

## Practical Work 2

Fully Automated Deep Learning System for Bone Age Assessment.

*Lee H., Tajmir S., Lee J., Zissen M., Yeshiwas B., Alkasab T. K., Choy G., Do S.*

*J Digit Imaging (2017), 30:427–441*

*Intelligent Decision Support Systems*

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# Agenda

1. Description of problem, data source, goals and scope
2. The architecture of the IDSS
3. Methods used to support IDSS process
4. Evaluation of IDSS

Description of problem, data  
source, goals and scope

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# Overview of IDSS

- Nowadays Bone Age Assessment is done mostly manually by doctors,
- IDSS predicts bone age using people X-ray images,
- Data was collected internally in *Massachusetts General Hospital and Harvard Medical School*,
- The goal of the IDSS is to make doctors do other things, which can not be automated.

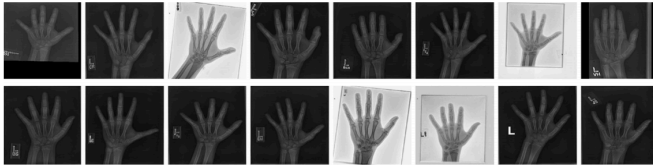


Figure 1: Examples of input radiographs utilized in this work. Source: [1]

## The architecture of the IDSS

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# System architecture

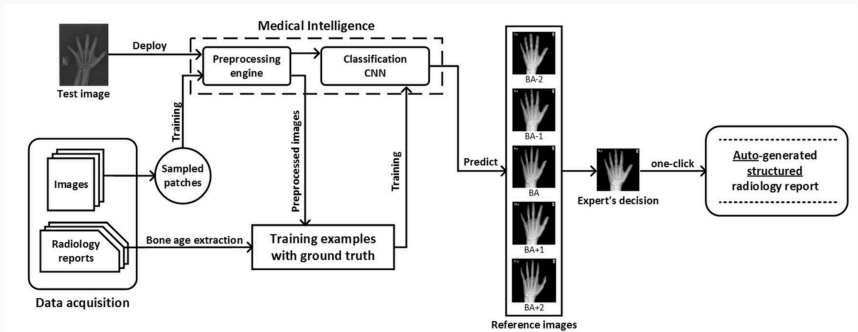


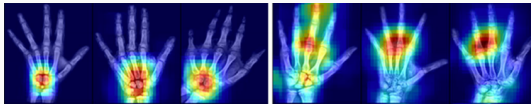
Figure 2: Overview of proposed fully automated Bone Age Assessment system. Source: [1]

## Methods used to support IDSS process

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# Used methods

- Convolutional Neural Networks with Attention Mechanism to classify age, see fig. 3,
- Data Augmentation for Medical X-Ray images,
- Normalization of images using another CNN (one of its step is Image Segmentation),
- Transfer learning (with pretrained GoogLeNet model).



**Figure 3:** Selected examples of attention maps. Source: [1]

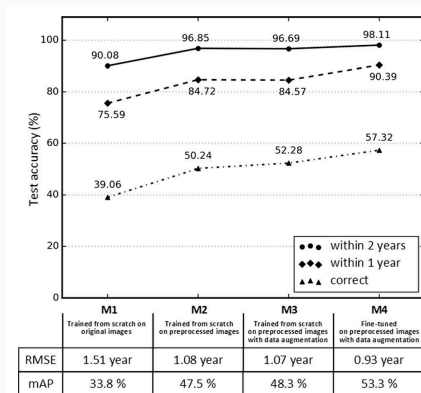


## Evaluation of IDSS

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# How the system was evaluated?

The system was evaluated on test set with following metrics:  
Accuracy, mAP (Mean Average Precision), RMSE.



**Figure 4:** Performance of four different methods (M1–M4) of training for female bone age assessments. Source: [1]

# The End

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Thank you!  
Q&A?



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