Medical Image Processing for Interventional Applications

Vesselness Examples

Online Course – Unit 8

Andreas Maier, Frank Schebesch

Pattern Recognition Lab (CS 5)

virtuelle hochschule bayern

FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG

TECHNISCHE FAKULTÄT

Topics

Applications of Vesselness

Take Home Message

Paper

Alejandro F. Frangi et al. "Multiscale Vessel Enhancement Filtering". In: *Medical Image Computing and Computer-Assisted Intervention – MICCAI'98*. Ed. by William M. Wells, Alan Colchester, and Scott Delp. Vol. 1496. Lecture Notes in Computer Science. Springer Berlin Heidelberg, 1998, pp. 130–137. DOI: 10.1007/BFb0056195
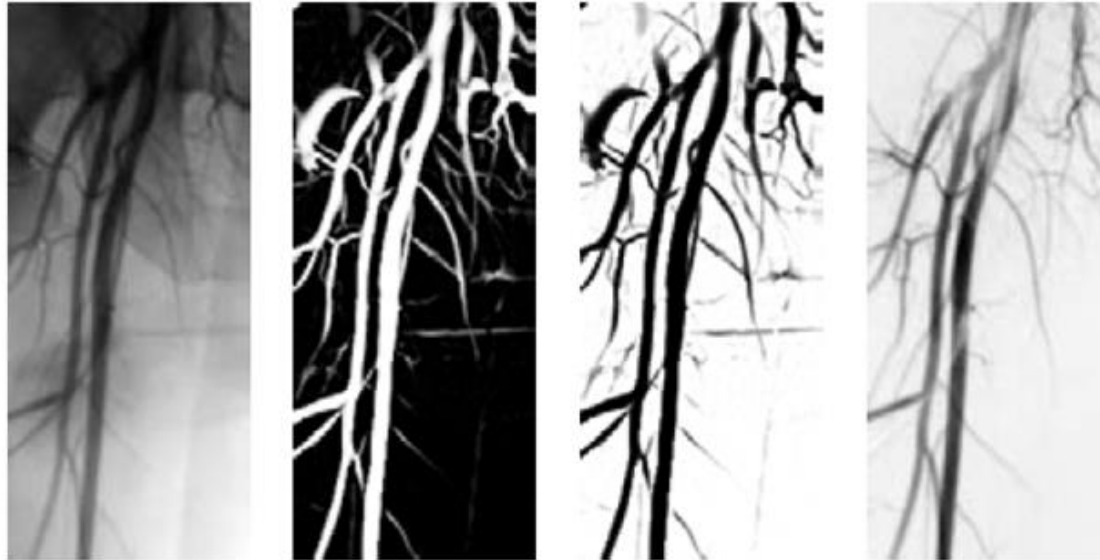
2-D Angiography

Figure 1: Part of a contrast X-ray image of the peripheral vasculature (left), calculated vesselness of the left image (middle-left), calculated vesselness after inversion of the grey-scale map (middle-right), image obtained by subtracting reference (without contrast) image from left image – shown here to facilitate visual inspection of the results of the filtering procedure (right) (source of images and description: Frangi's article cited on slide no. 3)
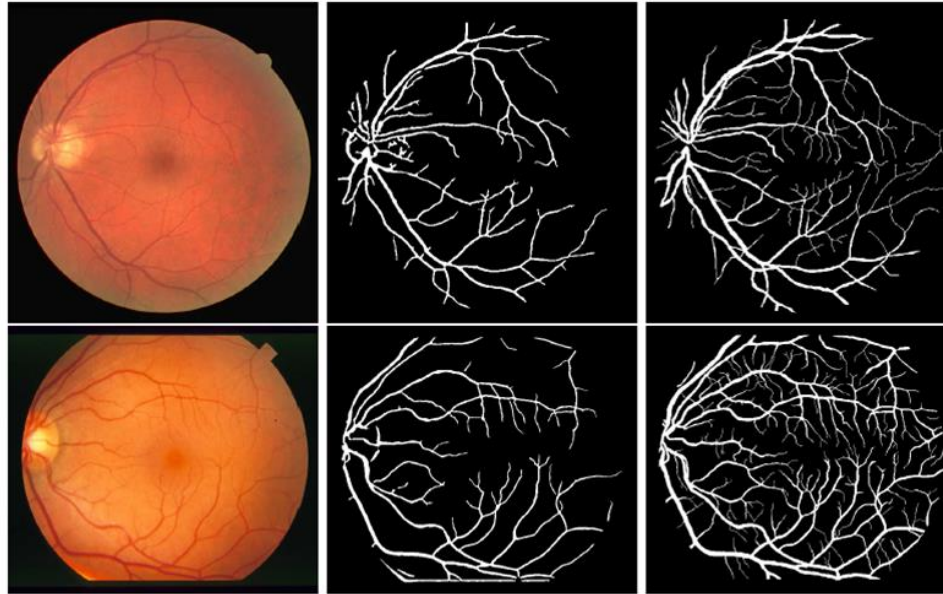
Fundus Imaging / Low Resolution Images

