

UNIVERSITY OF TWENTE.

*AS WE ZOOM IN, AND  
AS WE MOVE  
FROM ICT TO ICU*

ROLF A. DE BY  
ITC

*Workshop Geo-Ethics  
March 14<sup>th</sup>, 2016  
Enschede*



FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION



# Agenda

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- **Historic setting**
- **Ramblings on two recent projects** that involved spatial data and where person/community privacy gave concerns
  - The **TimeTrails** project, within the Dutch COMMIT/ programme, on high-income country geoprofiling of individuals
  - The **STARS** project on low-income country smallholder farming
- The **Hofmann model** of geospatial data systems and applications
- **Reflections and concerns**

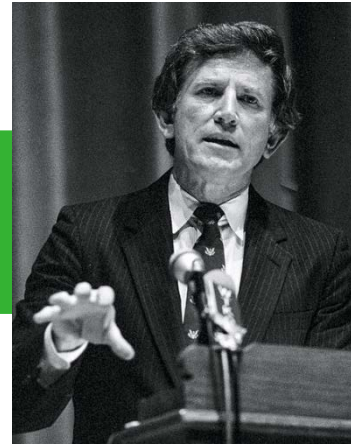
# There's history ... in snapshot photography



1906



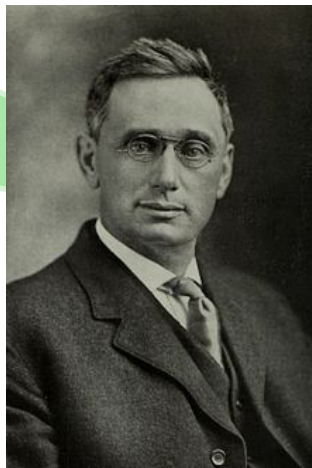
1962



1987



1998



1916

**The Right to Privacy,**  
Samuel Warren & Louis Brandeis,  
*Harvard Law Review*, vol. IV, no. 5,  
*December 15, 1890.*

# “The Right to Privacy”

Warren and Brandeis

such a term can be enlarged by the judicial mind, or to supply reasons upon which a trust or confidence can be erected, there may be no objection to working out the desired protection through the doctrines of contract or of trust. But the court can hardly stop there. The narrower doctrine may have satisfied the demands of society at a time when the abuse to be guarded against could rarely have arisen without violating a contract or a special confidence; but now that modern devices afford abundant opportunities for the perpetration of such wrongs without any participation by the injured party, the protection granted by the law must be placed upon a broader foundation. While, for instance, the state of the photographic art was such that one's picture could seldom be taken without his consciously "sitting" for the purpose, the law of contract or of trust might afford the prudent man sufficient safeguards against the improper circulation of his portrait; but since the latest advances in photographic art have rendered it possible to take pictures surreptitiously, the doctrines of contract and of trust are inadequate to support the required protection, and the law of tort must be resorted to. The right of property in its widest sense, including all possession, including all rights and privileges, and hence embracing the right to an inviolate personality, affords alone that broad basis upon which the protection which the individual demands can be rested.





# Let's face(book) it ... we are at risk



Stanford/Cambridge data mining study

**Reading your personality** from your facebook profile

- A *few* fb likes give away your gender, sexual orientation, happiness & self-confidence levels, and alcohol consumption
- *Ten* fb likes produce a better computer personality judgment than your colleagues would be able to
- *Seventy* fb likes outperform your friends' assessment of you
- *150* fb likes beat your family members
- *300* fb likes beat your spouse

Wu, Kosinski & Stillwell,

*Computer-based personality judgements are more accurate than those made by humans,*

PNAS 12 (4), January 2015, 1036—1040.

# Two recent projects

COMMIT/

A PUBLIC-PRIVATE ICT RESEARCH COMMUNITY

## TimeTrails

- *Spatiotemporal Data Warehousing for Trajectory Exploitation*
- Geographic exploration of twitter hotspots
- Geographic profiling for commercial advisories (holiday homes, greeting cards)



## STARS

- *Very-high resolution satellite image time series to monitor crop growth over smallholder farms*
- Derivation of information products that inform decisions by
  - farmer (communities)
  - extension services
  - local private sector
  - government agencies in Agriculture and Food Security

# TimeTrails — GeoSocial Recommender Systems

**Idea** Have your own smartphone collect private data that allows for knowledge-based recommendations on commercial service offerings.

**Contra** Big data approaches by IT molochs that are based on collaborative filtering.



eurocottage Holiday home Finlandia Telephone +31 (0)33 763 0877

Home Viewed holiday homes (2) Last minutes Ski Holidays

Start new search

Home » Holland » Zeeland » Renesse » Finlandia

### Holiday home Finlandia - 5 Persons

Location: Renesse, Zeeland, Holland [Show map](#)

Number of people: 2 - 5 Persons

Number of bedrooms: 3 Bedrooms

Pets are permitted: Yes

Propertycode: 184

For € 460,-  
Just € 65.71 per night

Availability and Prices

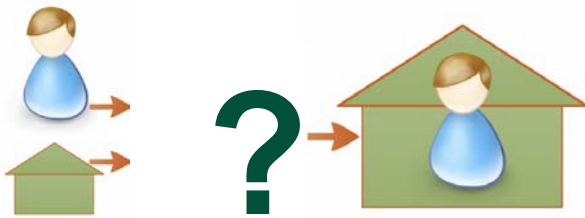
Print Download Brochure Tell-a-Friend

You arrive on: Saturday, 6  
You depart on: Saturday, 6  
Duration of stay: 1 week  
Total price: € 460,- + ext  
You got the  
Book  
Check

Victor de Graaff, *GeoSocial Recommender Systems*, Ph.D. thesis, University of Twente, December 2015

