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Scene level deep learning people flow trend estimation approach and quantitative explanation based on street view images

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Background

People flow trend estimation is of great importance to traffic and urban safety planning and management, and also to social and economic benefit like better navigation and location-based marketing. To estimate the people flow trend, we proposed an end-to-end deep learning approach which based on not only street view images, but also the human subjective score of each street view. This study initiatively illuminated the relationship between streetscape, human subjective feeling and people flow trend, contributing to the evaluation of existing urban development.

Contribution

1. We proposed a scene level end-to-end people flow trend estimation approach.
2. We improved the subjective feeling score extraction method and analyzed the relationship between Streetscape and people flow.
3. We proposed a novel quantitative deep learning explanation approach.

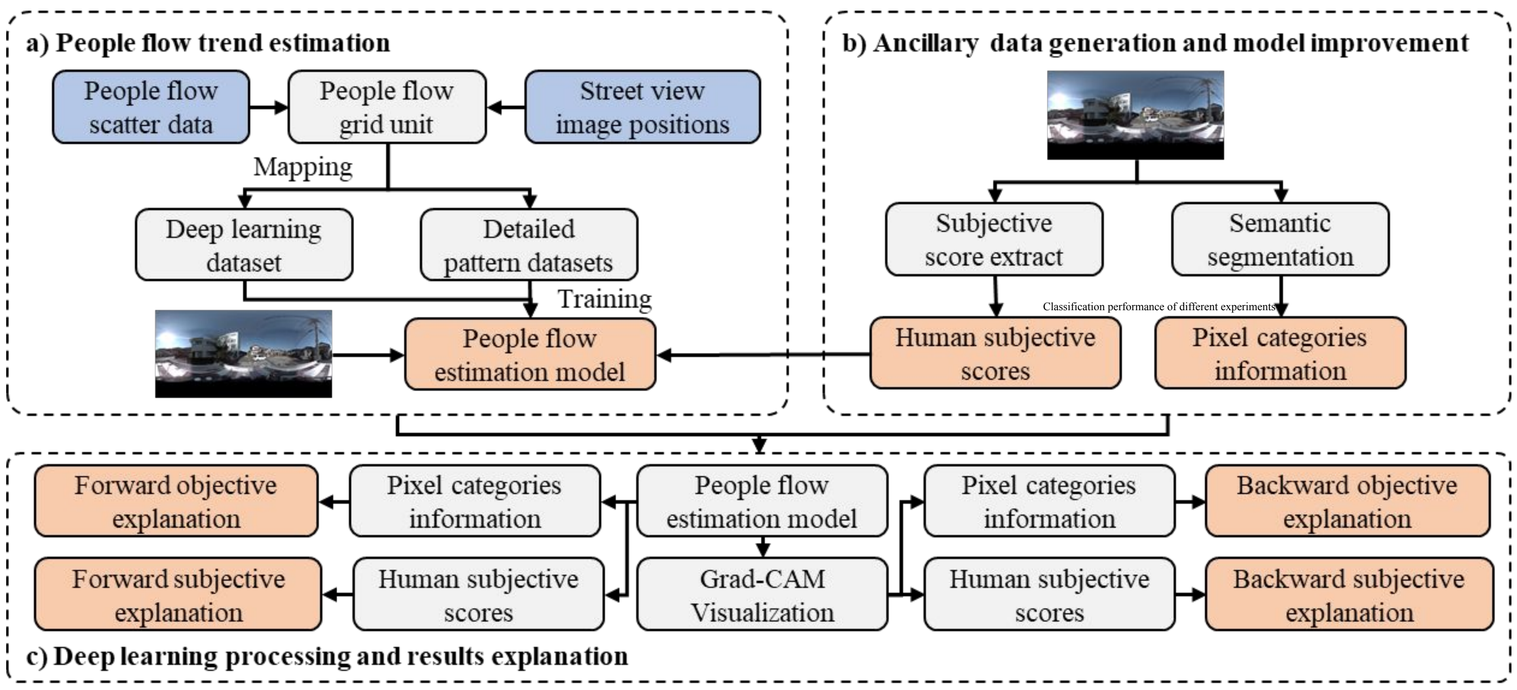
Dataset

“Konzatsu-Tokei (R)” (C)ZENRIN DataCom CO., LTD.

