abstract: This study represents the first research to investigate the impacts of two critical determinants—level of congestion and travel time reliability—on routing decisions with two groups of truck drivers having different levels of awareness of the real-time and the historical traffic conditions on available routes. The research analyzed 14,538 global positioning system devices recording trips on the I-495 crossing through Maryland, Virginia, and Washington, DC, and 2,166 trips in the Dallas area, to explore how truck drivers make routing decisions based on real-time travel time and reliability information by applying a binary logistic regression model. Researchers found that for truck drivers...

[73] Exploring public transport accessibility equity to railway stations under travel time uncertainty
Long Cheng, ..., and Tanhua Jin. Transportmetrica B: Transport Dynamics, 2025. 1 citations.
1% Topic Match
Abstract: The equity of public transport accessibility is vital for promoting fairness and sustainable development. While many studies have examined accessibility inequities, few focus on inter-group and intra-group disparities. This study assesses public transport accessibility to a high-speed railway station (HSR) for different income groups in Nanjing, China, using total travel time to the station as an indicator. Results show that accessibility during the morning peak (8 AM) is lower than at night (10 PM). Population density is positively correlated with accessibility. High-income groups have the highest accessibility, low-income groups the lowest. Theil index shows highest equity in high-income groups, and...

[74] Travel-time uncertainty, departure time choice, and the cost of morning commutes
R. Noland and K. Small. Transportation Research Record, 1995. 407 citations.
1% Topic Match
No summary or abstract available

[75] The impact of travel information's accuracy on route-choice
Eran Ben-Elia, ..., and Y. Shiftan. Transportation Research Part C-emerging Technologies, 2013. 191 citations.
1% Topic Match
No summary or abstract available

[76] Network congestion games are robust to variable demand
J. Correa, ..., and M. Schröder. Transportation Research Part B: Methodological, 2019. 12 citations.
1% Topic Match
Abstract: Abstract We consider a non-atomic network congestion game with incomplete information in which nature decides which commodities travel. The users of a commodity do not know which other commodities travel and only have distributional information about their presence. Our main result is that the price of anarchy bounds known for the deterministic demand game also apply to the Bayesian game with random demand, even if the travel probabilities of different commodities are arbitrarily correlated. Moreover, the extension result of price of anarchy bounds for complete information games to incomplete information games in which the set of players is randomly determined...

[77] Multiclass, Multicriteria Dynamic Traffic Assignment with Path-Dependent Link Cost and Entropy-Based Risk Preference
J. Yu and R. Jayakrishnan. Transportation Research Record, 2017. 5 citations.
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[78] A Model of Travel Time Reliability Based on Risk Aversion
Xin-quan Liu. 2008 International Conference on Information Management, Innovation Management and Industrial Engineering, 2008. 1 citations.
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No summary or abstract available

[79] The effect of travel time variability on route choice decision: a generalized linear mixed model based analysis
Hongcheng Gan and Yang Bai. Transportation, 2013. 0 citations.

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No summary or abstract available

[80] A Smart Path Recommendation Method for Metro Systems With Passenger Preferences
Wei Li, ..., and Qing Cai. IEEE Access, 2020. 6 citations.
1% Topic Match
Abstract: Passenger travel paths in metro networks have become more diversified with the development of network structures and the complexity of train schedules. Nowadays, passengers may have more than one alternative path in an OD (Origin-Destination) pair. In order to provide high-quality service to passengers, this paper proposes a smart path finding method to recommend fast and comfortable routes to passengers. By including the structure of the metro network as a two-dimensional plane and time as the third dimension, the space-time range of passenger activities is constructed. The accessible transfer stations for arrival are firstly computing by forward searching from O...

[81] VALUATION OF TRAVEL-TIME SAVINGS AND PREDICTABILITY IN CONGESTED CONDITIONS FOR HIGHWAY USER-COST ESTIMATION
K. Small, ..., and D. Lewis. NCHRP Report, 1999. 373 citations.
0% Topic Match
No summary or abstract available

[82] Finding Reliable Shortest Paths in Road Networks Under Uncertainty
B. Chen, ..., and Z. Fang. Networks and Spatial Economics, 2013. 166 citations.
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No summary or abstract available

[83] Risk Route Choice Analysis and the Equilibrium Model under Anticipated Regret Theory
P. Yuan and Z. Juan. Promet-traffic & Transportation, 2014. 1 citations.
0% Topic Match
Abstract: The assumption about travellers’ route choice behaviour has major influence on the traffic flow equilibrium analysis. Previous studies about the travellers’ route choice were mainly based on the expected utility maximization theory. However, with the gradually increasing knowledge about the uncertainty of the transportation system, the researchers have realized that there is much constraint in expected util-ity maximization theory, because expected utility maximiza-tio n requires travellers to be ‘absolutely rational’; but in fact, travellers are not truly ‘absolutely rational’. The anticipated regret theory proposes an alternative framewor k to the tra-ditional risk-taking in route choice behaviour which might be more scientific and

[84] Computing Spatiotemporal Accessibility to Urban Opportunities: A Reliable Space-Time Prism Approach in Uncertain Urban Networks
A. Sahebgharani, ..., and Hossein Haghshenas. Comput., 2019. 5 citations.
0% Topic Match
Abstract: Space-time prism (STP) is a comprehensive and powerful model for computing accessibility to urban opportunities. Despite other types of accessibility measures, STP models capture spatial and temporal dimensions in a unified framework. Classical STPs assume that travel time in street networks is a deterministic and fixed variable. However, this assumption is in contradiction with the uncertain nature of travel time taking place due to fluctuations and traffic congestion. In addition, travel time in street networks mostly follows non-normal probability distributions which are not modeled in the structure of classical STPs. Neglecting travel time uncertainty and disregarding different types of probability...

[85] Investigating the Effect of Travel Time Variability on Drivers' Route Choice Decision via Discrete Choice Analysis
Ye Xin. Journal of Transportation Systems Engineering and Information Technology, 2010. 1 citations.
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[86] Travel-time Reliability Impacts on Railway Passenger Demand: A Revealed Preference Analysis
R. Loon, ..., and Martijn Brons. Journal of Transport Geography, 2011. 63 citations.
0% Topic Match
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[87] Optimal Information Provision at Bottleneck Equilibrium with Risk-Averse Travelers
Peng Liu and Yang Liu. Transportation Research Record, 2018. 25 citations.
0% Topic Match
Abstract: This paper aims to study the effects of travel information provision on risk-averse travelers when travel time is uncertain. A stochastic bottleneck model is examined with risk-averse commuters, in which the free-flow travel time is assumed to be uncertain and follows a uniform distribution. A mean-variance approach is adopted to measure the travel cost under risk. It is proven that the individual travel cost at bottleneck equilibrium monotonically increases with the risk-aversion level. With a higher risk-aversion level, the morning peak hour starts earlier, but the duration of the peak hour remains constant regardless of the risk-aversion level. If improvement...

