

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

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<https://doi.org/10.3389/fdata.2023.1168692>



What we will cover Today



Introduction: Stakeholder in TRS, Multi-stakeholder TRS



Findings from our Literature Review



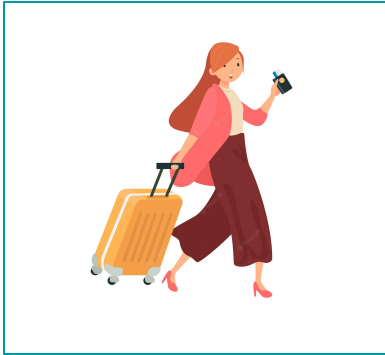
Q&A and Discussion



The background of the slide is a photograph of a city street. In the foreground, there are several multi-story buildings with light-colored facades and many windows. Some buildings have dormer windows on their roofs. In the distance, two prominent domes with green patina roofs are visible against a hazy sky. A white rectangular box is overlaid on the left side of the image, containing the word 'Introduction' in black text.

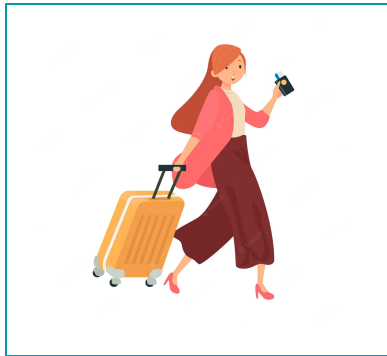
Introduction

Stakeholders in TRS



Consumers

Stakeholders in TRS

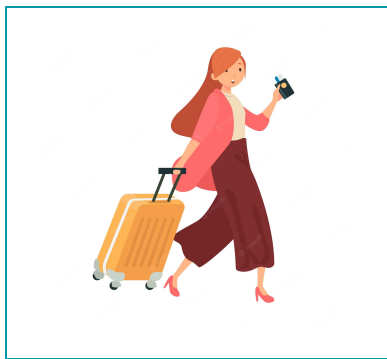


Consumers



Platforms

Stakeholders in TRS



Consumers

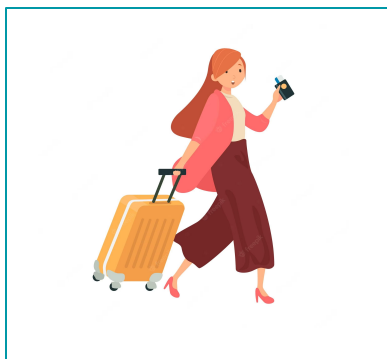


Platforms



Item Providers

Stakeholders in TRS



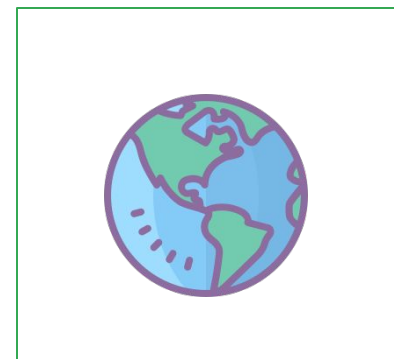
Consumers



Platforms

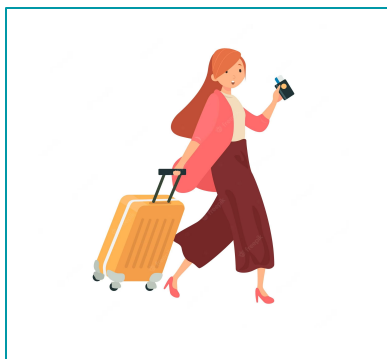