# Project approach

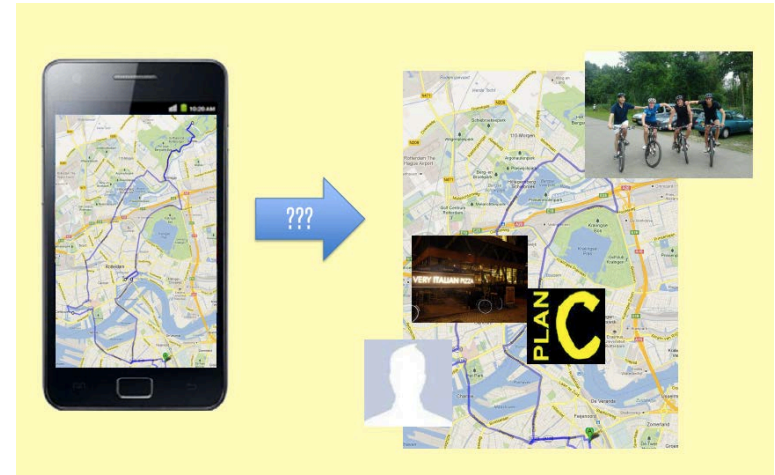
## Phase 1: Exploration



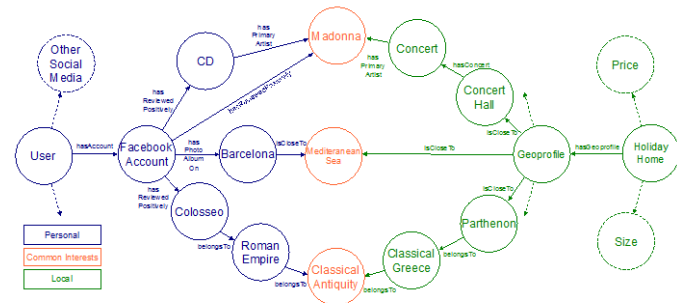
## Phase 3: Behavioral analysis



## Phase 2: Trajectory analysis

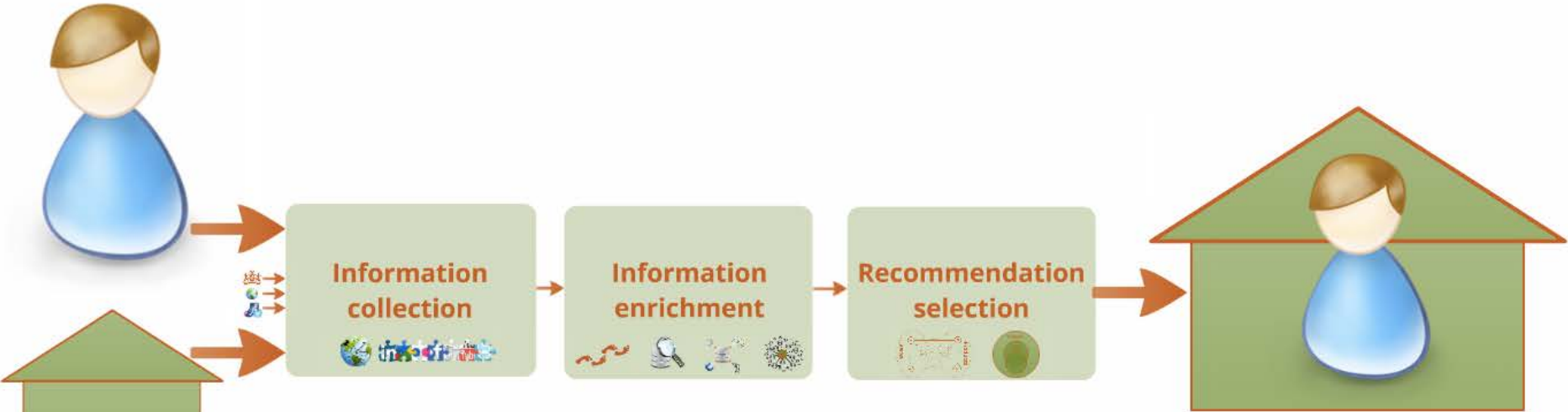


## Phase 4: Recommendation





# Simple Overall Workflow



*profiling*

*associating*

*matching offerings  
with interests*



# Web harvesting for POIs

Home Gouden Gids kpn De Telefoongids 99+ Kaart & Route

de telefoongids gouden gids ? restaurant X enschede X Zoek Afstand

Home Restaurant Restaurant in Enschede

Sorteer op: 146 resultaten voor restaurant in Enschede

Locatie

- Enschede
- Enschede & omgeving
- Enschede (122)
- De Lutte (3)
- Oldenzaal (3)
- Denekamp (3)
- Hengelo ov (3)

Rubrieken

- Restaurant (108)
- Hotel (8)
- Restaurants-Afhalen en bezorgen (7)
- Zaalverhuur (6)
- Catering (4)

Openingstijden

Vandaag geopend (26)

m	d	w	d
v	z	z	

Media Type

Kaart resultaten

Hu's Garden Chinees-Aziatisch Restaurant ★★★★★ (#1)