[88] Efficient and Exact Public Transport Routing via a Transfer Connection Database
Abdallah Abu-Aisha, ..., and Bojie Shen. Unknown journal, 2024. 1 citations.
0% Topic Match
Abstract: We explore the earliest arrival time problem in public transport journey planning. A journey typically consists of multiple scheduled public transport legs. The actual time required to transfer between these legs can substantially influence route planning. Therefore, we properly model transfers by incorporating their exact costs. We then introduce a novel oracle-based routing algorithm that constructs an efficient transfer database, considering the proposed transfer model. The database is leveraged online to quickly reconstruct the optimal journey in response to an earliest arrival time query. Our experimental results show that neglecting exact transfer costs often lead to either infeasible or suboptimal...

[89] Application of Lagrangian relaxation approach to α-reliable path finding in stochastic networks with correlated link travel times
Weiliang Zeng, ..., and T. Morikawa. Transportation Research Part C-emerging Technologies, 2015. 78 citations.
0% Topic Match
No summary or abstract available

[90] Performance measure for reliable travel time of emergency vehicles
Zhenhua Zhang, ..., and Xiaoling Li. Transportation Research Part C-emerging Technologies, 2016. 39 citations.
0% Topic Match
No summary or abstract available

[91] The Effect of Route-choice Strategy on Transit Travel Time Estimates
Nate Wessel and S. Farber. Journal Not Provided, 2019. 1 citations.
0% Topic Match
Abstract: Estimates of travel time by public transit often rely on the calculation of a shortest-path between two points for a given departure time. Such shortest-paths are time-dependent and not always stable from one moment to the next. Given that actual transit passengers necessarily have imperfect information about the system, their route selection strategies are heuristic and cannot be expected to achieve optimal travel times for all possible departures. Thus an algorithm that returns optimal travel times at all moments will tend to underestimate real travel times all else being equal. While several researchers have noted this issue none have yet...

[92] Uncertain Travel Times and Activity Schedules under Conditions of Space-Time Constraints and Invariant Choice Heuristics
S. Rasouli and H. Timmermans. Environment and Planning B: Planning and Design, 2014. 18 citations.
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No summary or abstract available

[93] Estimating a Route Travel Time Distribution Function With Segment Correlations Using Segment-Level Travel Time Data Only: A Moment-Based Method

Zihan Jian, ..., and Zhaoqi Zang. IEEE Transactions on Intelligent Transportation Systems, 2024. 1 citations.

0% Topic Match

Abstract: Travel time reliability is a major factor affecting travelers' route and mode choice behaviors, which is an important aspect of intelligent transportation systems. The calculation of travel time reliability measures is founded on the travel time distribution function. In practice, directly fitting the route-level travel time distribution function using complete route-level travel time data is challenging. As an alternative to route-level travel time data, segment-level travel time data are more abundant and easier to obtain. However, existing estimation methods of route travel time distribution function either neglect travel time correlation among segments, or rely on historical route-level data, or assume...

[94] Towards demand-oriented flexible rerouting of public transit under uncertainty

Saideep Nannapaneni and A. Dubey. Proceedings of the Fourth Workshop on International Science of Smart City Operations and Platforms Engineering, 2019. 6 citations.

0% Topic Match

Abstract: This paper proposes a flexible rerouting strategy for the public transit to accommodate the spatio-temporal variation in the travel demand. Transit routes are typically static in nature, i.e., the buses serve well-defined routes; this results in people living in away from the bus routes choose alternate transit modes such as private automotive vehicles resulting in ever-increasing traffic congestion. In the flex-transit mode, we reroute the buses to accommodate high travel demand areas away from the static routes considering its spatio-temporal variation. We perform clustering to identify several flex stops; these are stops not on the static routes, but with high...

[95] Green Accessibility: Estimating the Environmental Costs of Network-Time Prisms for Sustainable Transportation Planning

Ying Song, ..., and Xuesong Zhou. Unknown journal, 2017. 31 citations.

0% Topic Match

No summary or abstract available

[96] Dynamic accessibility: Incorporating day-to-day travel time reliability into accessibility measurement

Konstantina Bimpou and N. Ferguson. Journal of Transport Geography, 2020. 37 citations.

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No summary or abstract available

[97] Assessing the probability of arriving on time using historical travel time data in a road network

Adam Samara, ..., and S. Göttlich. 2019 IEEE Intelligent Transportation Systems Conference (ITSC), 2019. 5 citations.

0% Topic Match

Abstract: This paper introduces a novel prediction model for assessing travel time reliability in a network considering alternate paths. Here the travel time reliability is defined as the probability of arriving within a given time budget. For that purpose historical travel time data provided by the BMW Group is used. When planning a trip, there are usually multiple alternate routes leading to the destination. At the time the trip is scheduled to start there is real-time information on the expected travel time available. Hence a path can then be chosen, based on the suggestion of a routing algorithm. When scheduling a...

[98] Empirical evaluation of public transport travel time variability

L. Kieu, ..., and E. Chung. Unknown journal, 2013. 5 citations.

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No summary or abstract available

[99] Hybrid Random Regret Minimization and Random Utility Maximization in the Context of Schedule-Based Urban Rail Transit Assignment

D. Li, ..., and Weiteng Zhou. Journal of Advanced Transportation, 2018. 11 citations.

0% Topic Match

Abstract: Route choice is one of the most critical passenger behaviors in public transit research. The utility maximization theory is generally used to model passengers' route choice behavior in a public transit network in previous research. However, researchers have found that passenger behavior is far more complicated than a single utility maximization assumption. Some passengers tend to maximize their utility while others would minimize their regrets. In this paper, a schedule-based transit assignment model based on the hybrid of utility maximization and regret minimization is proposed to study the passenger route choice behavior in an urban rail transit network. Firstly, based...

[100] Response to Travel Information: A Behavioural Review

Eran Ben-Elia and E. Avineri. Transport Reviews, 2015. 162 citations.

0% Topic Match

No summary or abstract available

[101] Directionality centric bus transit network segmentation for on demand public transit

Thilina Perera, ..., and T. Srikanthan. IET Intelligent Transport Systems, 2020. 0 citations.

