Project Workflow

LiDAR Data (Scottish Remote Sensing Portal)

Building Modelling

Tree Modelling

Point Cloud Classification (K-mean, PCA)

Building Point Cloud cleaning (Euclidean Cluster Segmentation)

Tree Point Cloud Cleaning (Euclidean Cluster Segmentation)

Generate DSM, DTM, and Building Height layer (by DSM – DTM)

Extract Building Footprints and Rooftop Sub-Footprints

Extrude Building Models

Tree Segmentation with lidR Package

Generate Tree Height Layer by DSM - DTM

Extrude Tree Models

Building and Tree Models Combined

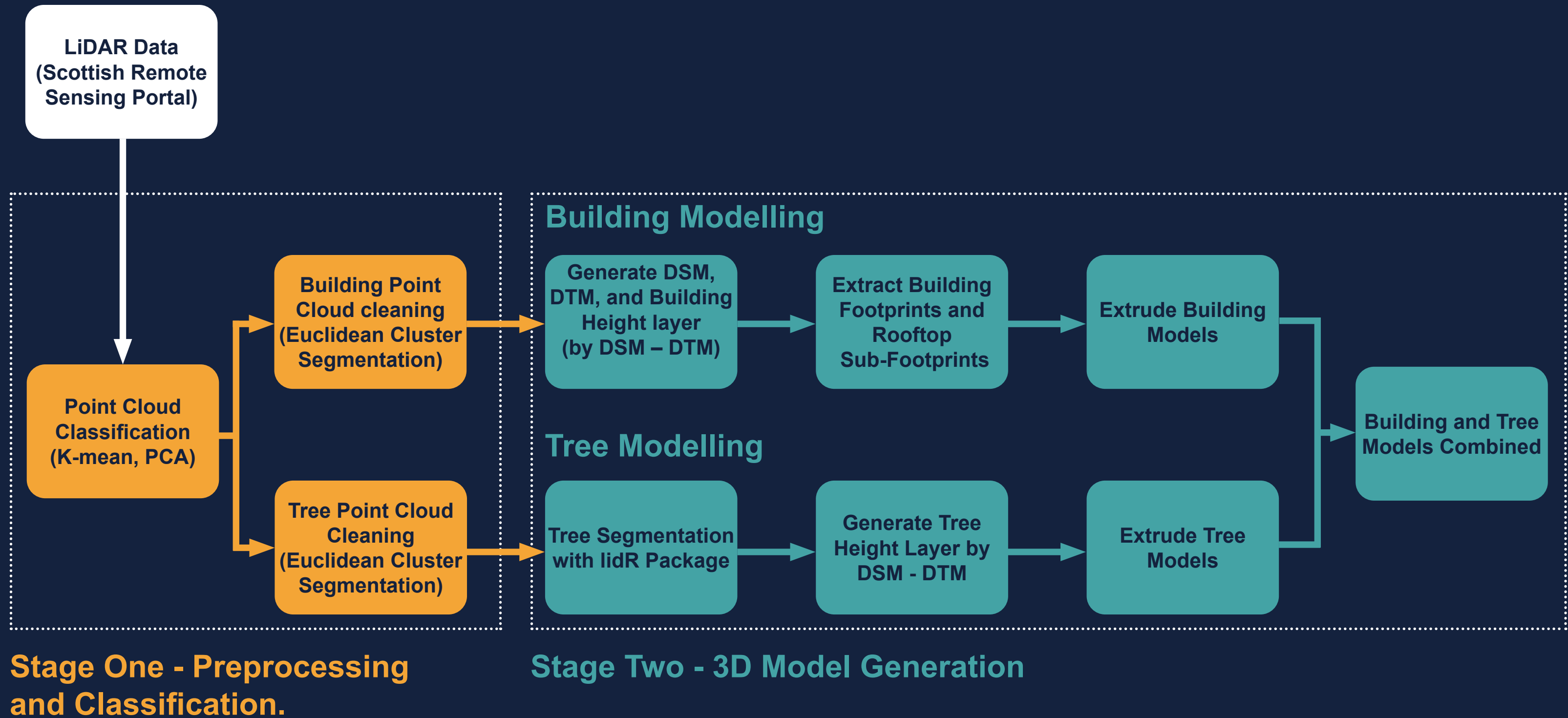**Stage One - Preprocessing and Classification.**

