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Workshop 3b: Creation of a basic orthopedic implant from segmented image data

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September, 2014

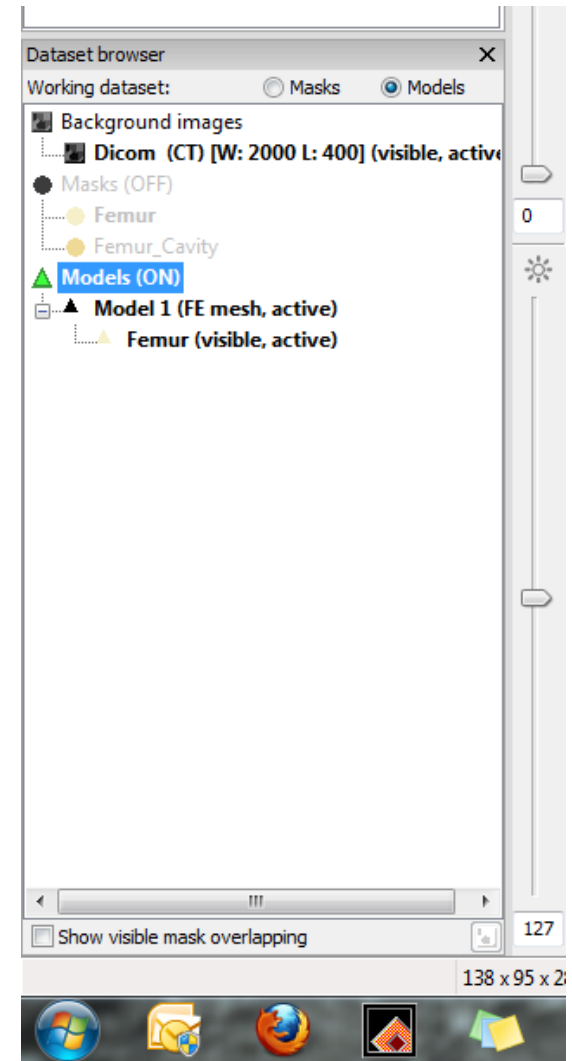


Before we begin...

- Log onto LMS
- Go to: Biomaterials (BMEN90023_2014_SM2) → Resources → Biomaterials Workshop - 3
- Download and extract/unzip contents into your work directory
- Open Simpleware software named 'ScanIP'

Create a model

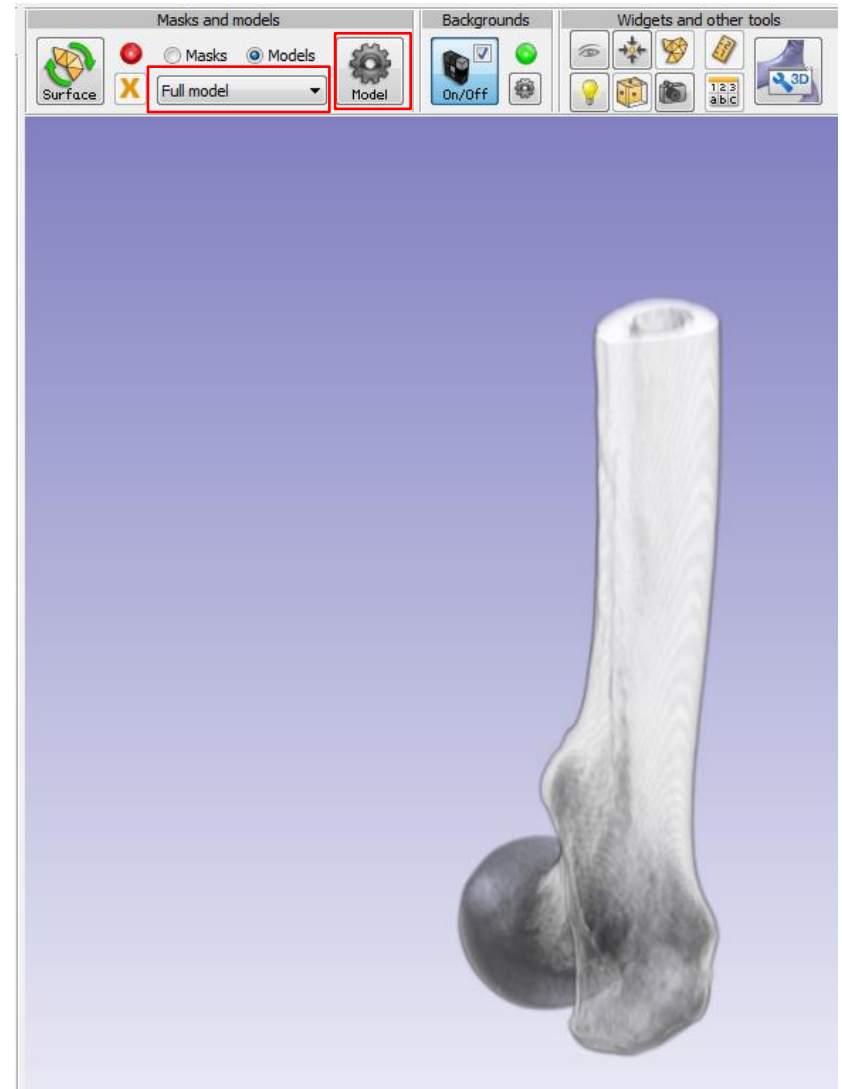
- Double click on 'Models' in the model tree to create a new FE model.
- Drag the 'Femur' mask in the model tree into the new FE model