Meer info

2 resultaten gevonden in Enschede en omgeving

Oldenzaalsestraat 266, Enschede

Restaurant: Hu's Garden serveert Kantonees, Sze... Lees meer

www.husgarden.nl | 360° foto

053-4333678

Restaurant Cateringservice IJzeren Pot De Geef uw mening#2

Meer info

Bedient ook: Enschede

Restaurant: ...lg en sfeervol ingericht restaurant... Lees meer

www.ijzerenpot.nl | Openingstijden

0546-812318

Griekse Specialiteiten Restaurant Thessaloniki Geef uw mening#3

Meer info

Langestraat 52, Enschede

Restaurant: bij restaurant Thessaloniki Lees meer

www.thessalonikienschede.com

053-4319320

Watermolen Bels Restaurant | Meer info Geef uw mening#4

2 resultaten gevonden in Enschede en omgeving

Bedient ook: Enschede

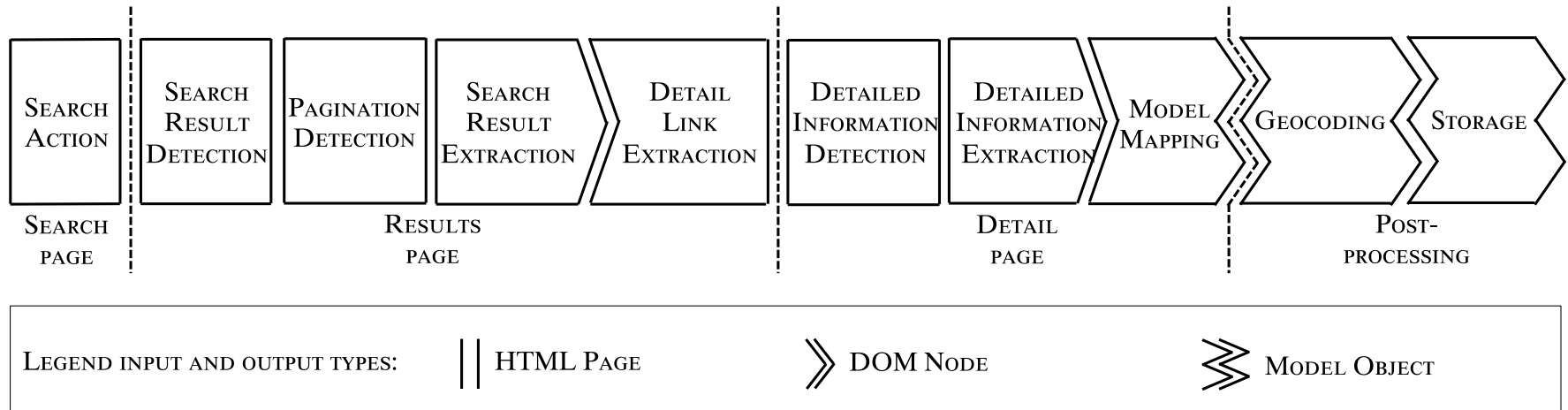
Restaurant: Restaurant "Watermolen Bels" heeft v... Lees meer

www.watermolenbels.nl

0541-680213

Titanic Restaurant | Meer info Geef uw mening#5

# Generic Web Harvest Architecture

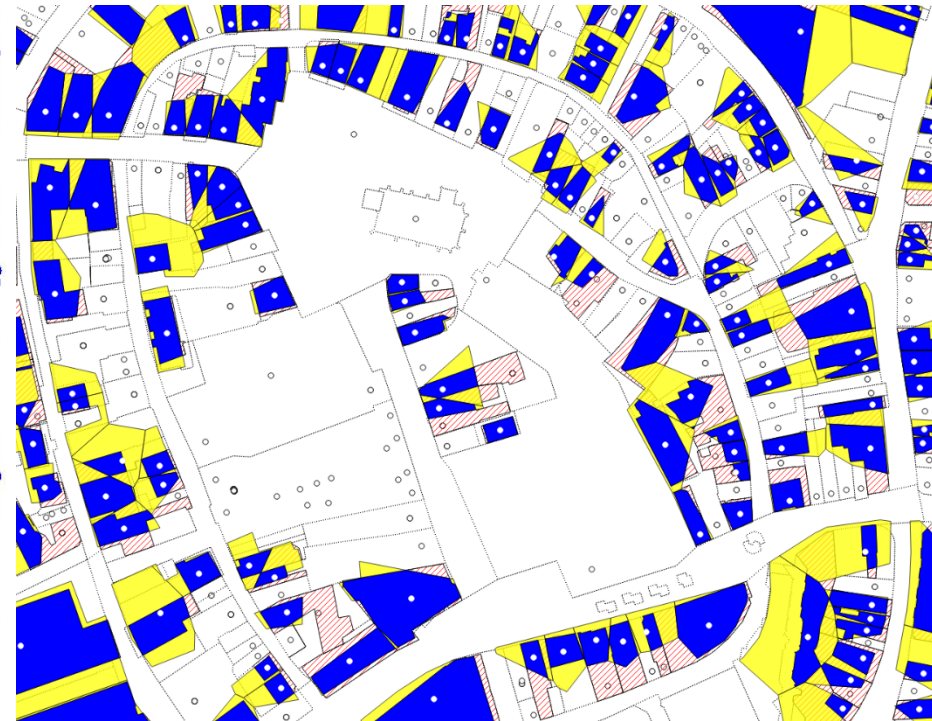
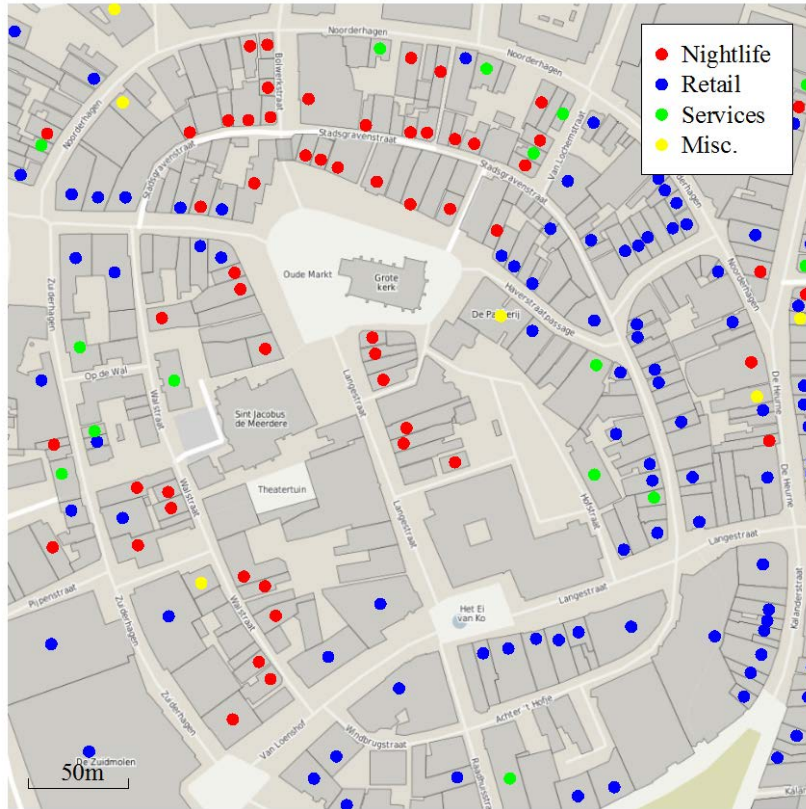


**Generic** Language- and web design-independent.

**Server-side** Compute-and-store capacity, no privacy concerns.

**Client-side** Actual association between entities is (later) mostly done on personal cell phone. Some tactics of fuzzifying service requests are applied.

