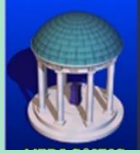
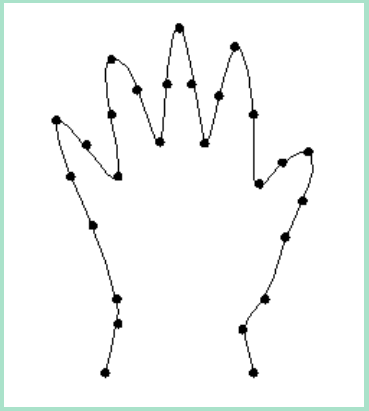
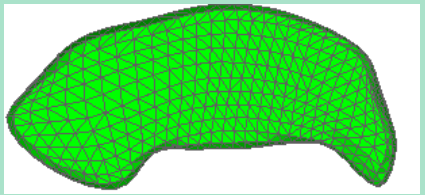
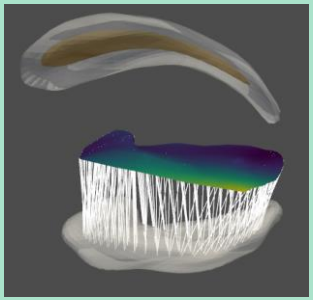
Shape Representation Categories

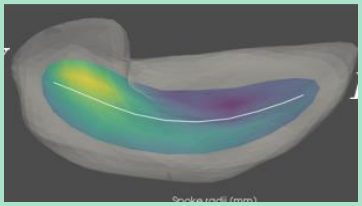


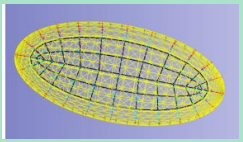
- Landmarks
- Objects
  - Boundaries
    - Points
    - Meshes
    - Normals
    - Spherical harmonics, Fourier
    - Signed distance images
  - Interiors and interior algebraic graphs
  - Skeletal models
  - Landcurves: currents
  - Multi-object representations
- Diffeos from a central example

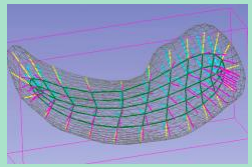




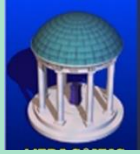


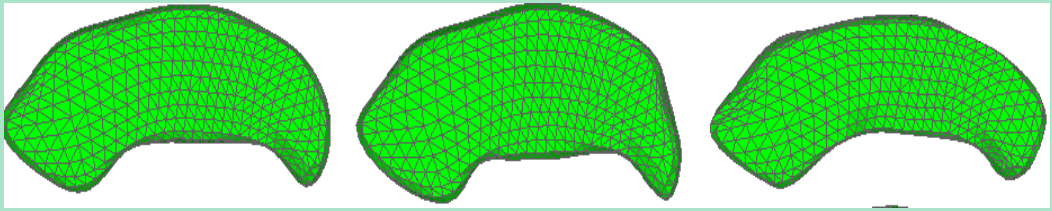




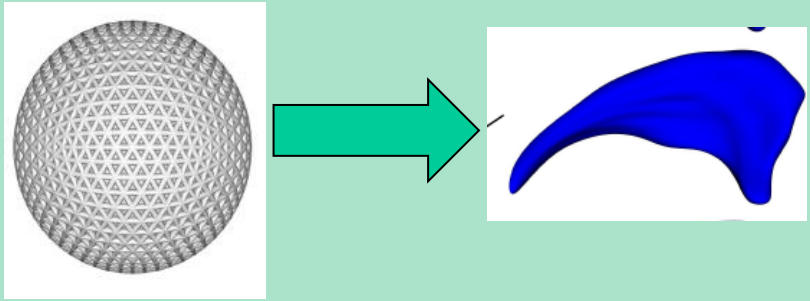


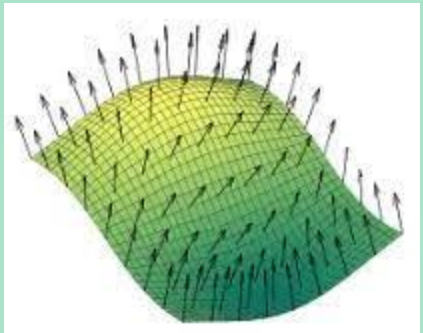
Shape Representation by Boundary Points



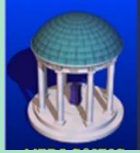


- Points in correspondence (PDM)
  - Correspondence produced by
    - Diffeomorphisms
    - Skeletal models
- Meshes
- Spherical harmonics, Fourier
- Points with normal, normals alone
- Points with tangents on landcurves (Currents)
- Normals with correspondence mod-ed out
- Signed distance images
- Distance measures
  - Riemannian metrics

