Abstract: Anatomical structures of branching topology are frequently met in the human body and are visualized in medical images using various image acquisition modalities. In this talk we present a number of automated methods for the analysis of anatomical structures of tree and network topology. More specifically, we first focus on the problem of detecting branching nodes on tree structures. The branching nodes are key components for tree localization as well as topology modelling and node detection is a very important first step towards the automated processing of these structures including image registration, segmentation and analysis of branching patterns. Developing automated techniques for node detection is a very challenging task due to different levels of noise fluctuations throughout across tree levels. The proposed methodology of node detection consists of multi-scale corner detection and branching localization. The evaluation of the methodology is performed using a dataset of clinical galactograms and its comparison with state-of-the-art methods. Another related problem is that of segmenting anatomical branching structures. Considering this problem we are presenting a novel and fully automated methodology that is applicable to a range of imaging modalities. The approach is applied and evaluated in two datasets of branching structures from different imaging modalities (x-ray galactograms and vasculature angiograms) and is compared to state-of-the-art segmentation techniques. Finally, considering the problem of classification of anatomical tree-shape structures we present new methodologies aiming at providing new insights into the association between topology and underlying pathology. The superiority of the new methods over state-of-the-art ones in terms of sensitivity, specificity and accuracy is evaluated experimentally. This is a joint work with A. Skoura, T. Nuzhnaya A. Maidment, P. Bakic and H. Ling.

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