Step 2

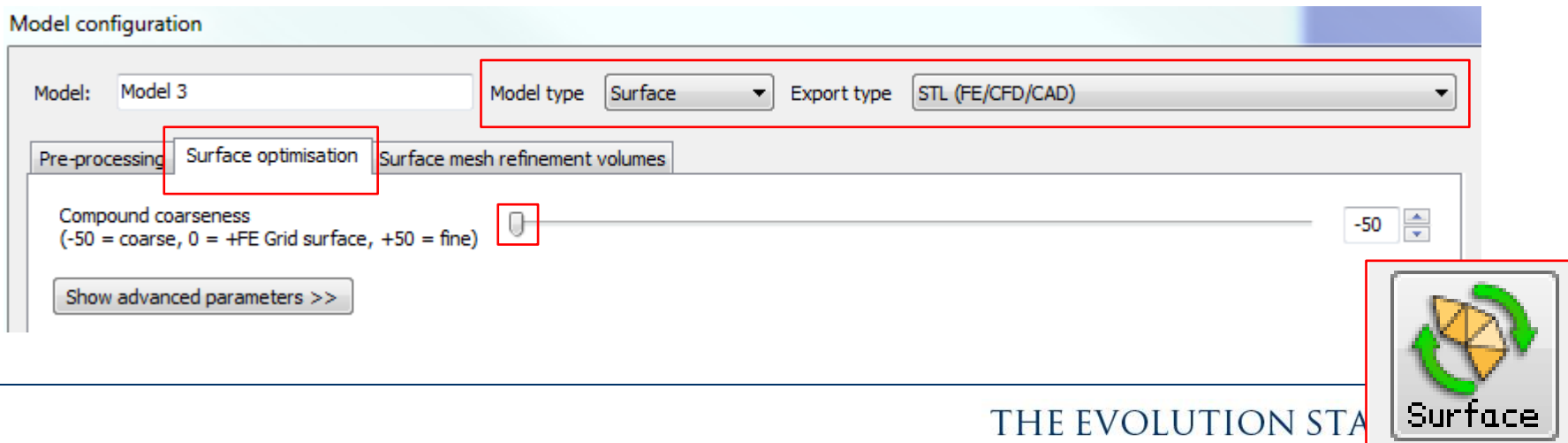
Model setup

- Select 'Full model' as the 3D view type.
- Select model to setup the model.