The raw data are:

1. Street view images
2. Corresponding people flow and coordinates data

Workflow



People flow trend estimation: Proposed a deep learning end-to-end model for the estimation.

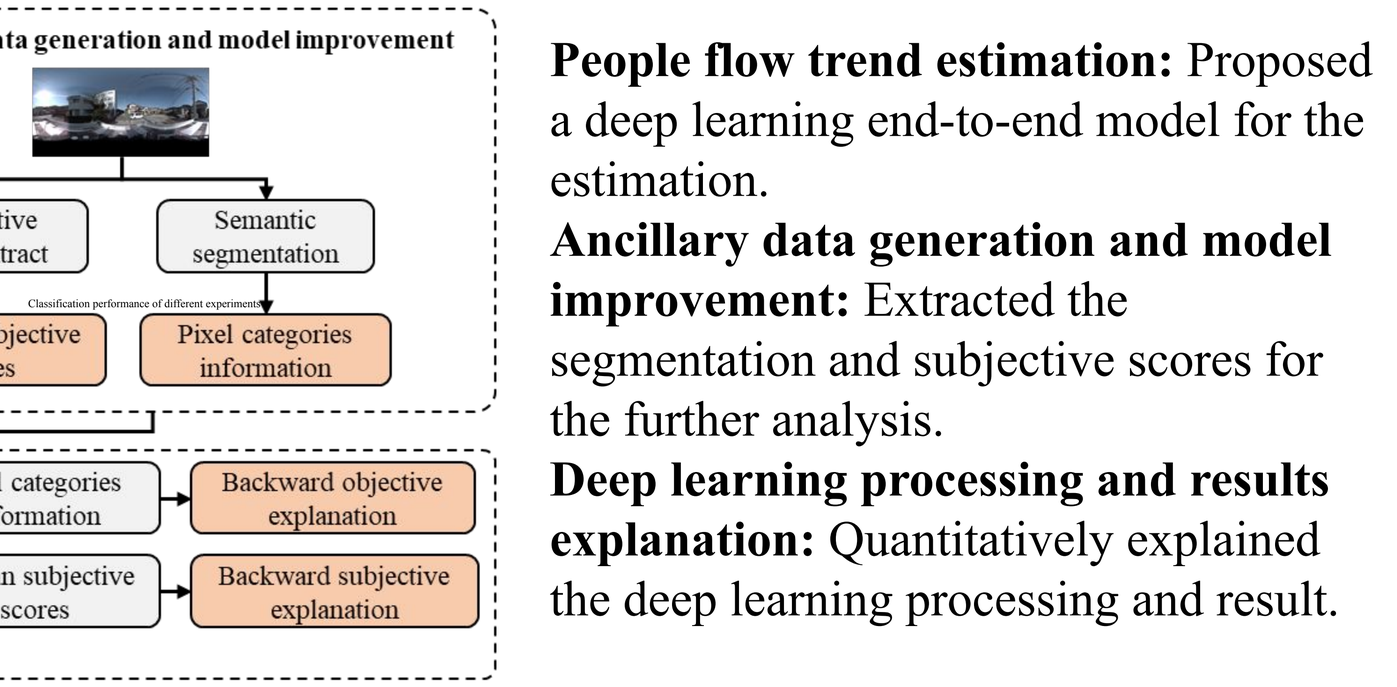
Ancillary data generation and model improvement: Extracted the segmentation and subjective scores for the further analysis.

Deep learning processing and results explanation: Quantitatively explained the deep learning processing and result.

Result

Our deep learning model achieved 78.12% accuracy on the 10K level test set and 72.71% on the total wide-area which contained about 1.5M images. What is more, we visualized the deep learning processing and results and initiatively connected and the people flow trend with the street view images and subjective scores.

Approach	Recall	Precision	mF1	Accuracy
ResNet-101	0.4974	0.4888	0.4898	0.4894
Swin-S	0.7272	0.7242	0.7255	0.7174
Swin-B	0.7676	0.7669	0.7672	0.7584
ConvNext-B	**0.7904**	**0.7883**	**0.7892**	**0.7812**
Swin-B, wide area	0.7802	0.7059	0.7367	0.7106
ConvNext-B, wide area	**0.7981**	**0.7211**	**0.7528**	**0.7271**



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