Stage Two - 3D Model Generation

Stage One - Point Cloud Error Checking

Achieved with plas.io

Buchanan Galleries

Glasgow Central Station
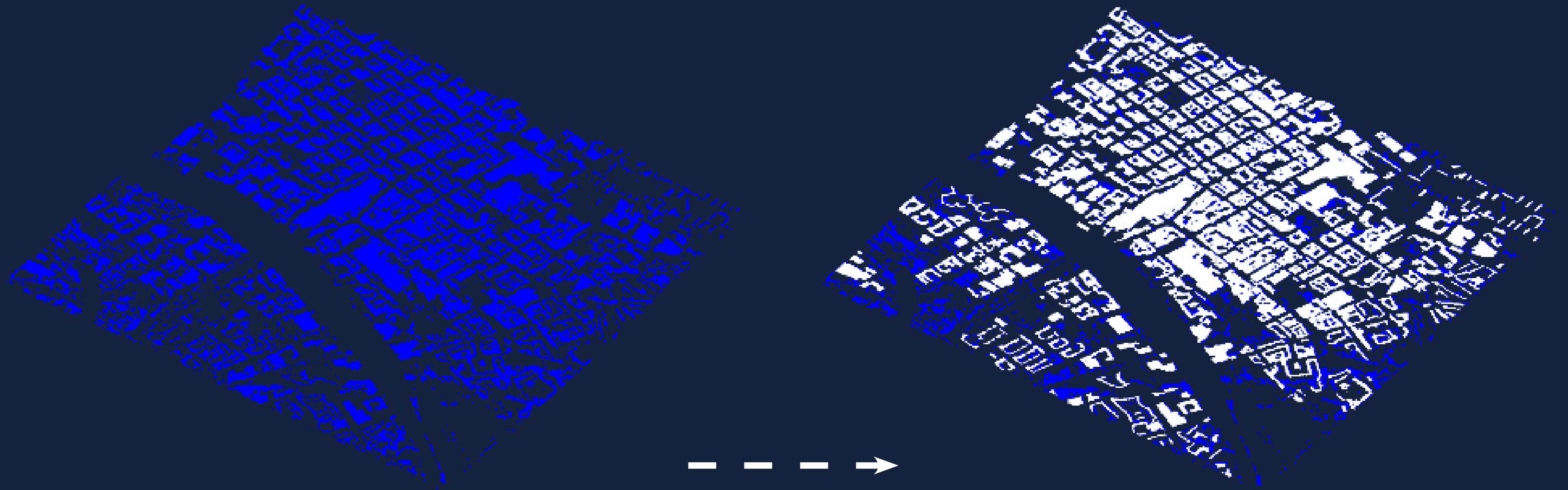
Trongate Shopping Centre
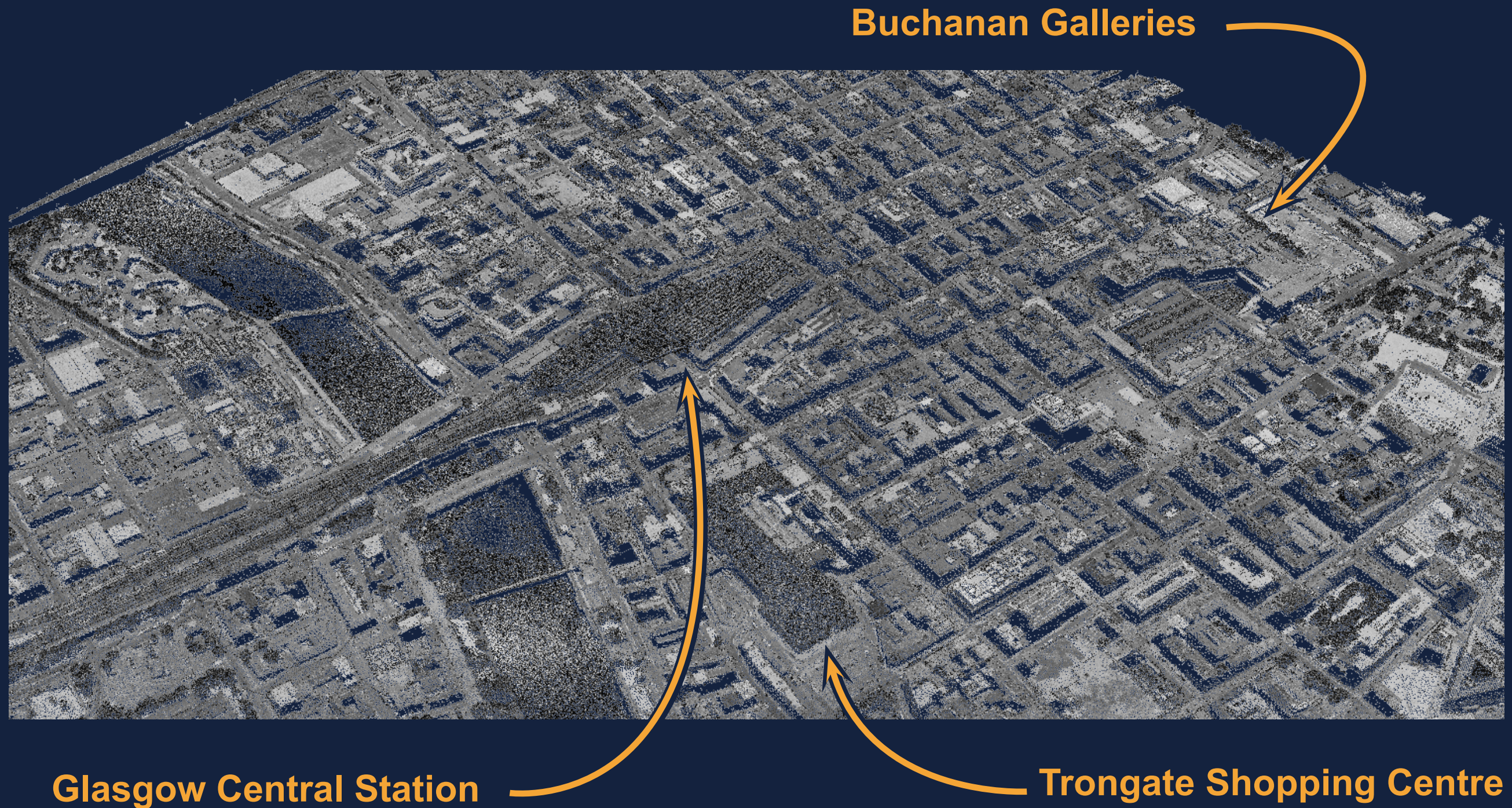
Stage One - Data Classification - Unsupervised K Means Analysis