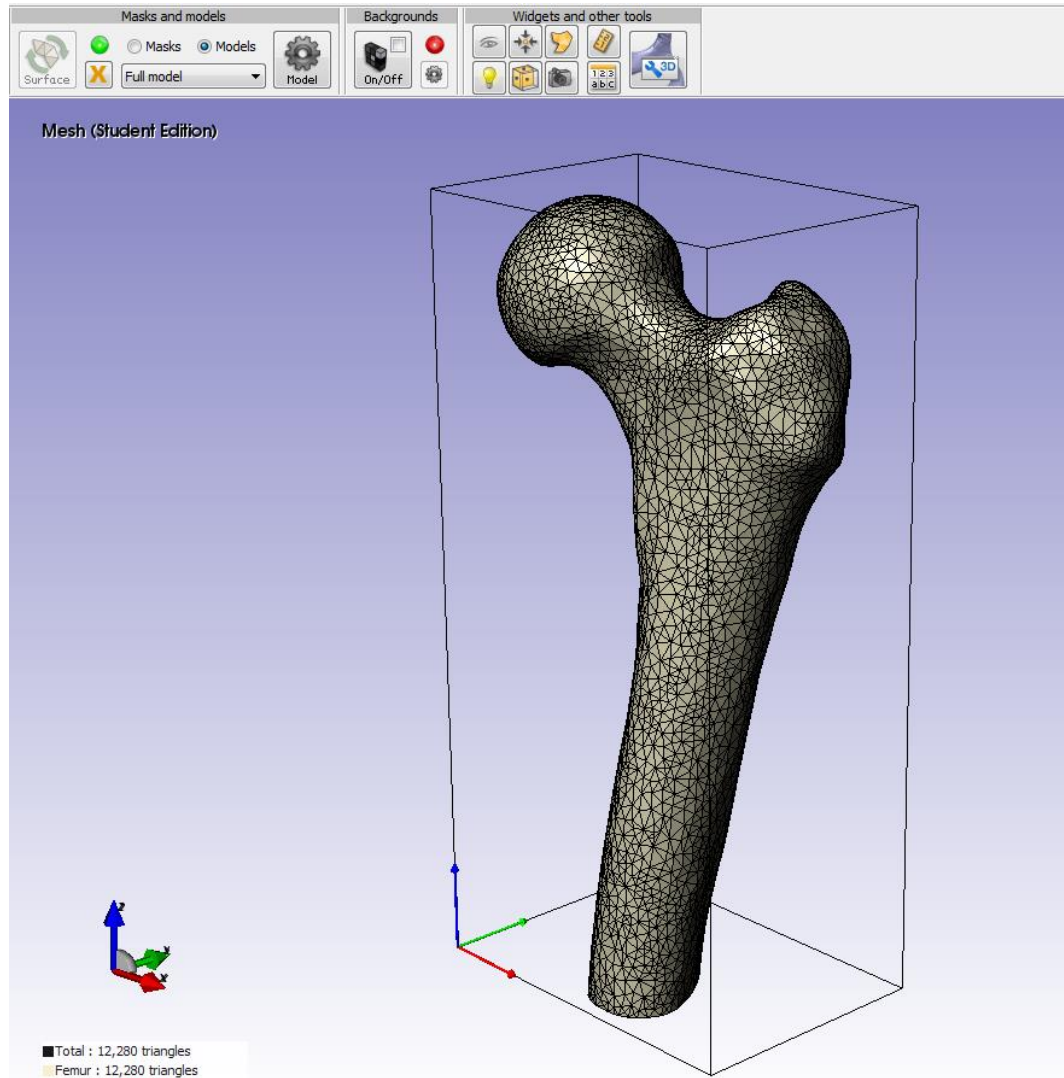
Mesh setup

- Select a 'Surface' model type to export an STL (FE/CFD/CAD) file.
- Select the surface optimisation tab and select a compound coarseness of '-50'
- Close the model configuration box and select the "Surface" icon to mesh the Femur mask.



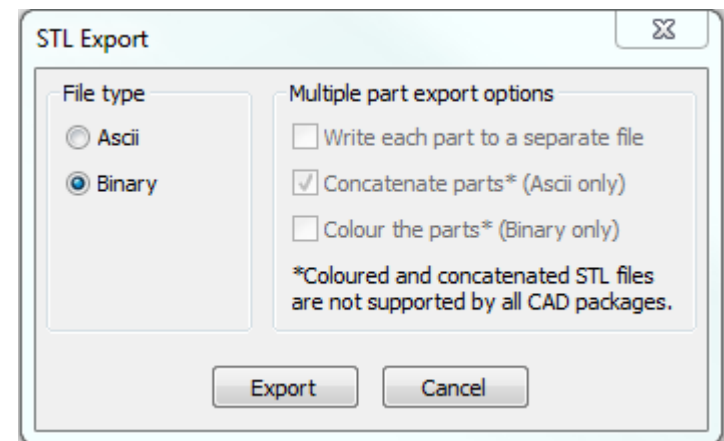
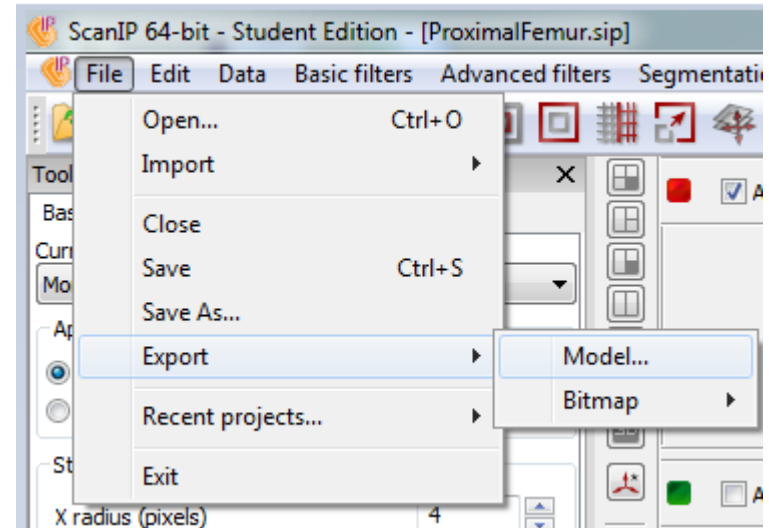


