Ground Detection

April 10, 2019

Ecole des Mines Fontainebleau

$2n \times 2n \times 32$

$F_{\text{size}} = (3, 3)$

$n \times n \times 512$

$F_{\text{size}} = (1, 1)$

$n \times n \times 32$
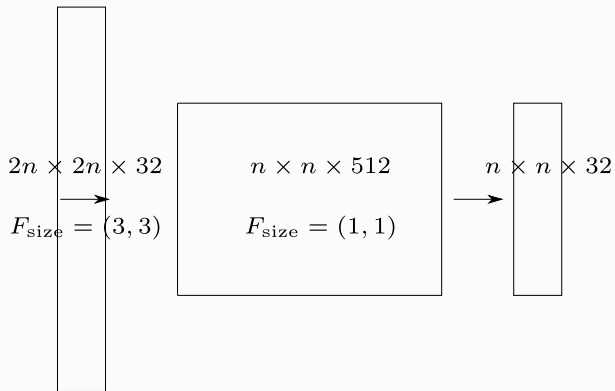
Classes

- Unlabeled
- man-made terrain
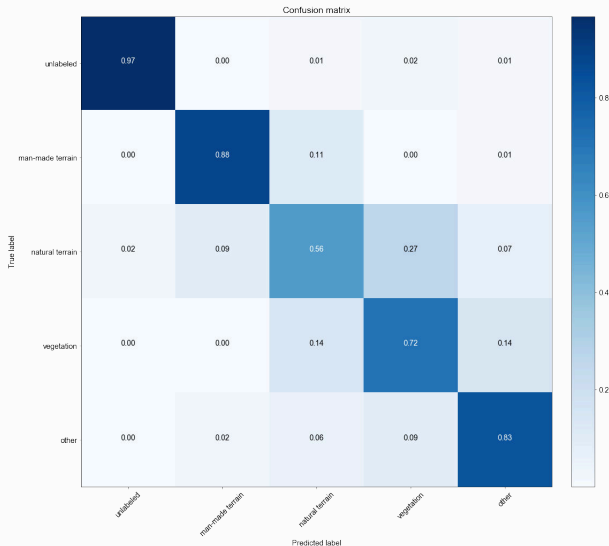- natural terrain
- vegetation
- other

Distribution of classes
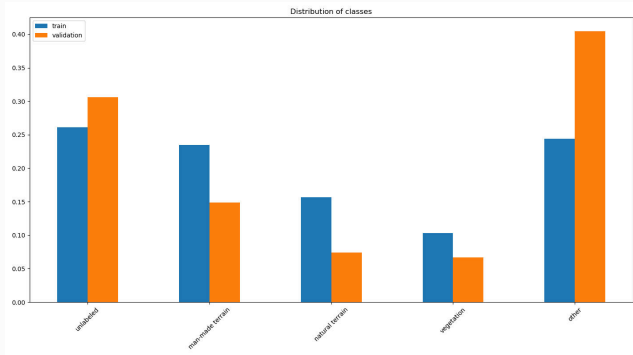
Features Tested

1. Normal
2. Normal + z
3. Normal + z + refl

Errors

1. 27% of "natural terrain" is classified as "vegetation"

2. 14% of "vegetation" is classified as "natural terrain"

3. 14% of "vegetation" is classified as "other (buildings)"

4. 11% of "man-made terrain" is classified as "natural terrain"