Achieved with Sklearn

Buildings
Ground
Trees
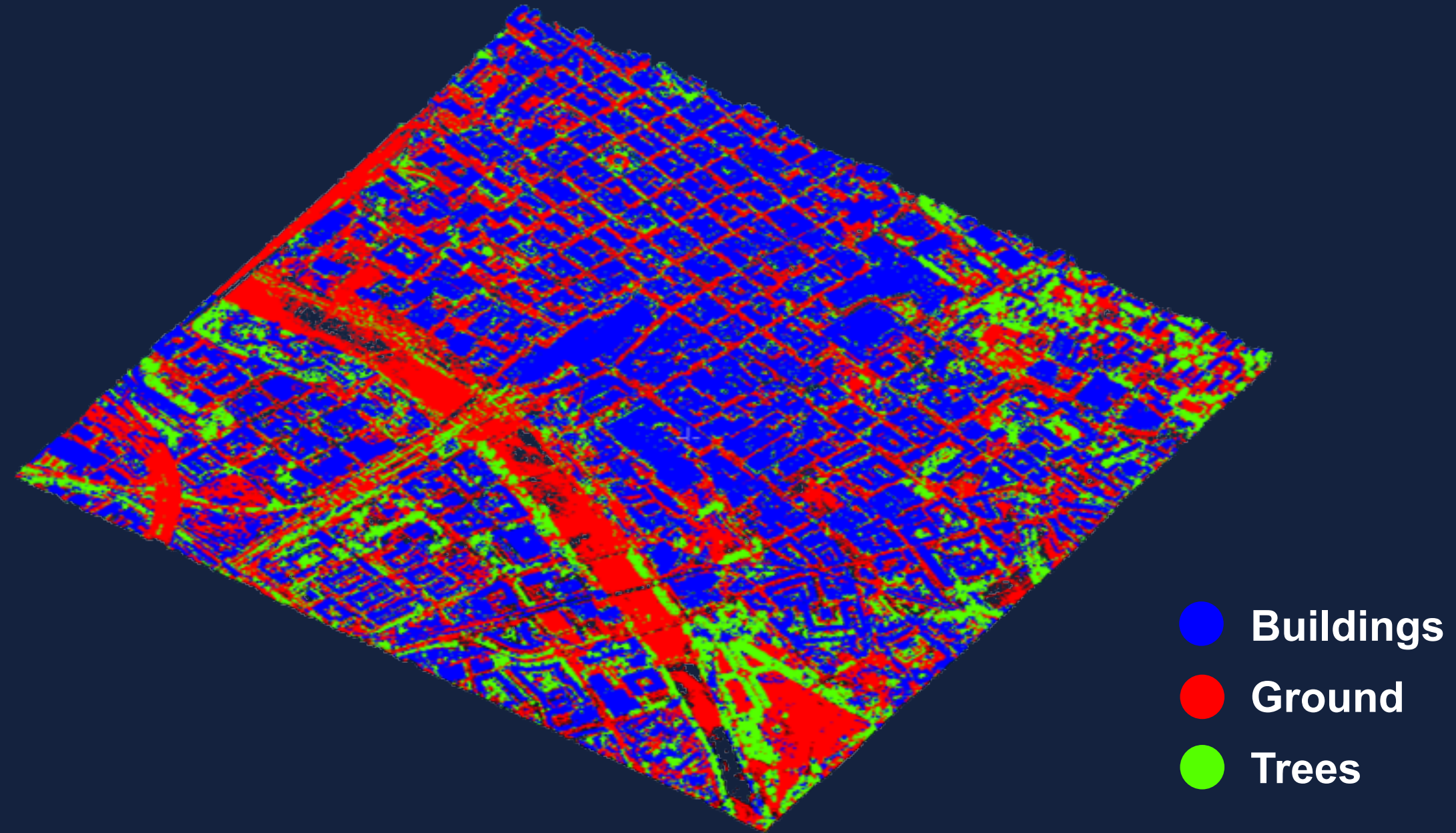
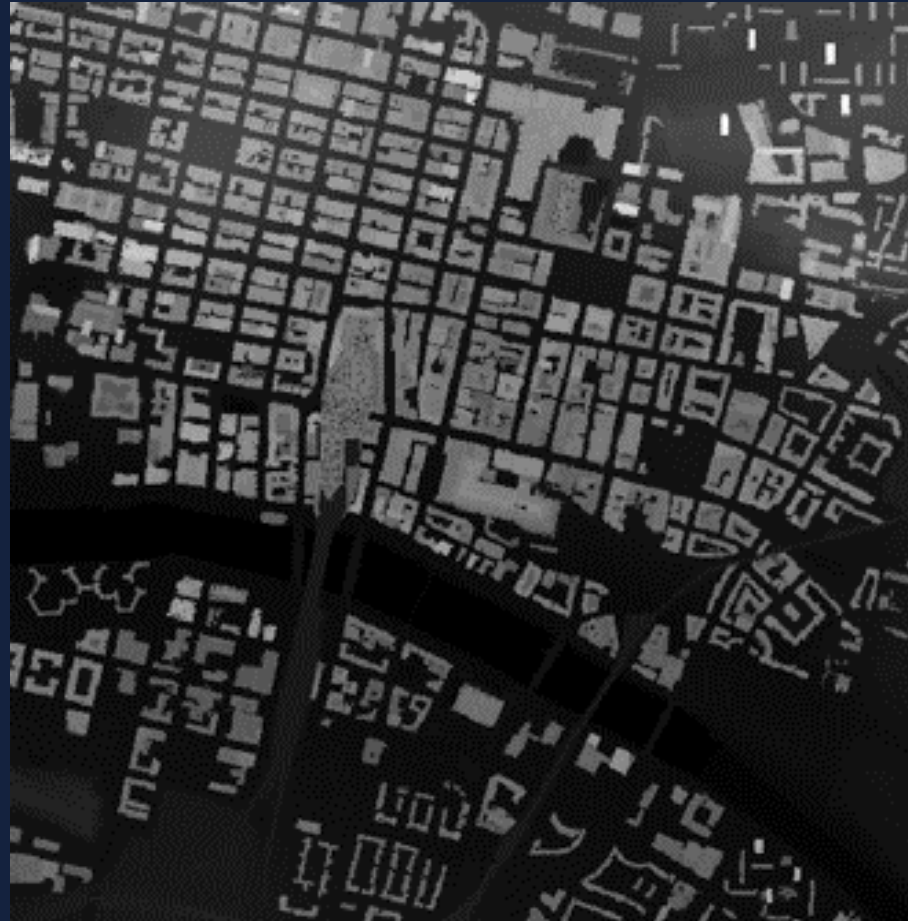# Stage One - Point Cloud Clean - Euclidean cluster segmentation

