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Visual Attention Modeling for Optimisation of Information Visualisations

Motivation

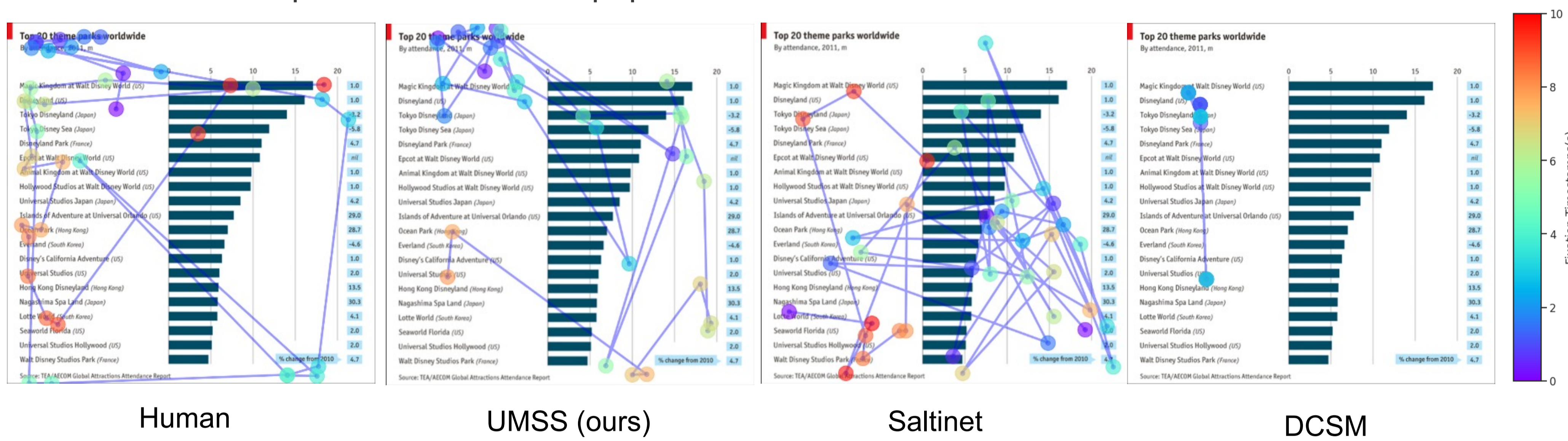
- Dominant approaches to quantify users' visual attention require special-purpose eye tracking equipment
- Eye tracking equipment is time-consuming and expensive to use
- This project aims to automatically quantify spatio-temporal visual attention during the visualisation design process without using eye tracking equipment

Goal

- Large-scale, crowd-sourced human attention InfoVis dataset
- A computational model for quantifying recallability on visualisations
- Visualisation optimisation for better recallability and lower gaze uncertainty
- A joint model for bottom-up and top-down saliency prediction

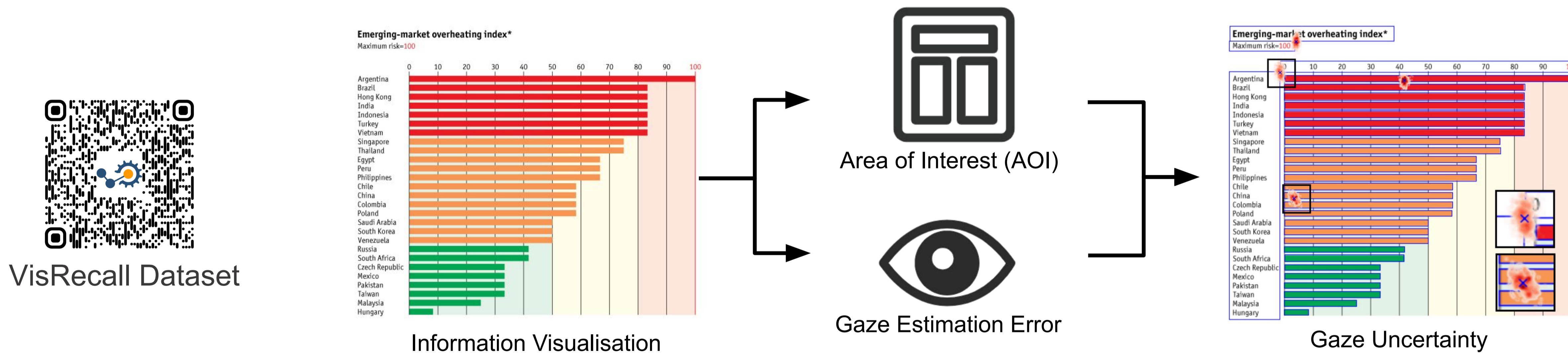
Scanpath Prediction on Information Visualisations [1]

