

# Street Recognizer

Challenge Projekt HS18

# Agenda

- Aufgabenstellung
- Management Summary / Ergebnis
- Vorgehen
  - Normalisierung
  - Modell Training
  - Vorhersagen
- Challenges
- Potential und mögliche Erweiterungen
- Fazit

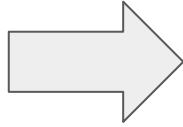
# Aufgabenstellung



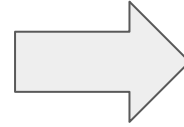
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«Mit einer durchschnittlichen **Wahrscheinlichkeit** von **92%\*** kann  
das Modell für eine **beliebige Strasse in der Schweiz** den  
Untergrund **bestimmen**»

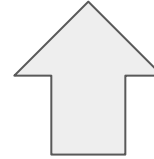
Technologie und  
Problem  
kennenlernen



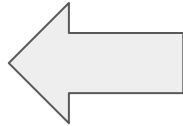
Vorgehensplanung



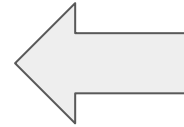
Daten  
Normalisieren



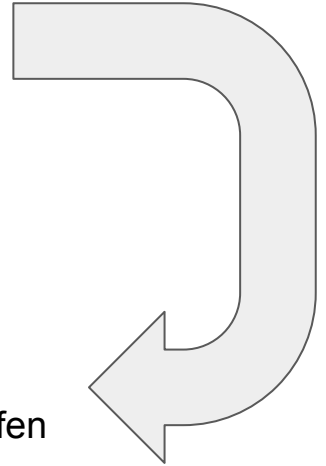
Finalisieren



Output  
Normalisieren und  
Aufbereiten

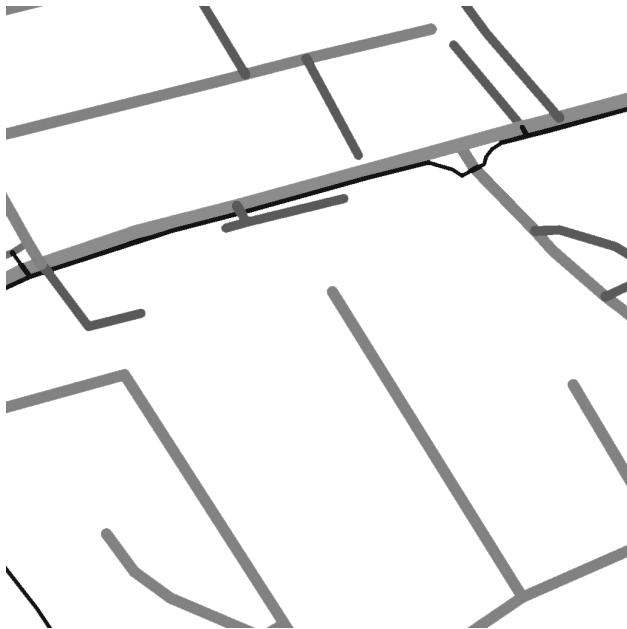


Modell erstellen,  
Vorhersagen treffen



# Normalisierung

# OSM



# Swisstopo



# OSM & Swisstopo

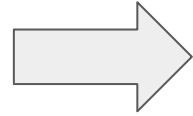




# OSM













# Swisstopo



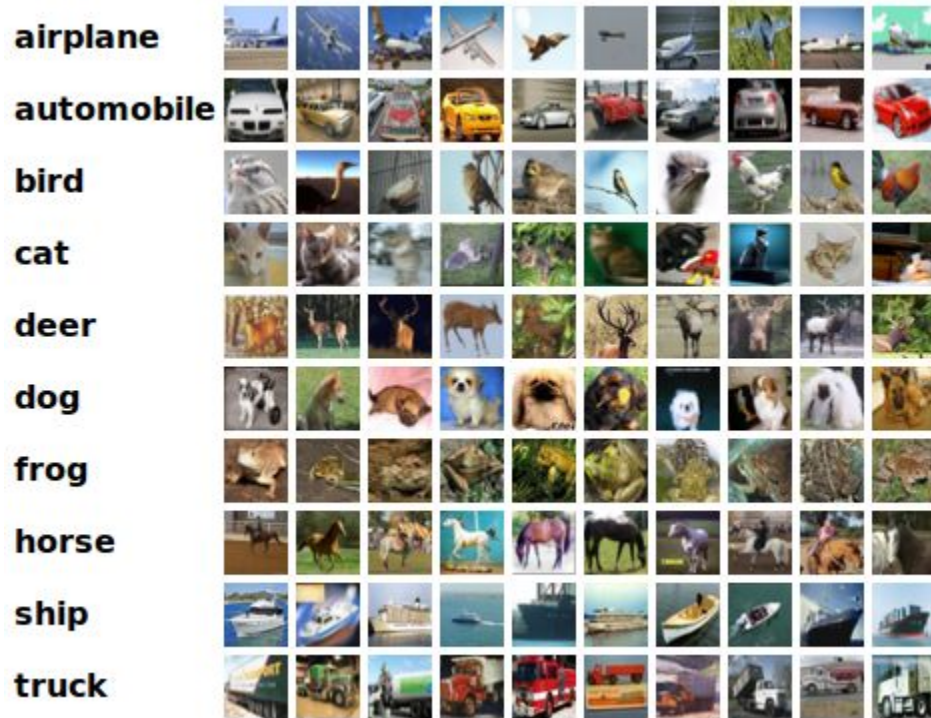
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
































































