Confusion matrix

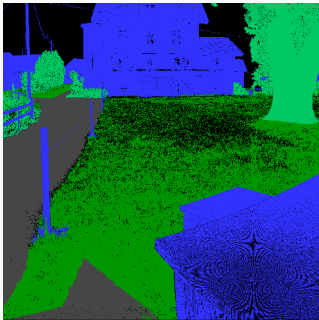**Natural terrain classified as vegetation: Example 22**
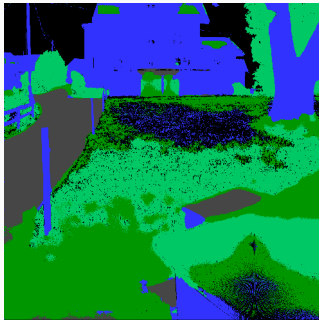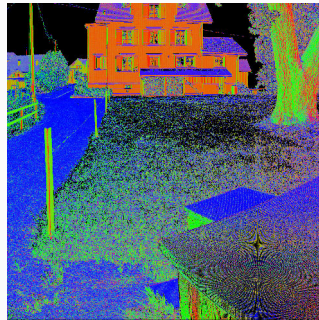

Figure 1: Ground Truth

Figure 2: Prediction

Figure 3: Normals

Vegetation classified as natural terrain: Example 12
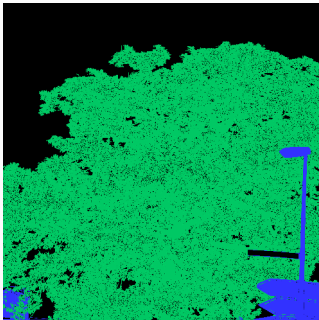

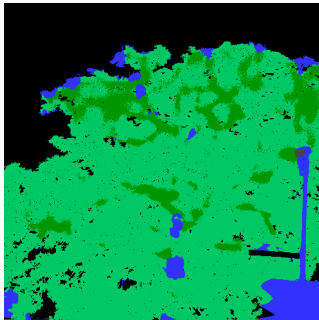**Figure 4:** Ground Truth

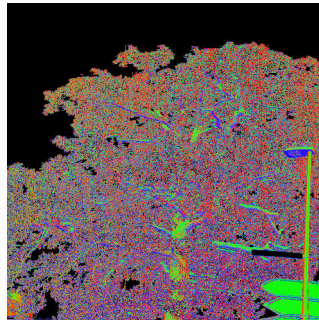**Figure 5:** Prediction

Figure 6: Normals

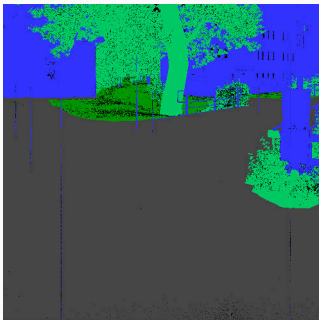**Vegetation classified as other: Example 21**

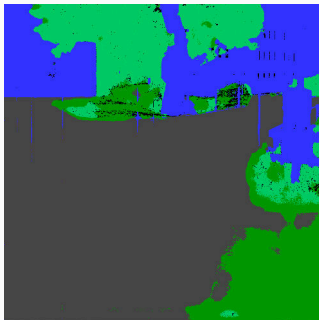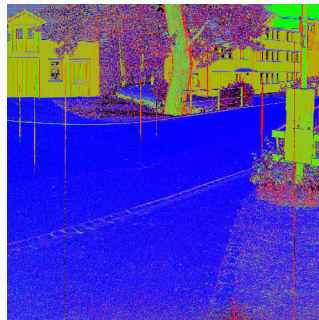**Figure 7:** Ground Truth

Figure 8: Prediction

Figure 9: Normals

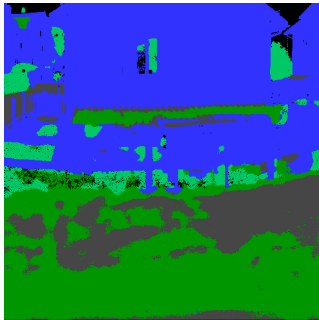**Man made terrain as natural terrain: Example 0**
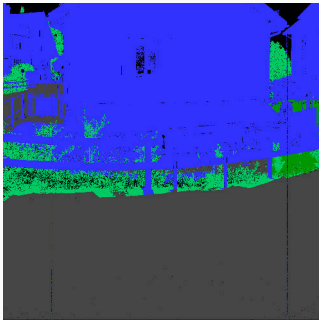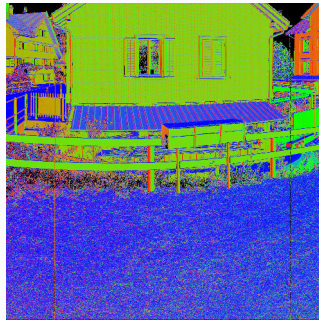