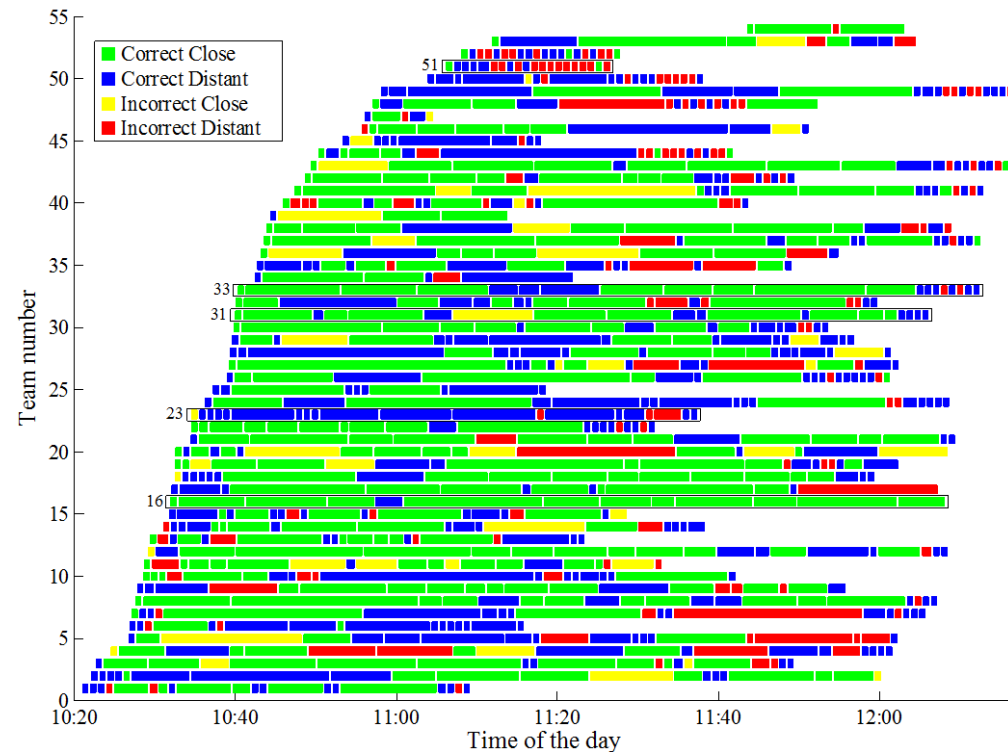
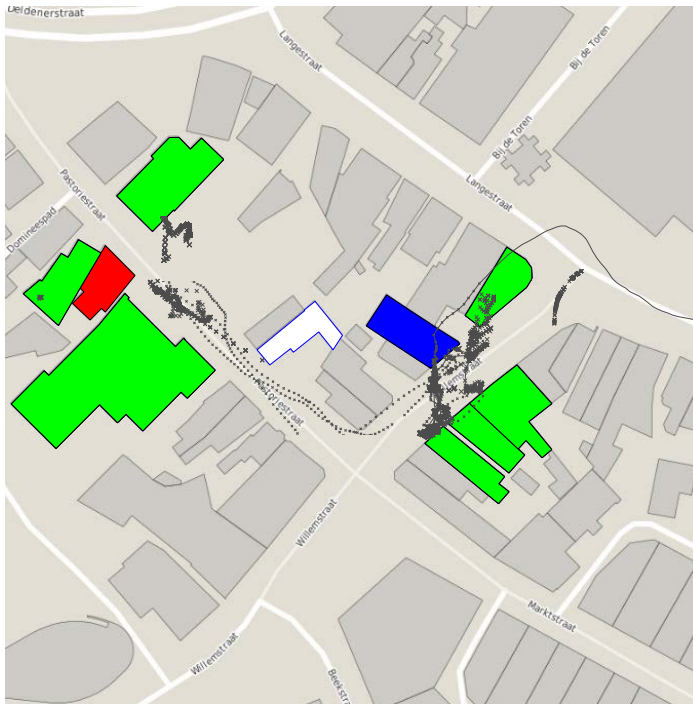
# POI collection from the web



