



Human Environment and Transport
Inspectorate
Ministry of Infrastructure
and Water Management



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Advanced Computer Science

Data-driven Risk Assessment in Infrastructure Networks

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Ministry of Infrastructure and Water Management

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LIACS seminar, June 20th 2018



Table of Contents

1 About the people involved

2 About the project

3 Two cases

- Waste transports across a border
- Truck transportation data



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About me



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About me

- 2012–2016: Bachelor Chemistry at Utrecht University
- 2016–2017: Master Analytical Chemistry in Amsterdam
 - Thesis on assessing reliability fuel inspections at ILT using data science.
- Started in November 2017 at LIACS!



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António Pereira
Barata



Frank Takes



Cor Veenman



Jaap van den
Herik

People from LIACS involved in this project.



Table of Contents

1 About the people involved

2 About the project

3 Two cases

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- Truck transportation data



Aim of the Ministry with this project

Universiteit Leiden Search students Staff members

Research Education Academic staff About us Facilities Campus The Hague Library

Home > News > Leiden University and Ministry of Infrastructure and Environment start data science collaboration


Leiden University and Ministry of Infrastructure and Environment start data science collaboration

04 October 2017
Leiden University and the Ministry of Infrastructure and the Environment (IenM) will joint forces in the field of data science.

On September 28, 2017, the University and the Ministry signed a joint declaration of intent on starting a multilateral collaboration (see press release).

PhD positions:
As part of the collaboration, Leiden University and the Dutch Ministry of Infrastructure and the Environment – which is part of the Ministry of Infrastructure and the Environment – have joint PhD positions. Under supervision of researchers from LIACS and the Leiden Institute of Advanced Computer Science (LIACS), Leiden University students will conduct research on the interface between data science and inspection of the environment.

Complex questions, joint approach:
The details of the collaboration will be developed in the near future. The parties intend to better match their education and demands for knowledge in the field of data science.

I am convinced that both parties will benefit from this collaboration; says Jaap van den Elst of the Leiden Centre of Data Science. Complex questions in the field of data science can only be answered if a joint, multidisciplinary approach. We can learn a lot from one another.

[BIO DATA](#) [DATA SCIENCE](#)

- Intelligence-led inspections
- Finding vulnerabilities in the administrative situation
- Learning risk profiles



About ILT

Dutch governmental agency responsible for inspections for safe and sustainable environment and transport. Broad scope of subjects:

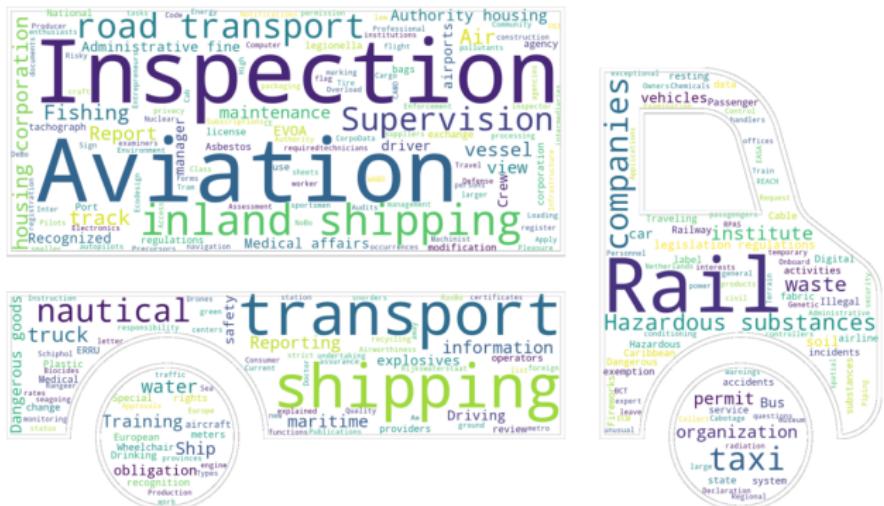




Table of Contents

1 About the people involved

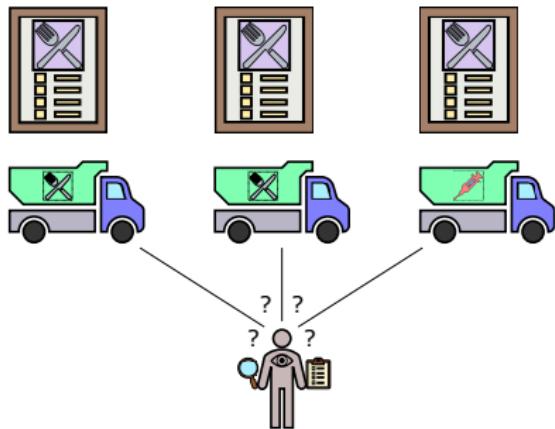
2 About the project

3 Two cases

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Waste Shipment Regulation



- Ensure proper waste handling
- Enforcement by ILT of:
 - notices
 - deposit
 - inspections
- Possible company misconduct
 - cheaper label



Goal

Use outlier detection for finding **mislabeled** notices.

- Strongly deviating notices (within same reported class)



Data

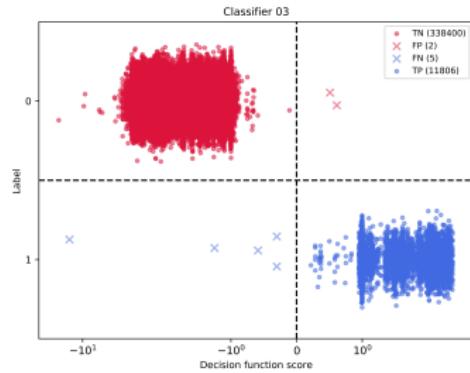
Labeled data

- 20 waste types
- Features:
 - company name
 - waste tonnage
 - border crossing
 - processor location
 - ...



Approach

- Target: waste category
- Linear SVM classifier
- One-vs-rest
- Lowest scoring false negatives



For example: wood waste vs non-wood waste



Table of Contents

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Truck transportation data



Weigh-In-Motion system at Dutch highway. Image taken from nmi.nl.



Data

Features:

- license plate (both truck and trailer)
- country of license plate
- speed
- weight of each axle
- company (including sector)