- We propose the first data-driven computational model for scanpath prediction on information visualisations
- Our method reaches state-of-the-art performance on the popular MASSVIS dataset [2]



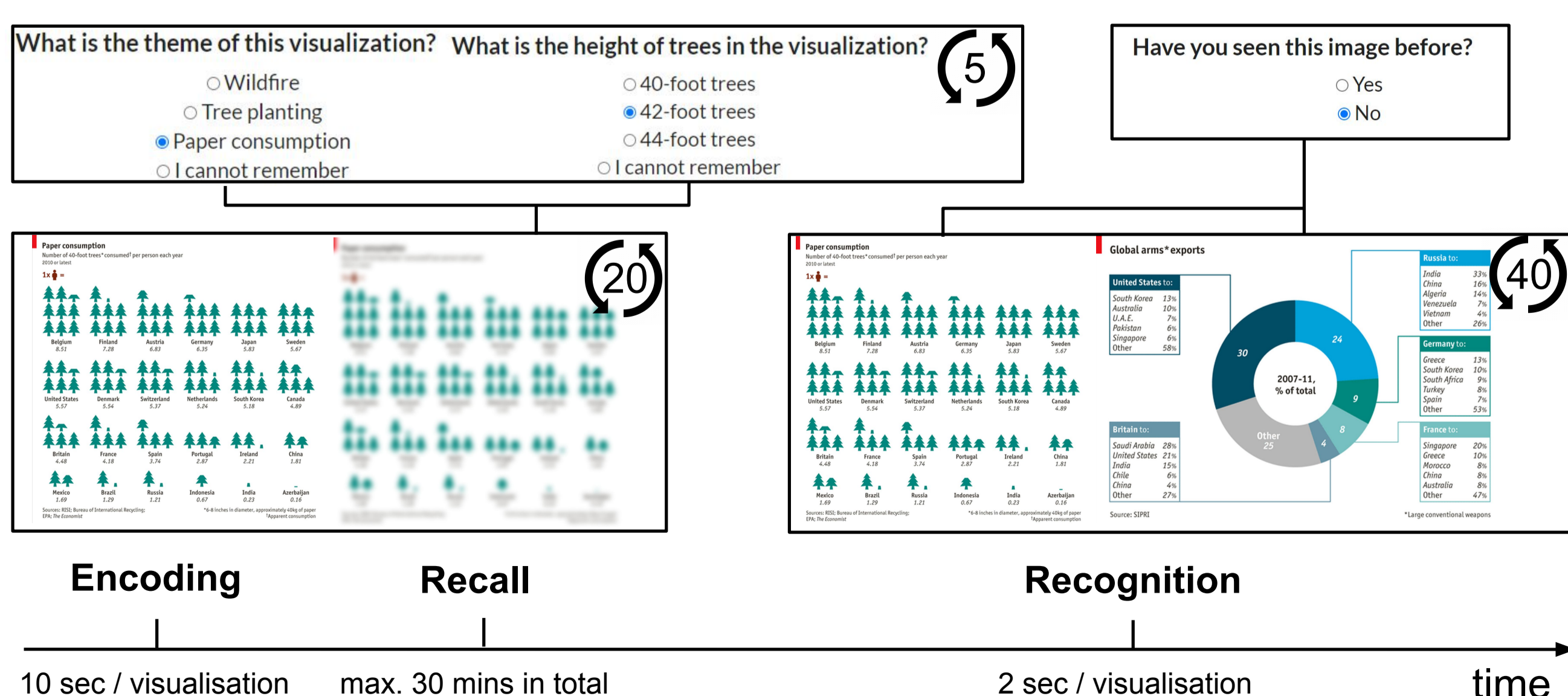
Impact of Gaze Uncertainty on AOIs in Information Visualisations [3]

- We propose two novel metrics to quantify the impact of gaze uncertainty on information visualisations: the Flipping Candidate Rate and Hit Any AOI Rate
- Our analysis results on **VisRecall** indicate that gaze uncertainty has an unneglectable impact on AOI-based analysis



