Quantitative image analysis (QIA) and computer-aided diagnosis (CAD) methods (i.e., computerized methods of analyzing digital breast images: mammograms, ultrasound and magnetic resonance images) can yield novel image-based tumor characteristics (i.e., signatures that may ultimately contribute to the design of patient-specific breast cancer treatments). The role of QIA continues to grow. With computer-aided detection (CAD) of breast cancer, the aim was to provide a ‘second opinion’ to aid the radiologist in locating suspicious regions within screening mammograms. Today, the role of QIA/CAD is expanding beyond screening programs towards applications in risk assessment, diagnosis, prognosis and response to therapy as well as in data mining to discover relationships of lesion characteristics as they apply to disease states. With QIA, computerized methods are being developed to (a) quantitatively characterize the features of a suspicious region or tumor, e.g., those describing tumor morphology or function, (b) merge the relevant features into diagnostic, prognostic, or predictive image-based biomarkers, (c) estimate the probability of a particular disease state, (d) retrieve similar cases, (e) compare the tumor in question to thousands of other breast tumors, and (f) explore the complex relationships among image-based tumor characteristics across large populations and association studies between the image-based signatures (i.e., image-based phenotypes) and histological/genomic data for imaging genomics. My lecture will focus on such quantitative radiomics of breast cancer.