# CEPHALOMETRIC LANDMARK DETECTION ACROSS AGES WITH PROTOTYPICAL NETWORK

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## METHOD

- Existing methods are mostly dedicated to detecting cephalometric landmarks ***on adult subjects only***, ignoring the more challenging adolescent subjects with complicated ***morphological changes*** in anatomy.
- Adolescent cases exhibit ***significantly different appearances*** compared to adults, leading to landmark shifts across age groups.

## CONTRIBUTION

- Propose ***the first prototype-based approach*** for the ***age-inclusive*** cephalometric landmark detection.
- Introduce a novel ***prototype relation mining paradigm*** to take advantage of crucial anatomical relationships between landmarks.
- Propose a ***new comprehensive benchmark dataset*** for the task of cephalometric landmark detection.

## REFERENCE

[1] Wu, Qian, et al. "Revisiting Cephalometric Landmark Detection from the view of Human Pose Estimation with Lightweight Super-Resolution Head." arXiv preprint arXiv:2309.17143 (2023).

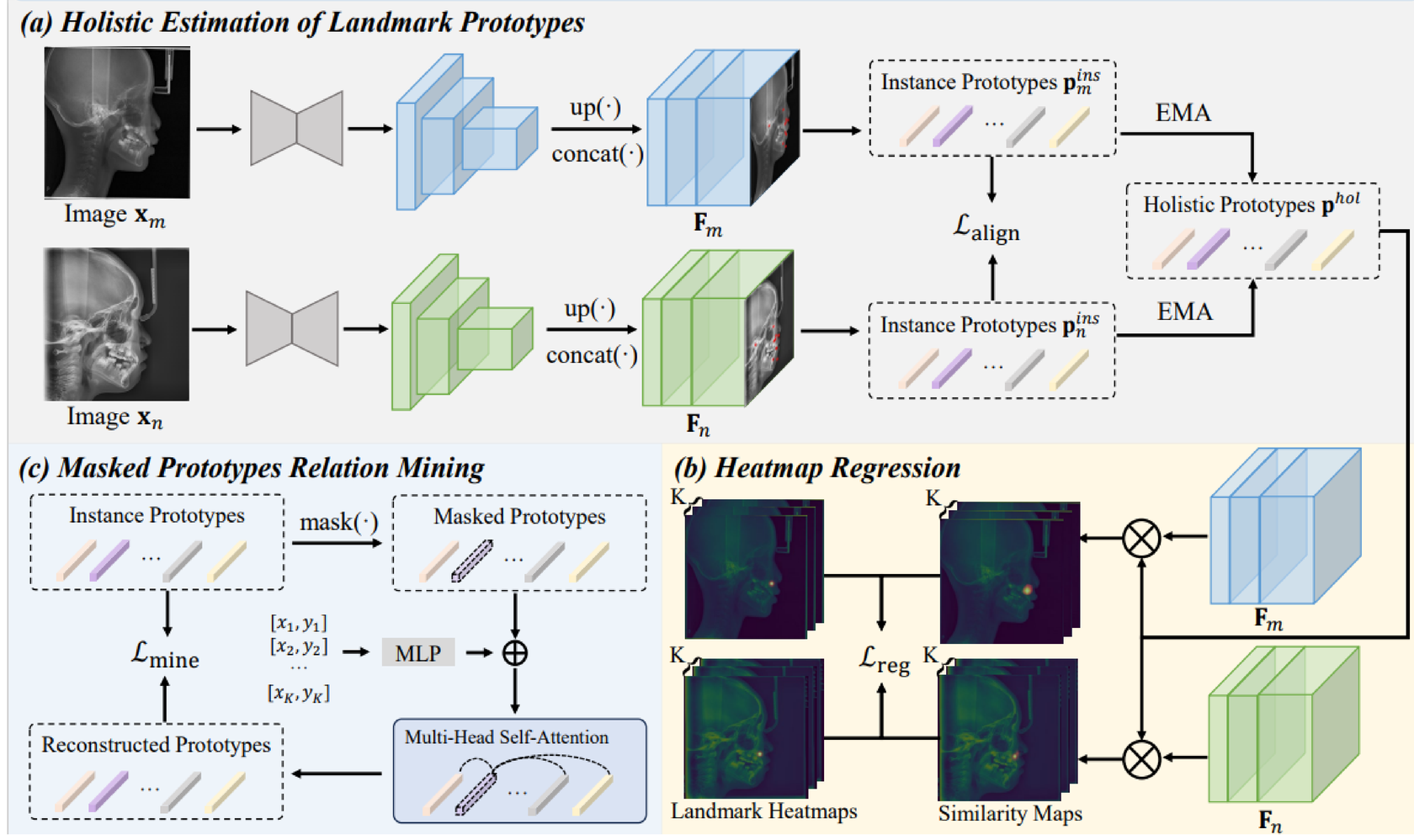
[2] Yang, Su, et al. "Ceph-Net: automatic detection of cephalometric landmarks on scanned lateral cephalograms from children and adolescents using an attention-based stacked regression network." BMC Oral Health 23.1 (2023): 803.

## LINK

Project Page

Code

## METHOD




## RESULTS

Table 1: Cephalometric landmark detection results with both adult and adolescent cases, only adult cases, and only adolescent cases, respectively.

| Methods | Adult + Adolescent | | | | | Adult | | | | | Adolescent | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MRE ↓ | SDR (%) ↑ | | | | MRE ↓ | SDR (%) ↑ | | | | MRE ↓ | SDR (%) ↑ | | | |
| | (mm, std.) | 2mm | 2.5mm | 3mm | 4mm | (mm, std.) | 2mm | 2.5mm | 3mm | 4mm | (mm, std.) | 2mm | 2.5mm | 3mm | 4mm |
| Cascade RCNN [1] | 2.31 (0.94) | 61.47 | 73.20 | 81.13 | 90.77 | 2.19 (0.97) | 59.93 | 72.13 | 80.47 | 90.80 | 2.43 (0.94) | 63.00 | 74.27 | 81.80 | 90.73 |
| SCN [11] | 1.73 (1.06) | 82.97 | 90.40 | 93.37 | 96.57 | 1.40 (0.48) | 82.07 | 91.20 | 94.33 | 97.33 | 2.05 (1.70) | 83.87 | 89.60 | 92.40 | 95.80 |
| GU2Net [29] | 1.69 (0.91) | 80.33 | 88.13 | 91.47 | 95.57 | 1.46 (0.50) | 80.27 | 88.80 | 92.07 | 96.33 | 1.93 (1.35) | 80.40 | 87.47 | 90.87 | 94.80 |
| Wu et al. [22] | 1.34 (1.24) | 87.17 | 91.93 | 95.57 | 97.10 | 1.13 (0.66) | 86.60 | 92.13 | 95.00 | 97.80 | 1.55 (1.87) | 87.73 | 91.73 | 94.13 | 96.40 |
| CeLDA | **1.05 (0.33)** | **89.13** | **93.60** | **96.17** | **98.67** | **1.10 (0.37)** | **88.33** | **92.93** | **96.20** | **98.80** | **1.00 (0.32)** | **89.93** | **94.27** | **96.13** | **98.53** |

## ABLATION