Figure 2: Example segmentation results on two public databases, from left to right: input fundus image, segmentation results, and gold standard images (Attila Budai, Pattern Recognition Lab, FAU)
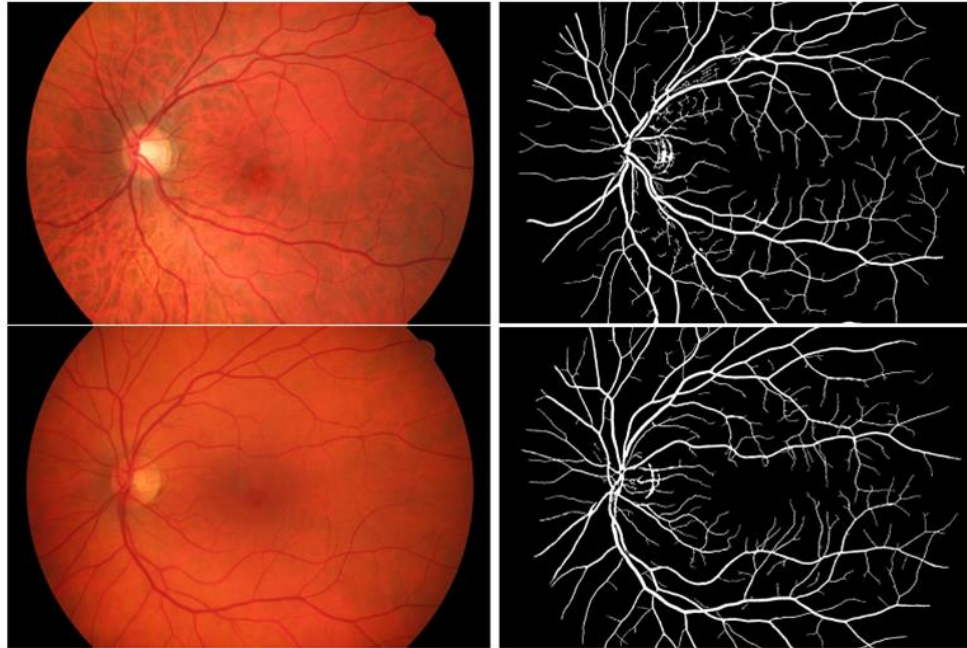
Fundus Imaging / High Resolution Images