Achieved with PCL with C++

Building point noise is removed, leaving just the white areas.

Stage Two - DTM and DSM Generation
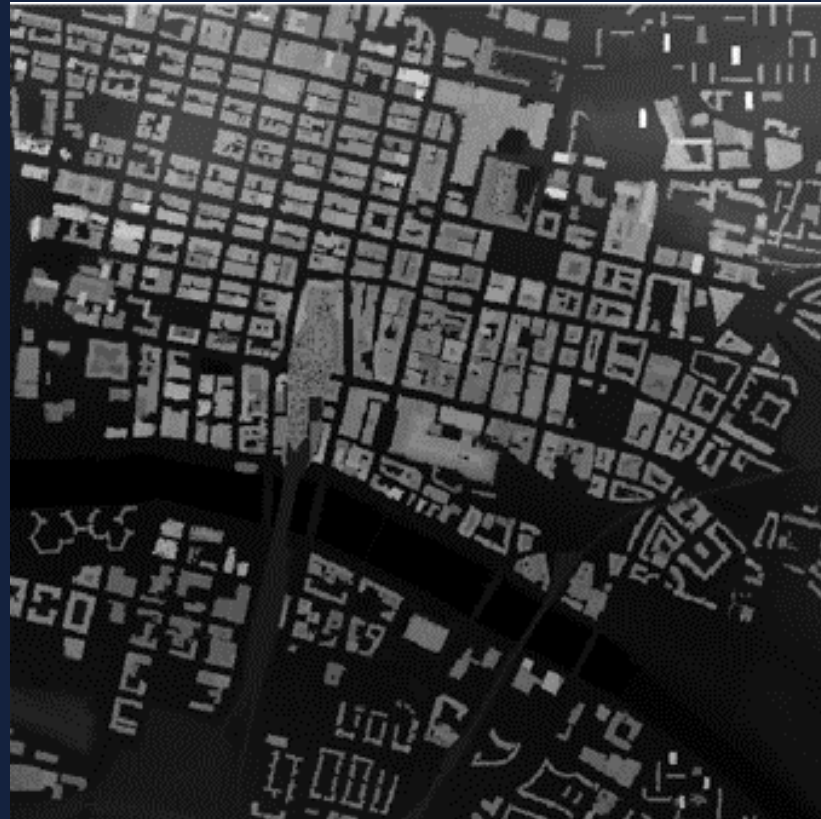
Achieved with CloudCompare.