0% Topic Match

Abstract: The recent growth in real-time, high-capacity ride-sharing has made on-demand public transit (ODPT) a reality. ODPT systems serving passengers using a vehicle fleet that operates with flexible routes, strive to minimise fleet travel distance. Heuristic routing algorithms have been integrated in ODPT systems in order to improve responsiveness. However, route computation time in such algorithms depends on problem complexity and hence increases for large scale problems. Thus, network segmentation techniques that exploit parallel computing have been proposed in order to reduce route computation time. Even though computation time can be reduced using segmentation in existing techniques, it comes at the...

[102] Reference-Dependent Stochastic User Equilibrium with Endogenous Reference Points

P. D. Site, ..., and Claudia Castaldi. European Journal of Transport and Infrastructure Research, 2013. 8 citations.

0% Topic Match

Abstract: We consider the application of reference-dependent consumer choice theory to traffic assignment on transportation networks. Route choice is modelled based on random utility maximisation with systematic utility embodying loss aversion for the travel time and money expenditure attributes. Stochastic user equilibrium models found in the literature have considered exogenously given reference points. The paper proposes a model where reference points are determined consistently with the equilibrium flows and travel times. The referencedependent stochastic user equilibrium (RDSUE) is defined as the condition where (i) no user can improve her utility by unilaterally changing path, (ii) each user has as reference point...

[103] A conservative expected travel time approach for traffic information dissemination under uncertainty

Ruiya Chen, ..., and Chao Yang. Transportmetrica B: Transport Dynamics, 2022. 8 citations.

0% Topic Match

Abstract: Travel time is important for both users and planners. Travel time variability widely exists in transportation systems. Positive skew with a long/fat upper tail is a basic characteristic of travel time variability, which poses great challenges to reporting travel time information to the public. There are two main approaches for disseminating travel time variability information: the traditional expected value and the percentile-based value. They are either unreliable when facing highly-skewed travel time variability, difficult to understand, or sensitive to individual risk preference. Motivated by this observation, this paper develops a conservative expected travel time (CET) approach to enhance the information...

[104] A Model for Continuous Dynamic Network Loading Problem with Different Overtaking Class Users

E. Castillo, ..., and H. Lo. Journal of Intelligent Transportation Systems, 2013. 6 citations.

0% Topic Match

No summary or abstract available

[105] Intelligent Route Planning Recommendation for Electric Bus Transport
Chunjie Zhou, ..., and Fusheng Wang. International Journal of Intelligent Systems, 2024. 2 citations.
0% Topic Match
Abstract: Electric bus transport, a popular mode of public transportation, offers punctual, safe, and comfortable services to passengers through the efficient and effective use of designated road space. The performance of electric bus transport systems depends largely on the design of proper locations of bus stops, with the consideration of passenger demands, waiting time, and traveling time. Optimal electric bus route planning can attract an increasing number of passengers and increase public transit services. Aiming to provide guidance for the electric bus route planning of developing cities, this study proposed an intelligent route planning method to minimize the waiting time and...

[106] Strategic Transit Route Recommendation Considering Multi-Trip Feature Desirability Using Logit Model with Optimal Travel Time Analysis
Marielet Guillermo, ..., and E. Dadios. J. Adv. Comput. Intell. Intell. Informatics, 2022. 6 citations.
0% Topic Match
Abstract: Route recommendation continues to manifest noteworthy contributions to the intelligent transportation system field of research as it evolves through time. Early related studies helped passengers and tourists experience a more convenient travel. At the same time, these helped transport planners analyze people's trip preferences and its correlation with the region-specific economic status in a more time-relevant data. Majority, however, require historical data and heavy data collection methods. For user quantified metrics such as route cost in terms of travel time and distance, the complexity and sparsity of preferences between travelers are persistent challenges. The strategic transit route recommendation proposed in...

[107] Modeling the Traveler's Route Choice Behavior under Unexpected Accidents
Minqing Zhu, ..., and Xinwei Ma. Journal of Advanced Transportation, 2023. 0 citations.
0% Topic Match
Abstract: To investigate the route choice behavior of travelers under unexpected accidents, this study designs four different scenarios of travelers' route choice behavior experiments according to the severity of unexpected accidents. The bounded rationality characteristics of travelers, such as the time perception difference coefficient, psychological threshold effect coefficient, and scale effect, are introduced into the generalized random regret minimization (GRRM) model. An improved generalized random regret minimization (IGRRM) model is constructed based on travelers' route choice behavior under unexpected accidents. The collected data of travelers' route choice results under four different congestion-level scenarios are analyzed by the IGRRM model. The study...

[108] Travel time variations over time and routes: endogenous congestion with degradable capacities
Hao Li, ..., and Xiaoning Zhang. Transportmetrica B: Transport Dynamics, 2017. 12 citations.
0% Topic Match
No summary or abstract available

[109] Statistical inference of travelers' route choice preferences with system-level data
Pablo Guarda and Sean Qian. ArXiv, 2022. 10 citations.
0% Topic Match
Abstract: Traditional network models encapsulate travel behavior among all origin-destination pairs based on a simplified and generic utility function. Typically, the utility function consists of travel time solely and its coefficients are equated to estimates obtained from stated preference data. While this modeling strategy is reasonable, the inherent sampling bias in individual-level data may be further amplified over network flow aggregation, leading to inaccurate flow estimates. This data must be collected from surveys or travel diaries, which may be labor intensive, costly and limited to a small time period. To address these limitations, this study extends classical bi-level formulations to estimate...

[110] Dynamic modelling of traffic incident impacts on network reliability
Xingang Li, ..., and Ziyou Gao. Transportmetrica A: Transport Science, 2015. 16 citations.
0% Topic Match
No summary or abstract available

[111] Methodology for Predictive Modeling and Correction Public Transport Times
A.A. Finogeev, ..., and R.S. Mayorov. International scientific and practical conference “Smart cities and sustainable development of regions” (SMARTGREENS 2024), 2025. 0 citations.
0% Topic Match
Abstract: The article discusses the problem of analyzing and predicting the arrival time of public transport at intermediate and final points of routes. The main requirement is to take into account the traffic congestion of urban road sections at different times of the day. To solve the problem, a methodology and tools for analyzing the movement of vehicles have been developed for predictive assessment of the average speed of movement on sections of the route. The goal is to increase the accuracy of forecasting the arrival time of public transport at stopping points along the routes. The efficiency criterion is the...