POI-to-POLOI conversion

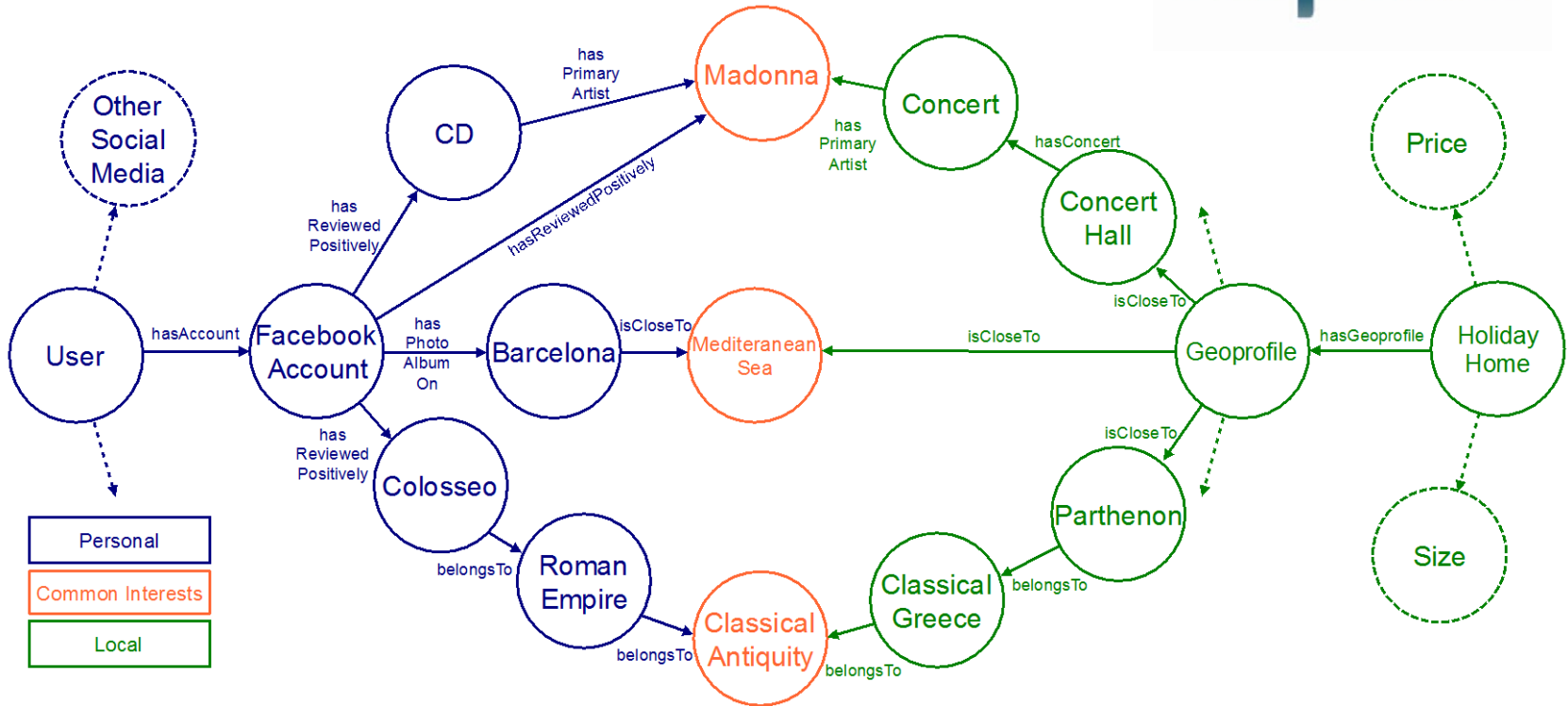


# Matching trajectories with POLOIs



## Staypoint and timeline analysis

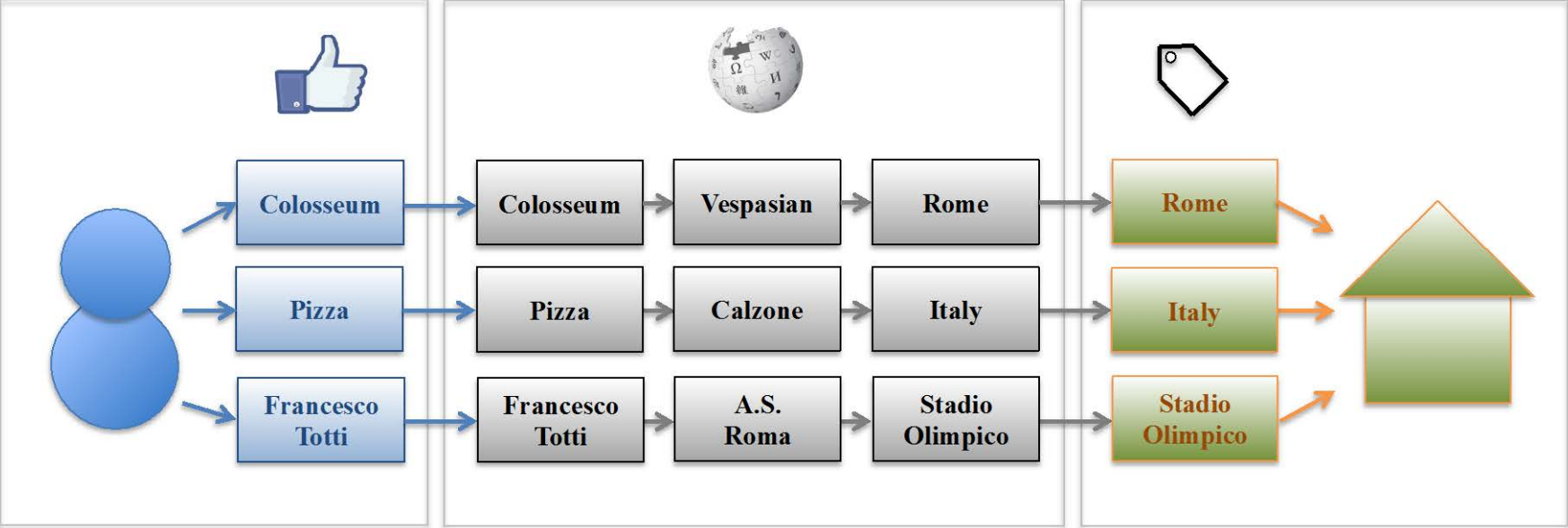
# Generate recommendations



**DBpedia**-fueled concept graph & graph traversals (crowd-sourced, linked open data obtained from a.o. Wikipedia)



# Interest-Based Recommender System



**IBRS**



# Ethical concerns related with TimeTrails

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## Data-related

Knowledge-based recommender systems are *data-intensive*:

- much data needed anyways
- much data quickly outdated

*Private data* as much as possible kept private (on the phone)

*Biggest privacy danger* is in sharing data indiscriminately wrt purpose of application

## Technology-related

- Published and improved algorithms (performance, selectivity, F-scores) may be *adopted by the ill-intending*.
- Privacy as *single separated design concern*.
- Probably naive to think that our algorithms are better than those developed by the IT molochs. They do serve as *state-of-art, public yardstick*.