Digital Terrain Model (DTM)

Digital Surface Model (DSM)

Stage Two - Footprint Extraction

Achieved with QGIS.

Digital Surface Model (DSM)   **Footprint Raster**   **Footprint Polygon**
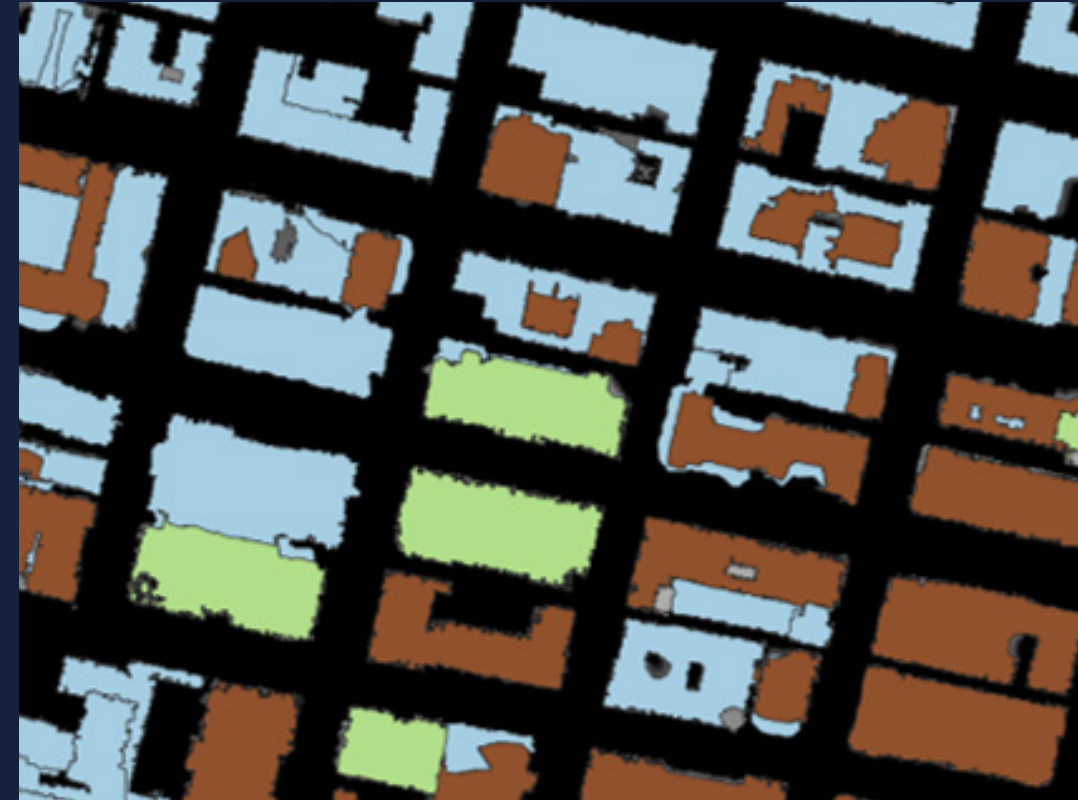
Raster Calculator   **Polygonize & Simplify**

