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How AI shapes land registration in the Netherlands

Wim Florijn

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Use Cases of AI at Kadaster

1. Fieldsketch vectorization
2. Detecting topographical elements
3. Disclosing cadastral information to the public

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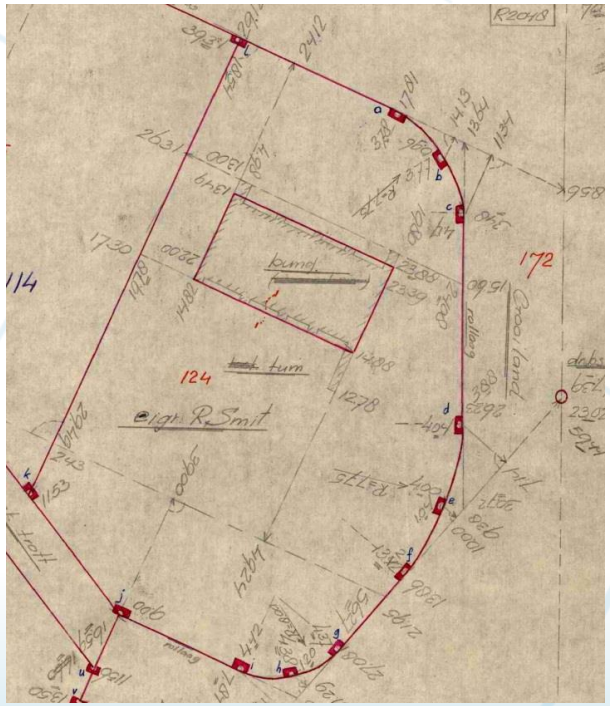
1. Fieldsketch Vectorization

We are digitizing our archive of fieldsketches in order to achieve a more positive registry



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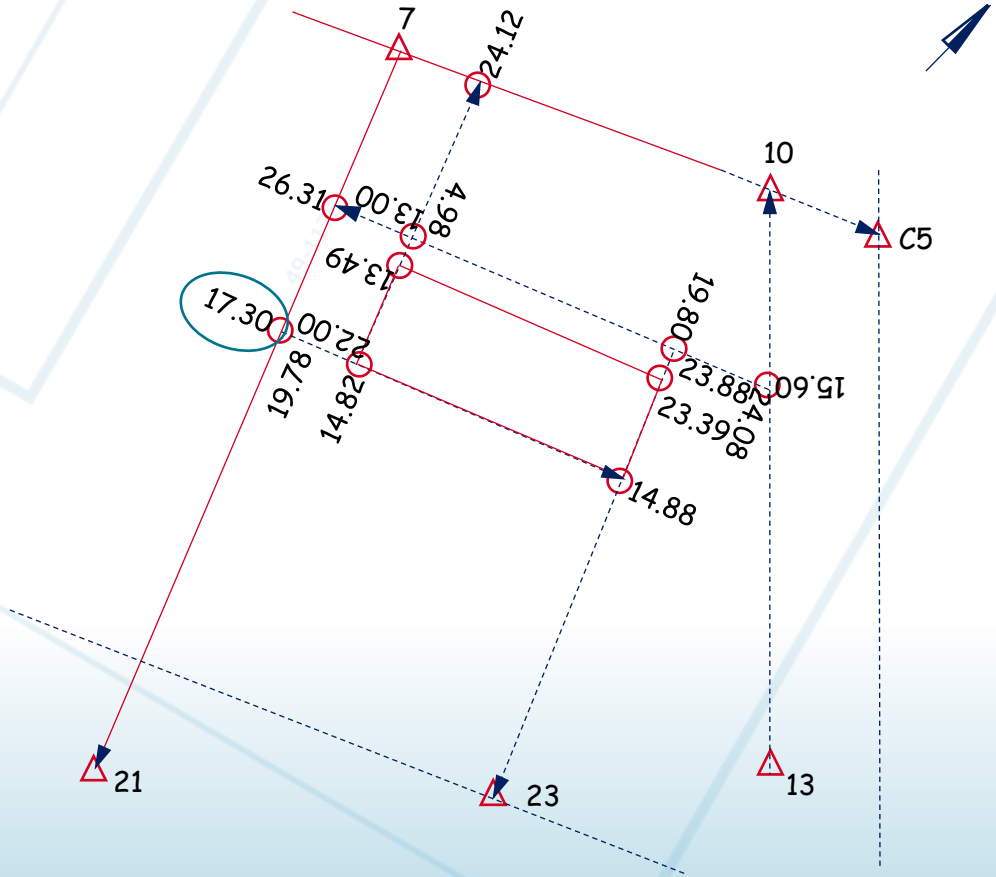
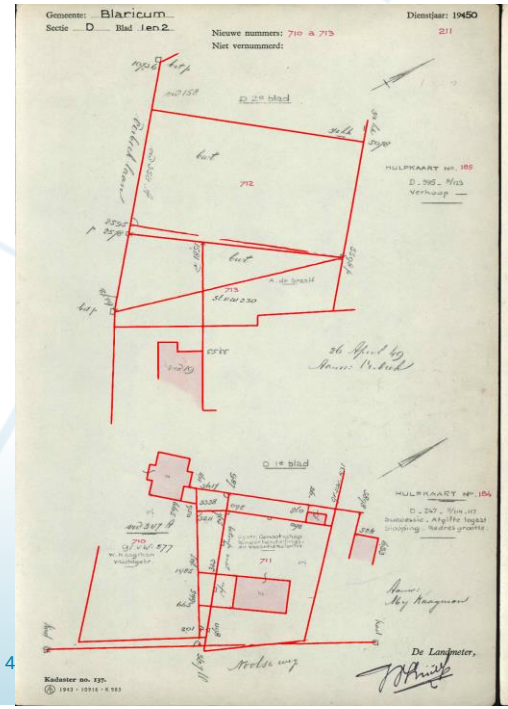


