Machine Learning for Image Processing in Orthopaedics

ORS Virtual Scientific Session

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A brief introduction

"Machine learning, neural networks, and artificial intelligence are increasingly being used in orthopaedics for image processing and analysis tasks. These techniques can be used to **automatically analyze medical images** such as X-rays, MRI scans, and CT scans to **extract important diagnostic information** and help with diagnosis and treatment planning. Machine learning algorithms can be trained to **recognize patterns in the images**, and neural networks can be used to process and interpret the data in a more human-like way. These approaches can be used to **identify abnormalities, measure bone density, and classify different types of tissue**, among other tasks. By automating these processes, doctors and other healthcare professionals can **save time and improve the accuracy of their diagnoses**"

- ChatGPT (emphasis mine)

Classification

Segmentation

Regression

EXAMPLES

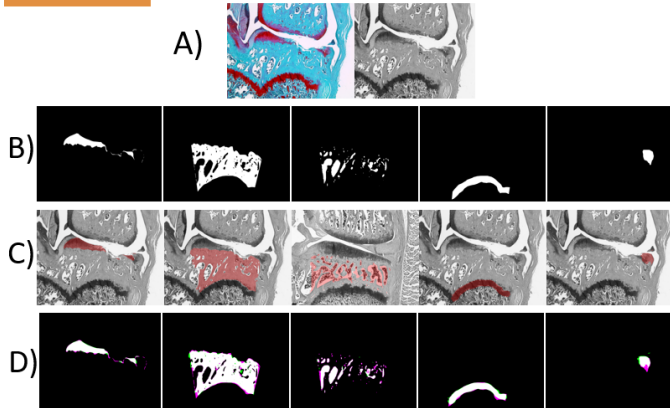# Automated Segmentation and Grading of Rodent Knee OA Histology using Convolutional Neural Networks

Jacob Griffith[1], Andrew Jensen[2], Scott Banks[2,4], Kyle D. Allen[1,2,3,4]

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Current Results

Figure 2. Example images of **A)** Raw histological images in RGB and grayscale color spaces, **B)** binary masks from manually segmented regions of interest (ground truth), **C)** HRNet estimated segmentation overlayed on the original histological image, and **D)** visualization of the Jaccard Index where pink is false negative, and green is false positive.

Joint Track Machine Learning: An Autonomous Method of Measuring TKA Kinematics from Single-Plane Images

Andrew Jensen, Paris Flood, Lindsey Palm-Vlasak, Will Burton, Paul Rullkoetter, Scott Banks
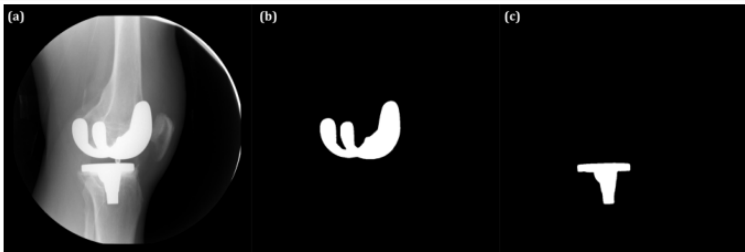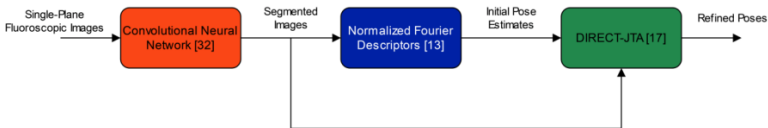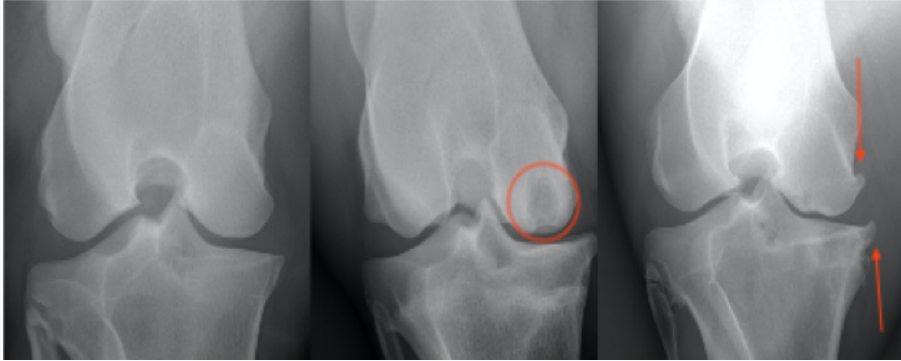
Artificial Intelligence to Identify Arthroplasty Implants From Radiographs of the Knee

Jaret M. Karnuta, MS [a], Bryan C. Luu, BS [a, c], Alexander L. Roth, MD [a],
Heather S. Haeberle, MD [a, b], Antonia F. Chen, MD MBA [d], Richard Iorio, MD [d],
Jonathan L. Schaffer, MD MBA [a], Michael A. Mont, MD [e],
Brendan M. Patterson, MD MBA [a], Viktor E. Krebs, MD [a],
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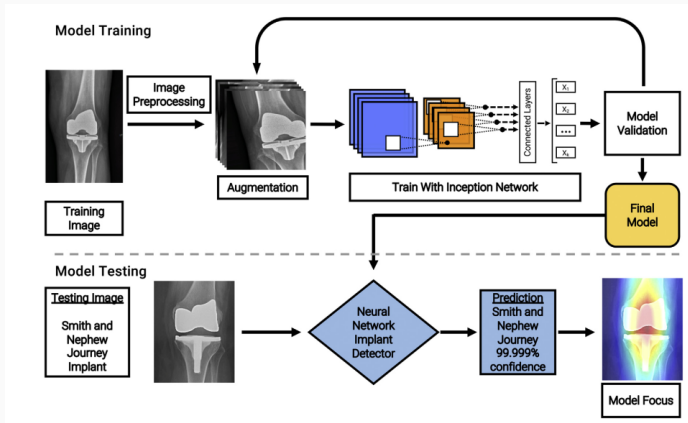
Deep High-Resolution Representation Learning for Visual Recognition

Jingdong Wang, Ke Sun, Tianheng Cheng, Borui Jiang, Chaorui Deng, Yang Zhao, Dong Liu, Yadong Mu, Mingkui Tan, Xinggang Wang, Wenyu Liu, and Bin Xiao

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Fig. 6. Qualitative COCO human pose estimation results over representative images with various human size, different poses, or clutter background.

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Color Palette

BIG BOLD TEXT

RUN!