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# Automatic Femur Segmentation for Femoral Implant Design

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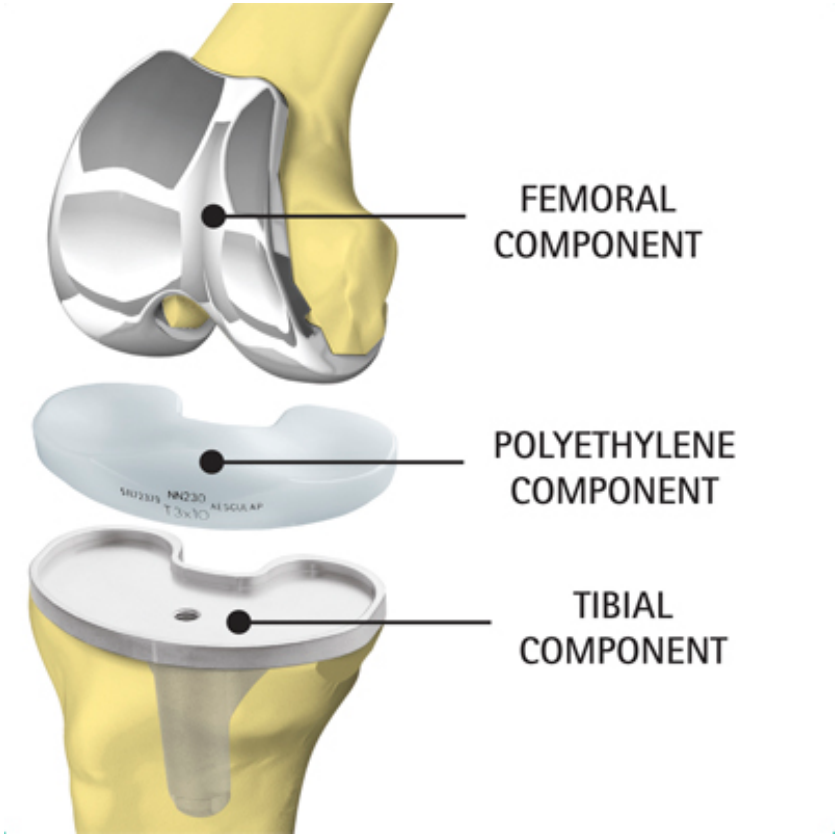
**16. December 2015, Medical Image Analysis Lab**