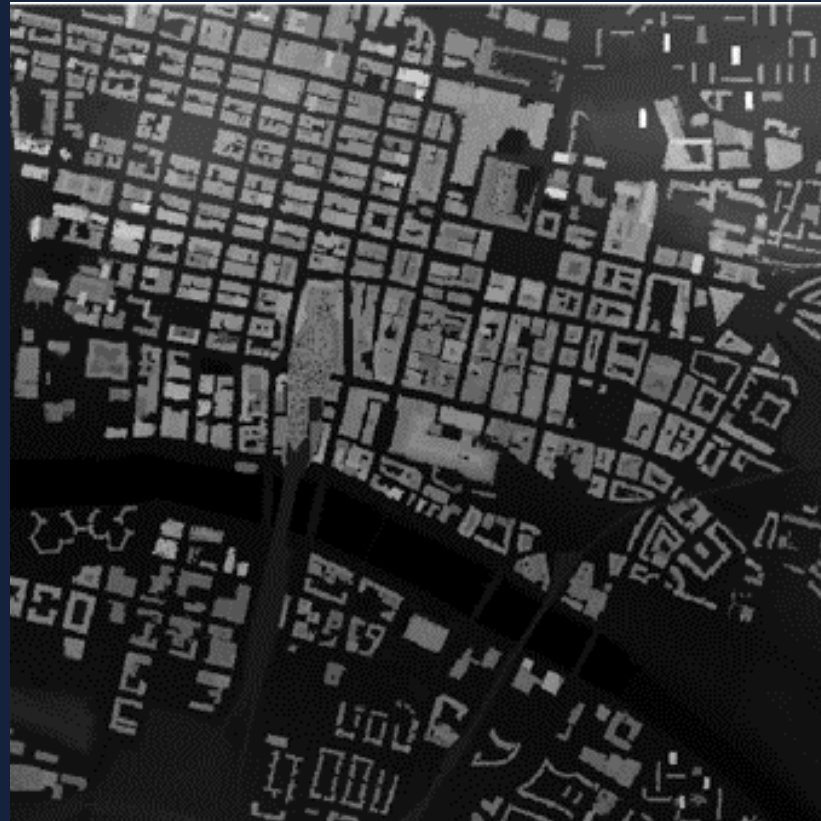# Stage Two - Sub-Footprint Extraction

Achieved with QGIS.

Roofs with multiple heights

Extracted sub-footprints
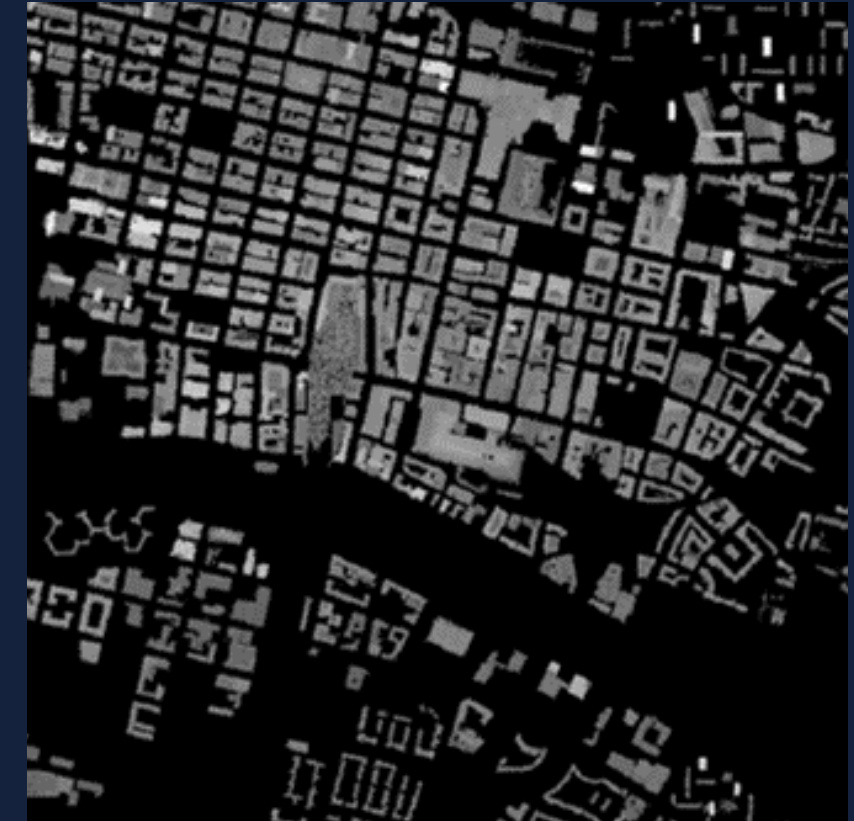
Stage Two - Building Height Calculation

Achieved with QGIS.

Digital Surface Model (DSM)

Digital Terrain Model (DTM)
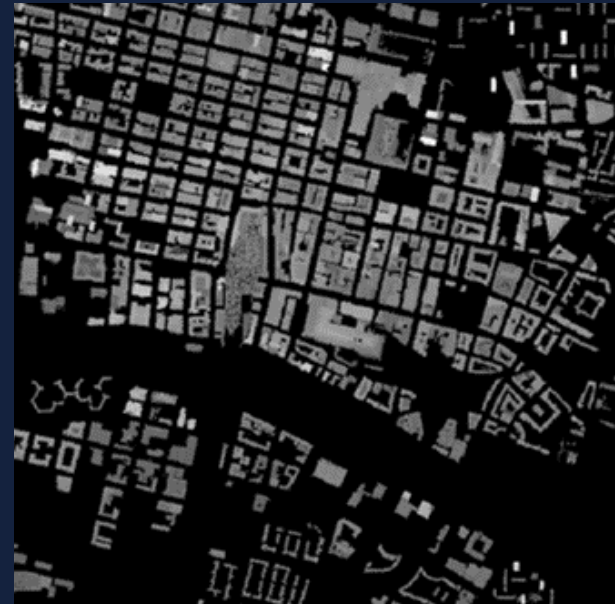

Building Height Layer

Subtracted from

Gives us:

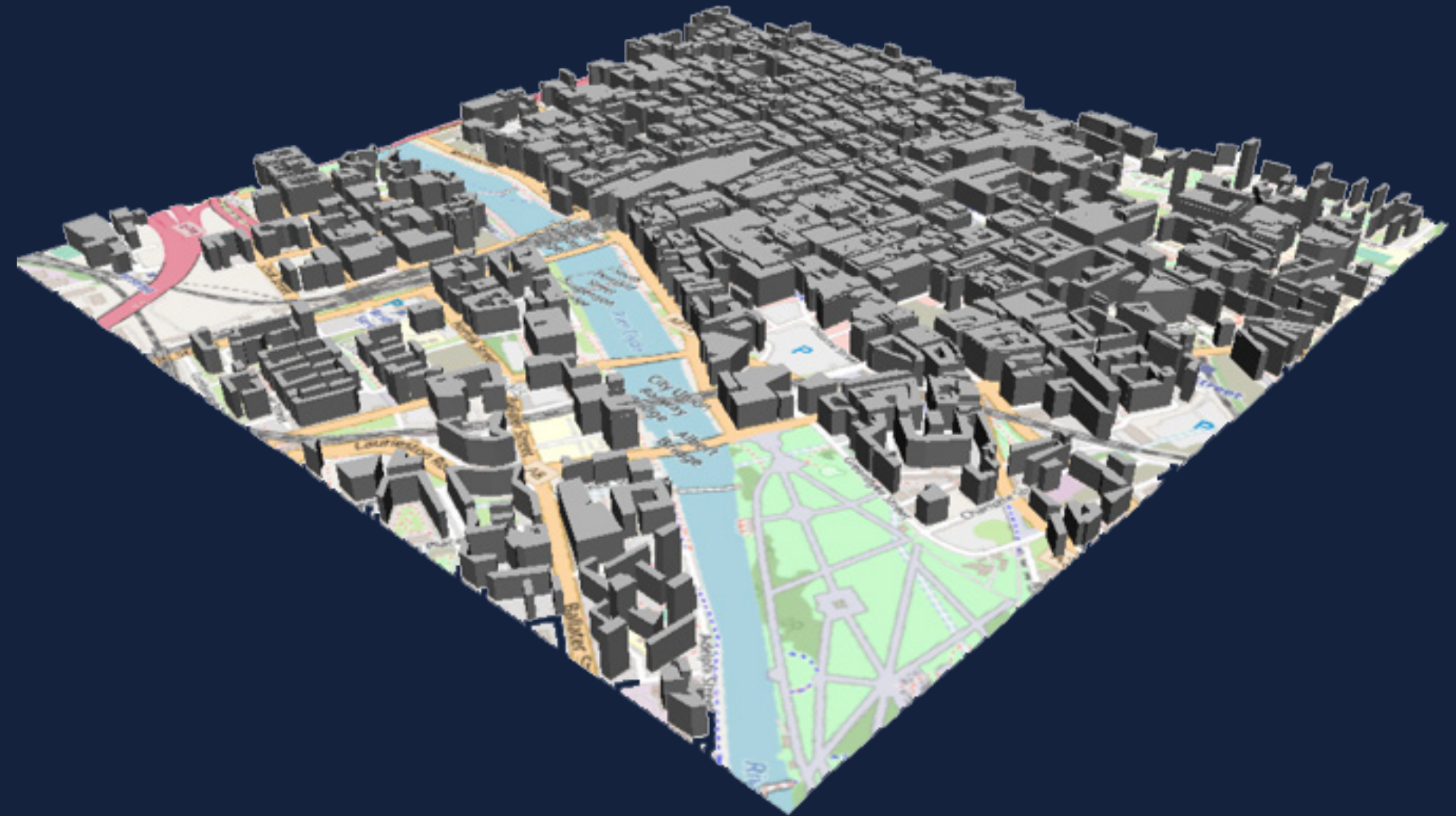**Stage Two - Building Extrusion**

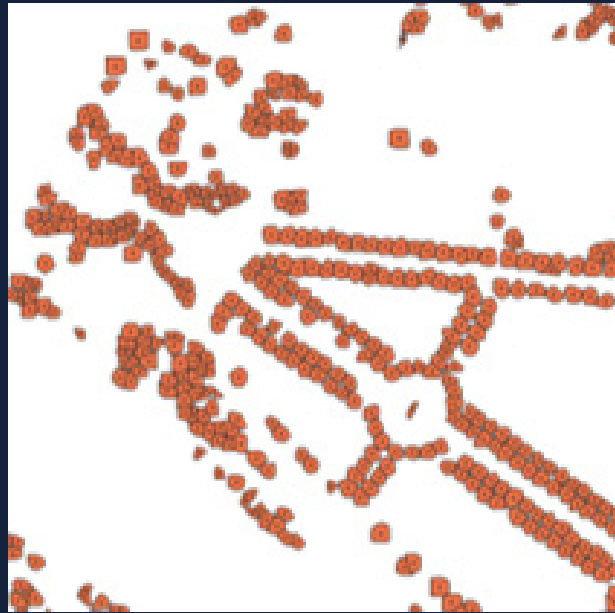Achieved with QGIS.