Item Providers



Society

Stakeholders in TRS



Consumers

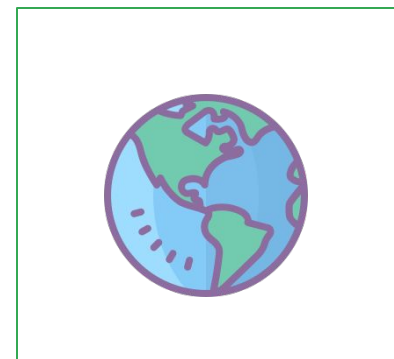
Matching Preferences



Platforms

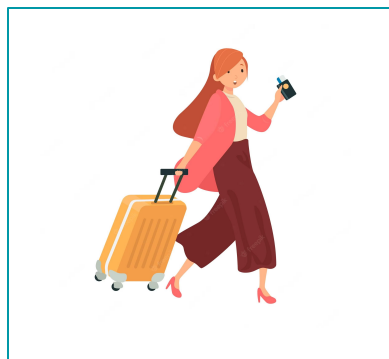


Item Providers



Society

Stakeholders in TRS



Consumers

Matching Preferences

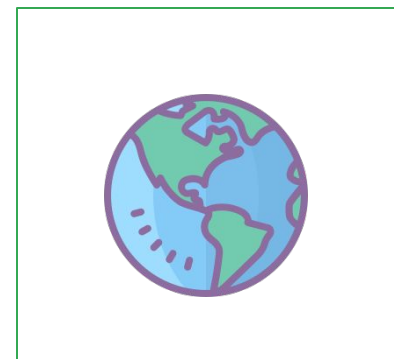


Platforms

Maximize Commissions

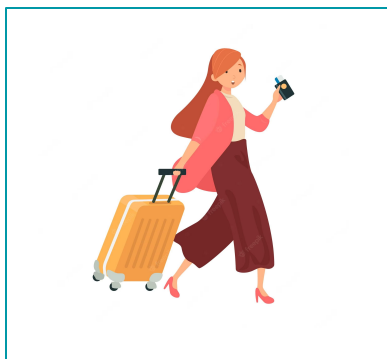


Item Providers



Society

Stakeholders in TRS



Consumers

Matching Preferences



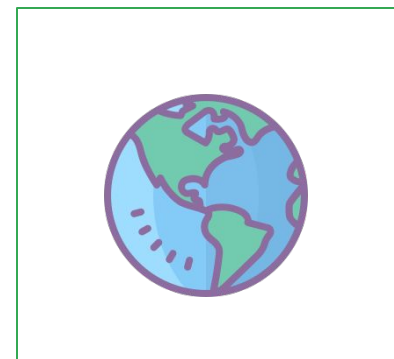
Platforms

Maximize Commissions



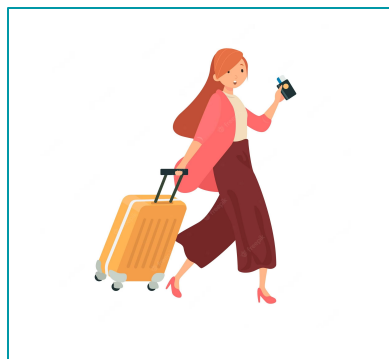
Item Providers

Maximize Exposure



Society

Stakeholders in TRS



Consumers

Matching Preferences



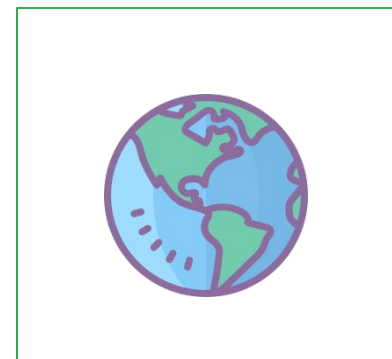
Platforms

Maximize Commissions



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**)

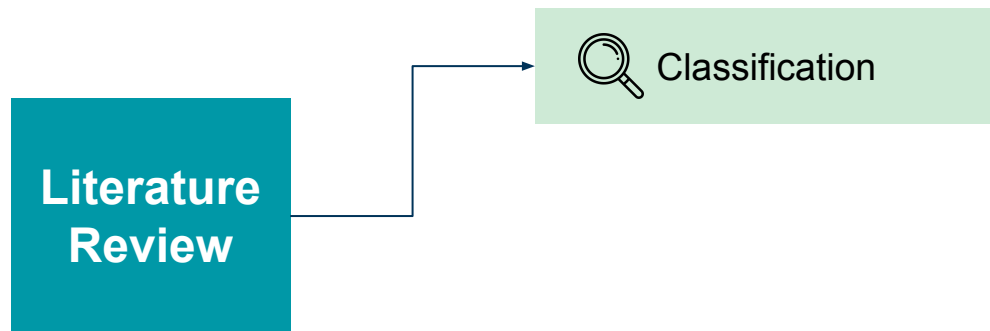
The background of the slide features a faded, light-colored image of European architecture. At the top, two prominent blue-tiled domes with golden finials are visible against a pale sky. Below them, the upper portions of several multi-story buildings with numerous windows and dormers are shown. The overall aesthetic is soft and historical.