# Digital Age: Billions of (*IP, Location, attributes*) triplets

... daily, even hourly.

## Mobile devices

Phones, pads, nav-systems & watches

## Sensors

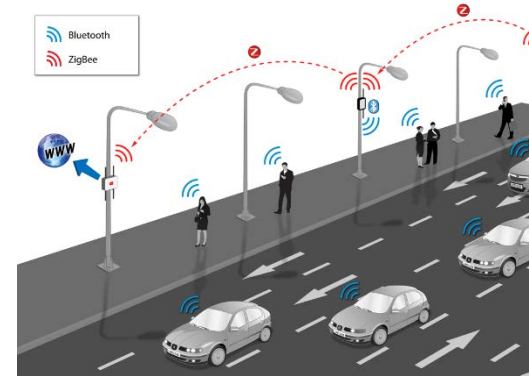
All branches of economy  
All sorts of monitoring purposes

## Internet of Things

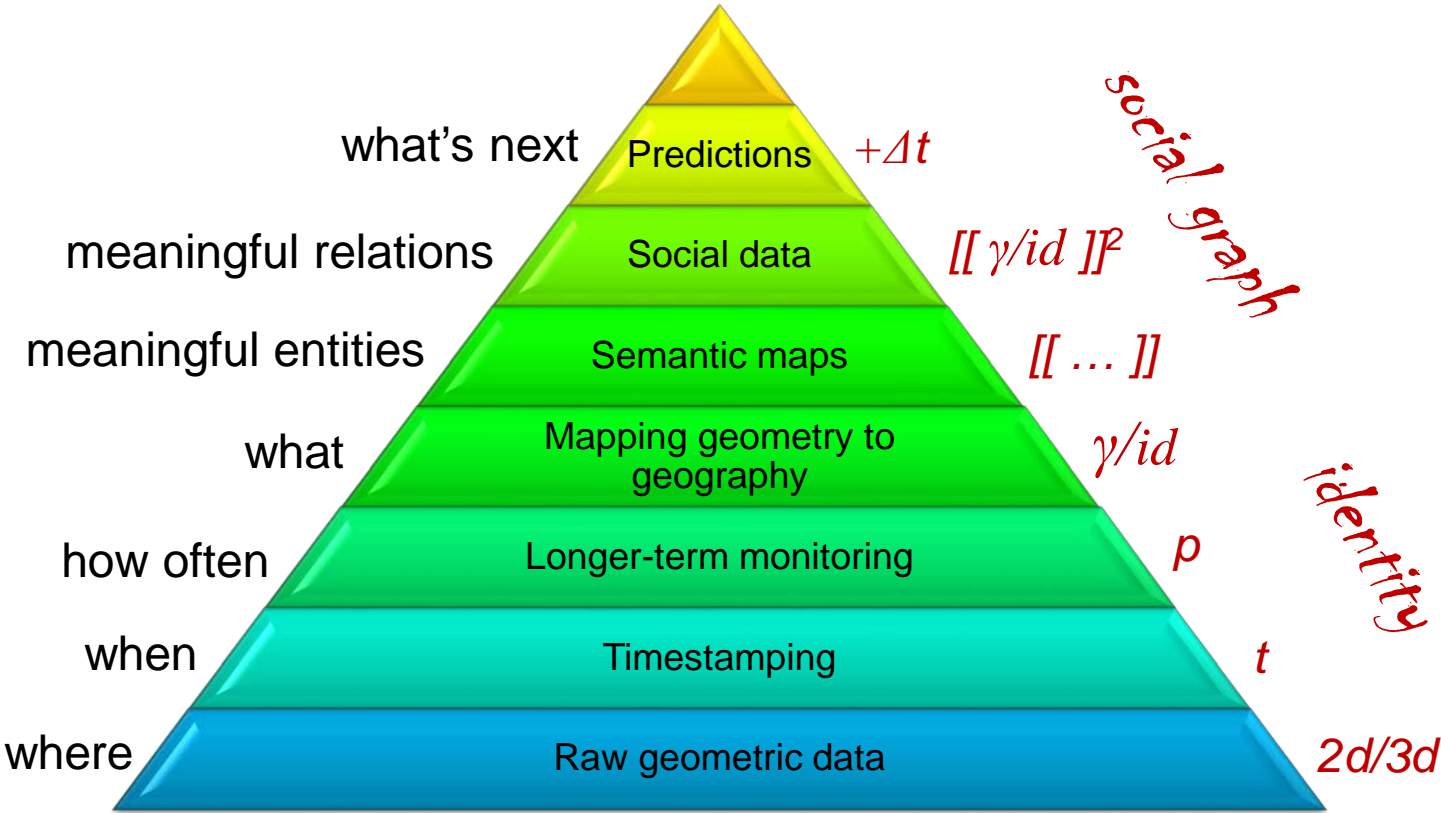
All man-made artefacts online

Strong emphasis on HW but little yet on function & purpose.

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# The Hofmann step model in making sense of geodata



Thomas Hofmann, *Hermeneutik digitaler Daten — Was sagen meine Daten (über mich)?*, ETH Zürich, 2014



# STARS — Satellite images to monitor smallholder farming

**High-income agriculture** is a *data-intensive* business in a *homogeneous* landscape.

Most systems are stressed out and cannot yield much more than present.



**Low-income agriculture** takes place in *heterogeneous* landscapes, and we have *no reliable data* on it.

World's future breadbaskets are in Africa and Asia.