[112] Public Transport Route Recommender Regarding Multiple Factors
Alican Bozyigit, ..., and S. Utku. 2018 3rd International Conference on Computer Science and Engineering (UBMK), 2018. 3 citations.
0% Topic Match
Abstract: Public transport route recommendation is a complex problem because passengers take many factors into consideration while planning their trips. In this paper, a novel route recommending approach is proposed to find the ideal public transport route with respect to multiple factors such that number of transfers, total distance, and walking distance (in the order of importance). Space P modelling technique and a Dijkstra's Algorithm based method are applied together for the first time by this approach. The proposed method is tested on the real-world dataset (Public Transport Network of Izmir, Turkey) having 7,704 stations and 43,467 connections between these stations....

[113] Investigating the Impact of Dwell Time on the Reliability of Urban Light Rail Operations
Z. Christoforou, ..., and I. Kaparias. Urban Rail Transit, 2020. 0 citations.
0% Topic Match
Abstract: The present study investigates the determinants of vehicle dwell time at stations in urban light rail networks. Using data collected from an on-board automatic passenger counting system of the tramway network of the French city of Nantes over a long period, the study performs graphical and statistical analyses enabling the identification of cause-and-effect relationships of a number of attributes on the dwell time and its reliability. The results confirm the significance of the boarding and alighting passenger volumes, as well as of the on-board passenger loading, on the dwell time. Additional effects on dwell time are found from the vehicle...

[114] A Strategic User Equilibrium for Independently Distributed Origin Destination Demands
Tao Wen, ..., and Fang Chen. Computer Aided Civil and Infrastructure Engineering 2018. 11 citations.
0% Topic Match
No summary or abstract available

[115] Distributionally Robust Optimisation in Congestion Control
Jakub Marecek, ..., and Jia Yuan Yu. arXiv: Optimization and Control, 2017. 0 citations.
0% Topic Match
Abstract: The effects of real-time provision of travel-time information on the behaviour of drivers are considered. The model of Marecek et al. [arXiv:1406.7639, Int. J. Control 88(10), 2015] is extended to consider uncertainty in the response of a driver to an interval provided per route. Specifically, it is suggested that one can optimise over all distributions of a random variable associated with the driver's response with the first two moments fixed, and for each route, over the sub-intervals within the minimum and maximum in a certain number of previous realisations of the travel time per the route.

[116] Modeling Evolutionary Dynamics of Railway Delays with Markov Chains
Beda Büchel, ..., and F. Corman. 2021 7th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS), 2021. 3 citations.
0% Topic Match

Abstract: Railway operators depend on accurate and reliable predictions on future arrival and departure times of trains. This information is also disseminated to passengers to facilitate their journeys. Railway operations are influenced by many variables and are thus highly stochastic and dynamic. Hence modeling the variability of arrival time prediction and its evolution over time and space is of great interest. We propose a set of non-stationary Markov chain approaches to model the stochastic evolution of train delays over a train run. The Markov chains base on a varying combination of arrival, departure, running, and dwell time events. The models are...

[117] Data-driven inverse learning of passenger preferences in urban public transits
Guojun Wu, ..., and Jie Fu. 2017 IEEE 56th Annual Conference on Decision and Control (CDC), 2017. 11 citations.
0% Topic Match
Abstract: Urban public transit planning is crucial in reducing traffic congestion and enabling green transportation. However, there is no systematic way to integrate passengers' personal preferences in planning public transit routes and schedules so as to achieve high occupancy rates and efficiency gain of ride-sharing. In this paper, we take the first step tp exact passengers' preferences in planning from history public transit data. We propose a data-driven method to construct a Markov decision process model that characterizes the process of passengers making sequential public transit choices, in bus routes, subway lines, and transfer stops/stations. Using the model, we integrate softmax...

[118] A Hybrid Control Strategy for a Dynamic Scheduling Problem in Transit Networks
Zhongshan Liu, ..., and Wensi Wang. International Journal of Applied Mathematics and Computer Science, 2022. 2 citations.
0% Topic Match
Abstract: Abstract Public transportation is often disrupted by disturbances, such as the uncertain travel time caused by road congestion. Therefore, the operators need to take real-time measures to guarantee the service reliability of transit networks. In this paper, we investigate a dynamic scheduling problem in a transit network, which takes account of the impact of disturbances on bus services. The objective is to minimize the total travel time of passengers in the transit network. A two-layer control method is developed to solve the proposed problem based on a hybrid control strategy. Specifically, relying on conventional strategies (e.g., holding, stop-skipping), the hybrid...

[119] Essays on travel mode choice modeling : a discrete choice approach of the interactions between economic and behavioral theories
H. Bouscasse. Unknown journal, 2017. 2 citations.
0% Topic Match
No summary or abstract available

[120] A New Route Choice Model for Urban Public Transit with Headway-based Service
P. Horbachov, ..., and Olha Svichynska. Periodica Polytechnica Transportation Engineering, 2022. 1 citations.
0% Topic Match
Abstract: A new approach to create the model of individual behavior in urban public transit systems with headway-based service that is built on the same principles of rational decision making as discrete choice models is presented. To describe a passenger's decision-making, the attractiveness function which reflects the difference between trip results and costs was used. The attractiveness of the transit route was determined by solving the system of Fredholm's integral equations based on observed frequencies of choosing the alternative routes by each individual. The frequencies were determined based on multi-day survey results and range between 0 and 1 but equal neither...

[121] Analysis of driver's choice behavior based on the combined model of utility-regret
Jun Kang, ..., and Fan Zhang. Journal of Physics: Conference Series, 2020. 0 citations.
0% Topic Match
Abstract: In the context of increasing urban traffic trajectory data, based on large-scale urban traffic trajectory data, in the field of intelligent transportation, it has become an urgent need to analyze travelers' routing behaviors and establish effective routing models to provide travelers with efficient and reasonable driving route recommendations. It is often the case that urban taxi groups has better route choice behavior than other travel group under the cost-benefit constraints. Therefore, providing route recommendations for other travelers according to the route choice habits of urban taxi group is a feasible solution to the above need. This paper starts with the...

[122] An Artificial Intelligence Approach to Estimate Travel Time along Public Transportation Bus Lines
M. Ghanim, ..., and Motasem Miqdad. Proceedings of the International Conference on Civil Infrastructure and Construction (CIC 2020), 2020. 5 citations.
0% Topic Match
Abstract: Public transportation sectors have played significant roles in accommodating passengers and commodities efficiently and effectively. The modes of public transportation often follow pre-defined operation schedules and routes. Therefore, planning these schedules and routes requires extensive efforts in analyzing the built environment and collecting demand data. Once a transit route is operational as an example, collecting and maintaining real-life information becomes an important task to evaluate service quality using different Key Performance Indicators (KPIs). One of these KPIs is transit travel time along the route. This paper aims to develop a transit travel time prediction model using an artificial intelligence approach....

