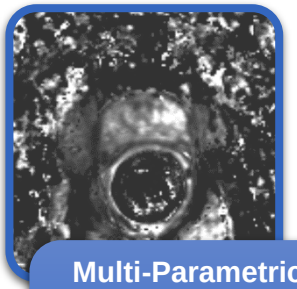
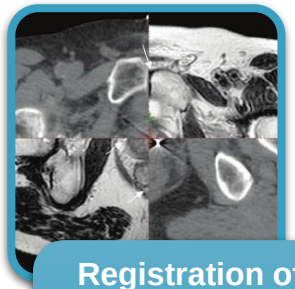
Steps of the Radiotherapy Planning Pipeline and their Uncertainties



Multi-Parametric Imaging & Feature Derivation

- Sensitivity/Specificity
- Motion, Noise, Artifacts
- Parameterizations
- Modeling Choices

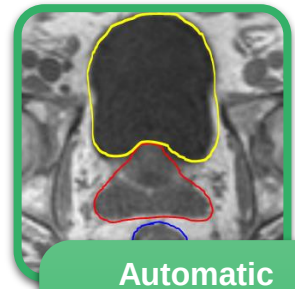


Registration of Multi-Parametric Imaging

- From Imaging
- Accuracy
- Robustness
- Parameterizations

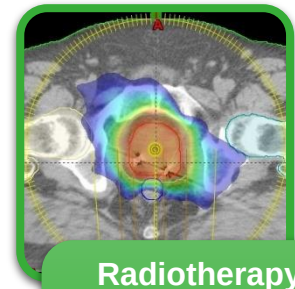
Tumor Tissue Characterization

- From Imaging :
  - Quality Assessment
  - Parameterizations
- From Histology



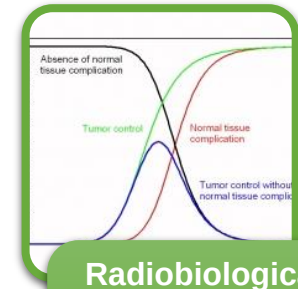
Automatic Segmentation of Organs at Risk

- Accuracy of algorithm
- Parameterizations
- Anatomical Variability



Radiotherapy Dose Planning

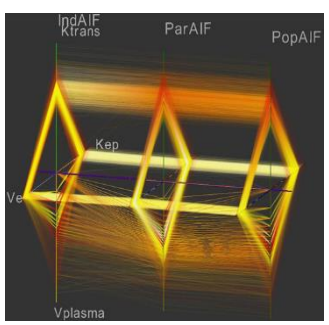
- From previous steps :
  - Assumptions
  - Adjustments
  - Choices
  - Variability

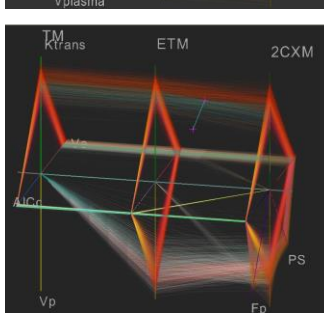


Radiobiological Modeling

- For Tumors :
  - From Imaging
  - Parameter Sensitivity
- For Normal Tissues :
  - Anatomical Variability

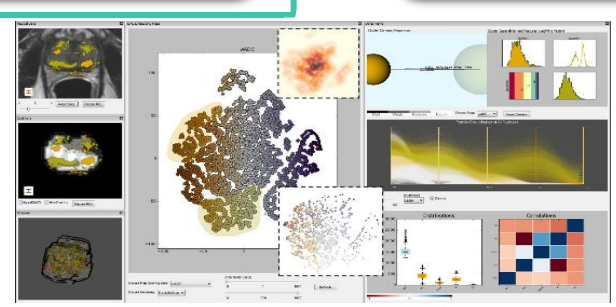
Exploration and Visual Analysis of Modeling Variability in DCE-MRI Data [RvdHvH*14]

