Zurich University
of Applied Sciences

School of
Engineering
IDP Institute of Data Analysis
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Deep learning classification of rheumatoid arthritis

Zurich University of Applied Sciences

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Abstract

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Acknowledgements

I want to thank...

A list of rheumatology offices and hospitals that are contributing to the SCQM registries can be found on www.scqm.ch/institutions. The SCQM is financially supported by pharmaceutical industries and donors. A list of financial supporters can be found on www.scqm.ch/sponsors.

Contents

1 Introduction

Rheumatoid arthritis is caused by a malfunctioning immune system. It is therefore a type of autoimmune diseases. The immune system attacks healthy tissue instead of bacteria and viruses. This causes inflammation in the joints. Irreversible damage to the bone in the joint can occur, if the inflammation lasts for a long time. [2] Rheumatoid arthritis is incurable.

Today, the severity of the bone erosion is assessed by a trained rheumatologist by using x-ray images of hand and feet. This process takes several minutes per patient. Recent advances in computer vision make it possible to automate this task. This leads to time savings which in return helps the rheumatologist to spend more time with the patient.

The Swiss Clinical Quality Management in Rheumatic Diseases (SCQM) Foundation runs a national registry of inflammatory rheumatic diseases. [3]

Nennt bestehende Arbeiten/Literatur zum Thema Literaturrecherche • Stand der Technik: Bisherige Lösungen des Problems und deren Grenzen • (Nennt kurz den Industriepartner und/oder weitere Kooperationspartner und dessen/deren Interesse am Thema Fragestellung)

Formuliert das Ziel der Arbeit • Verweist auf die offizielle Aufgabenstellung des/der Dozierenden im Anhang • (Pflichtenheft, Spezifikation) • (Spezifiziert die Anforderungen an das Resultat der Arbeit) • (Übersicht über die Arbeit: stellt die folgenden Teile der Arbeit kurz vor) • (Angaben zum Zielpublikum: nennt das für die Arbeit vorausgesetzte Wissen) • (Terminologie: Definiert die in der Arbeit verwendeten Begriffe)

1.1 Related literature

2 Theory

2.1 Convolutional neural networks

Convolutional neural networks take an image as an input. The image then gets passed through several convolutional layers. These layers work as filters and detect different features in the image. The weights of these layers are combined to class scores. Andrey Karpathy provides a good overview over convolutional neural networks in his course notes for the Stanford class CS231n. [1]

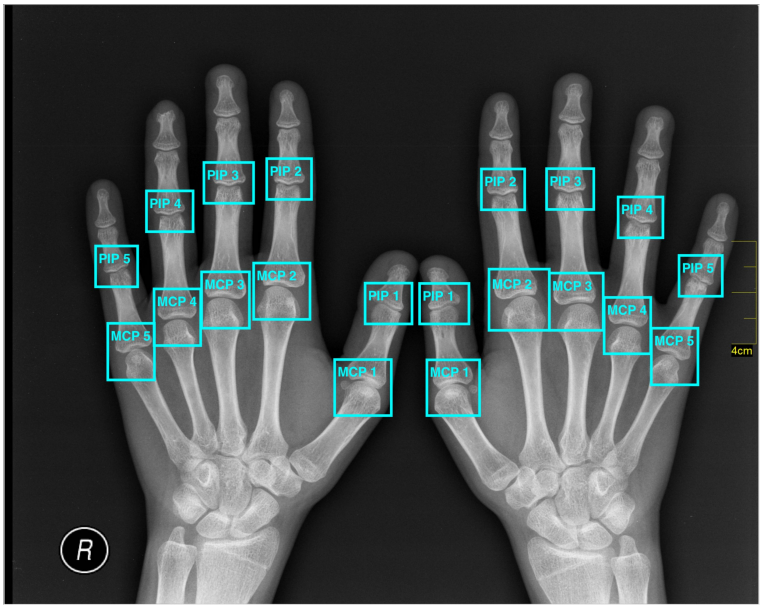

Figure 1: Proximal interphalangeal joints (PIP) and carpometacarpal joints (MCP).

Original image by Nevit Dilmen (CC BY-SA) `https://commons.wikimedia.org/wiki/File:Medical_X\discretionary{-}{}{}Ray_imaging_OPC06_nevit.jpg`

2.2 Rau classification

3 Methods

4 Predicting Rau scores

5 Results

6 Discussion

7 Conclusion

References

[1] Stanford University Andrej Karpathy. *CS231n Convolutional Neural Networks for Visual Recognition*. [Online; accessed 26-September-2017]. URL: http://cs231n.github.io/convolutional-networks/.

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[3] SCQM. *About Us*. [Online; accessed 11-October-2017]. URL: https://www.scqm.ch/en/ueber-uns/.

List of Figures