Algorithms for Vectorization: Lines

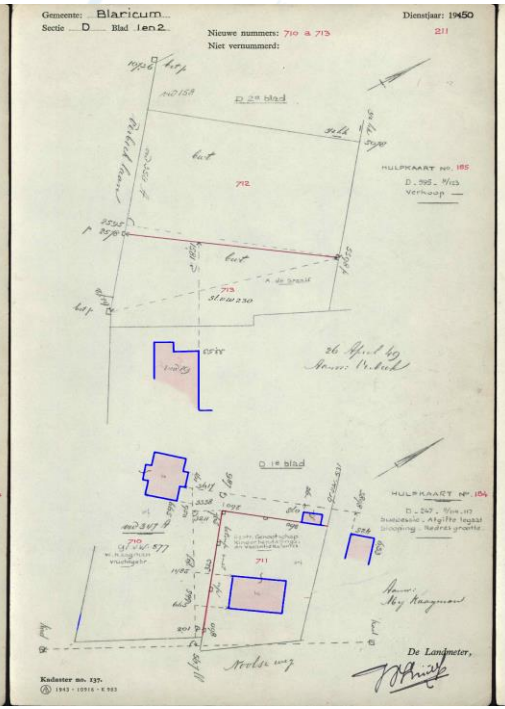
Detection of pixels belonging to one of the classes