Literature Review

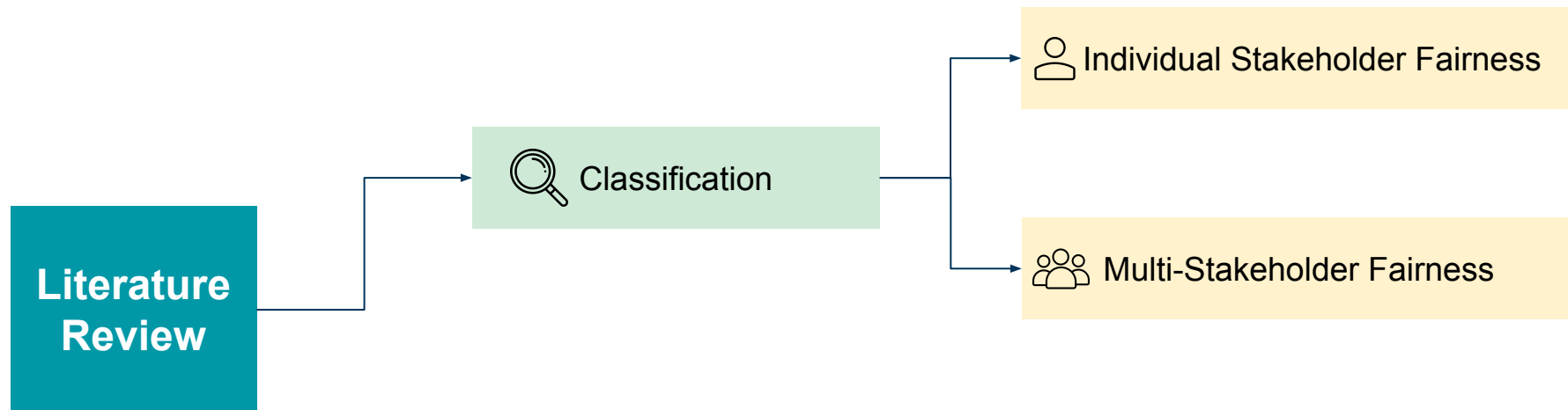
Literature Review: Fairness in TRS

**Literature
Review**

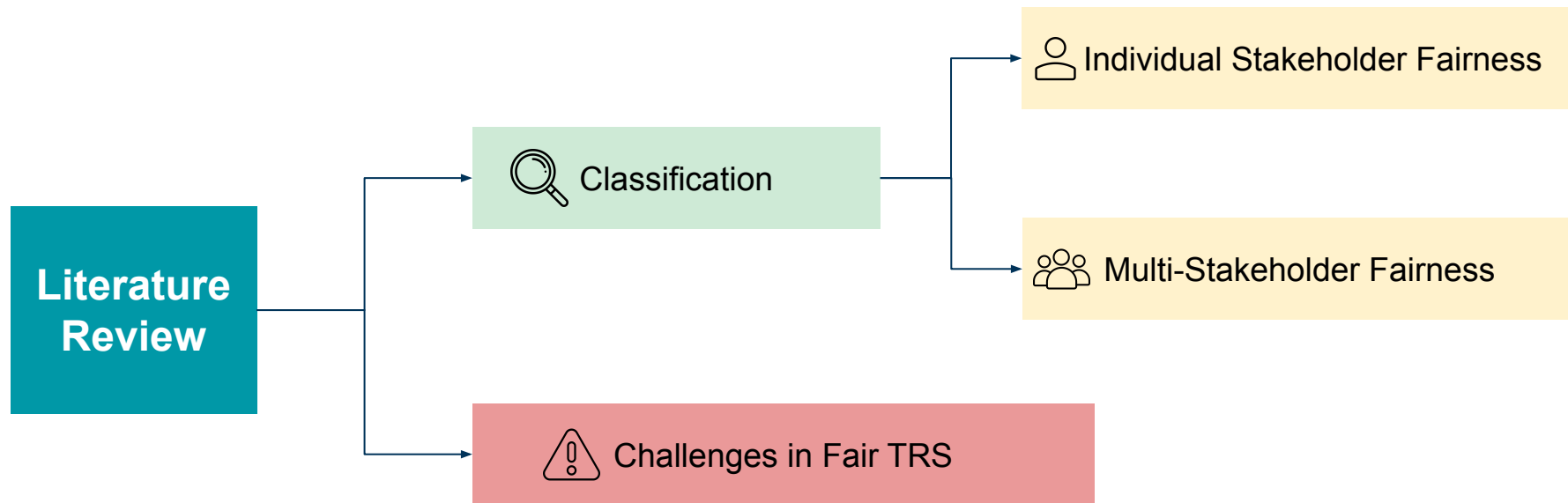
Literature Review: Fairness in TRS



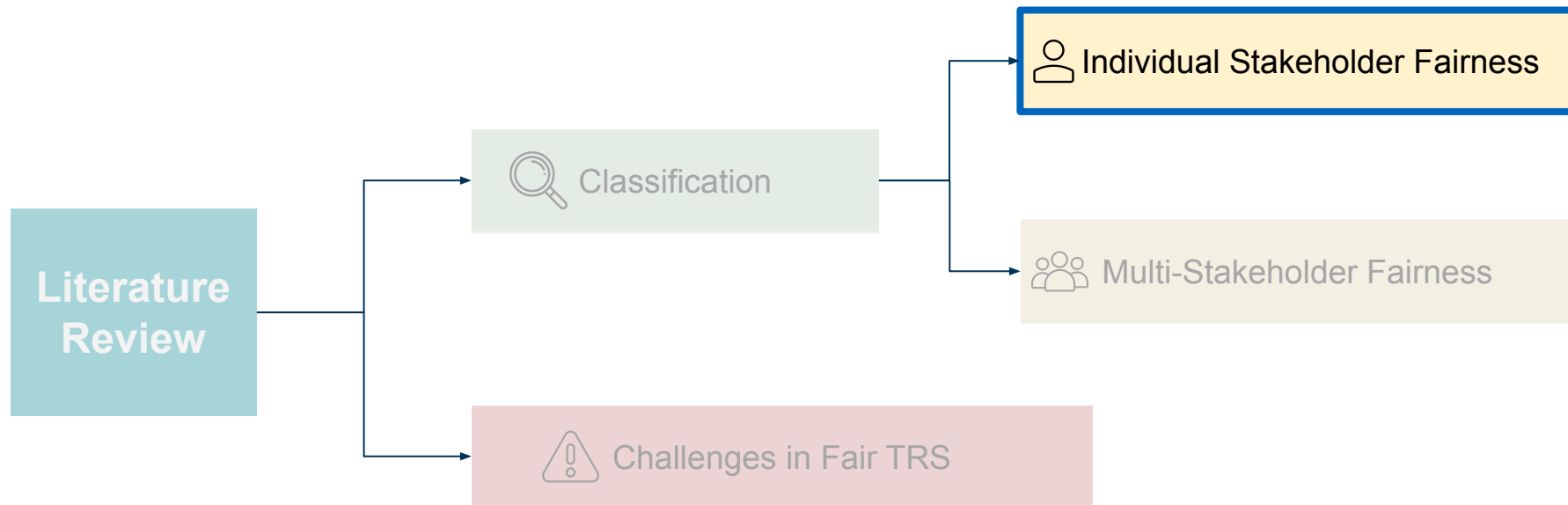
Literature Review: Fairness in TRS



Literature Review: Fairness in TRS



Literature Review: Fairness in TRS



Individual Stakeholder Fairness in TRS

★ Main Fairness Criteria

Fairness Type

Consumer Fairness (**C-Fairness**)

Item Provider Fairness (**I-Fairness**)

Platform Fairness (**P-Fairness**)

Societal Fairness (**S-Fairness**)

