[ΨΣ] interuniversity graduate school of Psychometrics and Sociometrics

summerschool UTRECHT

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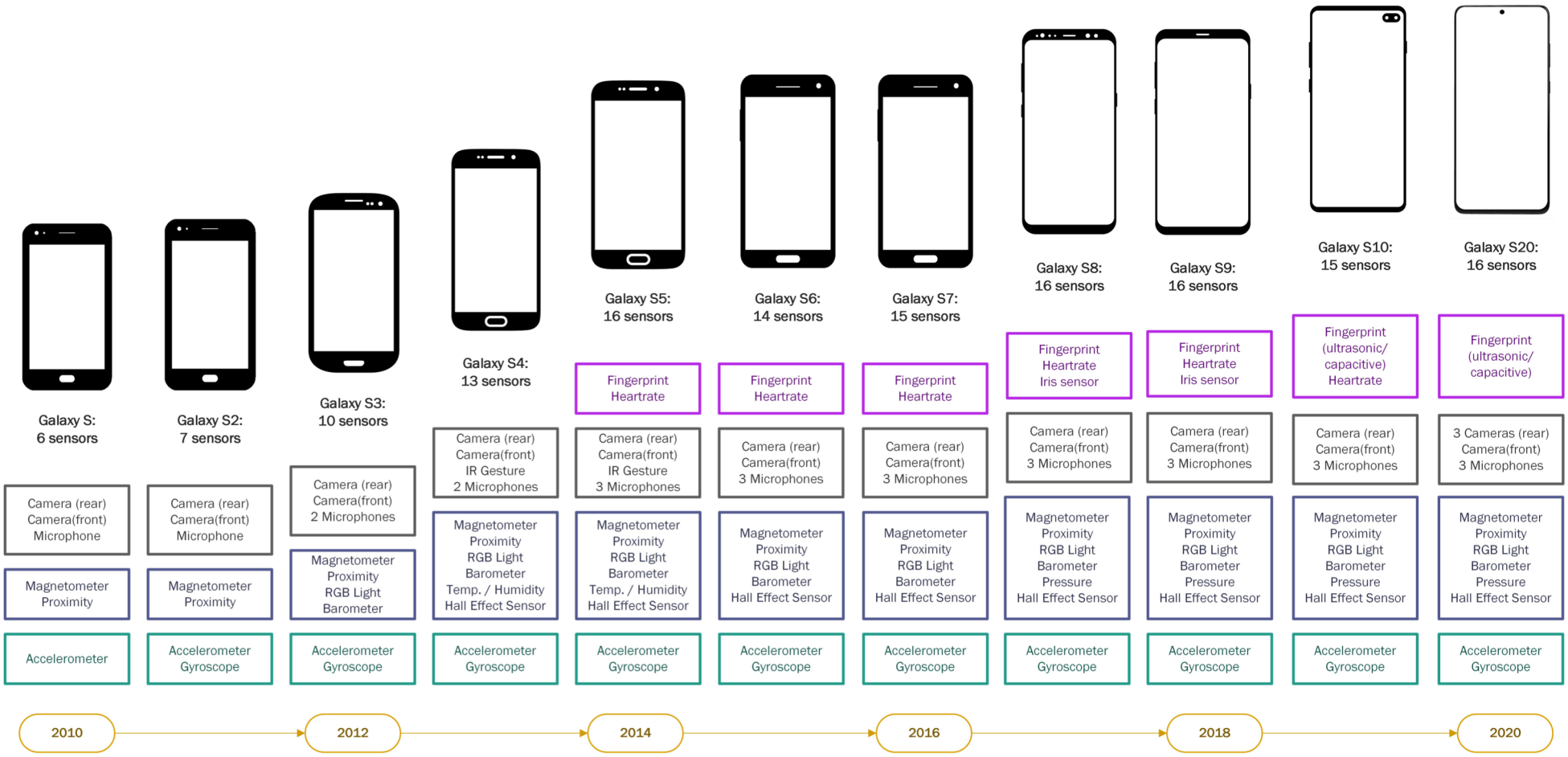
Working with picture and text data

Day 4 Advanced Survey Design

Peter Lugtig

p.lugtig@uu.nl www.peterlugtig.com

Evolution of smartphone sensors



Picture data collected using (smartphone) senors

- Urbanicity and neighborhood characteristics
  (Saad-Sulonen 2008, Jones et al. 2011, Fritz et al. 2017)
- Special populations
  (e.g., children, Plowman & Stevenson 2012)
- Consumer behavior
  (e.g., receipts, Read 2018)
- Collected not as often as geolocation or smartphone log data in the context of surveys

Examples of use of camera sensors: environment

Fig 1. The Autographer wearable camera on adjustable lanyard.

doi:10.1371/journal.pone.0142198.g001

Fig 2. Sample of participants Autographer images from Pilot Study. Clockwise (from top left) these show the following activities with their appropriate HETUS Level one codes: food shopping (3: Household and family care), reading a magazine (8: Mass media), cycling (9: Travel), driving (9:Travel), computer use (1: Employment), and walking (6: Sports and outdoor activities).