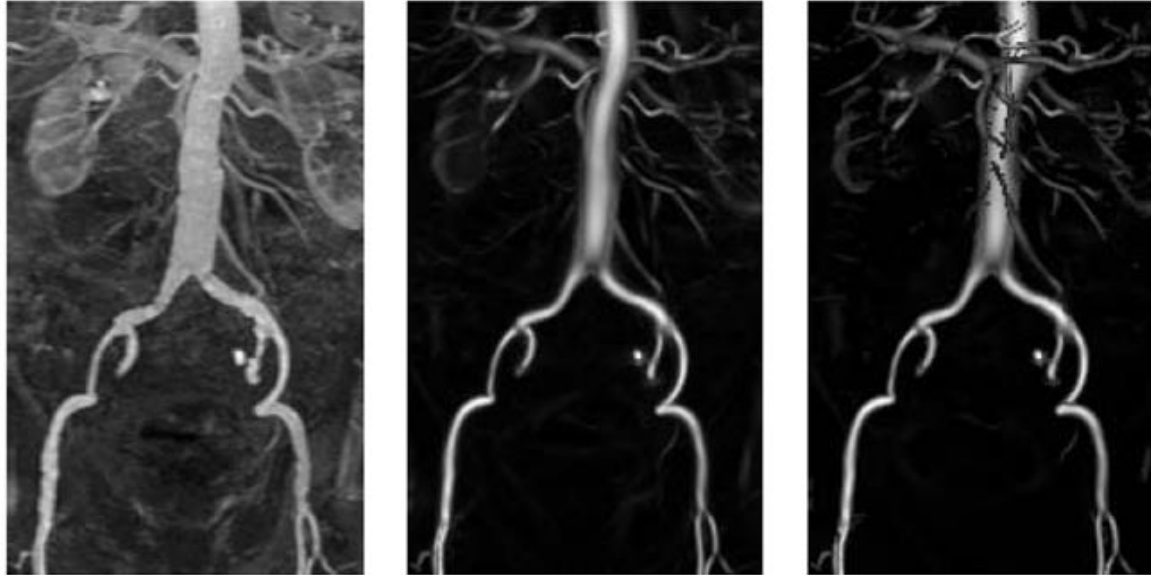Figure 3: Source by Attila Budai, Pattern Recognition Lab, FAU

3-D MRI Angiography

Figure 4: Original maximum intensity projection of a contrast (Gd-DTPA) MRA image (left); maximum intensity projection of vessel enhanced image →obtaining quite good background suppression (middle); closest vessel projection, facilitated by the filter's excellent background suppression (source of images and description: Frangi's article cited on slide no. 3)
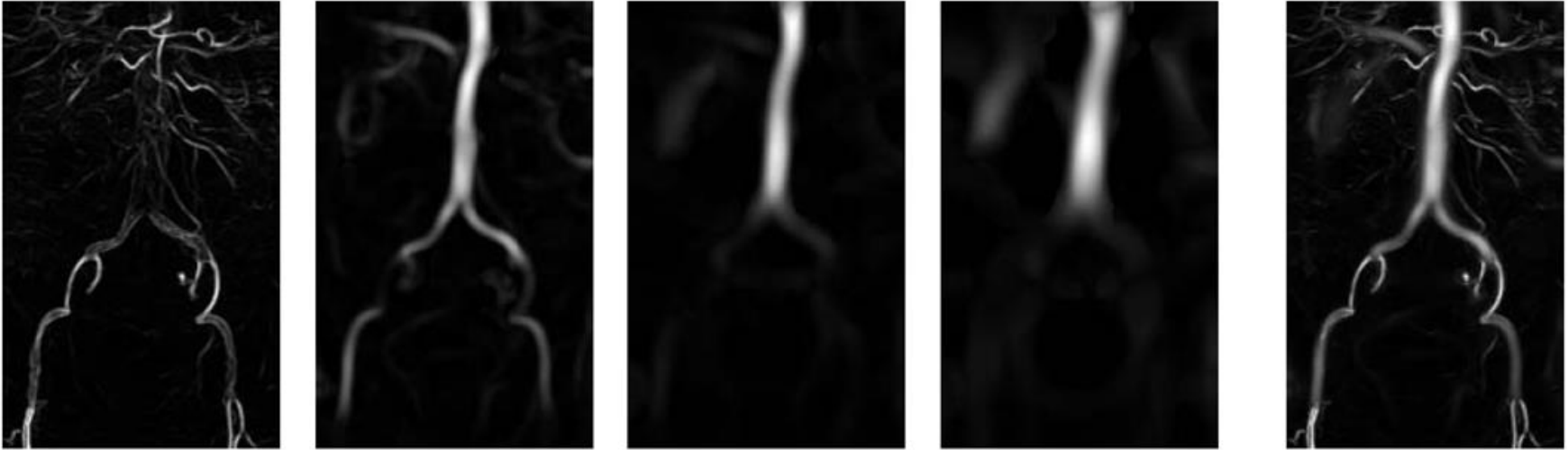
3-D MRI Angiography

Figure 5: The first four images show the vesselness obtained at increasing scales. The last image is the result after the scale selection procedure. (source of images and description: Frangi's article cited on slide no. 3)

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There are a lot of applications in medical imaging where vesselness measures are useful. In this regard, always recall Frangi's original work which is often cited when vesselness is used.