# STARS Hypothesis



We think we can

- **monitor crop growth** within the small farms of sub-Saharan Africa and Southern Asia, *using time-series remote sensing.*

If achievable, *this will*

- allow **improved outlooks for crop yields** throughout the season, *informing policy-makers,* and
- ensure more effective evidence-based advisory services at the farm scale, **informing farmers and agro-business.**



BILL & MELINDA  
GATES foundation

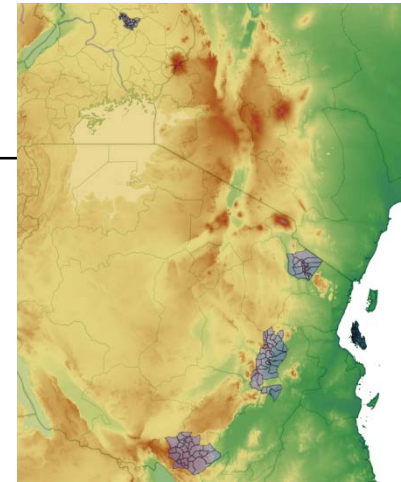




# TANZANIA & UGANDA

CROPLAND DELINEATION => CROP IDENTIFICATION & MONITORING

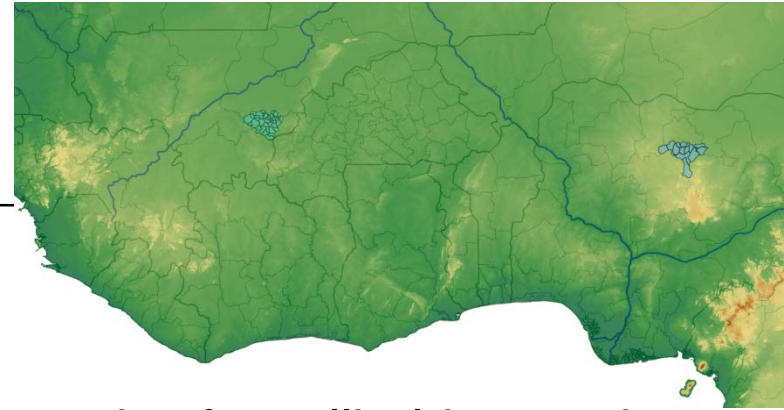
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- Frequent, reliable updates on crop conditions are badly needed to inform national, district and local planning around yields and food security.
- `Classical crop monitoring' for small farm plots is highly challenged due to heterogeneity of many factors.
- *How much crop yield will my plot produce this year, and is crop growth stressed?*
- **Customer segment 1:** Tanzania National Food Security Office, Tanzania National Bureau of Statistics for national monitoring, national statistics
- **Customer segment 2:** Application of developed technology by private sector in Uganda.

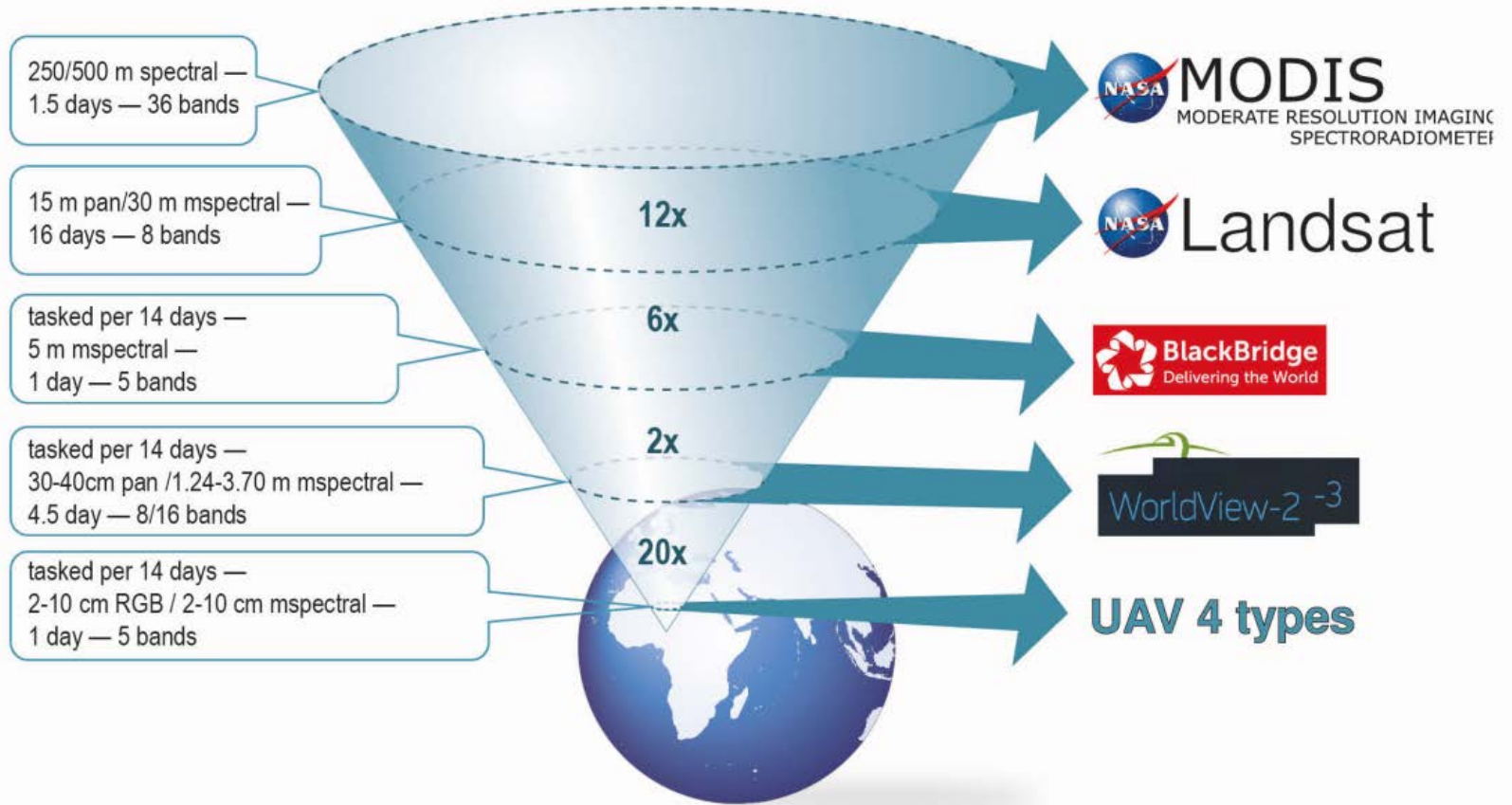
# MALI & NIGERIA

## ACTIVATING BUSINESS ENTRY POINTS



- Imagery for Smallholders
- Interventions often do not address the information and transformation needs of smallholders and their partners (extension, agrotraders, NGOs, gov, ...).
- *Which RS data products (granularity, salience, relevance, timeliness) provide best support in sustained farm information services at scale?*
- **Customer segment 1:** Socially accepted land tenure systems for smallholders to empower in agro-transactions.
- **Customer segment 2:** Agrotraders by support in spatially disaggregated crop recognition and crop health detection.

