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Towards Individual and Multi-Stakeholder Fairness in Tourism Recommender Systems (TRS)

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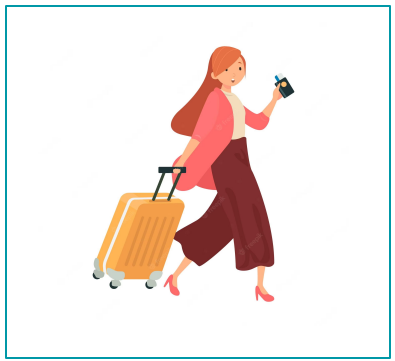
frontiers

What we will cover Today

- Introduction: Stakeholder in TRS, Multi-stakeholder TRS
- Findings from our Literature Review
- Q&A and Discussion

Introduction

Stakeholders in TRS



Consumers

tripadvisor Hotels.com yelp Booking.com airbnb

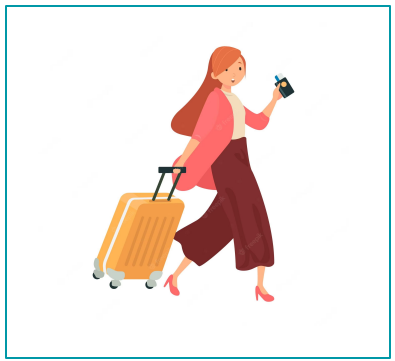
Platforms

MOTEL ONE

Item Providers