Source: Kelly et al. (2015)

Using images to answer research questions

- Purposive sample of older African-American adults (n = 100) living in a variety of neighborhoods in Detroit; for a subsample (n = 20):
  - participant-generated photos and photo-elicitation interviews
  - to examine how participation in everyday occupations changes (or not) for older African-Americans residing in urban neighborhoods that have undergone significant physical and socio-demographic changes
  - Android phones loaned for 7 days to answer EMA questions: 720 images collected
  - "For the next 7 days, while you are filling out the activity survey, we want you to carry the smartphone with you during your daily activities and take photographs while you are out doing your usual everyday activities. The photographs can be of anything about your neighborhood that you feel is important to your daily activities or stress."

Heather Fritz & Malcolm P. Cutchin (2017) Changing neighborhoods and occupations: Experiences of older African-Americans in Detroit, Journal of Occupational Science, 24:2, 140-151, DOI: 10.1080/14427591.2016.1269296

Using images to answer research questions

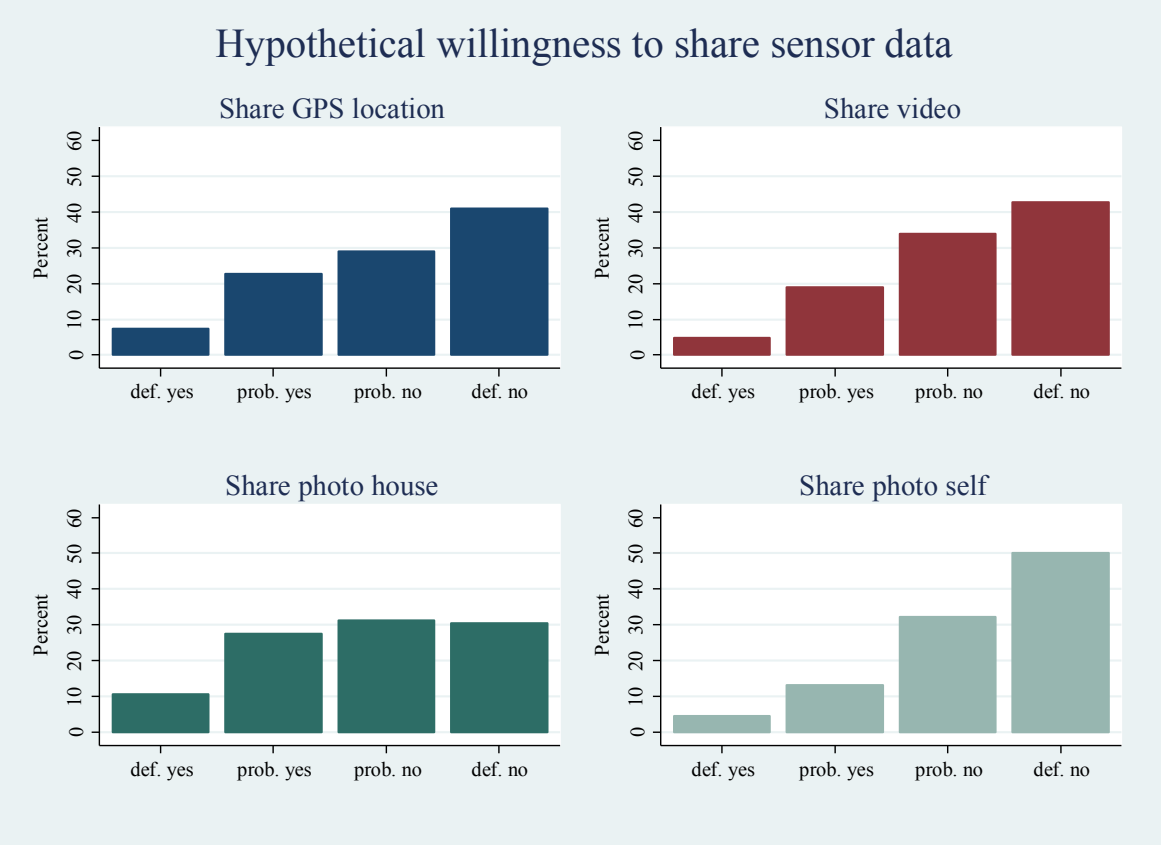
- Photo elicitation interviews: for each participant, photographs uploaded to an iPad/laptop to view during the interview.
- Researcher and participant review every photo that the participant has taken. Participants asked to explain the content and meaning of the photographs, expand upon issues raised through those explanations.
- Findings about changing daily routines (no night-time outings), changes in daily occupations, fear of crime, changed social participation, heightened vigilance during daily occupations, etc.