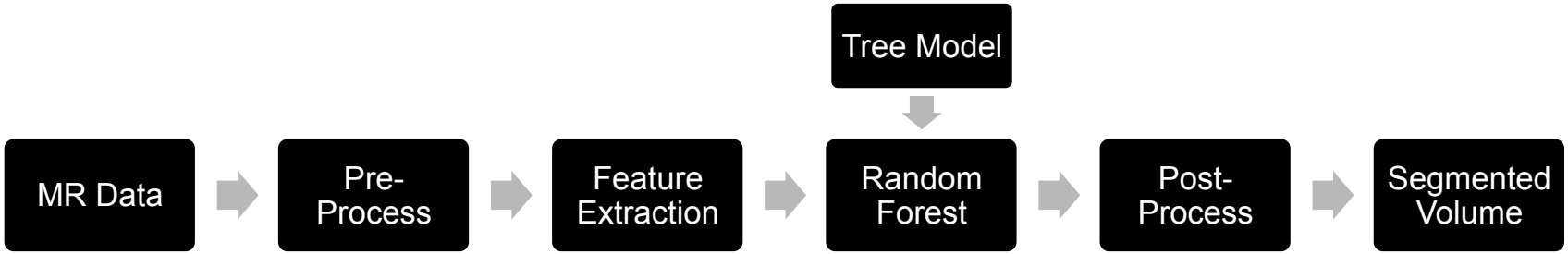
# Introduction



> Goal: DICE 0.95 with 0.05 std




# Methods – Algorithm Pipeline



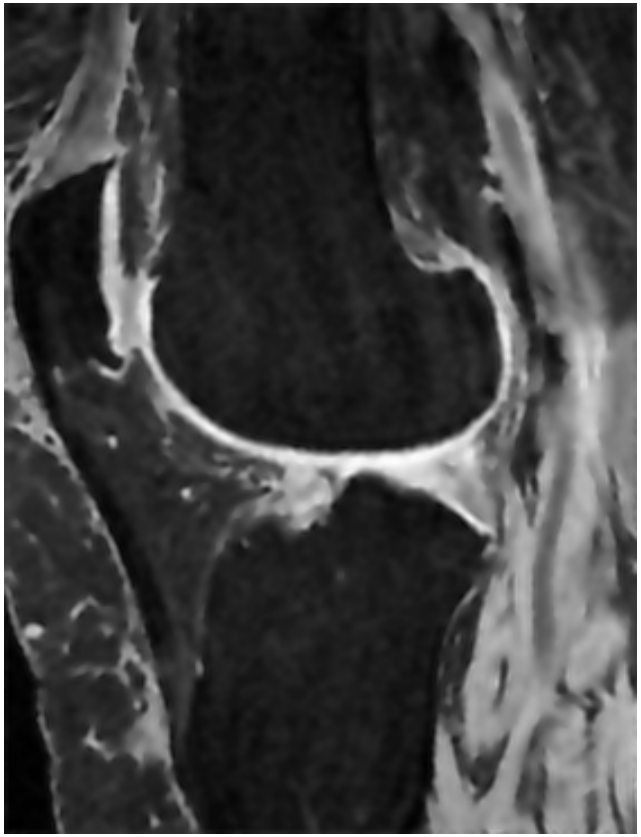
# Methods – Pre-Process



- Normalization

$$I_n = \frac{I - \mu}{\sigma}$$

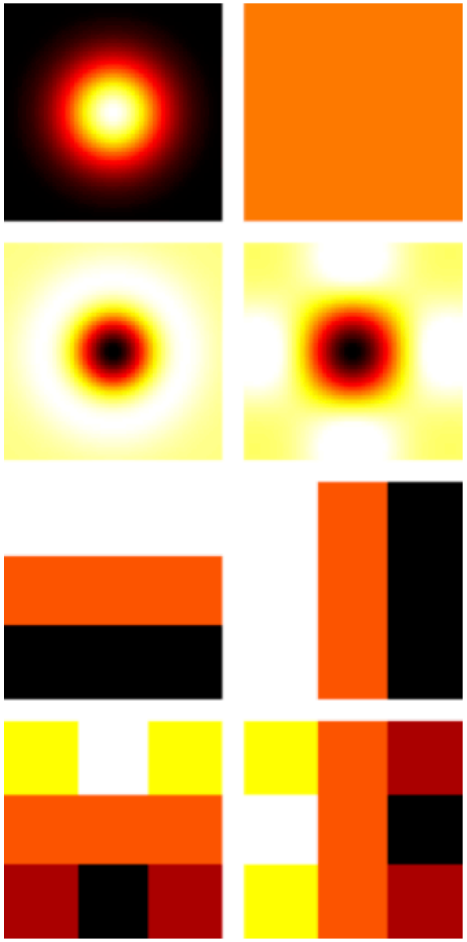
- Noise removal
  - 3D Wiener filter



# Methods – Feature Extraction



- Standard deviation
- Entropy
- Relative position (3D)
- Gaussian
- Average
- Laplacian of Gaussian
- Laplacian
- Prewitt (horizontal and vertical)
- Sobel (horizontal and vertical)