Society

Stakeholders in TRS



Consumers

Matching Preferences

tripadvisor

Hotels.com

yelp

Booking.com

airbnb

Platforms

Maximize Commissions

MOTEL ONE

Item Providers

Maximize Exposure

Society

Environmental Damage

Multistakeholder Recommender Systems

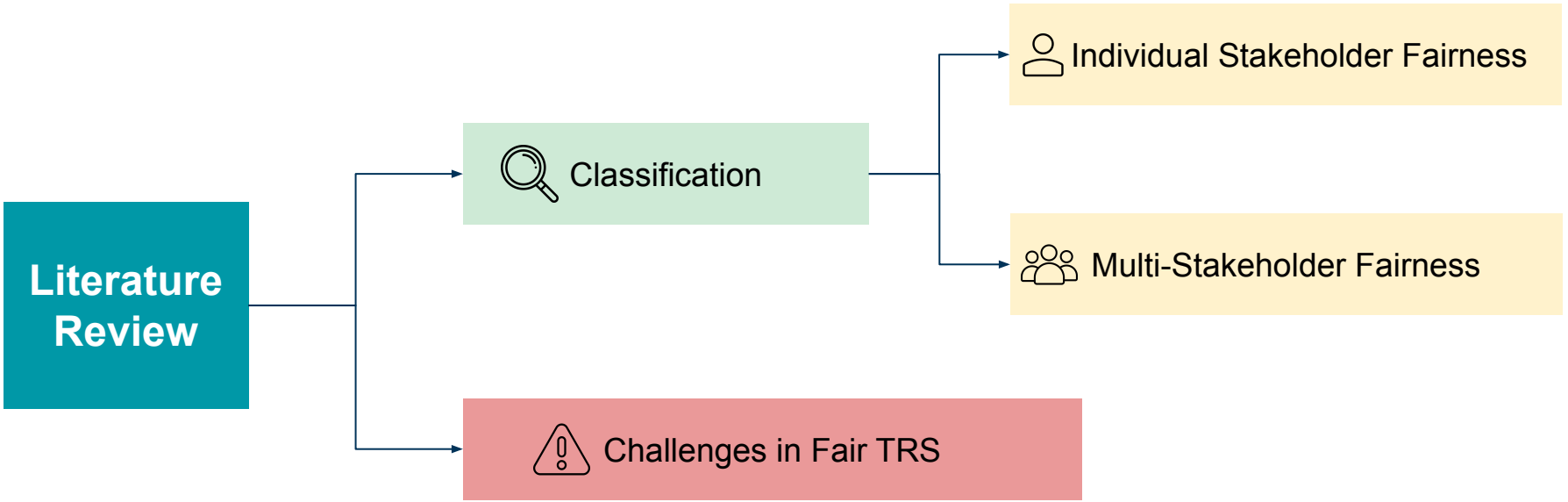
🌈 Ideal Scenario

➡️ Balances the needs of **all** stakeholders i.e. is fair to all of them

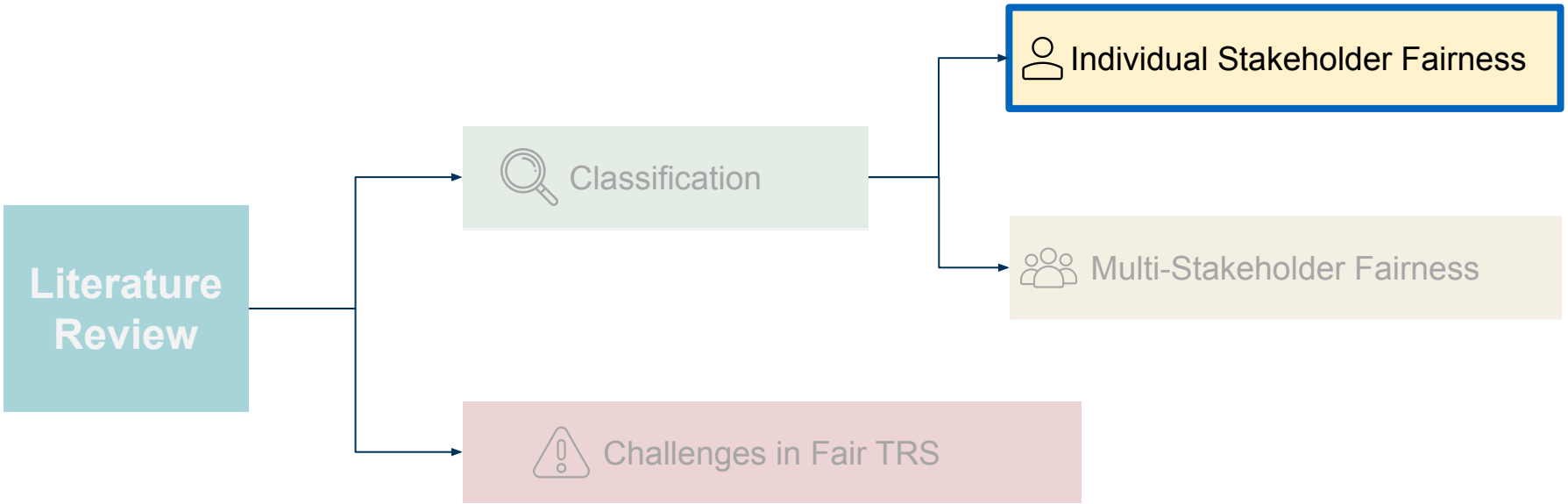
- ✓ Consumers **(C-Fairness)**
- ✓ Item Providers **(I-Fairness)**
- ✓ Platforms **(P-Fairness)**
- ✓ Society **(S-Fairness)**

