Computational Modelling for Biomedical Imaging - Individual Report

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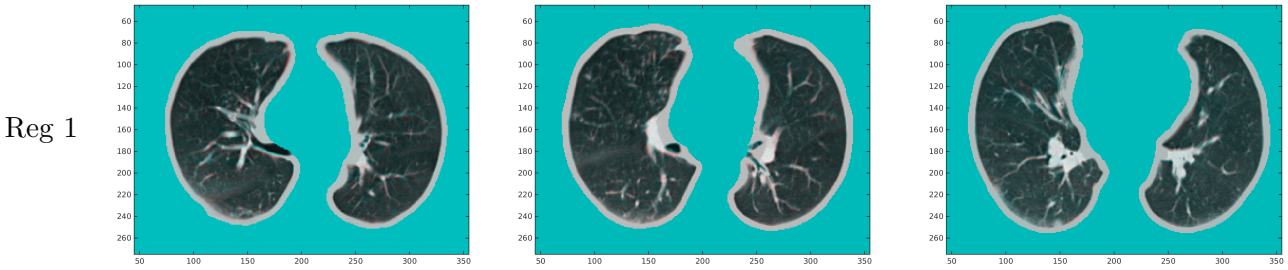
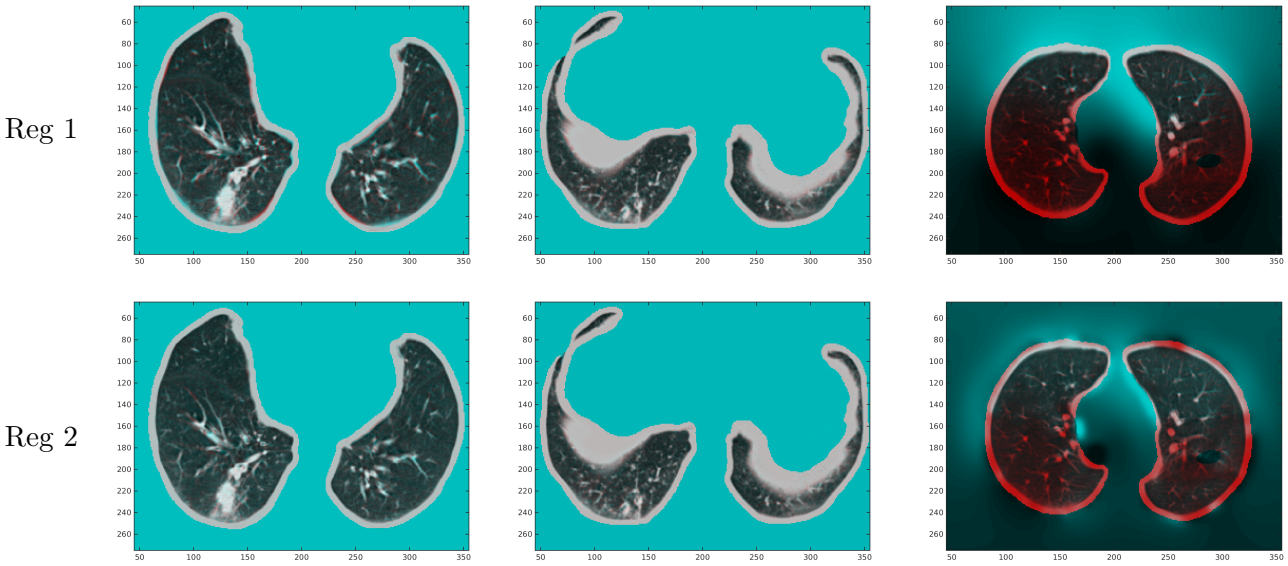
Task 1 - Visual assessment



(a) Couch 1, volume 1, slice 66 (b) Couch 2, volume 5, slice 60 (c) Couch 3, volume 2, slice 49