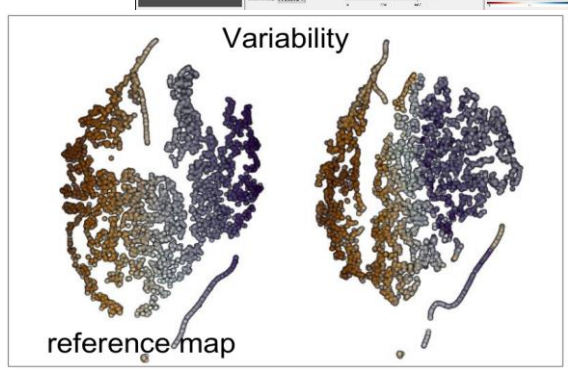


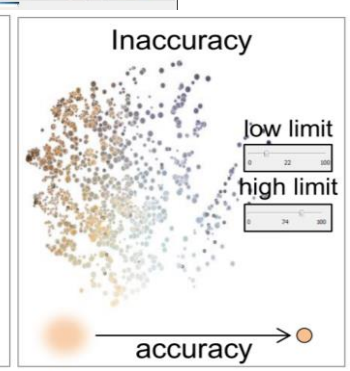


Visualization of Deformable Image Registration Quality [SFJ*16]

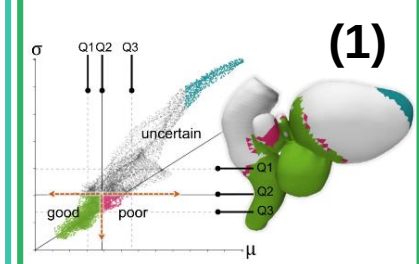
Visual Analytics for the Exploration of Tumor Tissue Characterization [RvdHD*15, RKS*16]

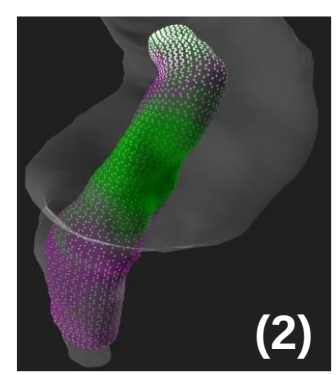




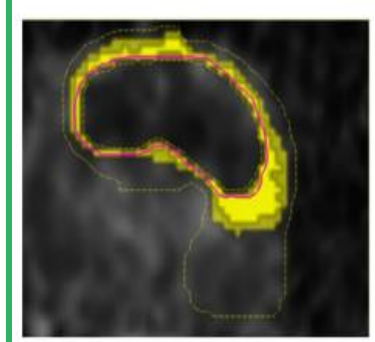


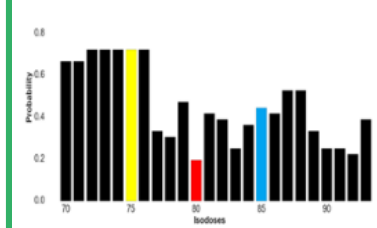
Visual Analytics for the Exploration and Assessement of Segmentation Errors [RMB*16]





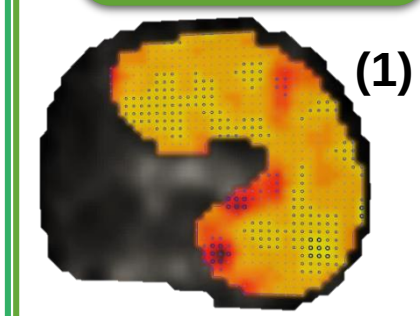
Visualization of Variability in Radiotherapy Dose Planning [SRV16]

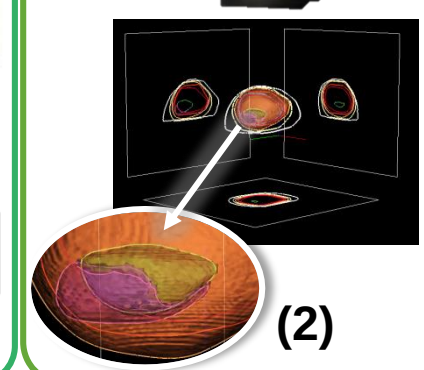




Visual Analysis of Tumor Control Probability Models [RCMM*16,CMRR*18]

Visual Analytics for the Exploration of Bladder Variability and Toxicity [RCMA*]





(a) (b) (c) (d) (e)

Visualization Strategies Addressing Uncertainty at Each Step of the Pipeline