[123] Investigating the Impact of Dwell Time on the Reliability of Urban Light Rail Operations
Z. Christoforou, ..., and I. Kaparias. Urban Rail Transit, 2020. 21 citations.
0% Topic Match
Abstract: The present study investigates the determinants of vehicle dwell time at stations in urban light rail networks. Using data collected from an on-board automatic passenger counting system of the tramway network of the French city of Nantes over a long period, the study performs graphical and statistical analyses enabling the identification of cause-and-effect relationships of a number of attributes on the dwell time and its reliability. The results confirm the significance of the boarding and alighting passenger volumes, as well as of the on-board passenger loading, on the dwell time. Additional effects on dwell time are found from the vehicle...

[124] Unravelling travellers' route choice behaviour at full-scale urban network by focusing on representative OD pairs in computer experiments
Humberto González Ramírez, ..., and J. Krug. PLoS ONE, 2019. 4 citations.
0% Topic Match
Abstract: In a city-scale network, trips are made in thousands of origin-destination (OD) pairs connected by multiple routes, resulting in a large number of alternatives with diverse characteristics that influence the route choice behaviour of the travellers. As a consequence, to accurately predict user choices at full network scale, a route choice model should be scalable to suit all possible configurations that may be encountered. In this article, a new methodology to obtain such a model is proposed. The main idea is to use clustering analysis to obtain a small set of representative OD pairs and routes that can be investigated...

[125] Artificial Intelligence-Based Demand Forecasting and Route Optimization Modeling for Public Transportation in Megacities
Luyao Tang. Applied and Computational Engineering, 2025. 0 citations.
0% Topic Match
Abstract: This study develops an AI-based integrated decision support system for public transportation demand forecasting and route optimization in megacities facing severe traffic congestion. The system employs an LSTM-GRU hybrid neural network architecture that combines long short-term memory networks' capability for handling long-term dependencies with gated recurrent units' computational efficiency. Multi-scale attention mechanisms capture temporal features, while spatiotemporal graph convolutional networks model spatial correlations between stations for comprehensive spatiotemporal pattern analysis. For route optimization, a multi-objective mathematical model considers operational costs, service quality, and environmental impact, utilizing an improved NSGA-III genetic algorithm to generate Pareto optimal solutions. The five-layer system architecture...

[126] Tri-reference-point hypothesis development for airport ground access behaviors
Yi-Shih Chung and Szu-Yu Tu. Transportation, 2020. 0 citations.
0% Topic Match
No summary or abstract available

[127] Regret minimization based joint econometric model of mode choice and departure time: a case study of university students in Toronto, Canada
Sabreena Anowar, ..., and Naveen Eluru. Transportmetrica A: Transport Science, 2019. 16 citations.
0% Topic Match

Abstract: ABSTRACT With the objective of enhancing our understanding of student travel patterns, we examine their mode and departure time choice for discretionary trip purposes. In our study, we hypothesize that students are likely to consider these joint choices or interconnected decisions in a sequence (mode first, departure time second and departure time first, mode second), even if the time difference between these decisions is infinitesimally small. A latent segmentation approach is proposed that allows for the incorporation of choice sequences simultaneously. Within this framework, mode and departure time decisions are examined using random utility and random regret decision framework. This...

[128] Multi-route choice modelling in a metropolitan context: A comparative analysis using Multinomial Logit and Fuzzy Logic based approaches
S. Dhulipala. European Transport/Trasporti Europei, 2020. 6 citations.
0% Topic Match
Abstract: Route choice plays a vital role in the traffic assignment and network building, as it involves decision making on part of riders. The vagueness in travellers' perceptions of attributes of the available routes between any two locations adds to the complexities in modelling the route choice behaviour. Conventional Logit models fail to address the uncertainty in travellers' perceptions of route characteristics (especially qualitative attributes, such as environmental effects), which can be better addressed through the theory of fuzzy sets and linguistic variables. This study thus attempts to model travellers' route choice behaviour, using a fuzzy logic approach that is based...

[129] Empirical Study of Effect of Dynamic Travel Time Information on Driver Route Choice Behavior
Jinghui Wang and H. Rakha. Sensors (Basel, Switzerland), 2020. 13 citations.
0% Topic Match
Abstract: The objective of this paper is to study the effect of travel time information on day-to-day driver route choice behavior. A real-world experimental study is designed to have participants repeatedly choose between two alternative routes for five origin-destination pairs over multiple days after providing them with dynamically updated travel time information (average travel time and travel time variability). The results demonstrate that historical travel time information enhances behavioral rationality by 10% on average and reduces inertial tendencies to increase risk seeking in the gain domain. Furthermore, expected travel time information is demonstrated to be more effective than travel time variability...

[130] An Effective Selection Method for Vehicle Alternative Route under Traffic Congestion
Jie Xu, ..., and Chunxiao Xing. 2018 IEEE 18th International Conference on Communication Technology (ICCT), 2018. 5 citations.
0% Topic Match
Abstract: The development of the city transportation system provides us lots of conveniences, but it also can brings traffic congestion causing environmental pollution and increasing the travel cost. The current research mainly focuses on traffic volume prediction, route recommendation. However, it is also very mea-ningful and instructive to select a suitable less time-consuming alternative route on a specified congested road. In general, skilled taxi drivers who are relatively familiar with the traffic condition would like to choose the less time routes to avoid peak congestion road segments. Inspired by above ideas, in this paper, we propose a novel hybrid framework which...

[131] Day-to-Day Traffic Assignment Model considering Information Fusion and Dynamic Route Adjustment Ratio
Manman Li, ..., and Jiahui Sun. Discrete Dynamics in Nature and Society, 2020. 1 citations.
0% Topic Match
Abstract: A new day-to-day traffic assignment model is proposed to describe travelers' day-to-day behavioral changes with advanced traffic information system. In the model, travelers' perception is updated by a double exponential-smoothing learning process combining experience and traffic information that is explicitly modelled. Route adjustment ratio is dynamically determined by the difference between perceived and expected utilities. Through theoretical analyses, we investigate the existence of its fixed point and the influence factors of uniqueness of the fixed point. An iterative-based algorithm that can solve the fixed point is also given. Numerical experiments are then conducted to investigate effects of several main parameters...