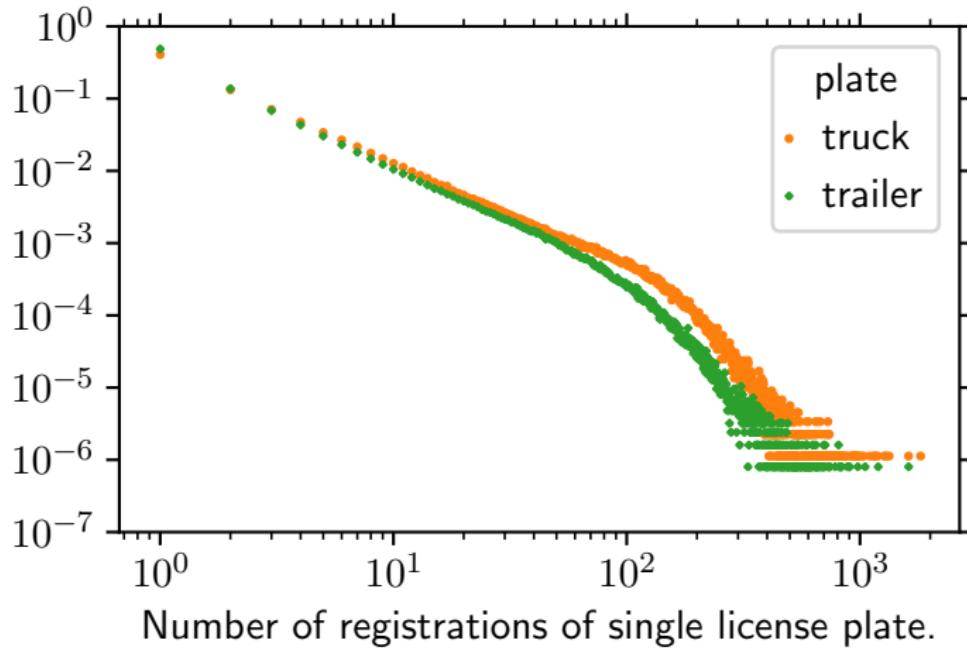
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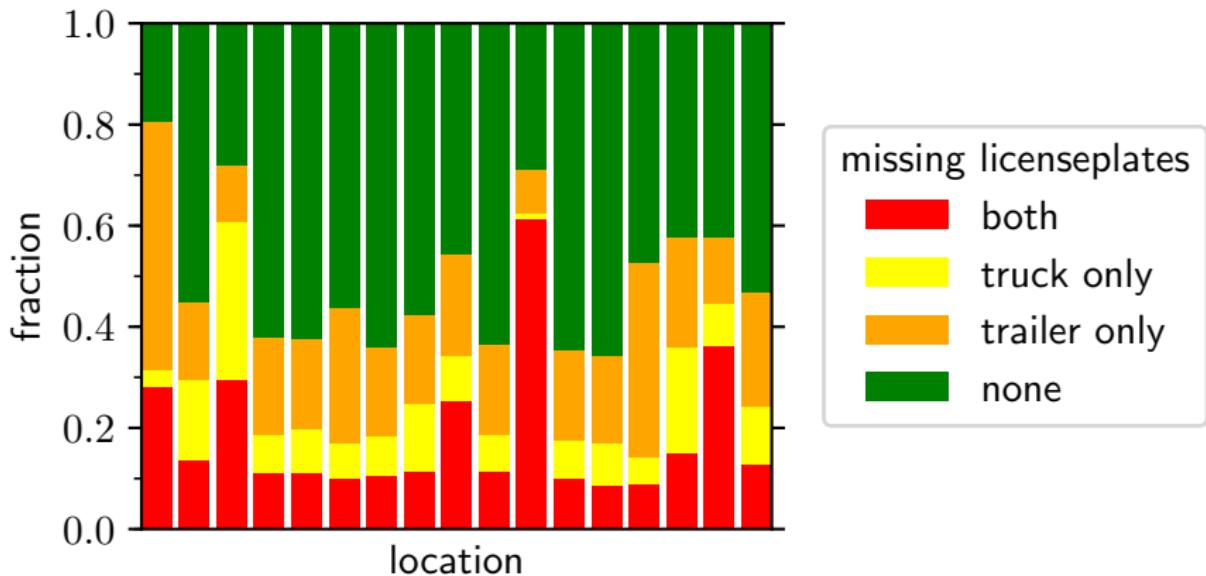


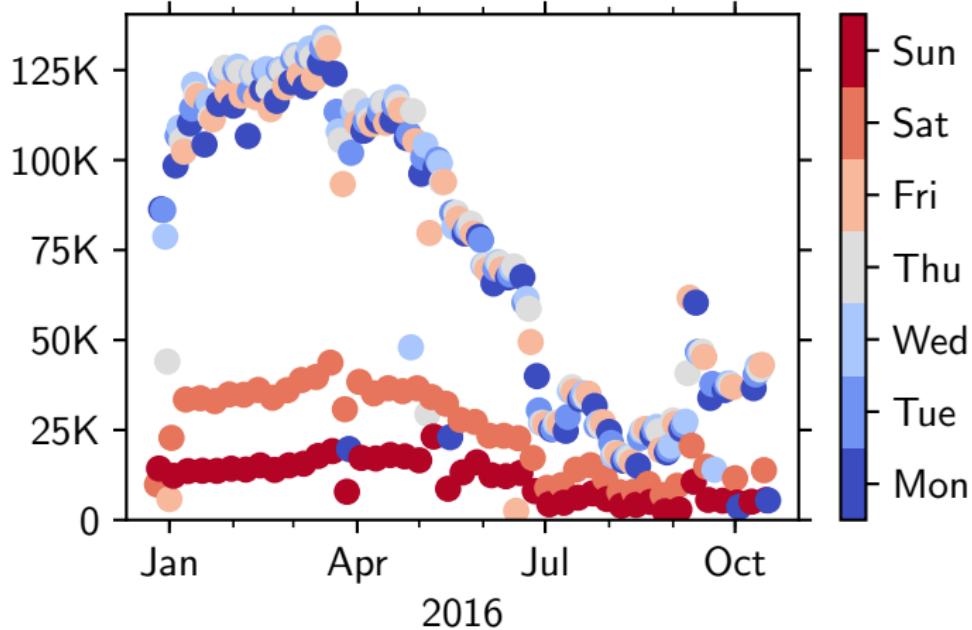
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Goal