Literature Review

Literature Review: Fairness in TRS



Literature Review: Fairness in TRS



Individual Stakeholder Fairness in TRS

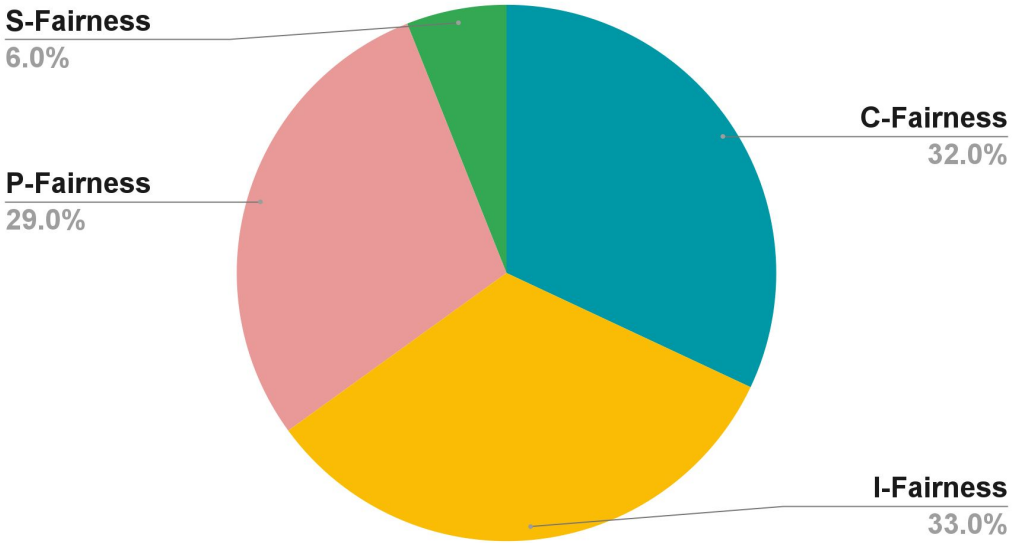
⭐ Main Fairness Criteria

Fairness Type	Main Fairness Criteria
Consumer Fairness **(C-Fairness)**	Individual & Group Fairness
Item Provider Fairness **(I-Fairness)**	Popularity Bias, Exposure Bias
Platform Fairness **(P-Fairness)**	Ranking Bias
Societal Fairness **(S-Fairness)**	Sustainability