Main Fairness Criteria

Individual & Group Fairness

Popularity Bias, Exposure Bias

Ranking Bias

Sustainability

Individual Stakeholder Fairness in TRS

Focus

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

S-Fairness

6.0%

P-Fairness

29.0%

C-Fairness

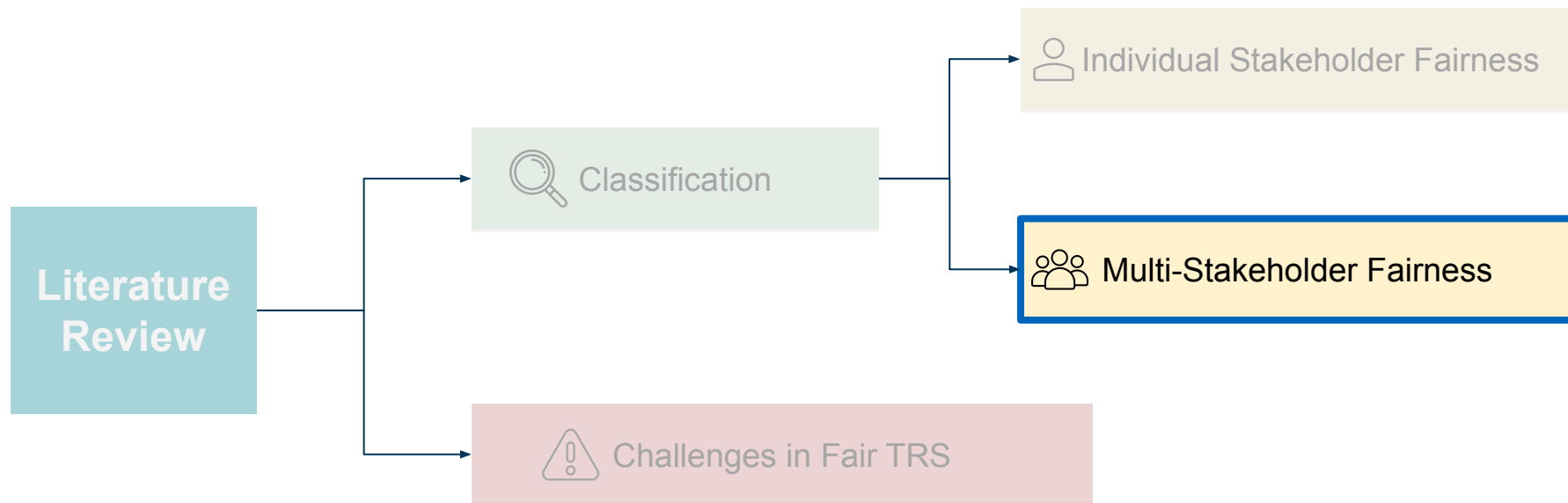
32.0%

I-Fairness

33.0%

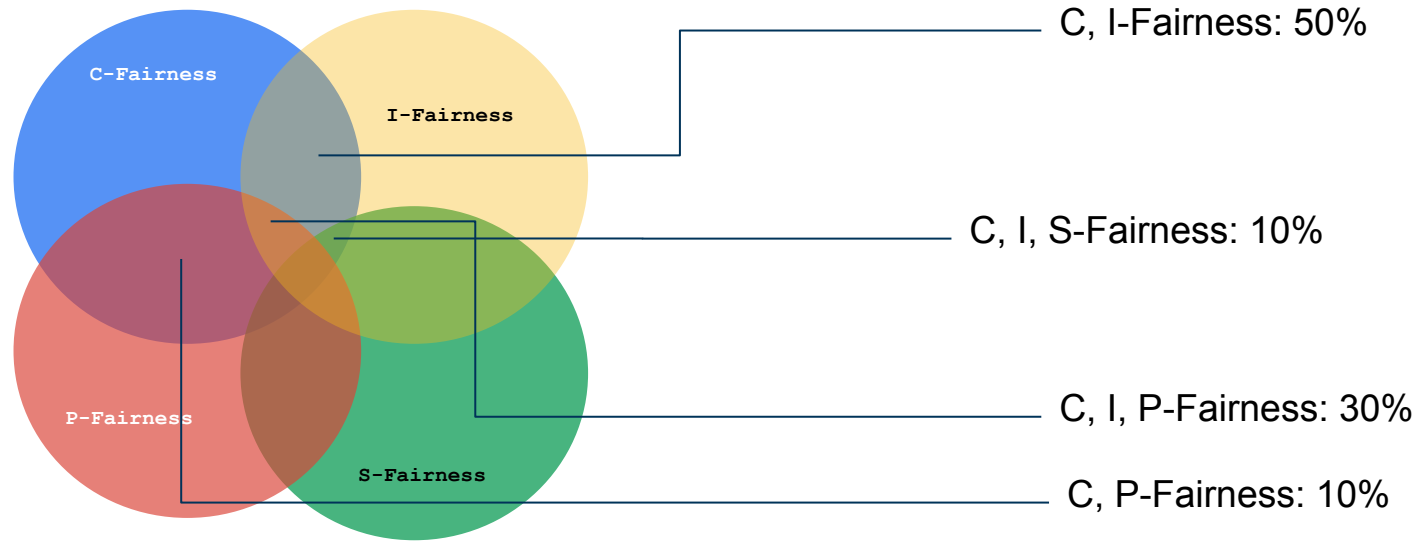
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- ✓ Item Providers (**I-Fairness**)
- ✓ Platforms (**P-Fairness**)
- ! Society (**S-Fairness**)