# Surface-Werte in der Schweiz (Top 10)

Value	Count		
asphalt	109 432	49.14%	
gravel	30 418	13.66%	
paved	27 821	12.49%	
ground	12 018	5.40%	
unpaved	9 921	4.45%	
grass	6 861	3.08%	
dirt	4 539	2.04%	
concrete	4 291	1.93%	
compacted	2 850	1.28%	
fine_gravel	2 466	1.11%	

Quelle: <https://taginfo.osm.ch/keys/surface#values>

# Inspiration: CIFAR-10



<b>Asphalt</b>										
<b>Paved</b>										
<b>Concrete</b>										
<b>Dirt</b>										
<b>Fine gravel</b>										
<b>Grass</b>										
<b>Gravel</b>										
<b>Ground</b>										
<b>Compacted</b>										
<b>Unpaved</b>										

➤ Modell trainiert mit 12'000 32x32 Bilder pro Surface

# Problem: Paved/Unpaved

- Paved ist unspezifische Oberkategorie von asphalt oder concrete
  - Unpaved ist Oberkategorie von dirt, grass, gravel, etc.
- Wie soll Modell zwischen z.B. **grass** und **unpaved** unterscheiden?

**Asphalt**



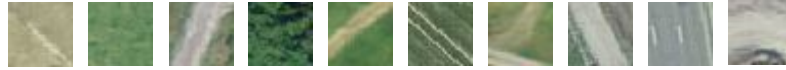
**Paved**



**Concrete**



**Dirt**



**Fine gravel**



**Grass**



**Gravel**



**Ground**



**Compacted**



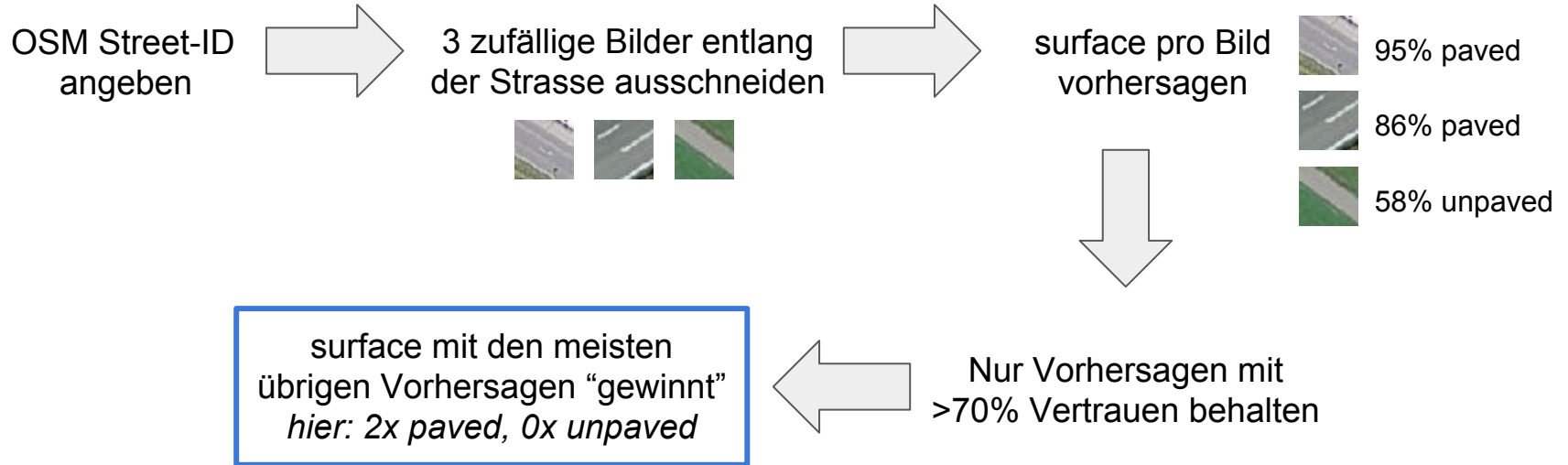