Heather Fritz & Malcolm P. Cutchin (2017) Changing neighborhoods and occupations: Experiences of older African-Americans in Detroit, Journal of Occupational Science, 24:2, 140-151, DOI: 10.1080/14427591.2016.1269296

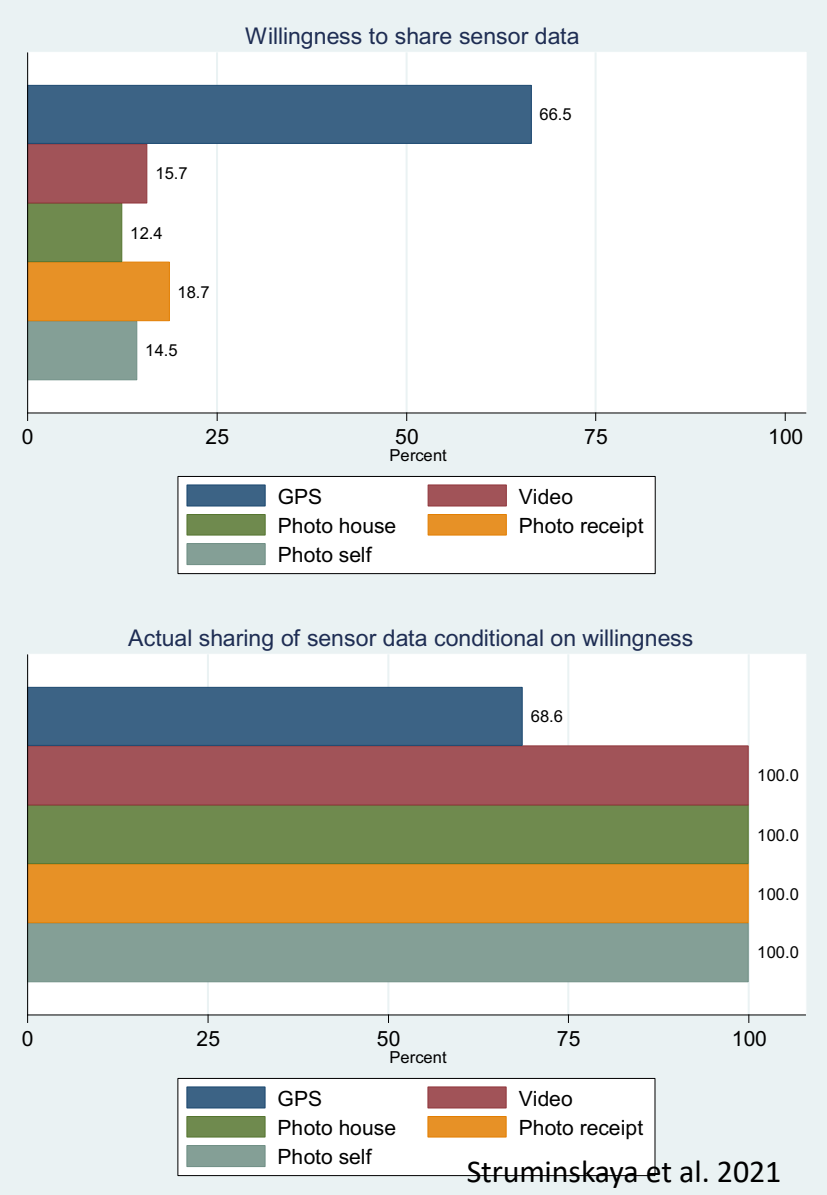
Willingness & collection of picture data

- General willingness is high:
  - 56% willing to take a picture at the end of a survey (Ribeiro & Kuegler 2014)
  - UK Understanding Society Innovation Panel: 65% willing to use their camera (Wenz et al. 2019)
- Willingness varies by country:
  - 25-52% for taking pictures across 7 countries (Revilla et al. 2016)
- Willingness & participation varies by picture content:
  - The Dutch LISS Panel: 38% willing to take a photo of house but 18% photo of self (Struminskaya et al. 2020)
  - Dutch (smartphone using) population cross-section: participation 12% for photo of house, 14% photo of self, 19% photo of receipt (Struminskaya et al. 2021)

Willingness & taking pictures



Struminskaya et al. 2020



Struminskaya et al. 2021

Collecting images in context: an example

- 41-58% have high concern collecting sensor data using their smartphone cameras (Keusch et al. 2020)
- What is the willingness of respondents to take pictures that relate to the context of the survey? What is the task completion rate?
- Will providing respondents with a choice of taking pictures result in higher task completion?

