Explainable Visitor Profiling for Adaptive Cultural Heritage Experiences

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Agenda

1. Motivation
2. Data challenges
3. Method
4. Evaluation
5. Explainable service
6. Future work & takeaways

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Personalisation begins with visitor motivation

- Museum visitors have **different** motivations, interests, constraints and preferred exploration ways
- **One-size-fits-all** experiences **cannot** provide the right content, depth, format, and interaction style
- An initial motivation profile gives a starting point for **personalization**



Figure 1. Five interpretable profiles

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Data challenges

- Real-world questionnaire based on relevant literature

189 valid visitor records

19 behavioral questions

0 observed In-depthExplorer cases

- The observed sample is **small** and **strongly imbalanced**
  - A high overall accuracy can hide majority-class bias
  - No observed class can be learned or evaluated directly
  - Synthetic data is selected as model development choice

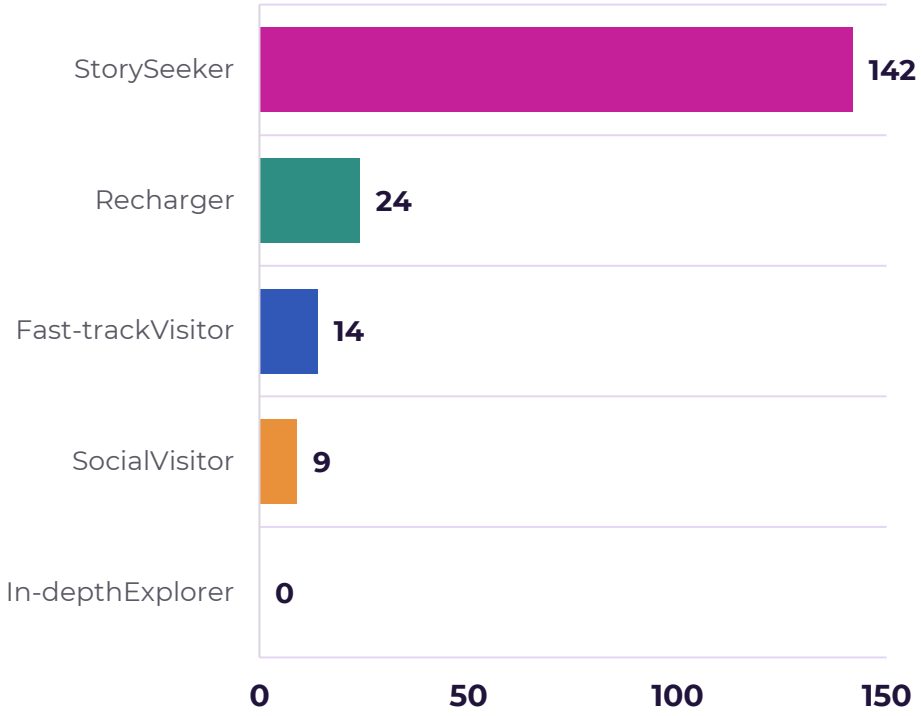


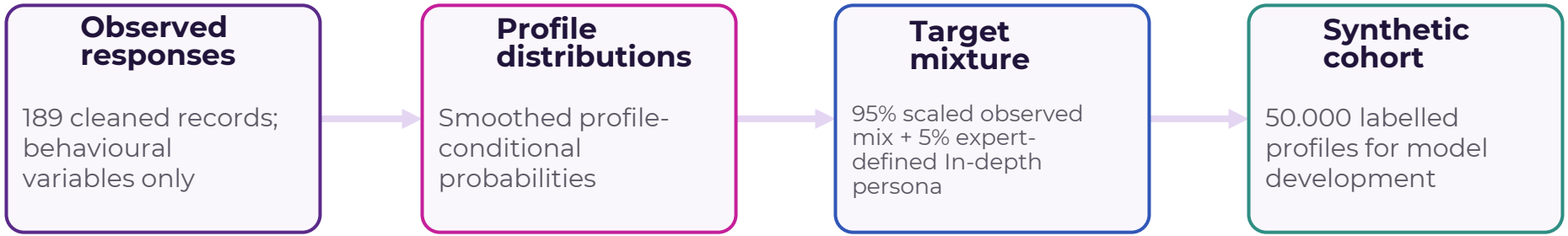
Figure 2. Direct user motivation responses

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Method

- Why data generation?
  - Expose a classifier to minority profile patterns
  - Compare balancing strategies before more real data arrive
  - Prototype the full explainable service end to end