# STARS Image stack





# Ethical concerns related with STARS

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## Community-related

We work with the most vulnerable people on the planet: any impact on their life better be positive, and must avoid risks.

## Data-related

RS data allows assessing quality of the land and of the labour.

Land security is a *big* issue.

Often combined with household survey data, to understand local economy: a highly intrusive pair.

## Technology-related

- Innovations may cause dependencies: cannot do this work for a single-project, short-lived success.
- Ag is very basal to economy: need to understand the local system holistically.
- Solution is not only to make plants grow better.
- Understand safe pathways out of poverty, and have a clear theory of change.





# Reflections

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**Digital Divide** threatens even our high-income societies.

Research standards & donors more and more demand *open access publication of results, methods and data.*

Construction scientists are often hardly trained in the ethics of empirical science.

**Double Digital Divide** threatens in low-income countries.

Poorly governed production systems offer huge opportunities to appropriate innovations for the stakeholders involved.

Intricate web of socio-economical dependencies makes operations risky

# ICT can also come to the rescue



- The Googles of this world collect data massively, often via tracking cookies from the search engine. **Other search engines** don't do this: *DuckDuckGo.com* and *Ixquick.nl*, for instance.

less is more

**DuckDuckGo Plus** 0.5.1 GEEN HERSTART  
door DuckDuckGo

DuckDuckGo is the search engine that doesn't track you. We also have smarter answers and less clutter. This extension makes DuckDuckGo available in the address bar, search bar and right-click menu. Also adds a handy toolbar button with more features!

[+ Toevoegen aan Firefox](#) [Privacybeleid](#)

AANBEVOLEN

- **Advertisement blockers** help against those ad pop-ups, but not all websites will like you. At OS level, sw like *AdFender*, *AdBlock Plus* or *HostsMan*. Browser-specific solutions also exist.

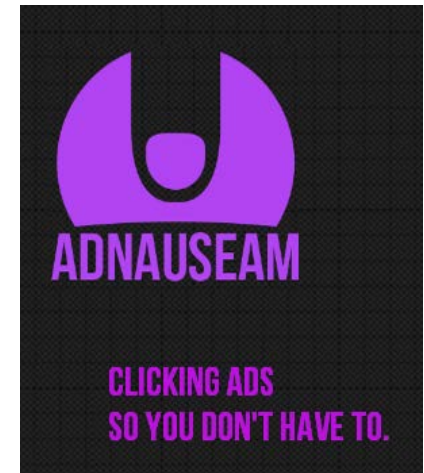
more is less

## ICT to the rescue

Can't beat them? Join them:

- **Browsing obfuscator sw** generates all the possible click behavior data for you, and swamps the surveillance service, rendering your profile totally noisy. Examples are *AdNauseam* and *TrackMeNot*.

AdNauseam automatically clicks every ad link on your page silently; TrackMeNot generates tons of search requests in the background, which *you* will never see back, but which will also add noise to your profile.





# Finally, design of public space

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## Education

- Fight the digital divide globally
- Focus on function and service
- De-emphasize hardware and access

## Legislation

- Protect the inviolate personality
- Install data custodianship transparency
- Install the right to regain anonymity

## Infrastructure

- Provide means for identity brokering
- Public (ad-free) HQ radio/TV stations → Public HQ internet
- Yes/no mailbox stickers





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Can we *trust the government?*

Well, duckduckgo on two keywords: “*ThinThread TrailBlazer.*”



# UNIVERSITY OF TWENTE.

## DR.IR. R.A. (ROLF) DE BY

Associate Professor

Department of Geo-Information Processing

Faculty of Geo-Information Science and Earth Observation

**P** +31(0)53 4874 553

**E** [r.a.deby@utwente.nl](mailto:r.a.deby@utwente.nl)

**M** +31(0)6 4604 2254

**I** [www.utwente.nl/en](http://www.utwente.nl/en)

**F** +31(0)53 4874 335

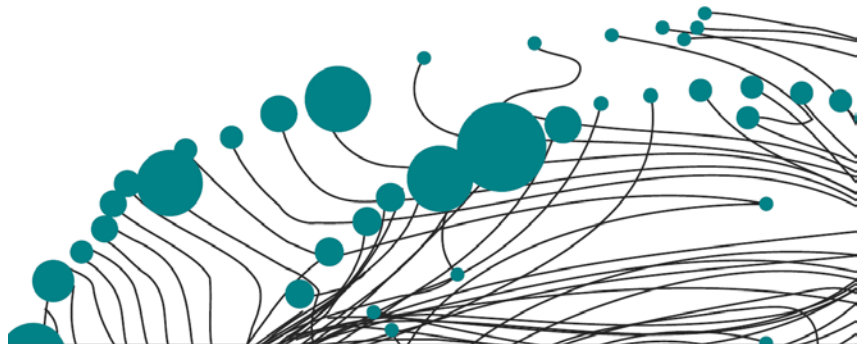
**I** [www.itc.nl](http://www.itc.nl)

P.O. Box 217  
7500 AE Enschede  
The Netherlands

**Building ITC**  
Hengelosestraat 99  
7514 AE Enschede



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