**Unpaved**



➤ Für binäres Modell gleich viele **paved** und **unpaved** Bilder

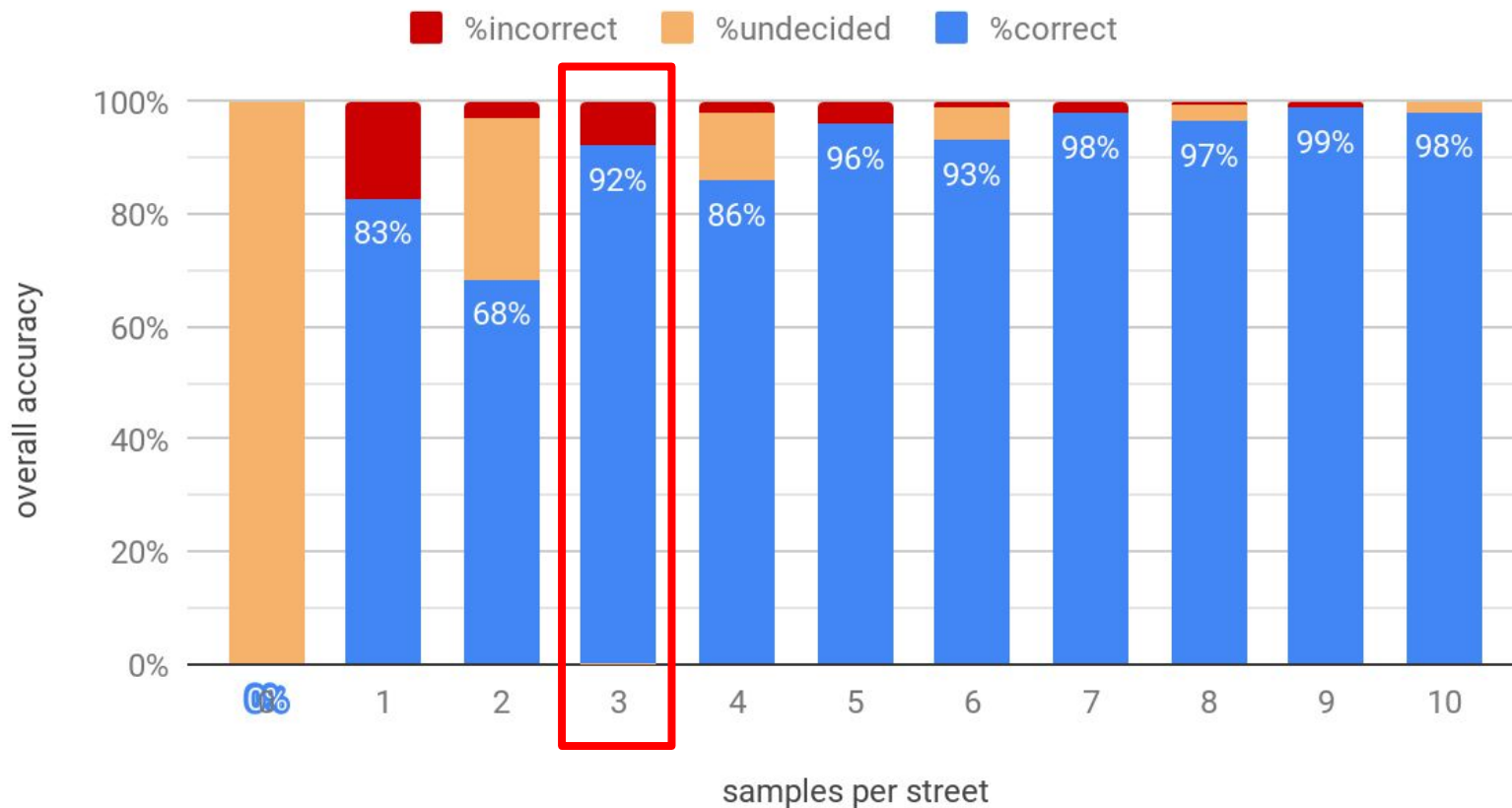
Vorhersage





- “unentscheidbare” Strassen sind nicht im Resultat enthalten  
(z.B. 1x paved, 1x unpaved)

## Prediction Accuracy (model accuracy = 82.7%)



# Challenges

# LV95 vs WGS84 Format



# Weitere Challenges

- HSR Harddisk space
- Performance Optimierungen
- osmtogeojson Tool ist sehr instabil
- Overpass API nicht geeignet für grosse Anzahl Abfragen

Potential

# Potential

- Orthofotos 10cm
- Modell Variieren
  - Bildgrösse
  - Anzahl / Typ hidden layers
  - komplett anderes Modell
- Einfließen lassen von zusätzlichen OSM Daten
  - z.B. Strassentyp (primary, secondary, etc.)
- Bereinigung von Daten
  - z.B. Löschen von “Rausch-Bilder”

Fazit



# Fazit

- Aufwand für Normalisierung ist enorm
- Qualität der attribuierten Strassen ist mässig, bzw. die Kategorien zu ähnlich
- Aufbau mit Modulen sehr gute Lösung
- Docker image hat sich bewährt
- AI Know-How Steigerung war mässig
- Sehr interessant

# Dokumentation und Code

<https://github.com/dvincenz/StreetRecognizer>