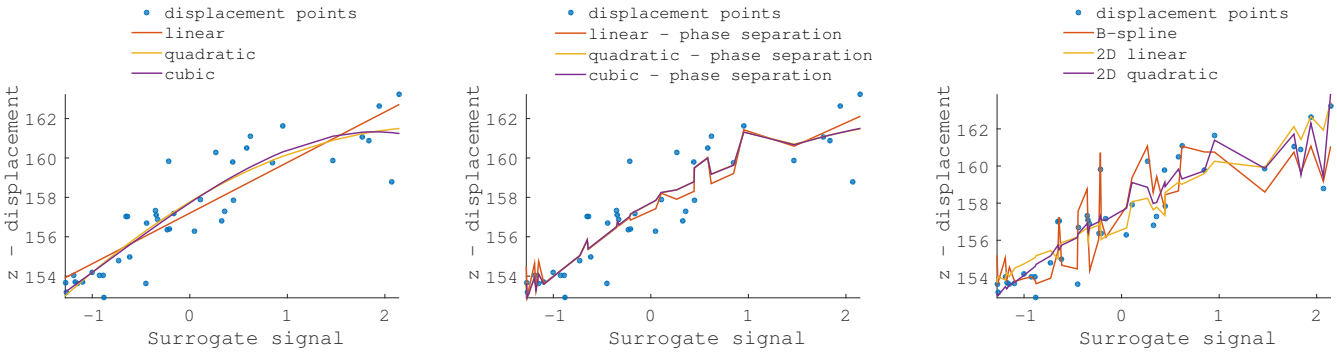


(d) Couch 4, volume 8, slice 37 (e) Couch 5, volume 4, slice 25 (f) Couch 1, volume 6, slice 76

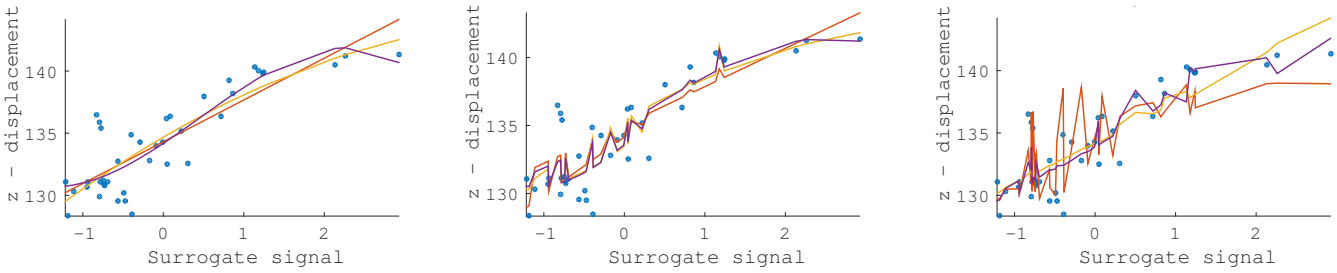
Figure 1: Registration results at several different slices and volumes for each couch position. For each subfigure, registration 1 and 2 are shown in the upper and lower figures respectively.

Figure 1 shows the registration results for a few representative slices and volumes over all couch positions. Both registrations perform equally well subfigures (1a - 1e), but yielded a bad registration in subfigure 1f. Similar bad registrations have been observed in the last slice of each volume. The images show us that there is a considerable ammount of respiratory motion across different slices which needs to be modelled. The shape of the lung is also dramatically different across different couch positions, reaching a concave shape at couch 5. Nevertheless, the segmentation and registration worked fine even for these slices.

