NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

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REGION ENSEMBLE NETWORK AND ITS APPLICATIONS TO RHEUMATOID ARTHRITIS IN HAND POSE ESTIMATION FROM DEPTH IMAGES

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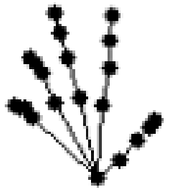
Introduction

- **Objective:** to perform hand pose estimation in real time from single depth images, for the purpose of diagnosing Rheumatoid Arthritis
- **Motivation:** X-rays come with potential side effects. Hand pose estimation circumvent the use of x-rays for safer diagnosis
- **Our Approach:** Adapt [1] to construct a Region Ensemble Network that can accurately use a Microsoft Kinect v2 to predict the 21 joints of the hand
- **Region Ensemble Network:** A state of the art hand pose estimation algorithm that allows detection of hand pose in real time

X-rays vs Hand Pose Estimation

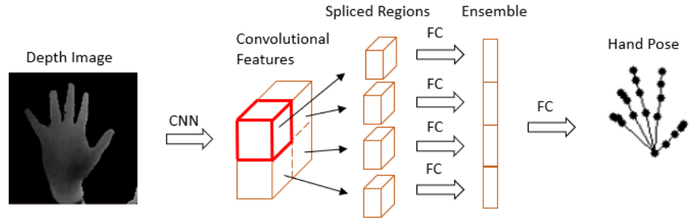


- **X-rays:** detect rheumatoid arthritis by analysing the joints of the hand
- **Hand Pose Estimation:** Circumvent x-rays while still being able to accurately predict hand joints, a much safer option

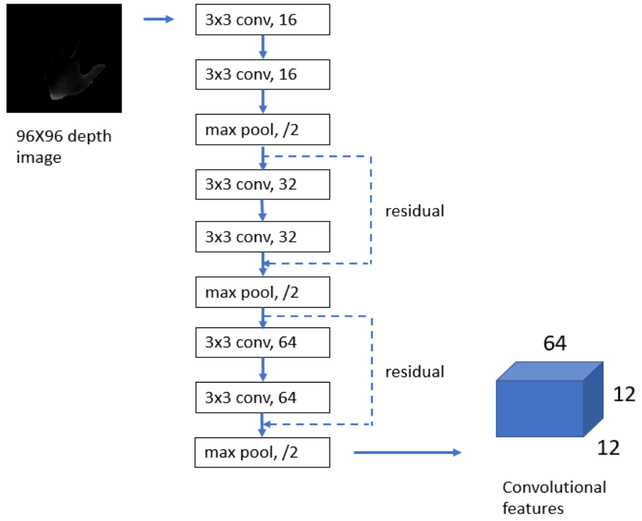
References

[1] Guo, H., Wang, G., Cheng, X., Zhang, C., Qiao, F., & Yang, H. (2017). Region Ensemble Network: Improving convolutional network for hand pose estimation. arXiv preprint. arXiv:1702.02447, 2017.
[2] Guo, H., Wang, G., Cheng, X., & Zhang, C. (2017). Towards good practices for deep 3d hand pose estimation. Journal of Visual Communication and Image Representation.

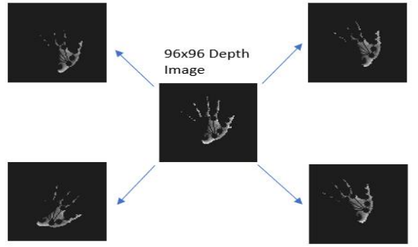
Methodology



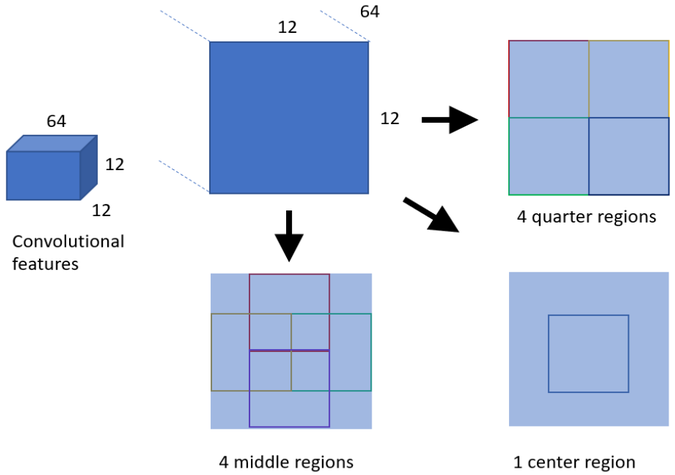
- **Region Ensemble from Convolutional features**



- **Data Augmentation**



- **Feature Splicing to get Regions**



Hardware

- **Microsoft Kinect v2**

- **GPU (optional)**

Main Software

- **Pytorch**
- **OpenCV**
- **PyKinect2**
- **CUDA**