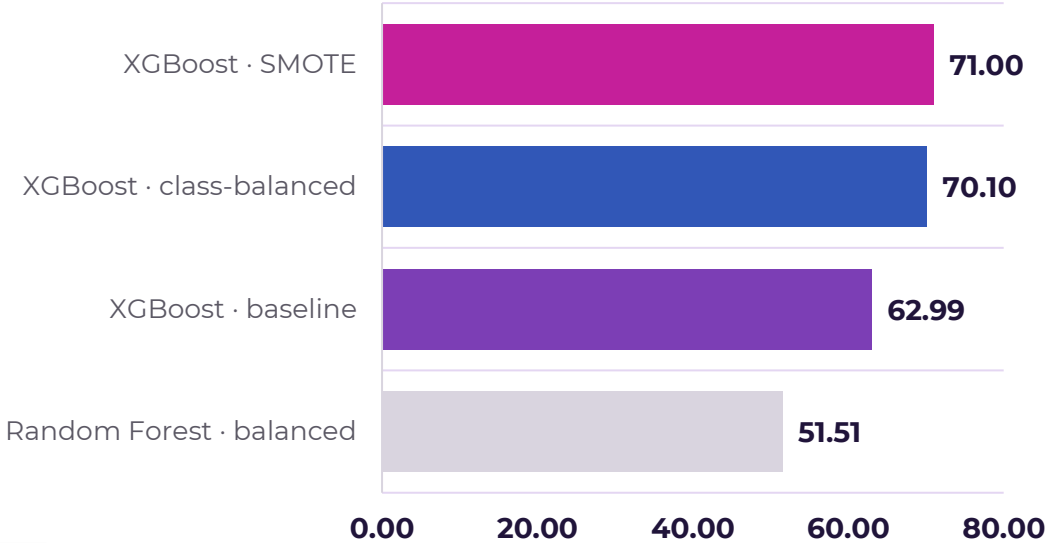


Demographics were excluded from model inputs to reduce unnecessary personal data use.

Evaluation

- Synthetic data are assessed through fidelity and transferability

1 Fidelity	Compare empirical and synthetic response distributions feature by feature.
2 Transfer	Train on synthetic profiles and test on the 189 observed records for the four represented classes.



Per-profile recall

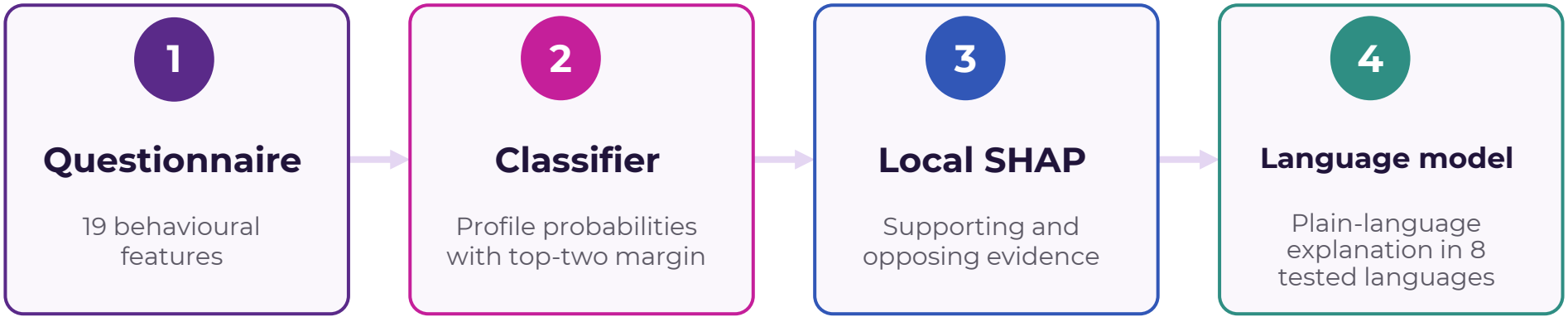
- SocialVisitor **88.9%**
- StorySeeker **68.3%**
- Fast-trackVisitor **64.3%**
- Recharger **62.5%**

In-depthExplorer: no observed ground truth

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Explainable service

- The classifier determines the profile
- An LLM verbalises the supplied evidence
  - 8 tested explanation languages



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Future work & takeaways

- The profile should evolve with the visit
  - The initial prediction is a starting state
  - A motivation stage agent can be used to update the profile based on user preferences during the visit

- Takeaways
  - Motivation-aware adaptation can make cultural heritage experiences more relevant and personalized
  - LLM-based explanations support interpretability
  - Synthetic data generation supported the initial model development; ML-based modelling will be re-evaluated once more data become available

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