[132] Urban travel behavior analyses and route prediction based on floating car data
D. Sun, ..., and Z. Peng. Transportation Letters, 2014. 66 citations.
0% Topic Match
No summary or abstract available

[133] Dynamic Timetable and Route Optimized Public Transport System
Rakhi Bharadwaj, ..., and Sakshi Oswal. 2022 Algorithms, Computing and Mathematics Conference (ACM), 2022. 1 citations.
0% Topic Match
Abstract: The current bus transportation system relies on experience-based manual decisions for route planning and timings which may result in longer ride times and total distance travelled as well as increasing cost and carbon emissions along with usage of resources more than required. On the other hand, timetables are often outdated and created based on static information resulting in suboptimal results and an increase in waiting time of passengers due to unreliable scheduling of buses. We propose a three-fold solution to the current system by Route Optimization which provides the most effective route connections concerning traffic and population using a genetic...

[134] Combining Profile Similarity and Kalman Filter for Real-World Applicable Short-Term Bus Travel Time Prediction
F. Schwinger, ..., and M. Jarke. 2021 IEEE International Intelligent Transportation Systems Conference (ITSC), 2021. 1 citations.
0% Topic Match
Abstract: The emergence of intelligent transportation systems and the availability of detailed past trips and real-time data enabled more accurate travel time prediction algorithms. Passengers of public transportation highly value reliable service and accurate travel information. Unexpected delays while traveling impact traveler satisfaction enormously. We present a novel approach for a travel time prediction model for public transit in an urban setting. For this, we extended the existing profile similarity model based on k-medoids clustering and augmented it for an urban regions. The algorithm integrates real-time data from preceding vehicles traveling on the same links with a Kalman filter. Hence, the...

[135] Verification and Optimization of Metro Fare Clearing Models Based on Travel Route Reconstruction
Pu Yichao. Unknown journal, 2020. 2 citations.
0% Topic Match
Abstract: How to verify and optimize metro fare clearing models efficiently and accurately is a research focus in metro operations. Metro fare clearing models are mostly based on probability distributions. In such models, the normal distribution of travel time corresponding to the section probabilities is used to calculate the route choice probabilities of passengers on a multi-route metro network. By integrating the operating mileage proportions of each metro line operator and the corresponding route choice probabilities, the fare clearing proportions are calculated for all the operators of the metro network. To verify the accuracy of the fare clearing proportions, we propose...

[136] A perturbed utility route choice model
M. Fosgerau, ..., and T. Rasmussen. ArXiv, 2021. 26 citations.
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Abstract: We propose a route choice model in which traveler behavior is represented as a utility maximizing assignment of flow across an entire network under a flow conservation constraint. Substitution between routes depends on how much they overlap. The model is estimated considering the full set of route alternatives, and no choice set generation is required. Nevertheless, estimation requires only linear regression and is very fast. Predictions from the model can be computed using convex optimization, and computation is straightforward even for large networks. We estimate and validate the model using a large dataset comprising 1,337,096 GPS traces of trips in...

[137] Machine Learning-Based Route Optimization for Smart Urban Transportation Systems
Adriel Moses Anson and Amirah. Journal of Computer Science Application and Engineering (JOSAPEN), 2025. 0 citations.
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Abstract: Urban transportation systems face increasing challenges due to rapid population growth, traffic congestion, and unpredictable road conditions. Traditional routing algorithms like Dijkstra and A* are limited in their ability to respond to real-time events such as accidents, roadwork, or weather disruptions. This study aims to develop a smarter, more adaptive route optimization system using machine learning techniques. The goal is to enhance travel time accuracy, reduce congestion, and improve commuter satisfaction through intelligent, data-driven decision-making. The proposed method integrates supervised learning for travel time prediction and reinforcement learning for real-time route selection, using data from GPS trajectories, traffic flow, weather...

[138] Contextual Bandit-Based Sequential Transit Route Design under Demand Uncertainty
Gyugeun Yoon and Joseph Y. J. Chow. Transportation Research Record, 2020. 16 citations.
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Abstract: While public transit network design has a wide literature, the study of line planning and route generation under uncertainty is not so well covered. Such uncertainty is present in planning for emerging transit technologies or operating models in which demand data is largely unavailable to make predictions on. In such circumstances, this paper proposes a sequential route generation process in which an operator periodically expands the route set and receives ridership feedback. Using this sensor loop, a reinforcement learning-based route generation methodology is proposed to support line planning for emerging technologies. The method makes use of contextual bandit problems to...

[139] Integrated optimization of logistics routing problem considering chance preference
Liang Ren, ..., and Yunfeng Ma. Modern Supply Chain Research and Applications, 2024. 2 citations.
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Abstract: PurposeThis study aims to examine the impact of the decision makers' risk preference on logistics routing problem, contributing to logistics behavior analysis and route integration optimization under uncertain environment. Due to the unexpected events and complex environment in modern logistics operations, the logistics process is full of uncertainty. Based on the chance function of satisfying the transportation time and cost requirements, this paper focuses on the fourth party logistics routing integrated optimization problem considering the chance preference of decision makers from the perspective of satisfaction.Design/methodology/approachThis study used the quantitative method to investigate the relationship between route decision making and human...