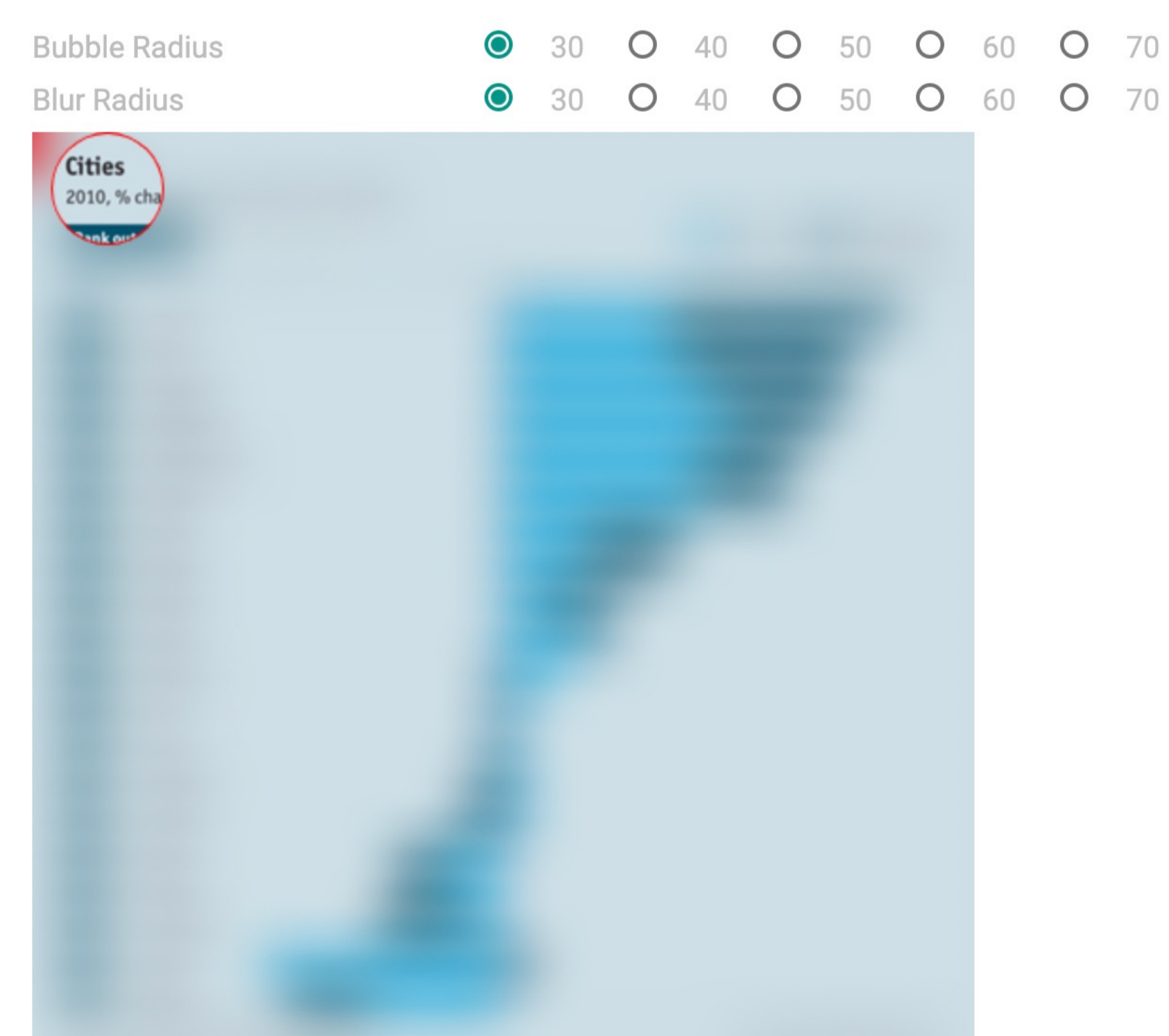
VisRecall: Quantifying Information Visualisation Recallability via Question Answering [4]

- We present **VisRecall** - a dataset consisting of 200 visualisations that are annotated with crowd-sourced human recallability scores obtained from 1,000 questions from 5 question types
- Our recallability quantification paves the way for understanding and optimising visualisations for better recallability



Research Plan & Next Steps

- Online crowd-sourcing attention data collection
- Top-down attention behaviour analysis and prediction
- Scanpath evaluation metrics
- Gaze-based layout optimisation



References

- [1] Wang, Yao, Mihai Băce, and Andreas Bulling. "Scanpath Prediction on Information Visualisations." arXiv preprint arXiv:2112.02340 (2021).
- [2] Borkin M A, Bylinskii Z, Kim N W, et al. Beyond memorability: Visualization recognition and recall[J]. IEEE transactions on visualization and computer graphics, 2015, 22(1): 519-528.
- [3] Wang, Yao, et al. "Impact of Gaze Uncertainty on AOIs in Information Visualisations." 2022 Symposium on Eye Tracking Research and Applications. 2022.
- [4] Wang, Yao, et al. "VisRecall: Quantifying Information Visualisation Recallability via Question Answering." arXiv preprint arXiv:2112.15217 (2021).