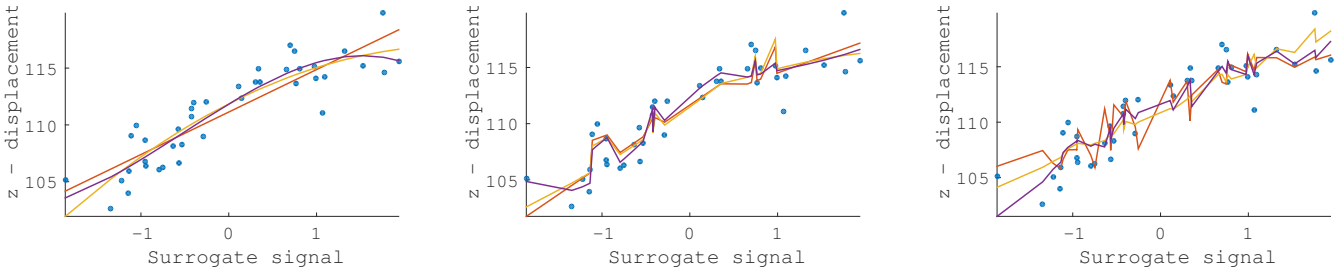
Task 2 & 3 - Fitting the models



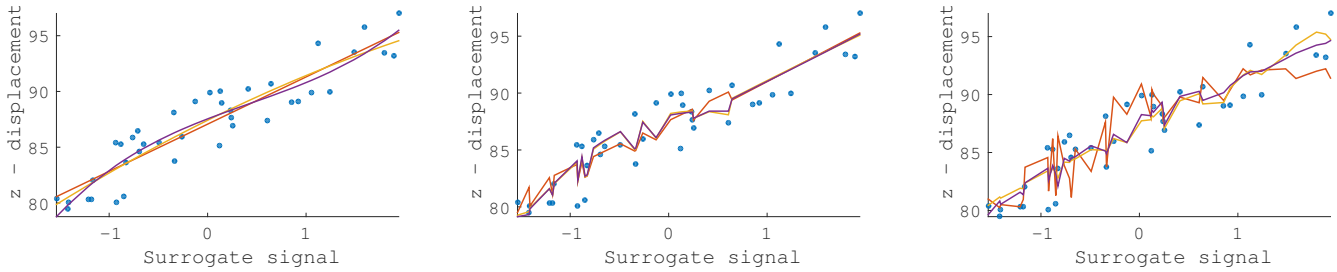
(a) Fit for couch position 1, voxel (30,40,33,1,3)



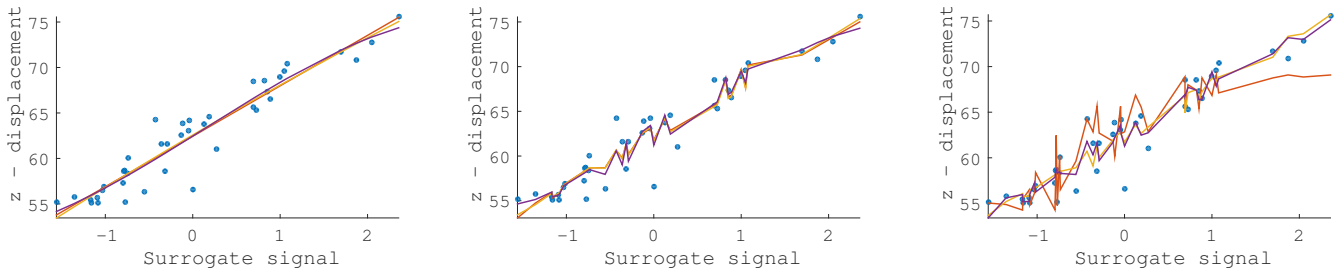
(b) Fit for couch position 2, voxel (30,40,28,1,3)



(c) Fit for couch position 3, voxel (30,40,23,1,3)



(d) Fit for couch position 4, voxel (30,45,18,1,3)



(e) Fit for couch position 5, voxel (30,45,13,1,3)

Figure 2: Fit of 9 different models across 5 voxels each from a different couch position. The first column shows the fit for the three basic models: linear, quadratic and cubic. The second column shows the same models with phase separation, while the last column shows the fit for the B-spline, 2D linear and 2D quadratic models.

Figure 2 shows the fit for 9 different models:

1. linear
2. quadratic
3. cubic
4. linear - phase separation
5. quadratic - phase separation
6. cubic - phase separation
7. B-spline
8. 2D linear
9. 2D quadratic

Task 4 - Motion evaluation

Task 5 - Parameter uncertainty

Advanced tasks