Literature Review: Fairness in TRS

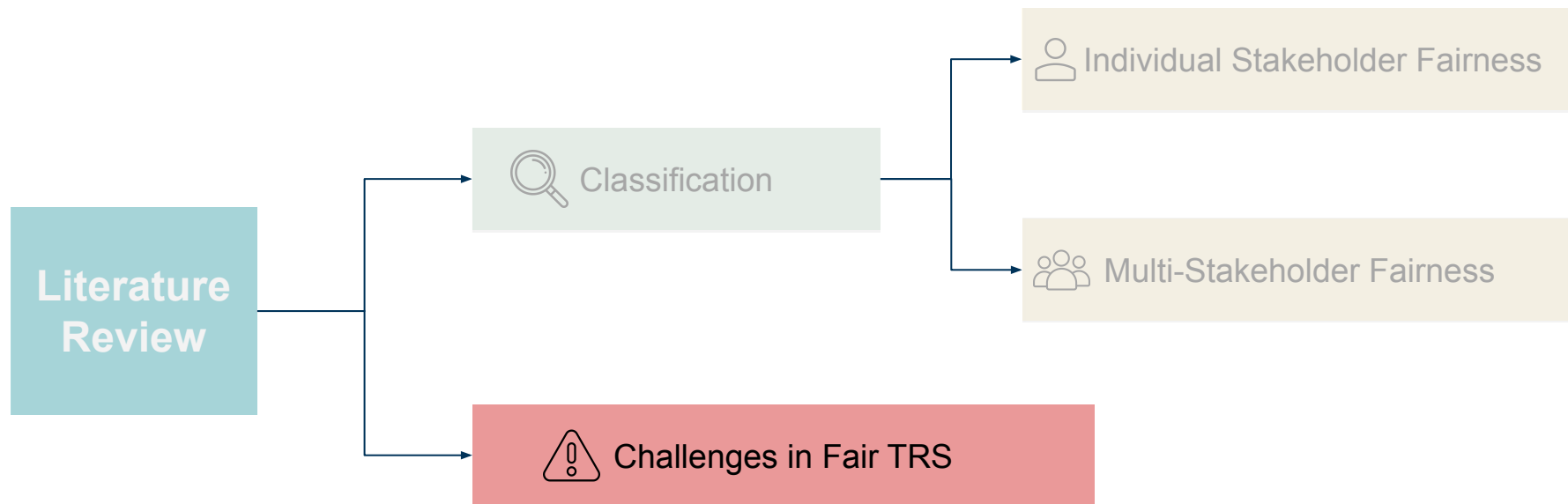


Multi-stakeholder Fairness in TRS

★ 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

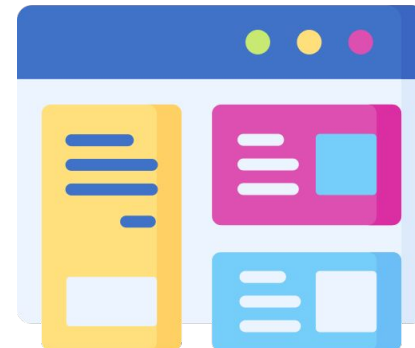
- Only **few studies** focus on multi-stakeholder relationships in TRS
- Relationship **between stakeholders** can impact interactions and outcomes.
- **Temporal factors & external influences** affect recommendation relevance



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.

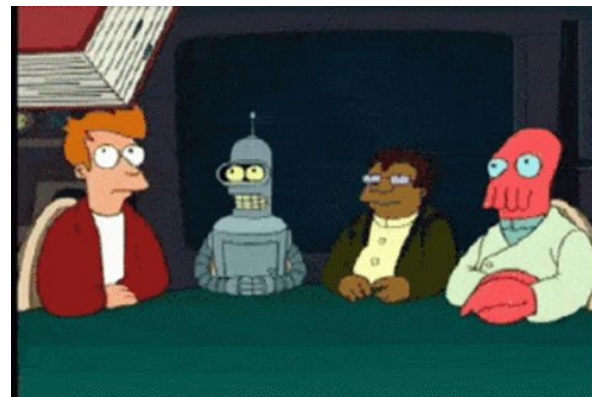


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Conclusion

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



<https://bit.ly/facctrec-banerjee-2023>



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What we will cover Today



Introduction to Tourism Recommender Systems (TRS)



Background - Stakeholder in TRS, Multi-stakeholder TRS



Findings from our Literature Review



Q&A and Discussion



Tourism Recommender Systems (TRS)

- **simplify trip planning** for travelers by offering **personalized recommendations**
- useful to **minimize information overload**
- particularly challenging domain owing to the **influence of dynamic factors** like seasonality and travel regulations, as well as capacity-limited items such as airline seats, hotel rooms, and event tickets



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Background