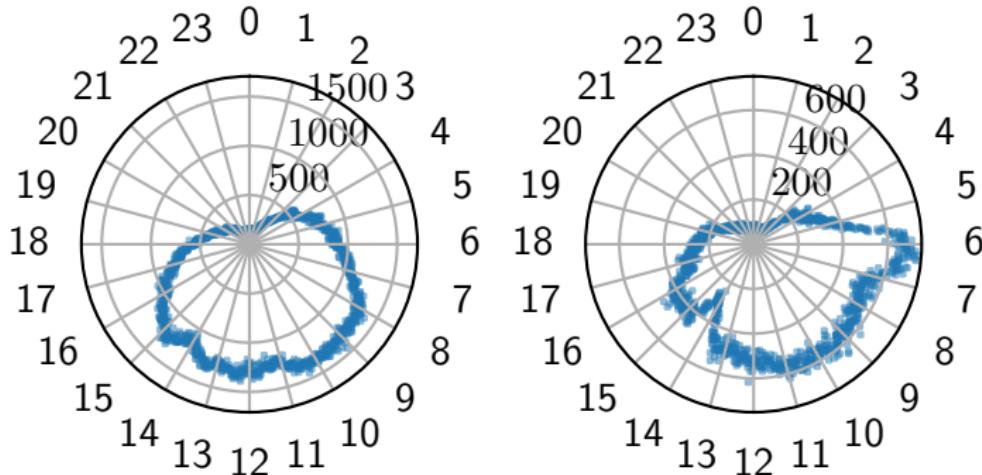
What information can we gain when we model this data as a network structure?



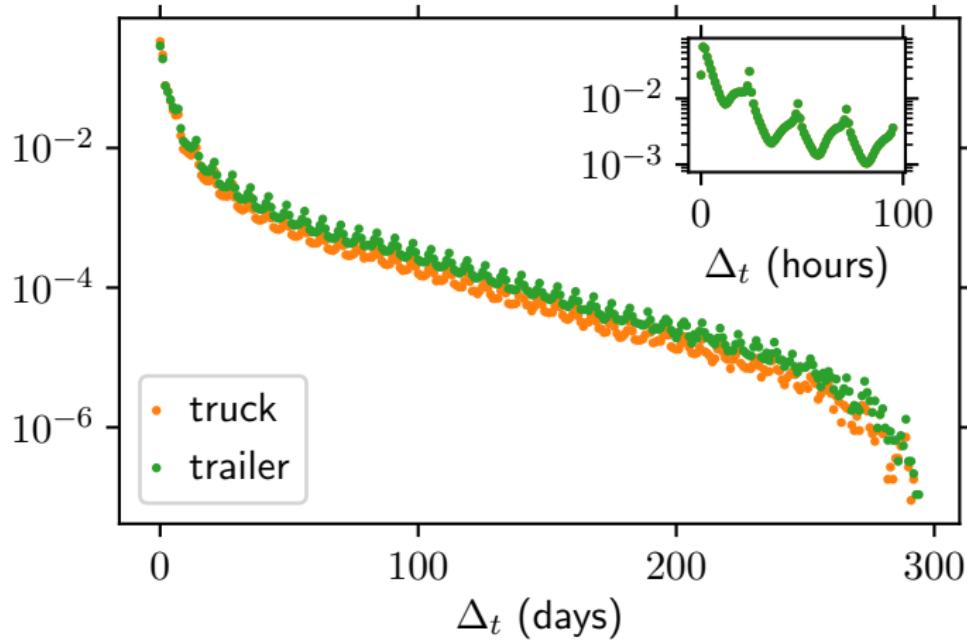




Number of trucks that was measured each day.



