The question I would like to help answer is: What is the role and what can imaging do for systems biology?

In recent years, the focus in biological sciences has shifted from understanding single parts of larger systems, sort of vertical approach, to understanding complex systems at the cellular and molecular levels, horizontal approach. Thus the revolution of “omics” projects, genomics and now proteomics. Understanding complexity of biological systems is a task that requires acquisition, analysis and sharing of huge databases, and in particular, high-dimensional databases. Processing such huge amount of bioimages visually by biologists is inefficient, time-consuming and error-prone. Therefore, we would like to move towards automated, efficient and robust processing of such bioimage data sets. Moreover, some information hidden in the images may not be readily visually available. Thus, we do not only help humans by using sophisticated algorithms for faster and more efficient processing but also because new knowledge is generated through use of such algorithms.

The ultimate dream is to have distributed yet integrated large bioimage databases which would allow researchers to upload their data, have it processed, share the data, download data as well as platform-optimized code, etc, and all this in a common format. To achieve this goal, we must draw upon a whole host of sophisticated tools from signal processing, machine learning and scientific computing. I will address some of these issues in this presentation, especially those where signal processing expertise can play a significant role.

**Short Bio:** Jelena Kovacevic’s research interests are in the area of signal analysis and processing. She is currently working on problems related to automated processing and analysis of large bioimage databases, including acquisition, segmentation, classification, and others. These problems use a variety of tools, including multiresolution tools, such as bases and frames. Her theoretical research interests include building new multiresolution tools as well as algebraic theory of signal processing. Jelena also serves as the co-director of the Center for Bioimage Informatics. She was the Editor-in-Chief of the IEEE Transactions on Image Processing, plenary speaker at numerous meetings and conferences. She teaches Bioimaging and Advanced Bioimaging. Jelena joined CMU in 2003 from Bell Labs.