1. Binary segmentation
2. U-NET based on Efficientnet-B5 architecture
3. From line pixels to vectorized lines

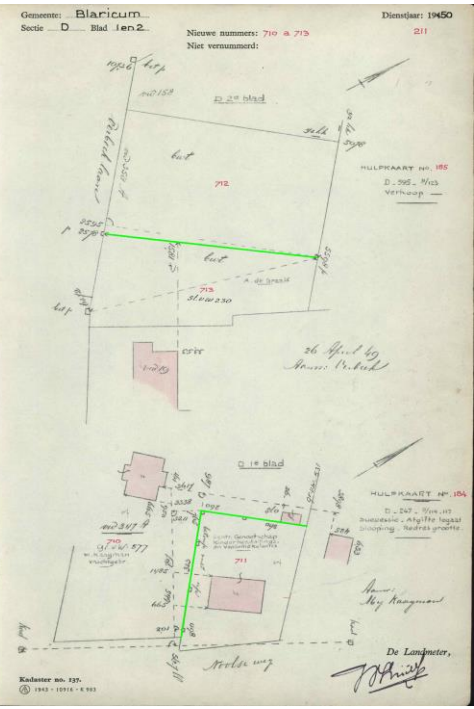
Lines



Buildings



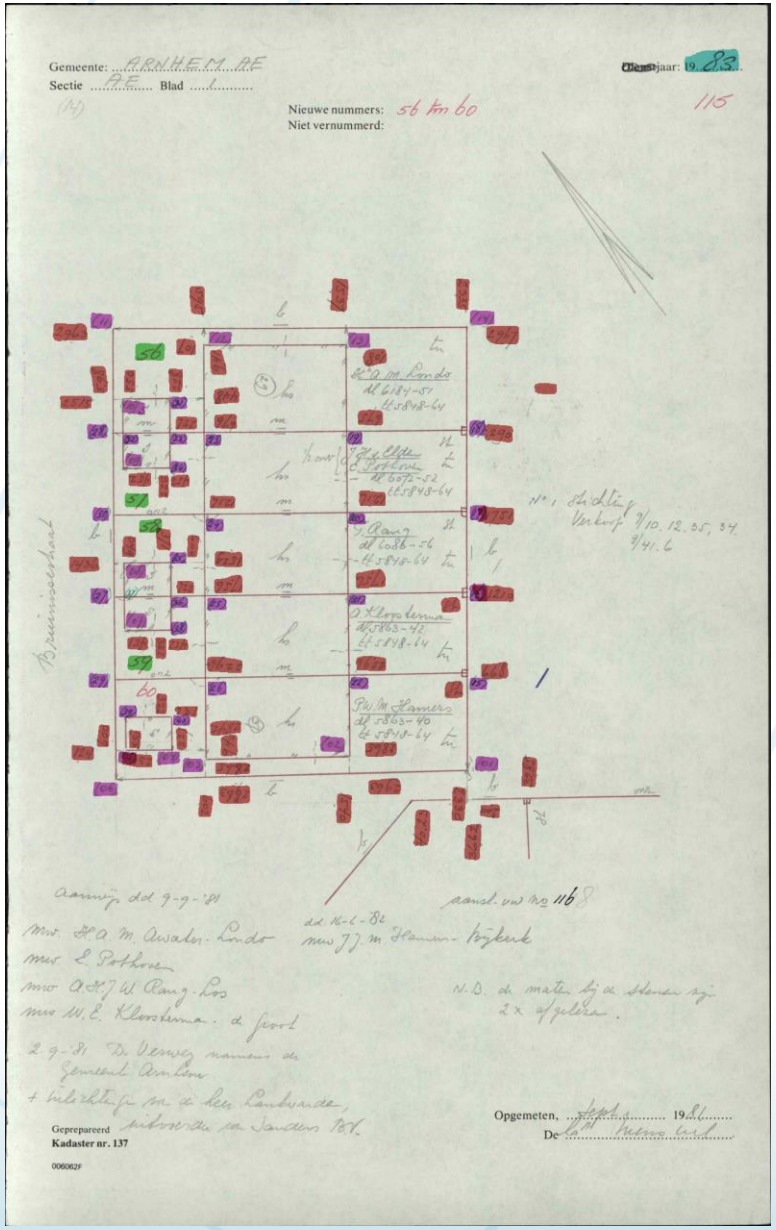
Borders



Algorithms for Vectorization: Objects