Number of trucks per minute on two different locations.

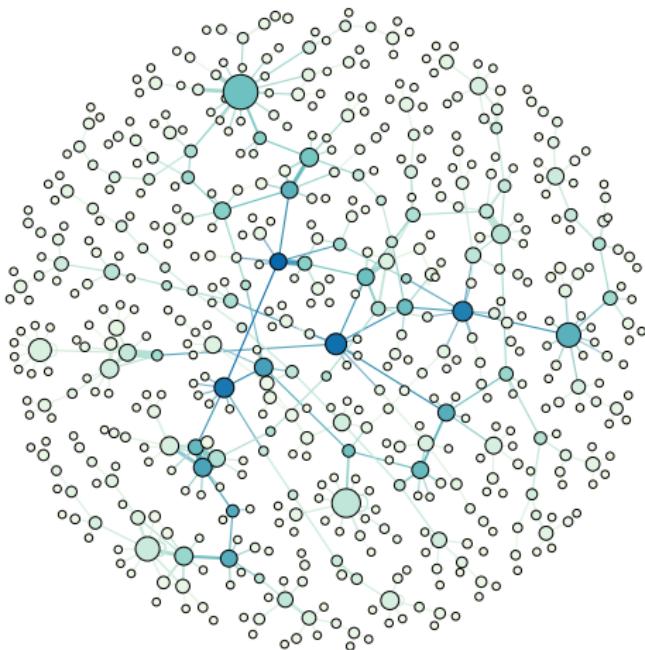


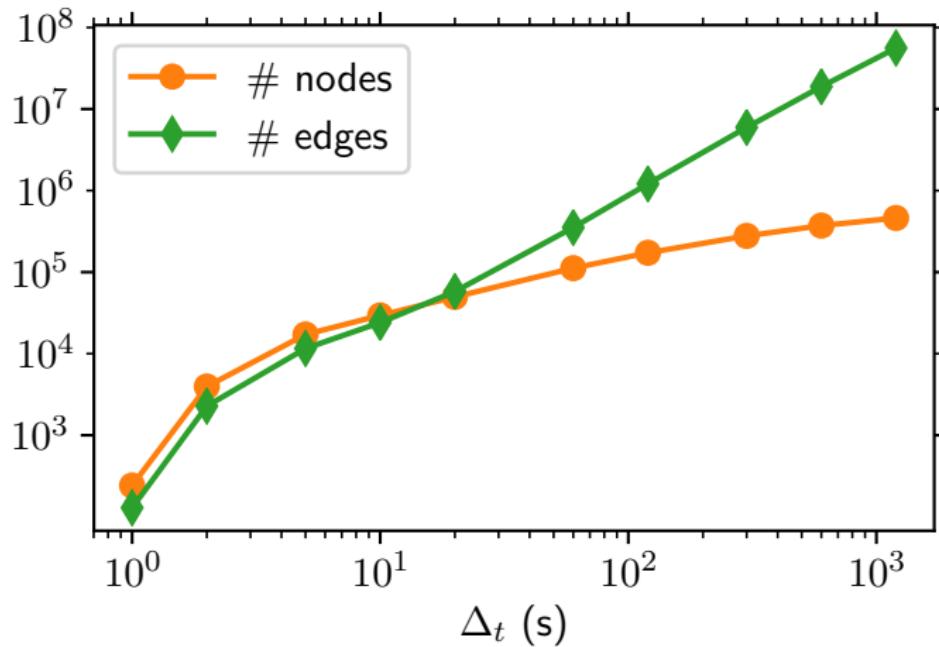


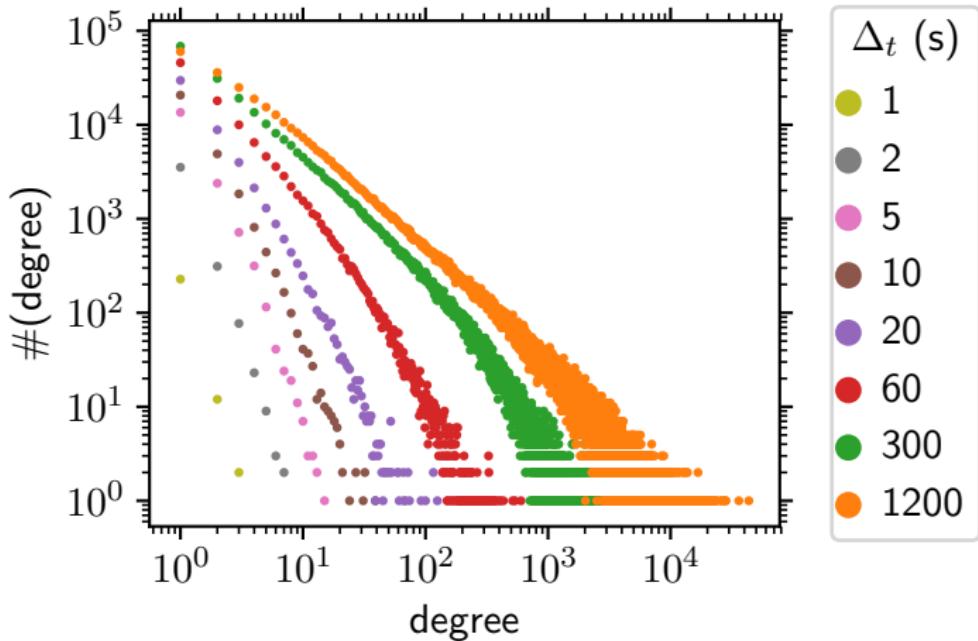
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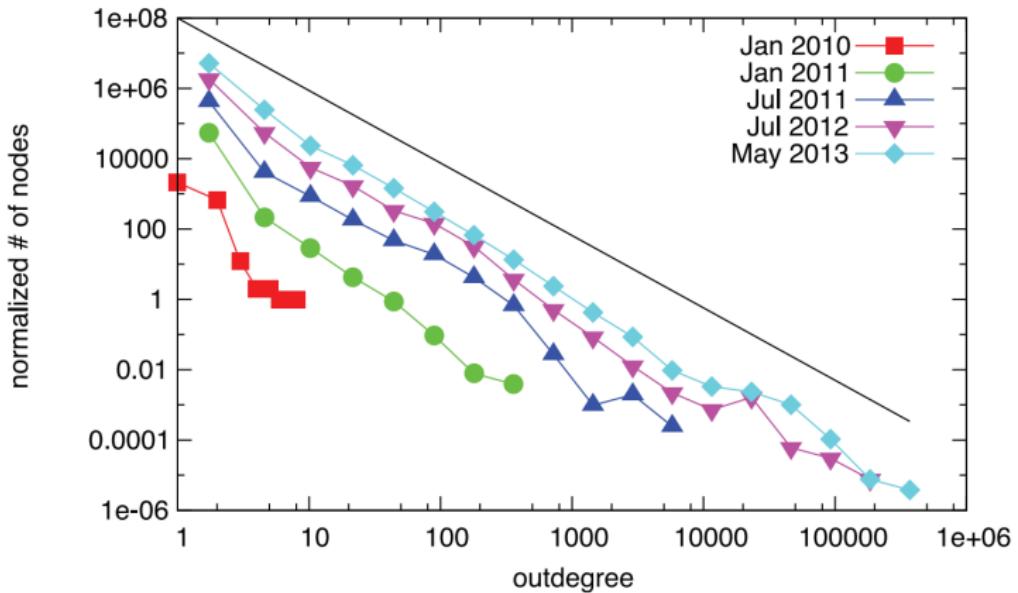
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Bitcoin network outdegree distribution



Kondor et al., Do the Rich Get Richer? An Empirical Analysis of the Bitcoin..., PLOS ONE 9(2): e86197, 2014



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Thank you for your attention!
Are there any questions?





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WIM measurement sites