Mesh result



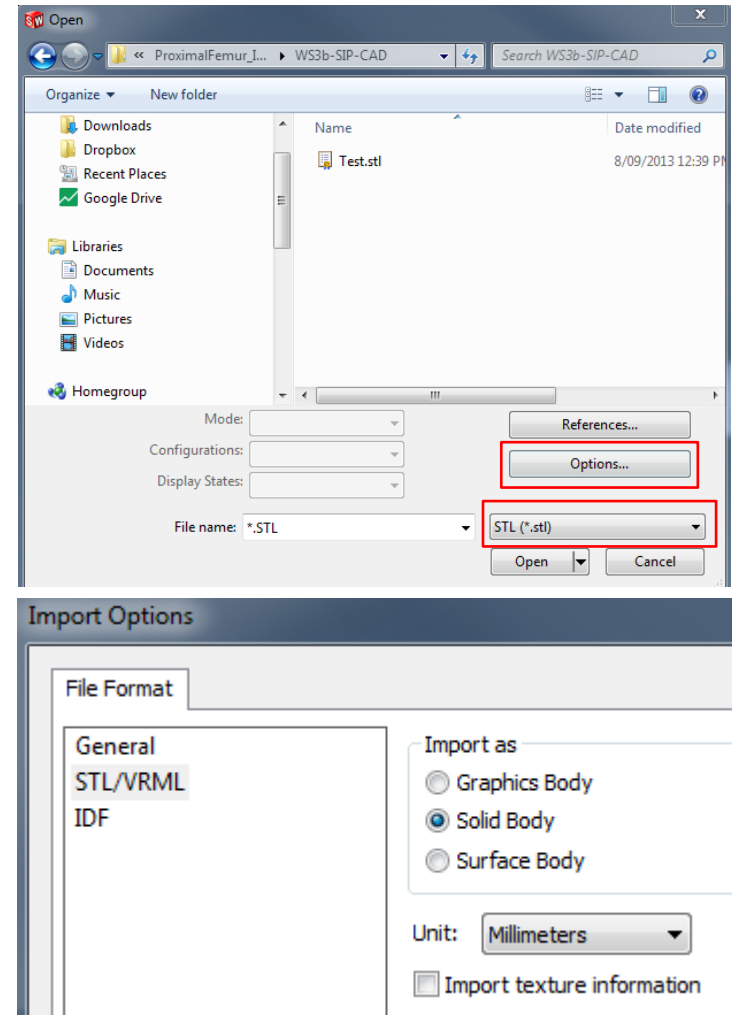
Export STL model

- Go to File → Export → Model
- Accept the default 'Binary' file type and save the STL model.
- Close ScanIP

