TokenPose: Learning Keypoint Tokens for Human Pose Estimation笔记

- Paper: TokenPose: Learning Keypoint Tokens for Human Pose Estimation
- Code: leeyegy/TokenPose

0. Summary Keywords

- explicitly
- simultaneously learn **constraint relationships** and **appearance cues**
- lightweight

1. Introduction

1.1 Why

- 关键点检测深度依赖各部位之间的**视觉线索**和**结构约束**等信息，**然而CNN方法缺乏显式地学习关键点之间约束关系的能力。**(Human pose estimation deeply relies on visual clues and anatomical constraints between parts to locate keypoints. Most existing CNN-based methods do well in visual representation, however, lacking in the ability to explicitly learn the constraint relationships between keypoints.)

1.2 What

- **TokenPose**(Token representation for human Pose estimation)：每一个关键点都被显式地编码为一个token，以同时从图像中学习**约束关系**和**外观信息**。(Each keypoint is explicitly embedded as a token to simultaneously learn constraint relationships and appearance cues from images.)
  - pure Transformer:
    - TokenPose-T*
  - hybrid Transformer:
    - TokenPose-S*: stem-net(CNN Backbobne)
    - TokenPose-B*: HRNet-W32-stage3(CNN Backbobne)
    - TokenPose-L*: HRNet-W48-stage3(CNN Backbobne)

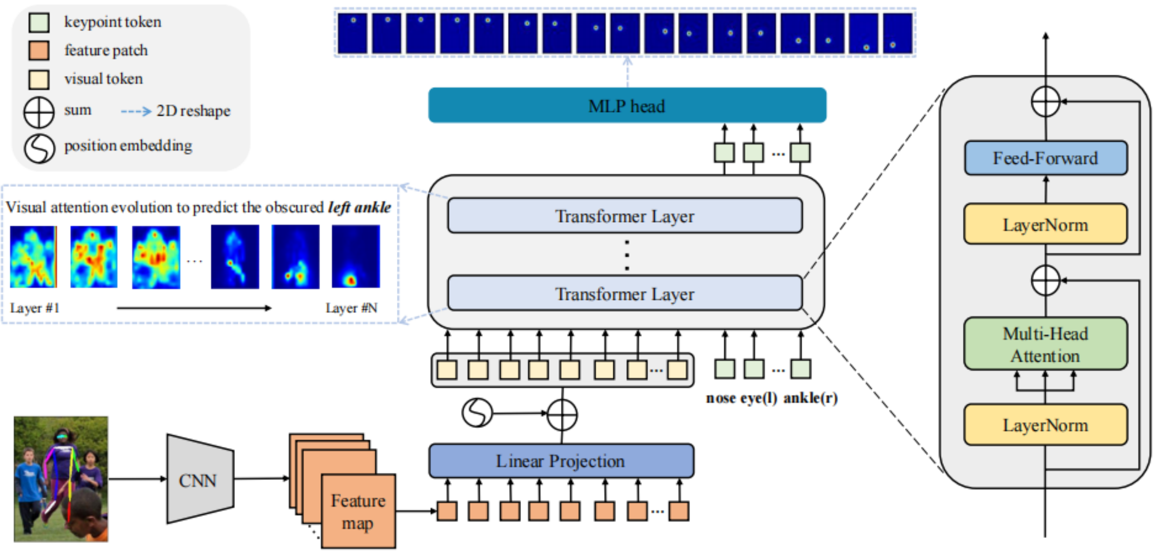
1.3 How

- TokenPose能从大量的数据中学习关键点之间的静态约束关系，这些信息被编码到关键点tokens中，关键点tokens向量可以通过向量相似度来记录关键点之间的关系。(It is worth noting that TokenPose learns the **statistic constraint relationships** between keypoints from large amounts of data. Such information is encoded into keypoint tokens that can record their relationships by **vector similarities**.)
- 在推理的过程中，TokenPose将关键点tokens与视觉tokens进行关联，视觉tokens对应的图像patches区域可能包含对应的target关键点。在某种程度上，这些关键点tokens起到的作用与解码相似，它将视觉信息从视觉tokens向量中解码出来，以获得最终的关键点预测结果。(During inference, TokenPose **associates keypoint tokens with those visual tokens** whose corresponding patches possibly contain the target keypoints. To some extent, such keypoint tokens work like decoders, which decode visual information from visual tokens to achieve the final predictions.)

1.4 Contributions

- 本文提出了用tokens向量来表征关键点实体。通过这种方法，**视觉线索**学习和**约束线索**学习可以被显式地合并在一个统一的框架下。(We propose to use **tokens** to represent each keypoint entity. In this way, **visual cue learning** and **constraint cue learning** are explicitly incorporated into a unified framework.)
- 本文研究了两种架构：CNN-Transformer混合架构、纯Transformer架构。本文的纯Transformer架构是二维人体关键点检测领域中第一个纯Transformer架构。(Both **hybrid** and **pure Transformer-based** architectures are explored in this work. To the best of our knowledge, our proposed TokenPose-T is the first pure Transformer-based model for 2D human pose estimation.)
- 在COCO和MPII两个数据集上，与CNN方法相比，在很少的参数和计算代价下，能够取得具有竞争力的先进性能。(We conduct experiments over two widely-used benchmark datasets: COCO keypoint detection dataset and MPII Human Pose dataset. TokenPose achieves competitive state-of-the-art performance with much fewer parameters and computation cost compared with existing CNN-based counterparts.)

2. Method



two different types of tokenizations:

- keypoint tokens: randomly initialized embeddings, each of which represents a specific type of keypoint
- visual tokens: flattened image patches

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