Individual Stakeholder Fairness in TRS

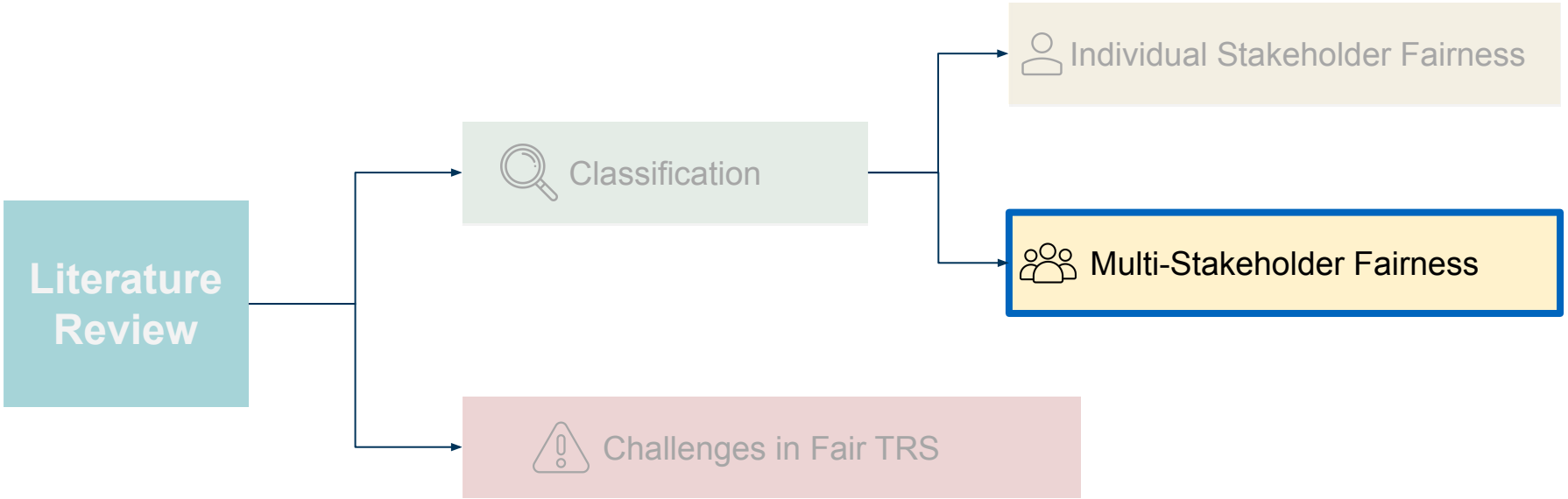
👀 Focus

Total papers in TRS: 66; Stakeholder-focused papers in TRS: % breakdown



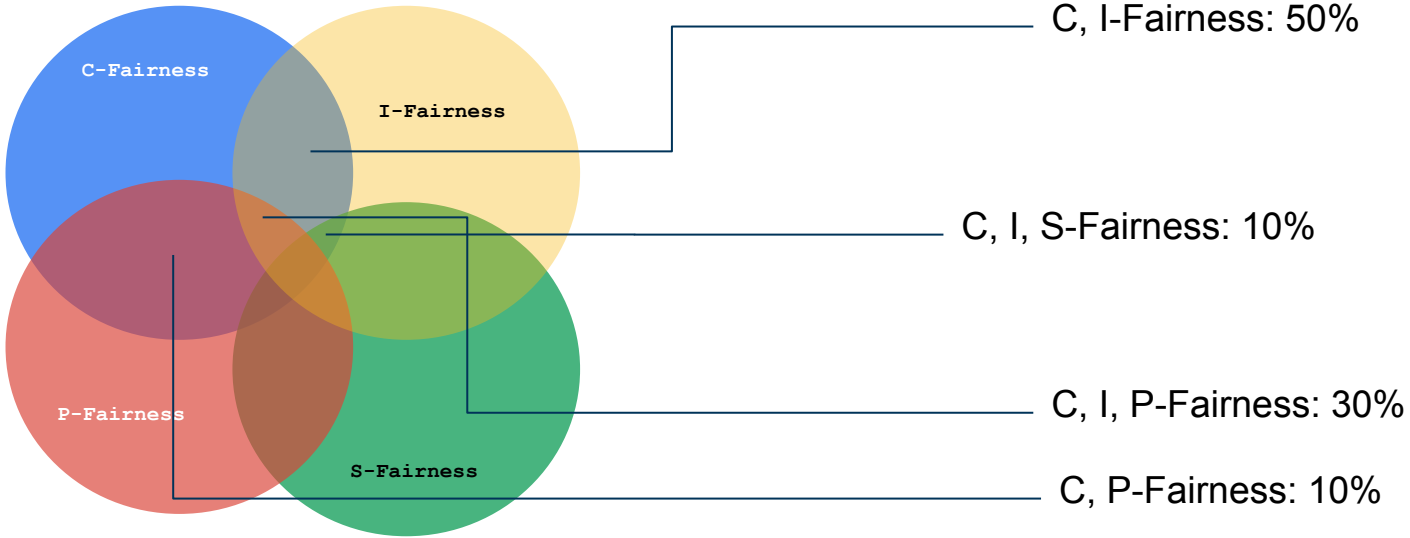
- ✓ Consumers **(C-Fairness)**
- ✓ Item Providers **(I-Fairness)**
- ✓ Platforms **(P-Fairness)**
- ! Society **(S-Fairness)**