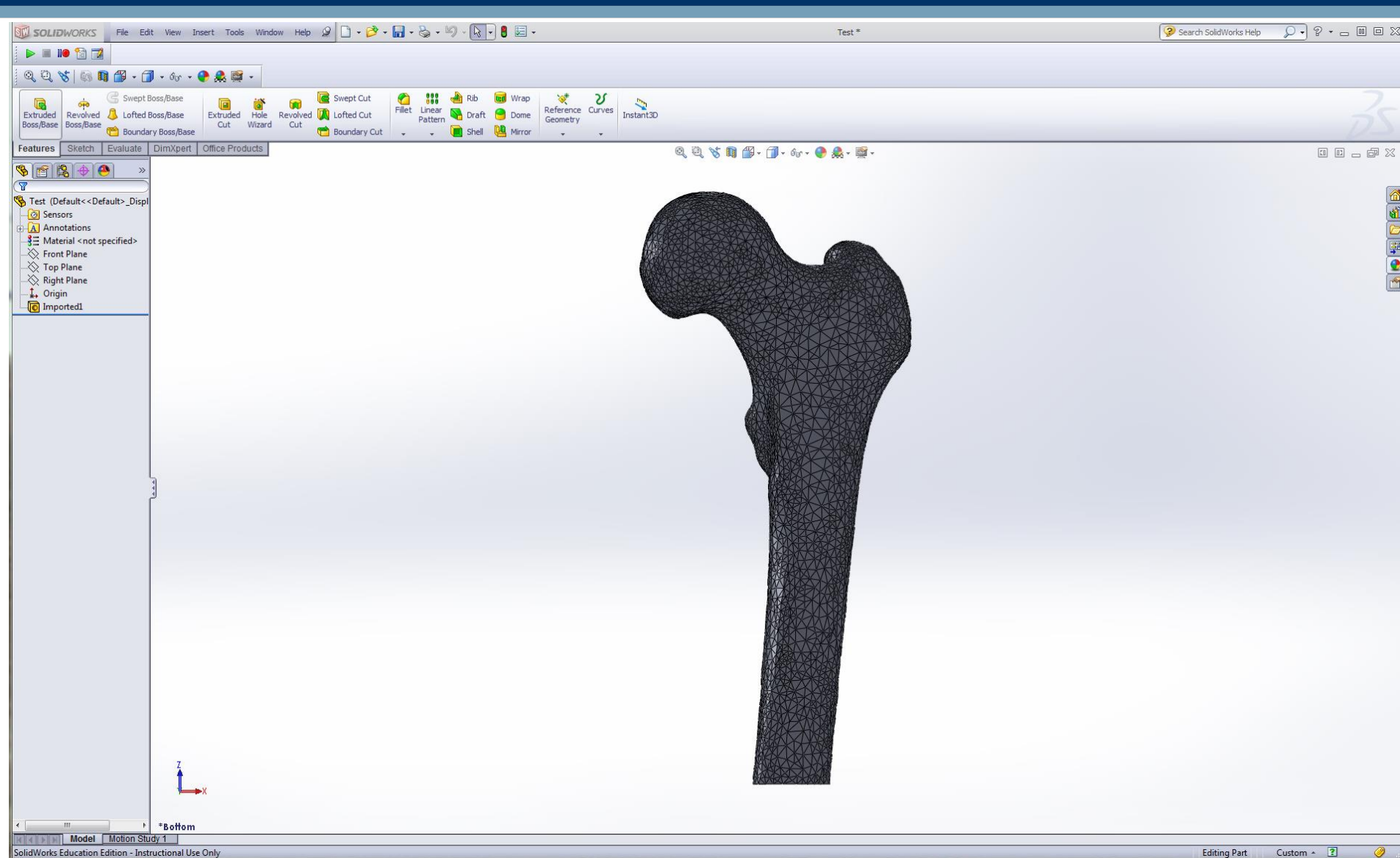


Open STL file in Solidworks

- Open Solidworks go to File → Open.
- Switch the file filter to STL and select the options tab.
- In the STL/VRML tab, configure file to import as a 'Solid Body'.
- Import the STL file.