Detection of classes of objects on fieldsketches

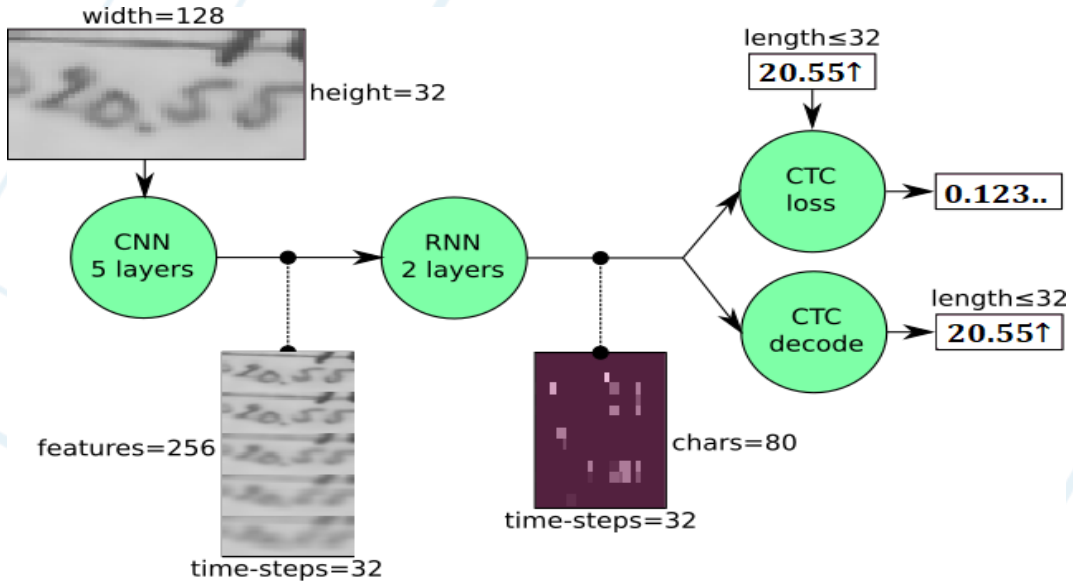
1. Mask-RCNN using vision transformers backbone
2. Classes: measurements, parcel numbers, year etc
3. Linking of objects to lines



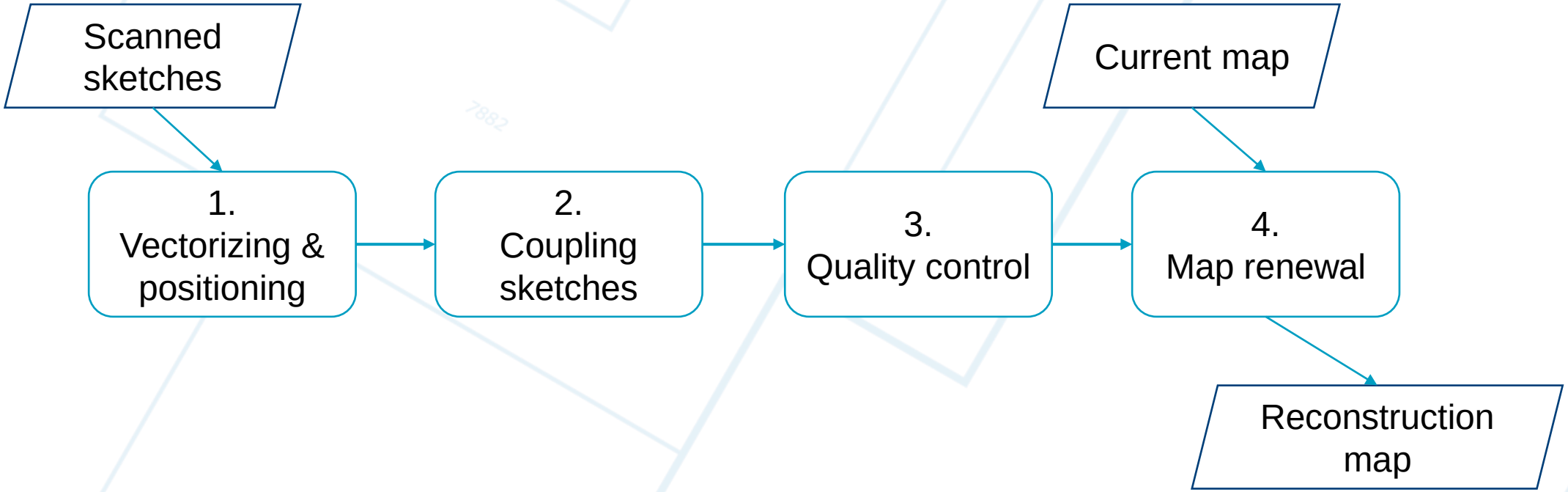
Algorithms for Vectorization: Handwritten Tekst