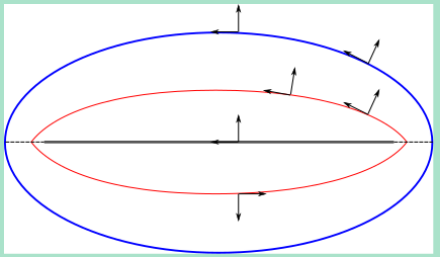


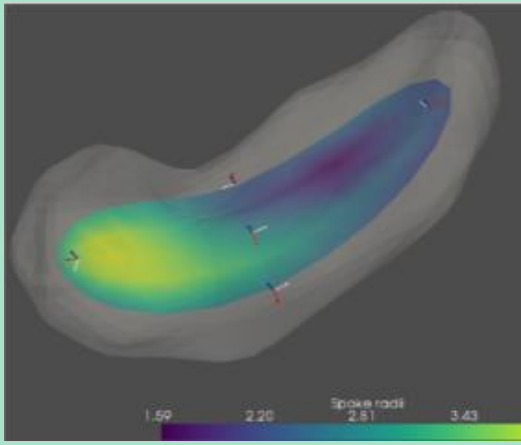


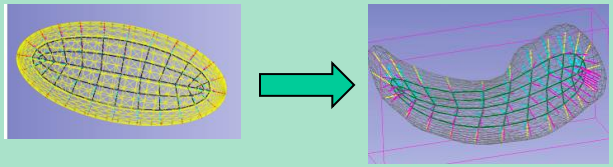
Shape Representation by Skeletal Models

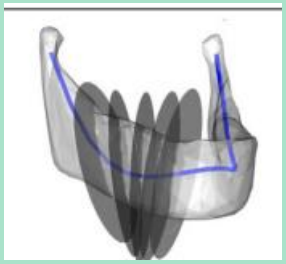


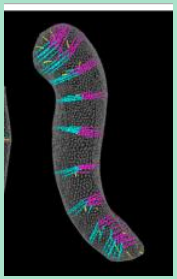
- Medial and skeletal mathematics
  - Blum medial axis: grassfire
    - Geometric relations among axis and width
    - Singularities: branching, ends, etc.
    - Radial shape operator S_{rad}
    - Radial distance
      - Geometry of onion skins
  - Skeletal generalization: S-reps
    - Skeleton and spokes
    - Discrete s-reps
    - Deformation from ellipsoids
      - Alignment-free coordinates
      - Fitted frames
    - Slabular planar cross-section sweeping
      - Implied Taheri s-reps
- Cm-reps [Yushkevich lectures]





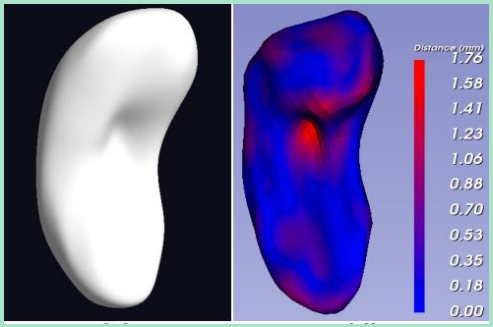






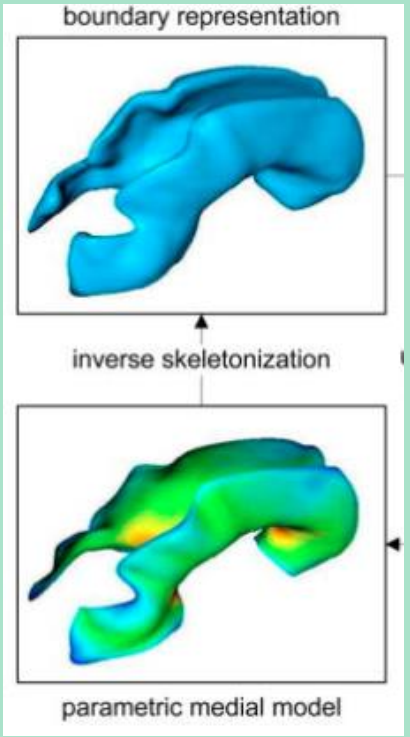
Shape Representation by Skeletal Models

- S-reps
  - Fitting to boundaries
    - Optimization
    - CNN



Bdry implied by s-rep Target object

- Cm-reps [2 lectures by P. Yushkevich]
  - Parametric
    - Based on PDE
    - Based on splines in x and width
  - Fitting to boundaries



Shape Representation by Deformations

- Diffeomorphisms: velocities
  - Points data
  - Currents data
    - For landcurves
    - For surfaces
  - Using CNN
- Displacements
  - Thin-plate splines
  - B-splines
  - Elastic deformations