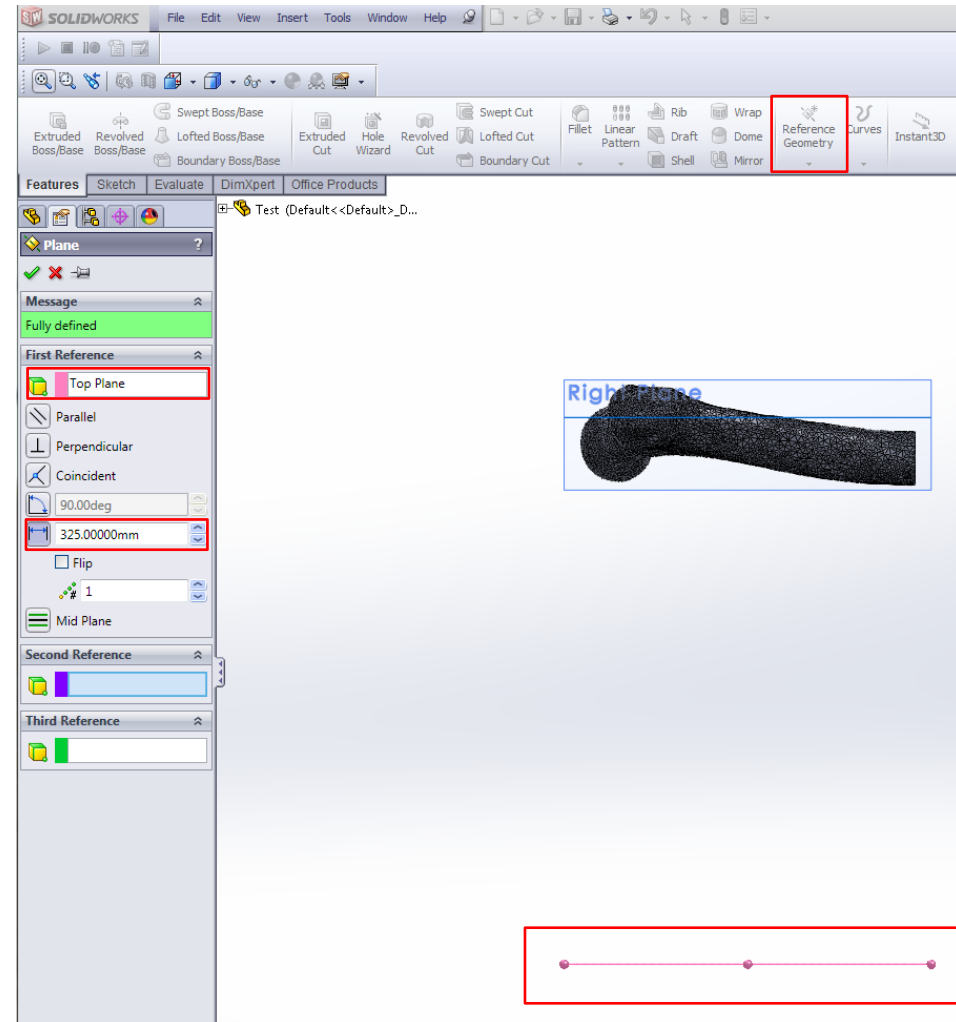
STL Import result



Step 6

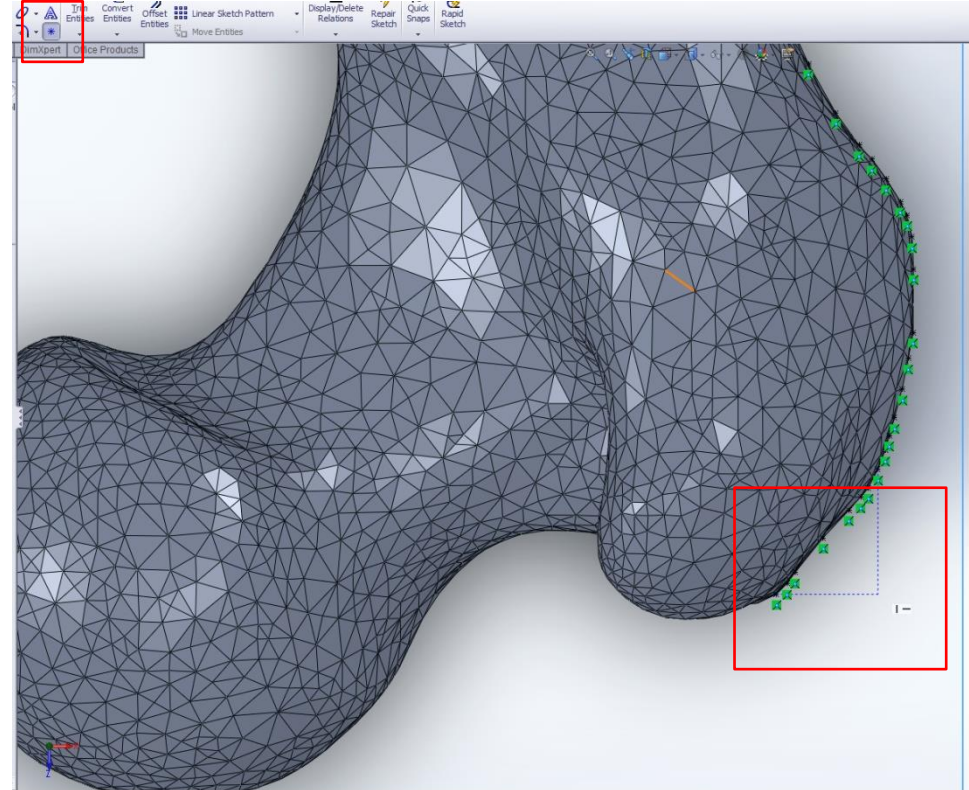
Create reference plane

- Set your view normal to the right plane.
- Select Reference Geometry → Plane.
- Select the 'Top Plane' and specify and projection displacement of 325.0 mm.
- This creates a reference plane approximately in the middle of the femur.



Create reference points

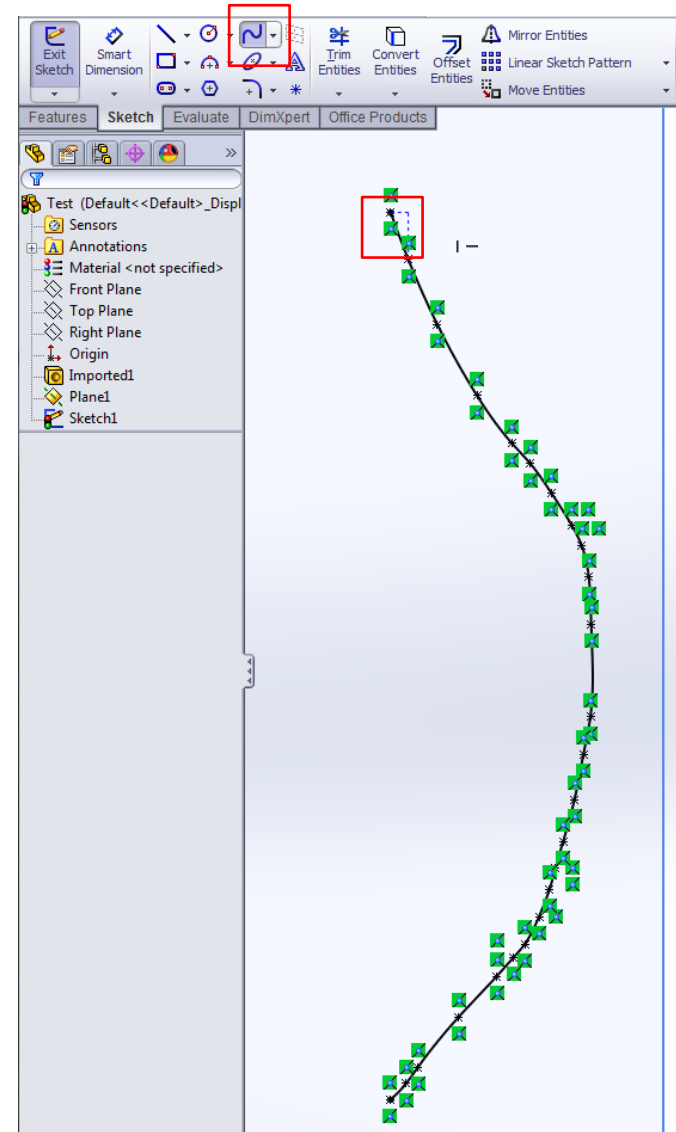
- Create a new sketch on the recently created plane.
- Select the point tool.
- Select points on the outer boundaries of the geometry where lines intersect to create nodes.
- Do this for the circular region on the hip-side of the model.