[140] Advanced Decision Modeling for Real Time Variable Tolling – Development and Testing of a Data Collection Platform
Ph.D Paul Hanley, ..., and Ph.D Suyun Ma. Journal Not Provided, 2013. 0 citations.
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[141] Value of Travel Time Reliability: A Review of Current Evidence
Carlos Carrion and David M Levinson. Social Science Research Network, 2010. 474 citations.
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[142] Approximation Algorithms for Reliable Stochastic Combinatorial Optimization
E. Nikolova. Unknown journal, 2010. 84 citations.
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[143] Stochastic Shortest Paths Via Quasi-convex Maximization
E. Nikolova, ..., and M. Mitzenmacher. Unknown journal, 2006. 158 citations.
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[144] Least Expected Time Paths in Stochastic, Time-Varying Transportation Networks
Elise Miller-Hooks and H. Mahmassani. Transp. Sci., 1999. 351 citations.
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[145] Travel time variability: A review of theoretical and empirical issues
R. Noland and J. Polak. Transport Reviews, 2002. 510 citations.
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[146] An Empirical Study of Travel Time Variability and Travel Choice Behavior
W. B. Jackson and J. Jucker. Transportation Science, 1982. 280 citations.
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[147] A Mean-Risk Model for the Traffic Assignment Problem with Stochastic Travel Times
E. Nikolova and Nicolas Stier-Moses. Oper. Res., 2014. 84 citations.
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[148] Link-Based Route Choice considering Risk Aversion, Disappointment, and Regret
A. Fonzone, ..., and D. Fukuda. Transportation Research Record, 2012. 16 citations.
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[149] Embedding risk attitude and decision weights in non-linear logit to accommodate time variability in the value of expected travel time savings
D. Hensher, ..., and Zheng Li. Transportation Research Part B-methodological, 2011. 110 citations.
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[150] Direct versus indirect models for the effects of unreliability
Y. Hollander. Transportation Research Part A-policy and Practice, 2006. 179 citations.
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[151] A self-regulation traffic-condition-based route guidance strategy with realistic considerations: Overlapping routes, stochastic traffic, and signalized intersections
Zhengbing He, ..., and B. Mao. Journal of Intelligent Transportation Systems, 2016. 14 citations.
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[152] Providing personalized system optimum traveler information in a congested traffic network with mixed users
Jiaqi Ma, ..., and Chang-Ju Lee. Journal of Intelligent Transportation Systems, 2016. 11 citations.
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[153] Generalized Traffic Equilibrium with Probabilistic Travel Times and Perceptions
P. Mirchandani and H. Soroush. Transp. Sci., 1987. 247 citations.
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[154] A Mobile Application for Real-Time Multimodal Routing Under a Set of Users' Preferences
Konstantinos Gkiotsalitis and A. Stathopoulos. Journal of Intelligent Transportation Systems, 2015. 21 citations.
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[155] Regret theory-based route choices and traffic equilibria
C. Chorus. Transportmetrica, 2012. 134 citations.
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[156] Use of Advanced Traveler Information Systems for Route Choice: Interpretation Based on a Bayesian Model
C. Liao and Chun-Wei Chen. Journal of Intelligent Transportation Systems, 2015. 19 citations.
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[157] Finding most reliable paths on networks with correlated and shifted log–normal travel times
K. Srinivasan, ..., and Ravi Seshadri. Transportation Research Part B-methodological, 2014. 123 citations.
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[158] Measuring Service Reliability Using Automatic Vehicle Location Data
Zhenliang Ma, ..., and M. Mesbah. Mathematical Problems in Engineering, 2014. 24 citations.
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Abstract: Bus service reliability has become a major concern for both operators and passengers. Buffer time measures are believed to be appropriate to approximate passengers' experienced reliability in the context of departure planning. Two issues with regard to buffer time estimation are addressed, namely, performance disaggregation and capturing passengers' perspectives on reliability. A Gaussian mixture models based method is applied to disaggregate the performance data. Based on the mixture models distribution, a reliability buffer time (RBT) measure is proposed from passengers' perspective. A set of expected reliability buffer time measures is developed for operators by using different spatial-temporal levels combinations of...

[159] An international meta-analysis of values of travel time savings.
J. Shires and G. C. D. Jong. Evaluation and program planning, 2009. 190 citations.
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[160] On including travel time reliability of road traffic in appraisal
G. Jong and M. Bliemer. Transportation Research Part A-policy and Practice, 2015. 71 citations.
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[161] Applied Choice Analysis
D. Hensher, ..., and W. Greene. Unknown journal, 2015. 823 citations.
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[162] On the relation between the mean and variance of delay in dynamic queues with random capacity and demand
M. Fosgerau. Unknown journal, 2010. 78 citations.
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[163] Modeling Departure Time Choice under Stochastic Networks Involved in Network Design
Hao Li, ..., and P. Bovy. Transportation Research Record, 2009. 20 citations.
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[164] Marginal valuations of travel time and scheduling, and the reliability premium
R. Batley. Transportation Research Part E-logistics and Transportation Review, 2007. 51 citations.
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[165] Brand Effects on Choice and Choice Set Formation Under Uncertainty
J. Swait and Tülin Erdem. Marketing Science, 2007. 153 citations.
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[166] User equilibrium traffic network assignment with stochastic travel times and late arrival penalty
D. Watling. Eur. J. Oper. Res., 2006. 211 citations.
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[167] New technology and the modeling of risk-taking behavior in congested road networks
Yafeng Yin, ..., and H. Ieda. Transportation Research Part C-emerging Technologies, 2004. 91 citations.
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[168] The price of anarchy for non-atomic congestion games with symmetric cost maps and elastic demands
Chi-Kin Chau and Kwang Mong Sim. Oper. Res. Lett., 2003. 117 citations.
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[169] Travel time reliability in transportation networks: A review of methodological developments
Zhaoqi Zang, ..., and A. Chen. Transportation Research Part C: Emerging Technologies, 2022. 85 citations.
Not measured Topic Match
Abstract: A REVIEW OF METHODOLOGICAL DEVELOPMENTS Zhaoqi Zang , Xiangdong Xu b, , Kai Qu , Ruiya Chen , Anthony Chen c a School of Civil and Environmental Engineering, Nanyang Technological University, Singapore b College of Transportation Engineering, Tongji University, Shanghai, China c Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University, Hong Kong, China ABSTRACT The unavoidable travel time variability in transportation networks, resulted from the widespread supply-side and demand-side uncertainties, makes travel time reliability (TTR) be a common and core interest of all of the stakeholders in transportation systems, including planners, travelers, service providers, and managers. This...

[170] From road waiting to road leading: can toll-road marketing strategies make a difference for truck drivers under uncertain travel times?

Mengru Shao, ..., and Tao Feng. Case Studies on Transport Policy, 2026. 0 citations.
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[171] Assessment of the barriers in establishing passenger mobility-as-a-service (MaaS) systems: An analogy with multimodal freight transport
Chenyang Wu, ..., and Aruna Sivakumar. Case Studies on Transport Policy, 2025. 3 citations.
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[172] Capacity-constrained mean-excess equilibrium assignment method for railway networks
Guangming Xu, ..., and Anthony Chen. Transportation Research Part C: Emerging Technologies, 2023. 3 citations.
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[173] Traveller Recurrence and Inter- versus Intratraveller Speed Variability: Analysis with Bluetooth Data
E. Jenelius. Journal of Advanced Transportation, 2022. 0 citations.
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Abstract: This paper proposes a linear mixed model of route speed distributions that separates the variability into an intertraveller component, consistent across days and time intervals for each recurrent traveller, and an intratraveller component representing uncertainty. The intratraveller variability corresponds to travel time uncertainty, while the total variability is typically captured by empirical measurements and used in travel time reliability assessments. The intratraveller and the total variability differ if there are systematic differences in speed between different recurrent travellers. The paper also investigates to what degree vehicles traversing a route during the morning or evening peak over multiple days are recurrent...