Literature Review: Fairness in TRS

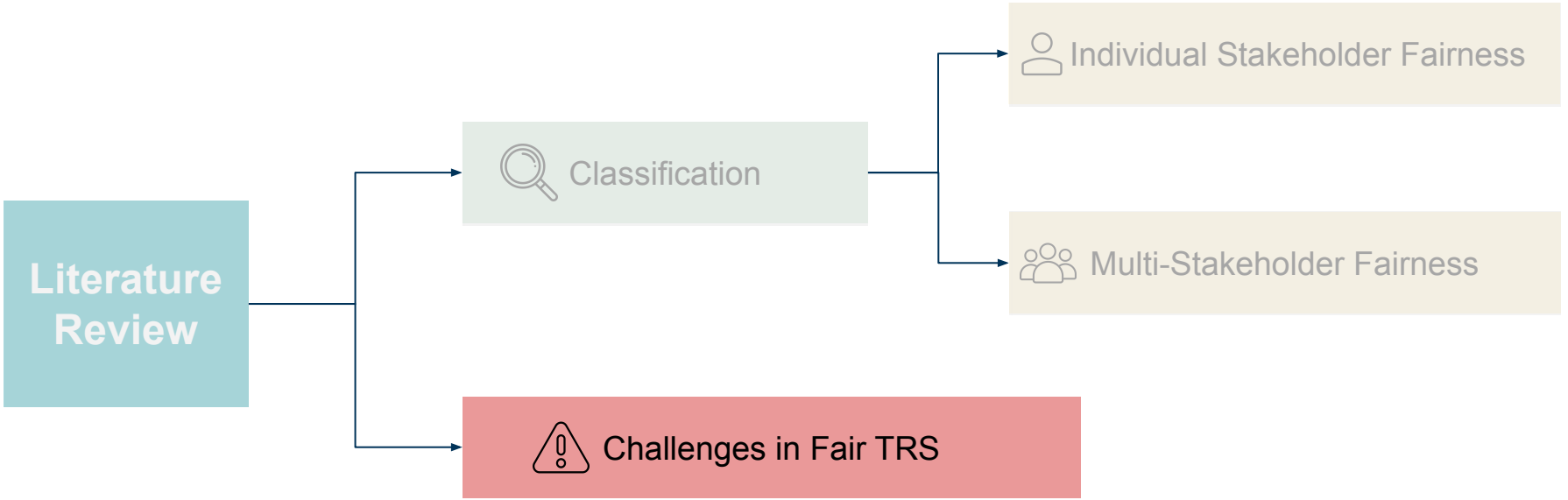


Multi-stakeholder Fairness in TRS

⭐ Main Fairness Criteria



Literature Review: Fairness in TRS



Challenges in Fair TRS

⭐ Modeling Individual Stakeholder Utilities

- Utility modeling is complex in TRS due to dynamic factors such as context, seasonality, travel regulations etc.
- Most research on modeling individual stakeholder utilities such as consumers and item-providers and platform.
- Modeling of utilities of Society as a stakeholder has often been overlooked.

Challenges in Fair TRS

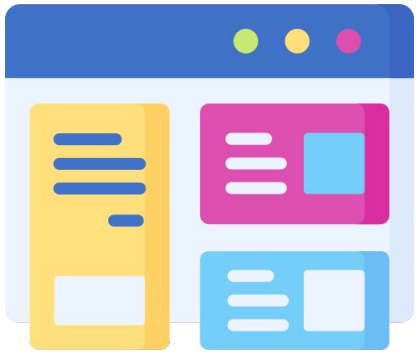
⭐ Complexity in inter-stakeholder relationships

- Only few studies focus on multi-stakeholder relationships in TRS
- Relationship between stakeholders can impact interactions and outcomes.
- Temporal factors & external influences affect recommendation relevance

Challenges in Fair TRS

⭐ Explanations to improve User Interfaces

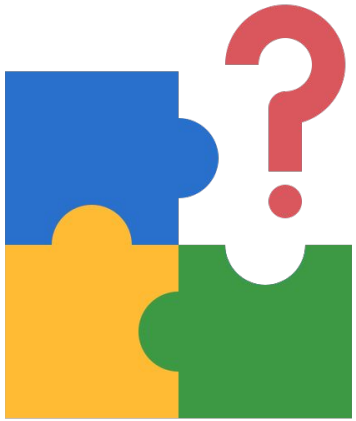
- Providing explanations behind recommendations ➡️ users understand the fairness objectives of the recommender system.
- Explanations also enhance transparency, efficiency, effectiveness, trust and user satisfaction.
- Research on explaining recommendations with a multi-stakeholder fairness objective in TRS is limited.



Challenges in Fair TRS

⭐ Insufficient Data, Missing Metrics and Evaluation

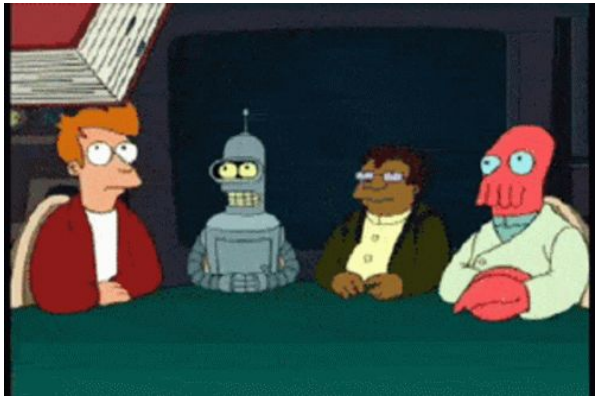
- Limited publicly available data; often relies on synthetic or proprietary datasets
- Available data lacks critical information such as user interactions, environmental metrics etc.
- Fairness metrics are domain specific and often hard to generalize for other scenarios.
- User acceptance of the fair ranked results is often overlooked.



Conclusion

Summary

- Limited exploration of fairness in the travel and tourism domain compared to other sectors.
- Neglect of responsible recommendations (S-Fairness) despite its significance in addressing over- and under-tourism and environmental concerns.
- Limited research on explaining recommendations with multi-stakeholder fairness objectives in the tourism industry.
- Challenges related to data availability, particularly detailed and representative data.
- Insufficient focus on user acceptance of re-ranked or fair recommendations in existing studies.



Thank You! Time for Q&A!

Paper

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