

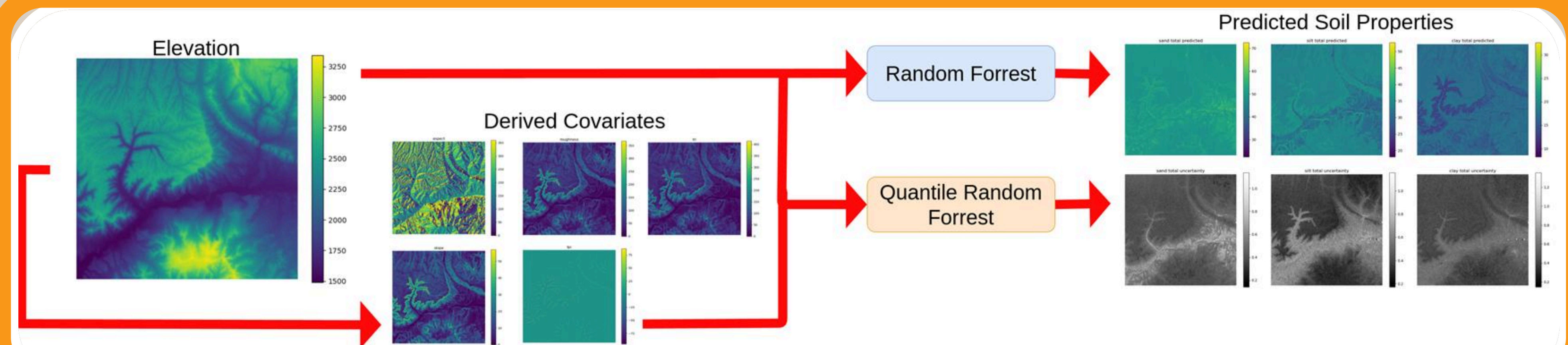
SOILAI

Generating Soilscapes with Random Forests

* BACKGROUND

Soils support plant life and form an important aspect of ecological biodiversity. Soil data is used in computational ecological simulations, soil erosion simulations or for terrain texturing. However, appropriate soil data is often hard to find, of too low a resolution or unsuitable.

We sought to develop a means of generating soil data given *only* a digital elevation map. The generated soil data was required to plausibly belong to the terrain described by the elevation map and be of the same resolution as the provided elevation map. Such a mechanism would enable researchers easily incorporate soil data into their own work.

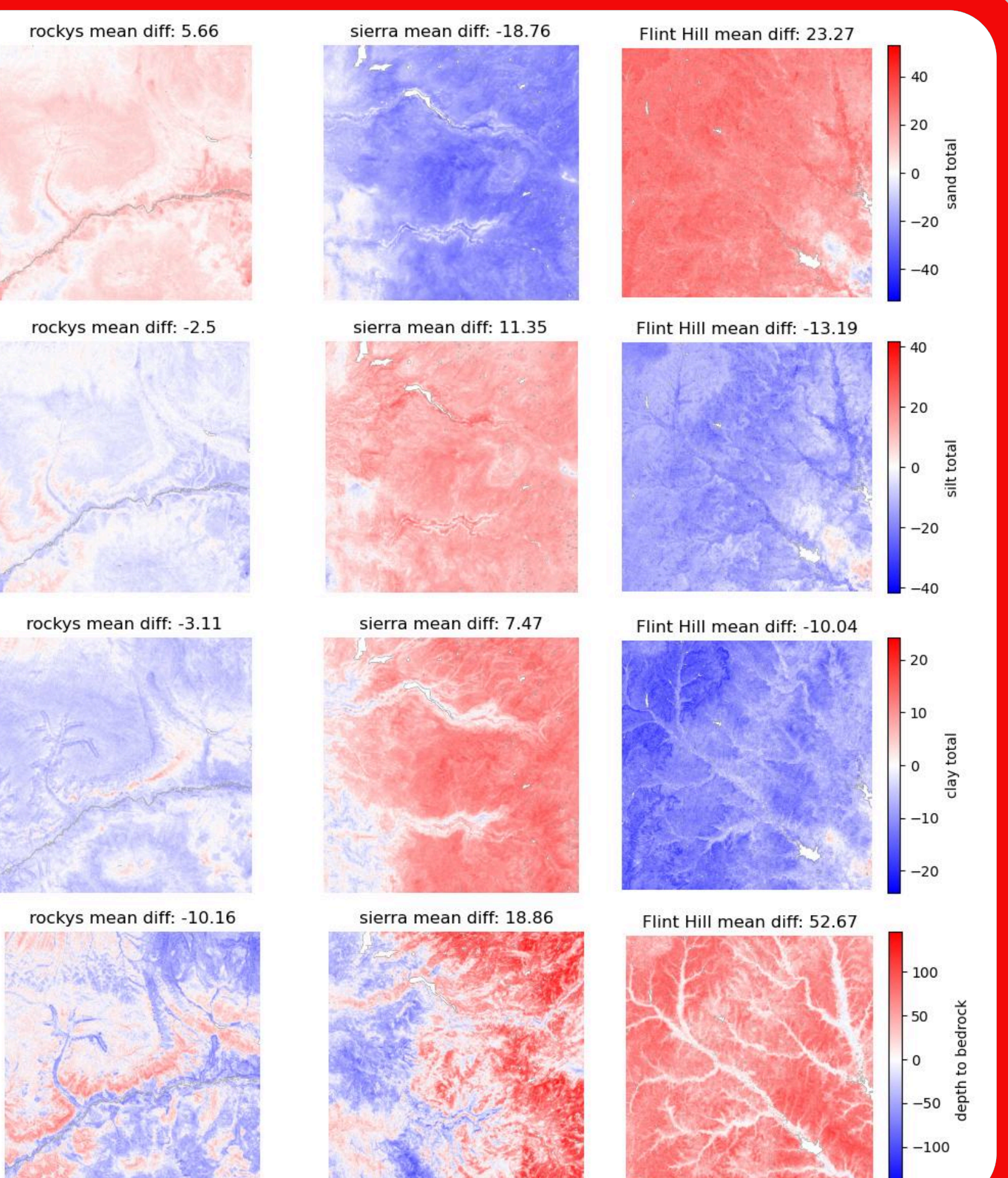


* METHODS

We choose to employ Random Forrest (RF) models to predict soil properties based on the provided elevation map. The RF models were fitted on the USGS SOLUS100 soil property dataset for the continental United States. The SOLUS100 rasters were sparsely sampled at 1,454,855 sample points to form our training set.

In order to supplement elevation data, we also generated a series of derived covariate rasters based on the elevation map that are jointly sampled with the SOLUS rasters. These rasters include slope, aspect, terrain roughness, etc.

Additionally we made use of Quantile-RF models to produce uncertainty rasters, that convey the confidence of the RF model's predicted rasters.



* RESULTS

Model performance was evaluated on a series of three real world elevation maps, from the **Colorado Rockies**, the **Nevada Sierras** and **Kansas Flint Hills**. We compared how well the RF models were able to reconstruct soil property rasters.

Plotted above is the difference between the predicted raster and the actual values from SOLUS100. The RF models generally performed better on elevations maps with large changes in elevation but struggled on flatter terrains. Each of the above 512x512 soil property rasters were generated in ~3s.



Members

Joshua Britz
BRTJOS005@gmail.com

Supervisor & Co-Supervisor

Professor James Gain
james.gain@uct.ac.za

A. Professor Patrick Marais
patrick.marais@uct.ac.za

Special Thanks

Dr. Stefan van der Westhuizen
stephanvdw@sun.ac.za

A. Professor Catherin Clarke
cdowding@sun.ac.za