Interpretation of objects

1. Reading handwritten tekst
2. Content of measurements, parcel numbers etc.
3. Neural Network with CNN and RNN layers
4. CTC loss merges output



From Sketch to Map



2. Detecting Topographical Elements

We want to make object registration more efficient by using AI on image data
1. POCs on objects registred by the dutch cadastre
2. Detected objects are checked by humans

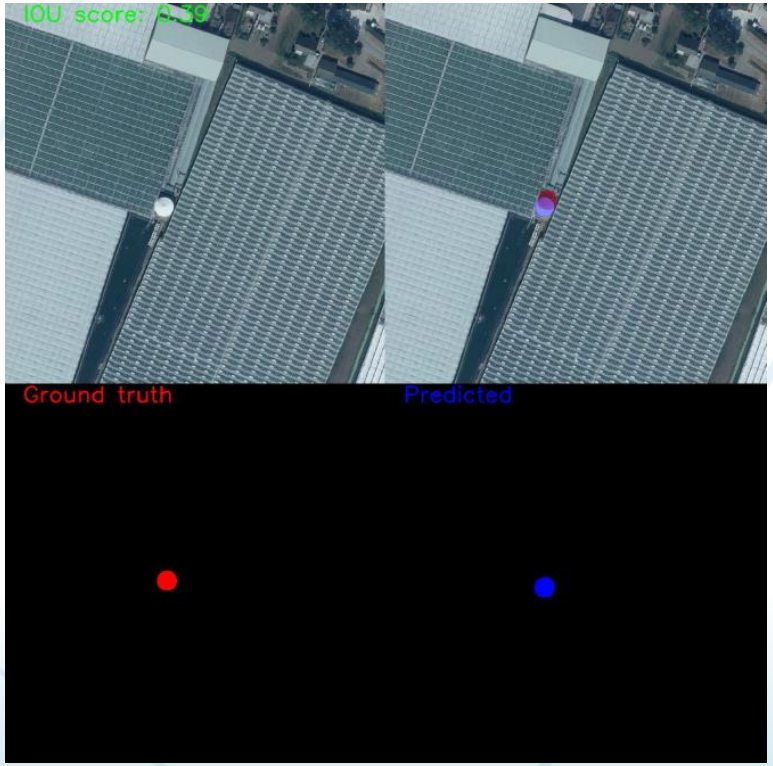
Ground Truth Data

Challenges

1. Data availability
2. Data quality

Solutions

1. Manual labelling
2. Transfer learning
3. Data set augmentation



Method

Multiple data sources (or a combination) may be used to detect objects on

1. Streetview (parking garages)
2. Oblique
3. Sattelite imagery (tanks)

Algorithm Used: U-Net

Disclosing Land Registry Information to the Public

Goal:
Low-threshold access to Land Registry data based on natural language.