# Methods – Post-Processing

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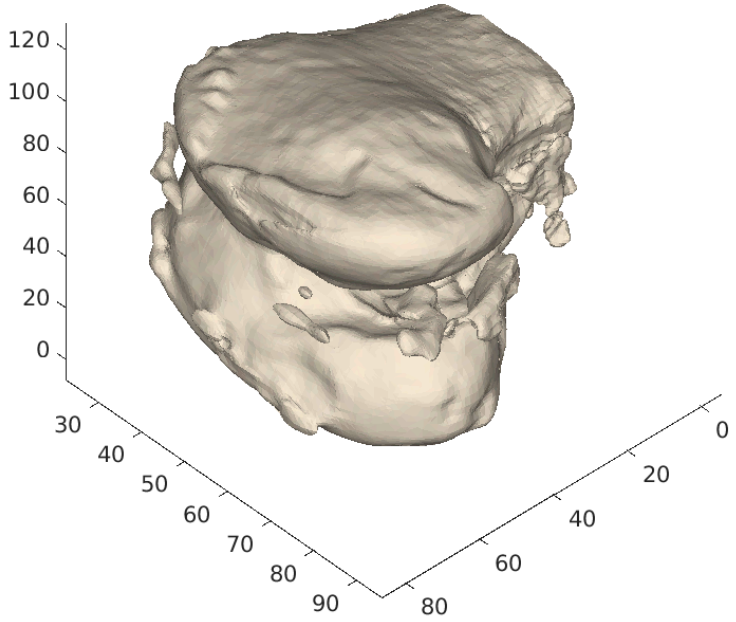
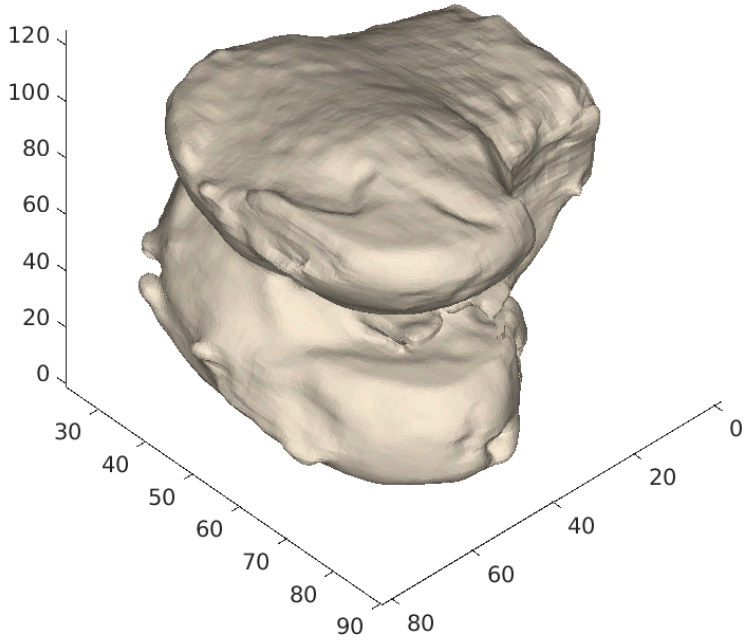
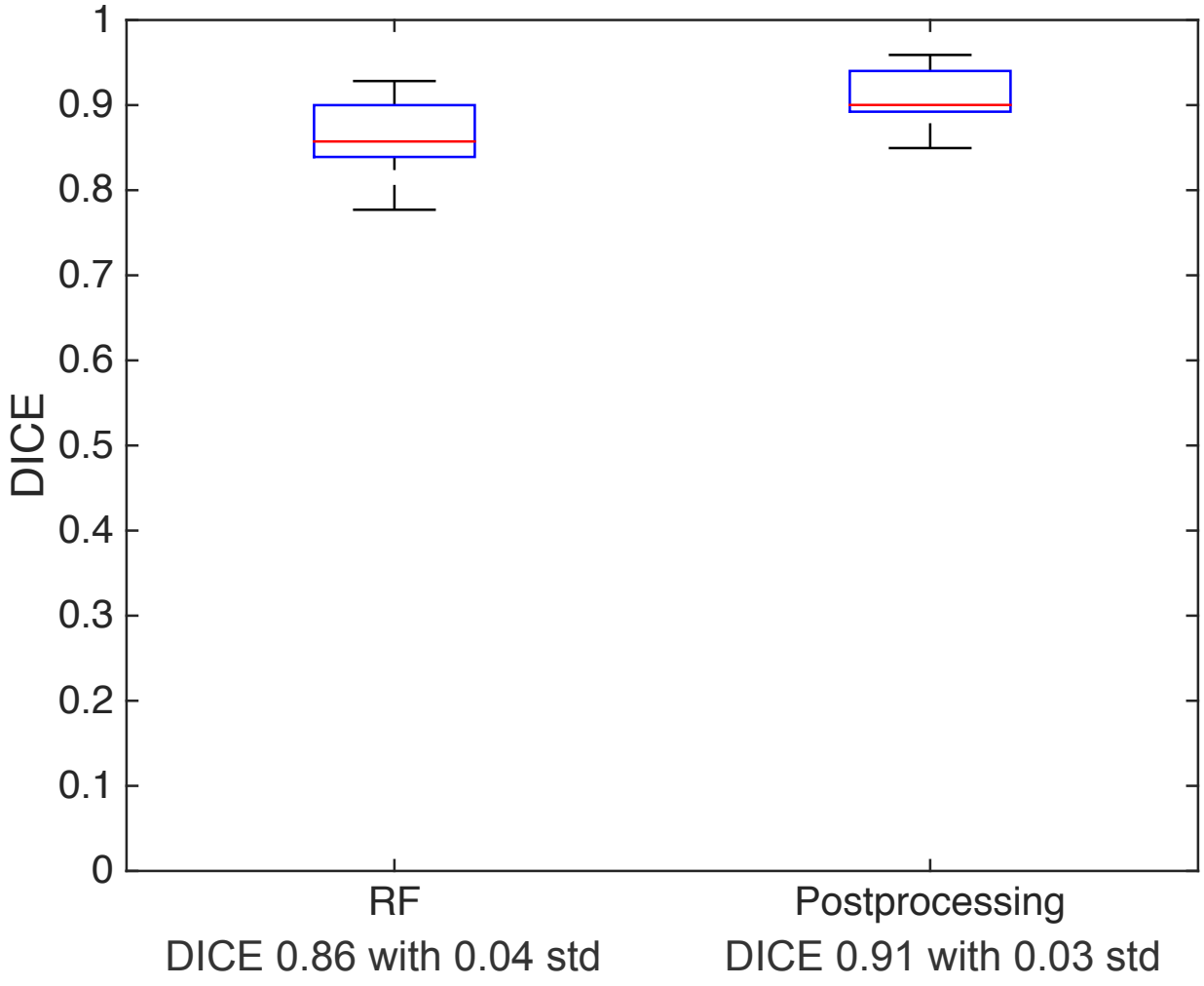
- Morphological opening
- Keep largest area / volume
- Fill holes