Step 8

Create a line

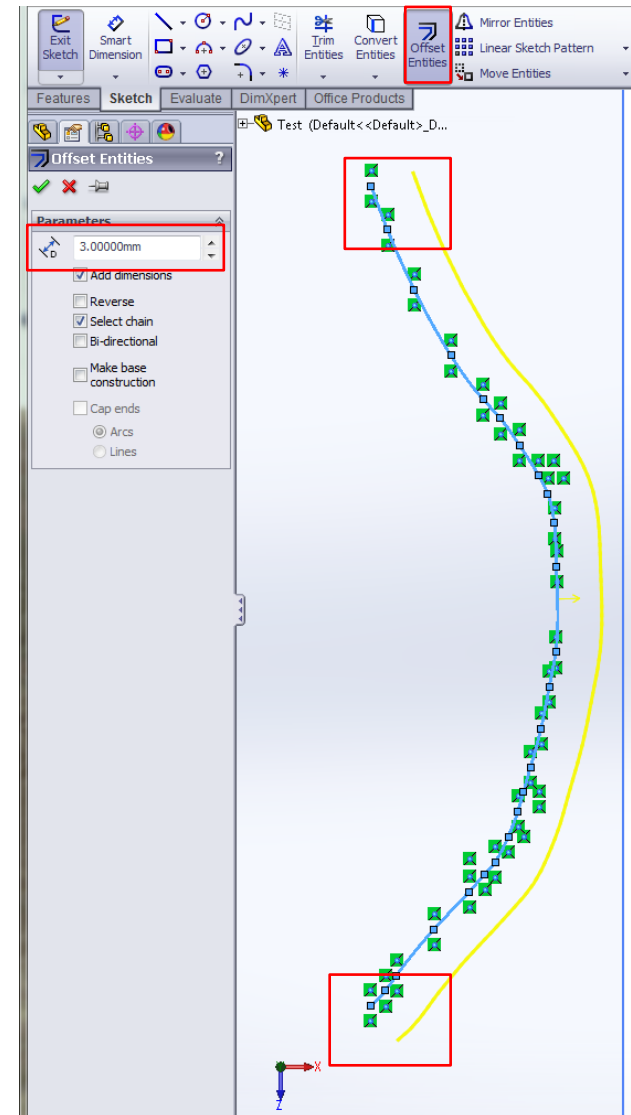
- Select the spline tool.
- From the bottom to the top, select each point, one-by-one, to join all the points together with a cubic spline.



Step 9

Create a closed volume

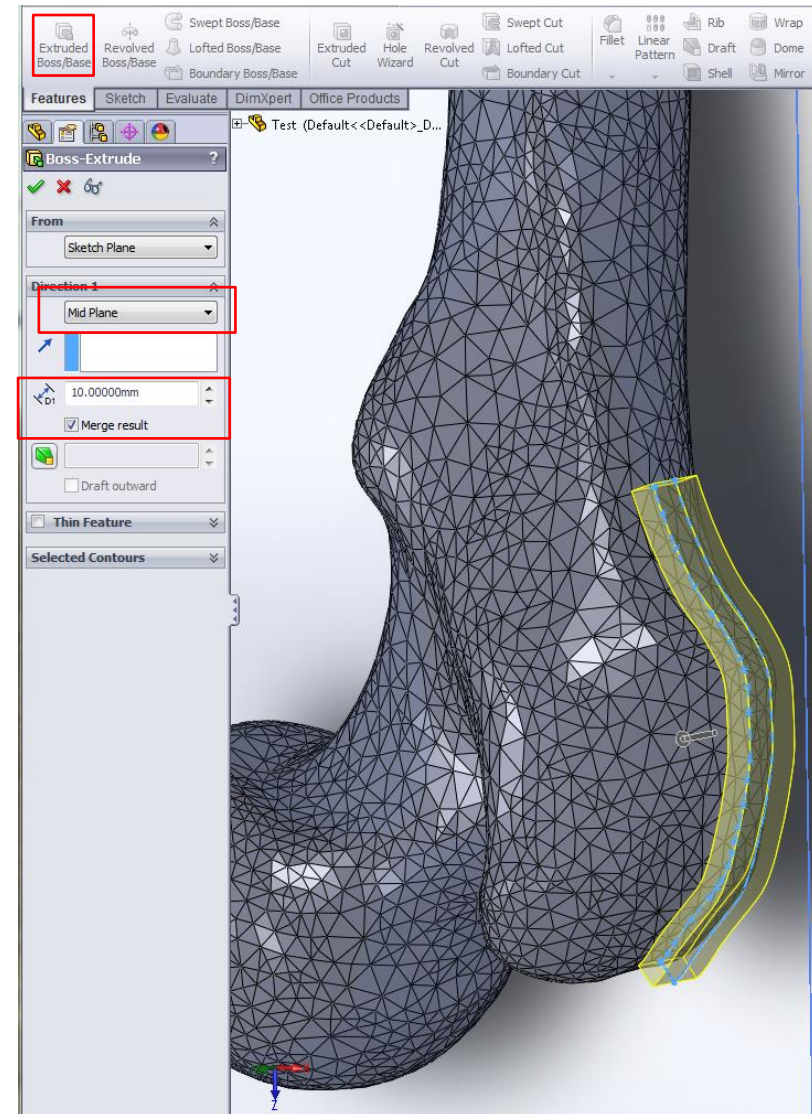
- Select the offset entities tool.
- Select the newly created line and ensure the projection direction is away from the Femur.
- Select a projection distance of 3mm and close off the sketch with connecting lines at the top and bottom of the sketch.