Challenges:
Easy access (multiple sources, complex data models, missing links)
Transparency and traceability (statistical AI methods, discrete explanation)

Techniques:
1. Knowledge Graph
2. Natural language AI

Question to Query Translation

Any NLP task can be written as a text-to-text task.

Google translate task:
Converting a source language to a target language

Our task:
Converting a question to a SparQL or GraphQL query

Method

Training a T5 language model and tokenizer to generate queries given input questions

Examples:
Q: How big is the garden of hofstraat 110 in Apeldoorn?
Q: Give me all buildings with construction year 2000 in Apeldoorn
External Q: Perform an inspection of hofstraat 110 in Apeldoorn in 10 minutes by bike

Process:
1. Convert query to tokens
2. Generate an output token sequence recursively based on the input sequence
3. Convert token sequence to query

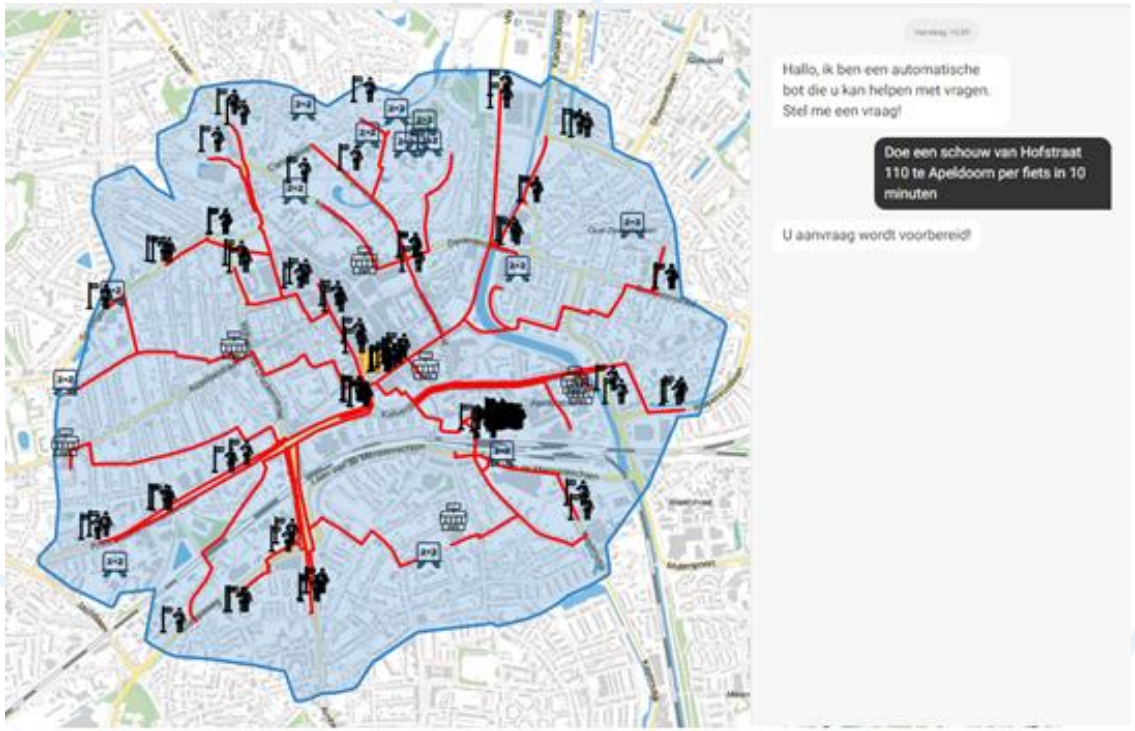
Current Status

Integration with applications: **API**

1. Chatbot
2. Map viewers

Goal:

1. Geodataplein
2. Serve public cadastral information to citizens



To Conclude

AI has a wide variety of applications within the Dutch cadastre

Human validation stays important

AI helps us to efficient retrieve, process and serve information

Wim Florijn
wim.florijn@kadaster.nl