# Results


1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
DICE
RF
DICE 0.86 with 0.04 std
Postprocessing
DICE 0.91 with 0.03 std

# Discussion



- Slim & Fast
- Best / Worst case
- Segmentation is always the Femur
- Dice interpretation

# Outlook



- Include prior information
- Investigate 3D features
- Extend to further bone structure

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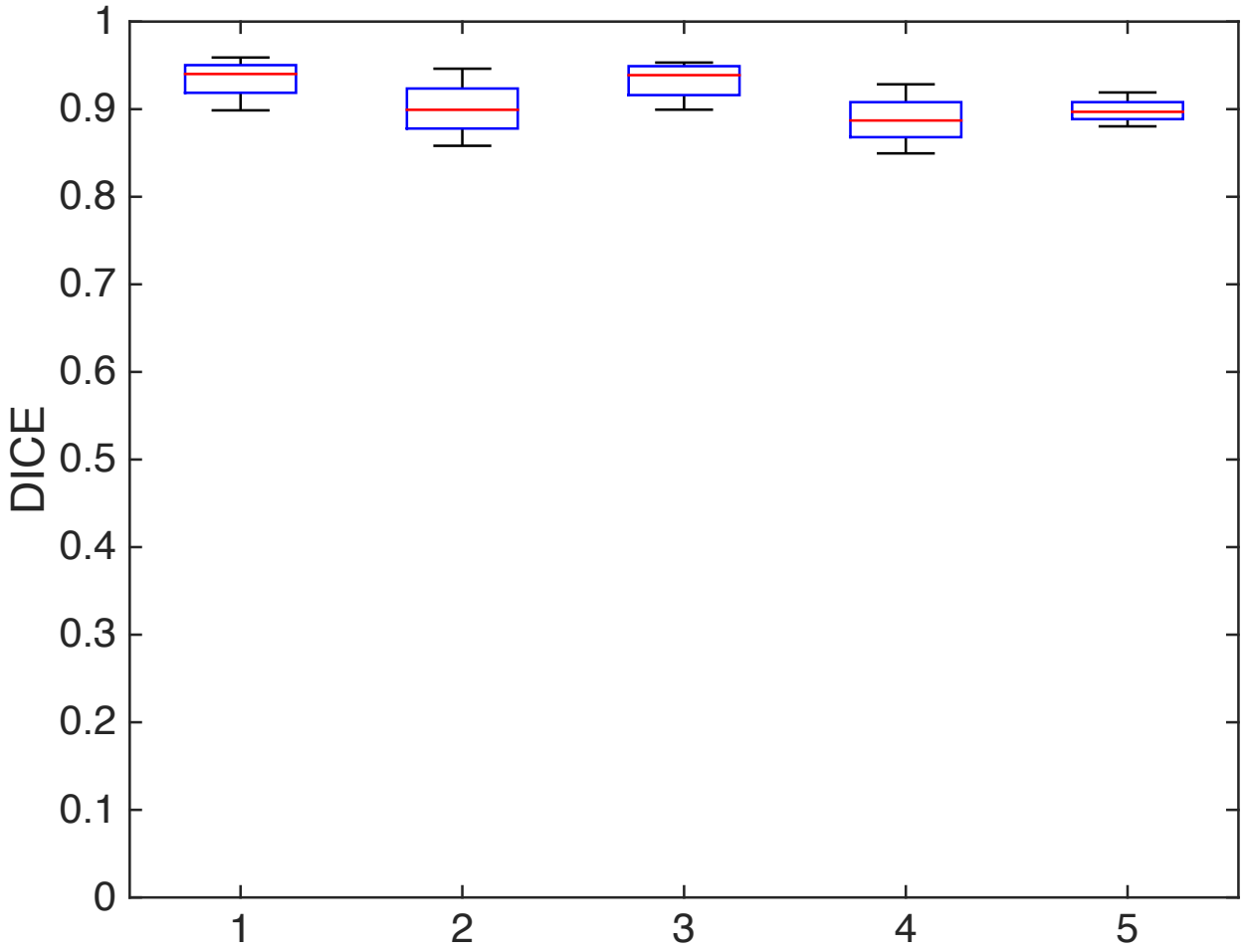
# Thanks for your attention!

Questions?

# Results Cross Validation (5 fold)





# Tested but was not good…



- ASM
- 3D filter for features
- Histogram bins as features
- Skewness as features