Figure 10: Ground Truth

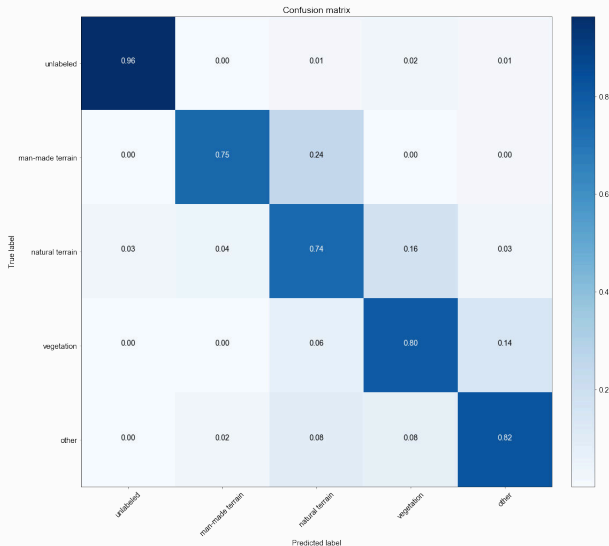**Figure 11:** Prediction

Figure 12: Normals

Errors

1. 24% of "man-made terrain" is classified as "natural terrain"

2. 16% of "natural terrain" is classified as "vegetation"

3. 14% of "vegetation" is classified as "other (buildings)"
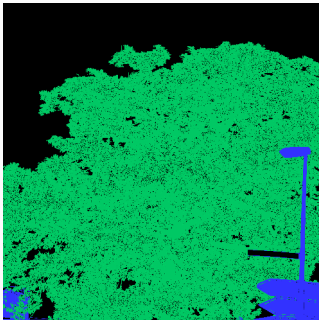

Confusion matrix

Comparing Prediction
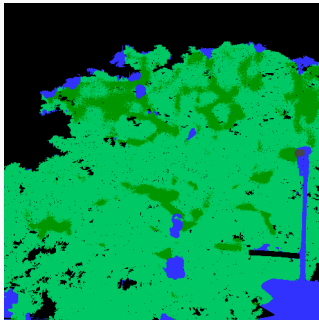

Figure 13: Ground Truth

Figure 14: Prediction using Normals

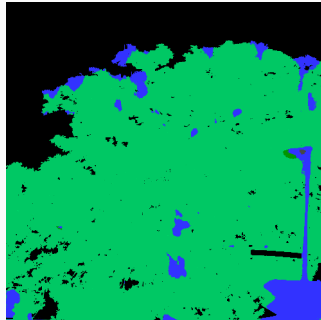**Figure 15:** Prediction using Normals + z
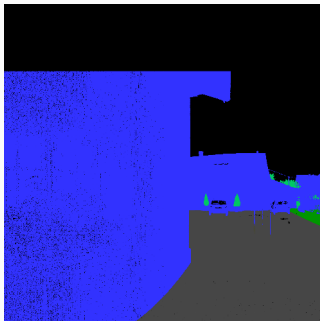
Comparing Prediction

Figure 16: Ground Truth

Figure 17: Prediction using Normals
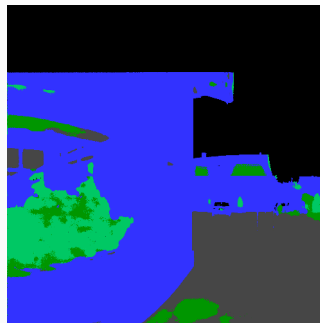
Figure 18: Prediction suing Normals + z
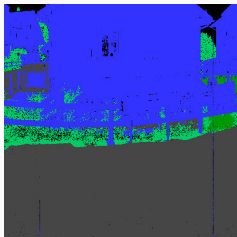
Man made terrain as natural terrain: Example 0