[174] Development of Traffic-Based Congestion Pricing and Its Application to Automated Vehicles
Jooyong Lee and K. Kockelman. Transportation Research Record, 2019. 8 citations.
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Abstract: Improved traffic management techniques are needed to reduce congestion on road networks, especially as “driving” is made easier, through self-driving vehicles. In this paper, reactive congestion pricing varies toll rates based on recent congestion levels, and automated vehicles are added to the conventional traffic mix for evaluation of evolving travel conditions. As expected, drivers with higher values of travel time (VOTT) are more likely to use the tolled route than drivers with lower VOTT, and tolled-route speeds rose (about 4%) while speeds on non-tolled road segments fell (about 15%). Thanks to traveler sorting, net benefits exceeded $600 per hour in...

[175] Reliable space–time prisms in the stochastic road networks under spatially correlated travel times
A. Sahebgharani, ..., and Mahmoud Mohammadi. Transportmetrica B: Transport Dynamics, 2020. 9 citations.
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Abstract: ABSTRACT Conventional space–time prisms (STPs) represent deterministic travel times but ignore the stochastic nature of travel speeds. To this extent, reliable STPs were developed to take the effect of time uncertainty into account. Although empirical studies showed that link travel times are correlated in the urban road networks and obey non-normal distributions, existing reliable prisms assume that travel times follow normal distribution and are spatially independent. This way, the aim of this paper is to extend the concept of reliable STP to non-normally distributed and spatially correlated networks. In doing so, a method is elaborated for computing such a prism,...

[176] Design of urban rail corridor over time : for cities with high population densities and growth uncertainties
Ding Liu. Unknown journal, 2018. 0 citations.
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[177] Tri-reference-point hypothesis development for airport ground access behaviors
Yi-Shih Chung and Szu-Yu Tu. Transportation, 2020. 4 citations.
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[178] Itinerary planning with time budget for risk-averse travelers
Yu Zhang and Jiafu Tang. Eur. J. Oper. Res., 2017. 18 citations.
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[179] Departure time and route choices in bottleneck equilibrium under risk and ambiguity
Y. Liu, ..., and Lu Hu. Transportation Research Part B: Methodological, 2017. 29 citations.
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[180] Travel cost budget based user equilibrium in a bottleneck model with stochastic capacity
Qiumin Liu, ..., and Ziyou Gao. Transportation Research Part B: Methodological, 2020. 27 citations.
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[181] A distribution-fitting-free approach to calculating travel time reliability ratio
Zhaoqi Zang, ..., and A. Chen. Transportation Research Part C-emerging Technologies, 2018. 18 citations.
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[182] The Effect of Regret-Based Risky Route Choice on the Traffic Equilibrium for Emergency Evacuation
Ze Wang, ..., and Ling-lin Ni. Journal of Advanced Transportation, 2020. 4 citations.
Not measured Topic Match
Abstract: Following the research on human decision-making under risk and uncertainty, the purpose of this paper is to analyze evacuees’ risky route decision behavior and its effect on traffic equilibrium. It examines the possibility of applying regret theory to model travellers’ regret-taking behavior and network equilibrium in emergency context. By means of modifying the utility function in expected utility theory, a regret-based evacuation traffic equilibrium model is established, accounting for the evacuee’s psychological behavior of regret aversion and risk aversion. Facing two parallel evacuation routes choice situation, the effect of evacuees’ risk aversion and regret aversion on traffic equilibrium is numerically...

[183] Information processing model of subjective estimates of the evolution of dynamic processes illustrated for anticipated future mortgage rates
S. Rasouli, ..., and A. Grigolon. International Journal of Urban Sciences, 2020. 2 citations.
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Abstract: ABSTRACT In recent years, the importance of incorporating attribute uncertainty in models of spatial choice behaviour has been recognized in urban planning research. The majority of studies concerned with decision-making under uncertainty assume some a-priori probability distribution for discrete attribute levels or continuous attribute values. Consequently, it has been implicitly assumed that the decision maker perceives the uncertain attributes as reflected in the presumed discrete or continuous probability distributions. This assumption may, however, not be necessarily true. Capturing the shape of the probability distributions from the decision maker’s perspective likely increases the accuracy of models of decision-making under uncertainty. The...

[184] Stochastic congestion pricing and urban spatial structure in a monocentric city: A risk-adjusted equilibrium model

G. Güven. Physica A: Statistical Mechanics and its Applications, 2026. 0 citations.
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[185] Optimization of Public Transport Route Accessibility in High Congestion Areas Using Arc GIS
Danish Farooq, ..., and M. Asghar. Periodica Polytechnica Transportation Engineering, 2025. 0 citations.
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Abstract: Due to increasing urbanization and environmental concerns, there is a growing need to enhance and optimize public transportation systems to make them more accessible, efficient, and sustainable. The aim of this study is to improve the public transportation network by optimization of the routes in high congested areas of Rawalpindi city. Geographic Information Systems (GIS) have emerged as a powerful tool for achieving such goal. The integration process involves collecting and analyzing geospatial data, including route information, passenger demographics, and real-time traffic conditions, to optimize transit routes. By incorporating real-time traffic data into the GIS model, the analysis provided insights...

[186] Estimating the value of safety against road crashes: A stated preference experiment on route choice of food delivery riders
Kuldeep Kavta, ..., and Gonçalo Homem de Almeida Correia. Transportation Research Part C: Emerging Technologies, 2025. 2 citations.
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[187] Identifying expressway network bottlenecks using iterative spectral bisection and OD detour degree
Jin-Qiang Xu, ..., and Yanqiu Cheng. Transportmetrica A: Transport Science, 2025. 1 citations.
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[188] Incorporating the inertia effect into a route choice model using fare transaction data from a large-scale public transport network
J. Arriagada, ..., and Marcela Munizaga. Transportation Research Part A: Policy and Practice, 2025. 2 citations.
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[189] Traffic Flow Theory-Based Modeling of Bike-Vehicle Interactions for Enhanced Safety and Mobility
Mustafa Gadah, ..., and Vamshi Yellisetty. Multimodal Transportation, 2025. 1 citations.
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[190] Trading Flexibility for Adoption: From Dynamic to Static Walking in Ride-Sharing
Julia Yan, ..., and Sean J. Taylor. Manag. Sci., 2024. 4 citations.
Not measured Topic Match
Abstract: On-demand ride-sharing aims to fulfill riders' transportation needs whenever and wherever they want. Although this service level appeals to riders, overall system efficiency can improve substantially if riders are willing to be flexible. Here, we explore riders' flexibility in space via walking to more accessible pickup locations. Ride-sharing platforms have traditionally implemented dynamic walking to optimize rider pickup locations and rider-driver assignment jointly. We propose an alternative that we call static walking, which presents a predetermined pickup location to the rider before optimizing rider-driver assignment. Although dynamic walking enables more efficient matching of riders and drivers, we hypothesize that riders...