Step 10

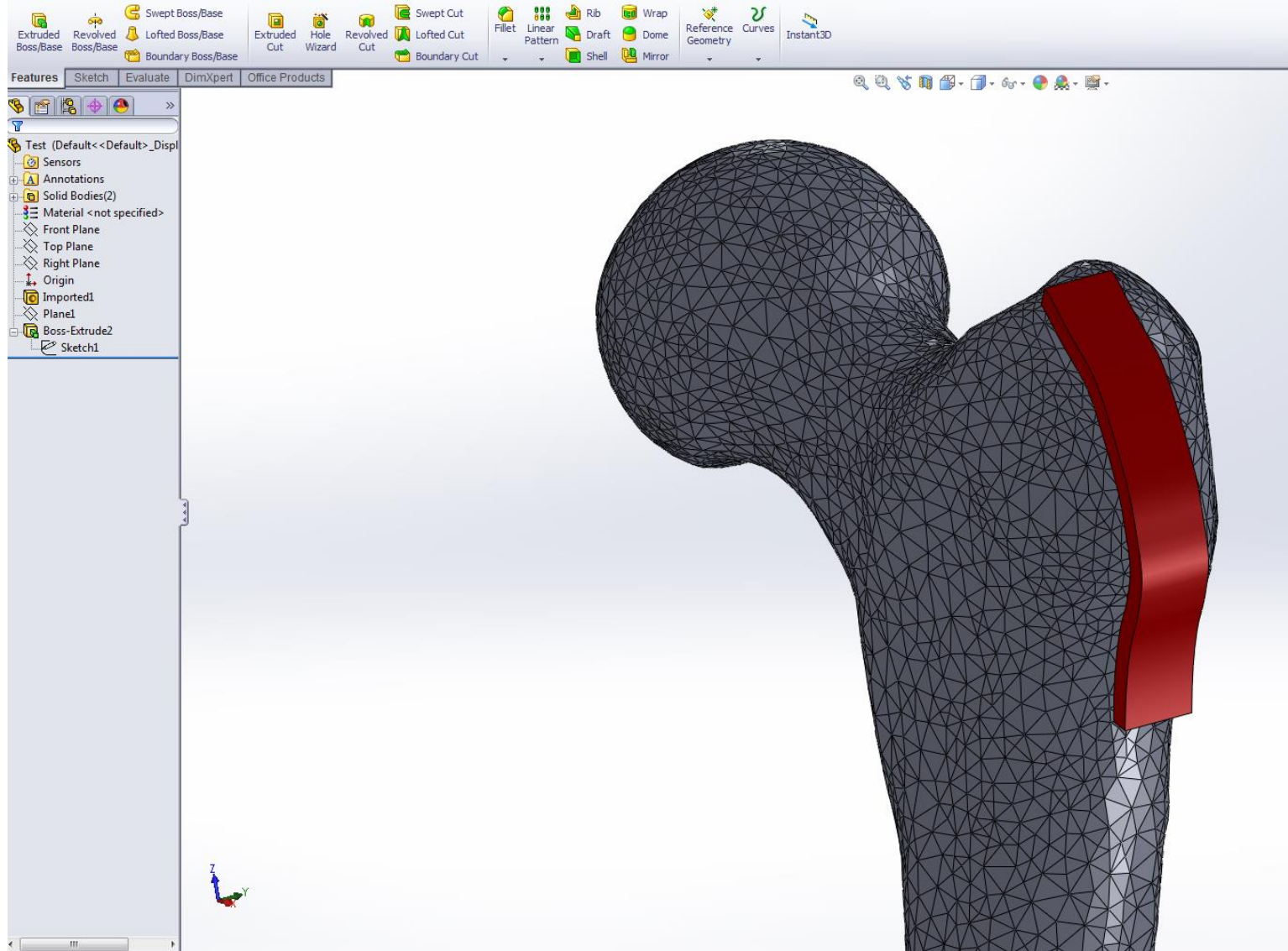
Extrude the profile

- Select the new sketch in the model tree and select 'Extruded Boss/Base'.
- Select the direction to "Mid Plane".
- Select the projection distance to 10mm and extrude the profile.





Final Result





Up for a challenge?

- Add chamfers to the orthopaedic part to improve ergonomics.
- Try to add holes in the middle of the part for screw supports.



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