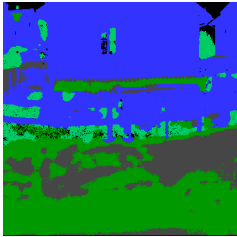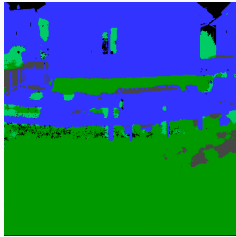**Figure 19:** Ground Truth

Figure 20: Prediction using normals

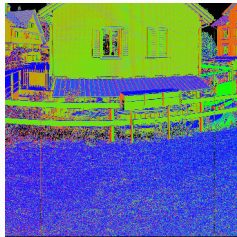**Figure 21:** Prediction using normals + z

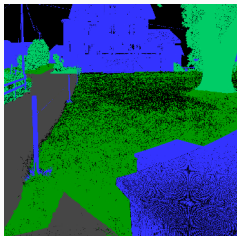**Figure 22:** Normals

Natural terrain as vegetation: Example 22

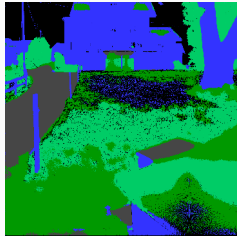**Figure 23:** Ground Truth

Figure 24: Prediction using normals
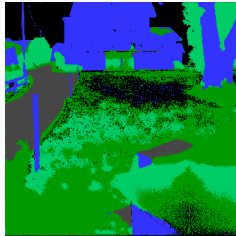

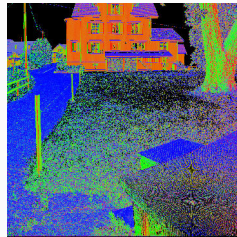**Figure 25:** Prediction using normals + z

Figure 26: Normals
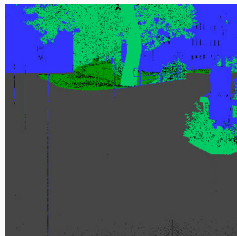
Vegetation as Other: Example 21
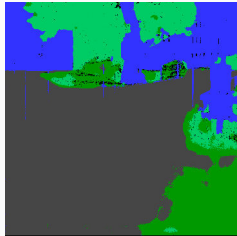

Figure 27: Ground Truth

Figure 28: Prediction using normals
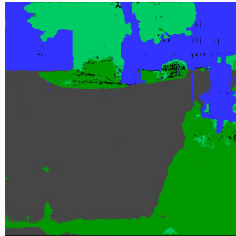
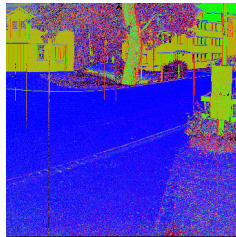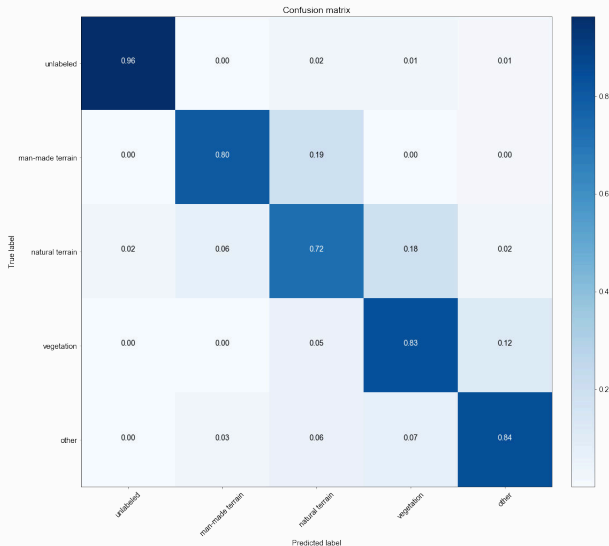**Figure 29:** Prediction using normals + z