Building Footprints

Building Height Layer

Zonal Statistics & Extrusion

LOD1 Building Model
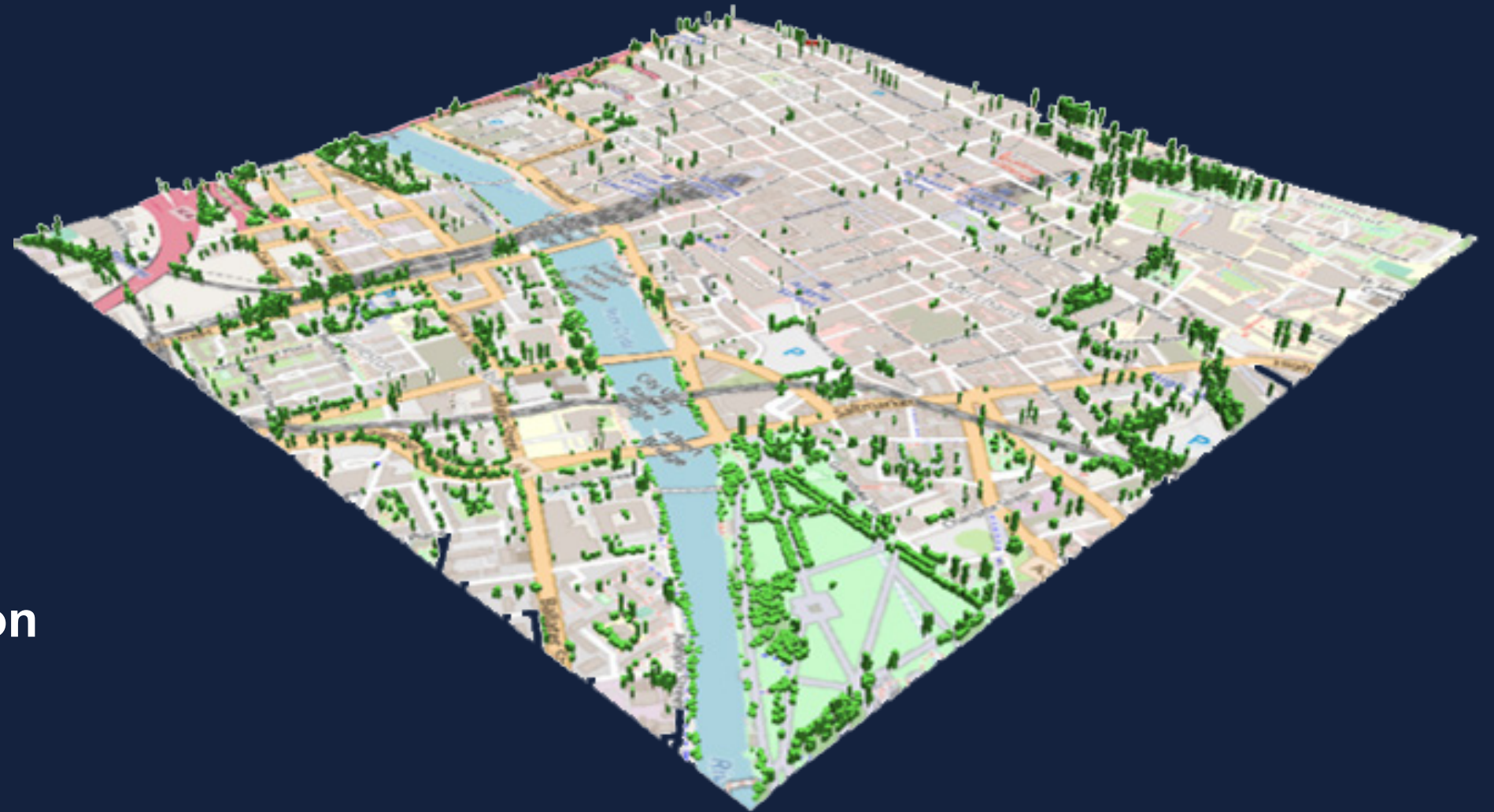
Stage Two - Tree Modelling

Achieved with R and QGIS.

Tree Segmentation by lidR Package

Tree Height Identification by DSM & DTM

3D Tree Model

Final 3D Model with Trees and LOD1.5 Buildings

Glasgow Central Station

Buchanen Galleries

Glasgow Sheriff Court

Glasgow Green