Figure 30: Normals

Errors

1. 19% of "man-made terrain" is classified as "natural terrain"

2. 18% of "natural terrain" is classified as "vegetation"

3. 12% of "vegetation" is classified as "other (buildings)"

Confusion matrix

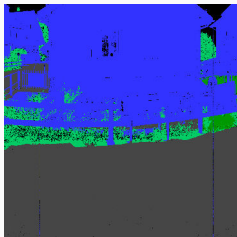## Man made terrain as natural terrain: Example 0

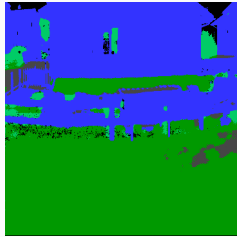

Figure 31: Ground Truth

Figure 32: Prediction using normals + z
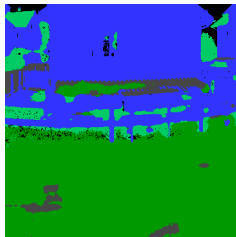

Figure 33: Prediction using normals + z + refl
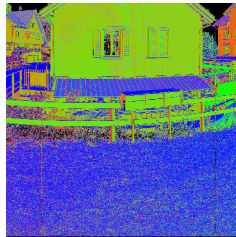

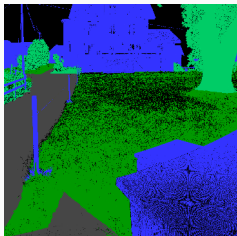**Figure 34:** Normals

Natural terrain as vegetation: Example 22

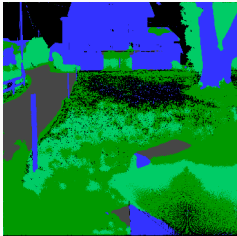**Figure 35:** Ground Truth

Figure 36: Prediction using normals + z
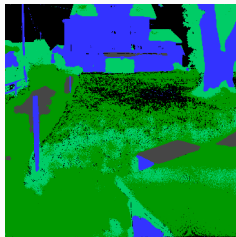

Figure 37: Prediction using normals + z + refl
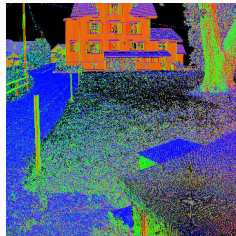

Figure 38: Normals
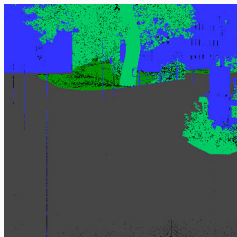
Vegetation as Other: Example 21

Figure 39: Ground Truth

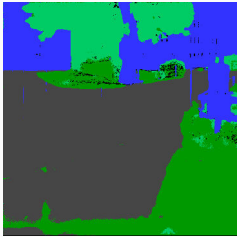**Figure 40:** Prediction using normals + z
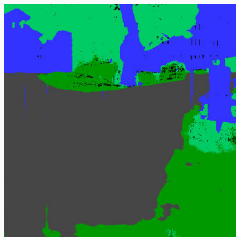
Figure 41: Prediction using normals + z + refl
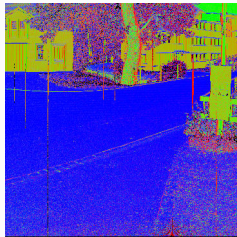
Figure 42: Normals

Errors

1. 13% of "man-made terrain" is classified as "natural terrain"

2. 9% of "natural terrain" is classified as "man-made terrain"

3. 7% of "natural terrain" is classified as "vegetation"

Confusion matrix