Data & Methods

- Probability-based online general population panel in the Netherlands (the LISS Panel)
  - 2,700 invited smartphone & tablet users
  - Response (AAPOR 1) = 65.1%
  - Fieldwork: October 3-31, 2019
- Randomly assigned to 3 conditions:
  - Take a picture
  - Answer survey questions
  - Choice between taking a picture and answering survey questions (initially and for each task)

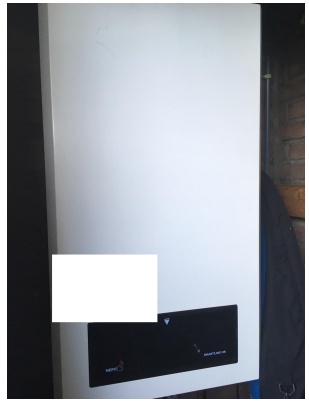
    In this study, we would like to ask you several times to take pictures of parts of your home. You can also choose to answer questions, but your answers are then less valuable for this study. You can make a choice with every question to either take a picture or not.

Picture tasks

- Photo of favorite place in their dwelling
- Photo of garden/balcony/patio/terrace/courtyard
- Photo of a heating element

- At the end of the questionnaire: asked to confirm submission

Note: pictures recreated, not actual pictures submitted by respondents



Pictures vs text

- Of those who had a choice, about 57% opted for photos
- Compliance varied by task
- Giving a choice is neither detrimental nor beneficial for picture task completion

Experimental Condition	Fav. place	Outdoors	Heating
Willingness rate: Choice condition	57% (540)	57% (521)	58% (444)
Picture condition: Took a photo	43% (540)	29% (521)	36% (444)
Text condition: Answered the question	98% (655)	99% (632)	67% (549)
Chose photo & took it	48% (564)	31% (537)	37% (479)

Note: eligible n in parentheses

Submission rates & Reasons for nonparticipation

- Privacy concerns: 56% favorite place, 15% heating element
- Technical difficulties: 15% favorite place, 12% heating element
- Submission rates high, do not differ by condition

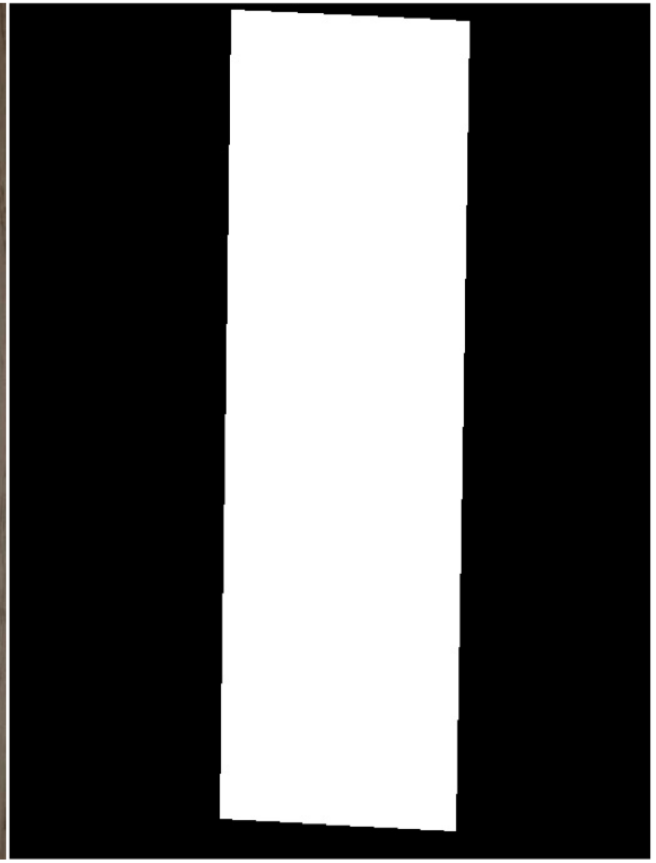
Experimental Condition	Fav. place	Outdoors	Heating
Submission rate: Choice condition	92% (269)	92% (167)	95% (175)
Submission rate: Picture condition	91% (233)	93% (149)	96% (161)

Data quality

Information about a heating device manually extracted (n=321 pictures)

- 88% made pictures in line with the task
- 66% of pictures contained half or more than half of the element
- 2% other than element of interest (radiator/floor), or bad quality
- In 44% of all pictures model and specifications could be extracted (using Optical Character Recognition, 40% of models and 6% of specifications extracted) – comparable to answers to survey questions

Another example: Receipt scanning and classification (De Wolf, Schouten 2021)



https://massworkshop.org/wp-content/uploads/sites/374/2021/05/2021_MASS-De-Wolf-Schouten.pdf

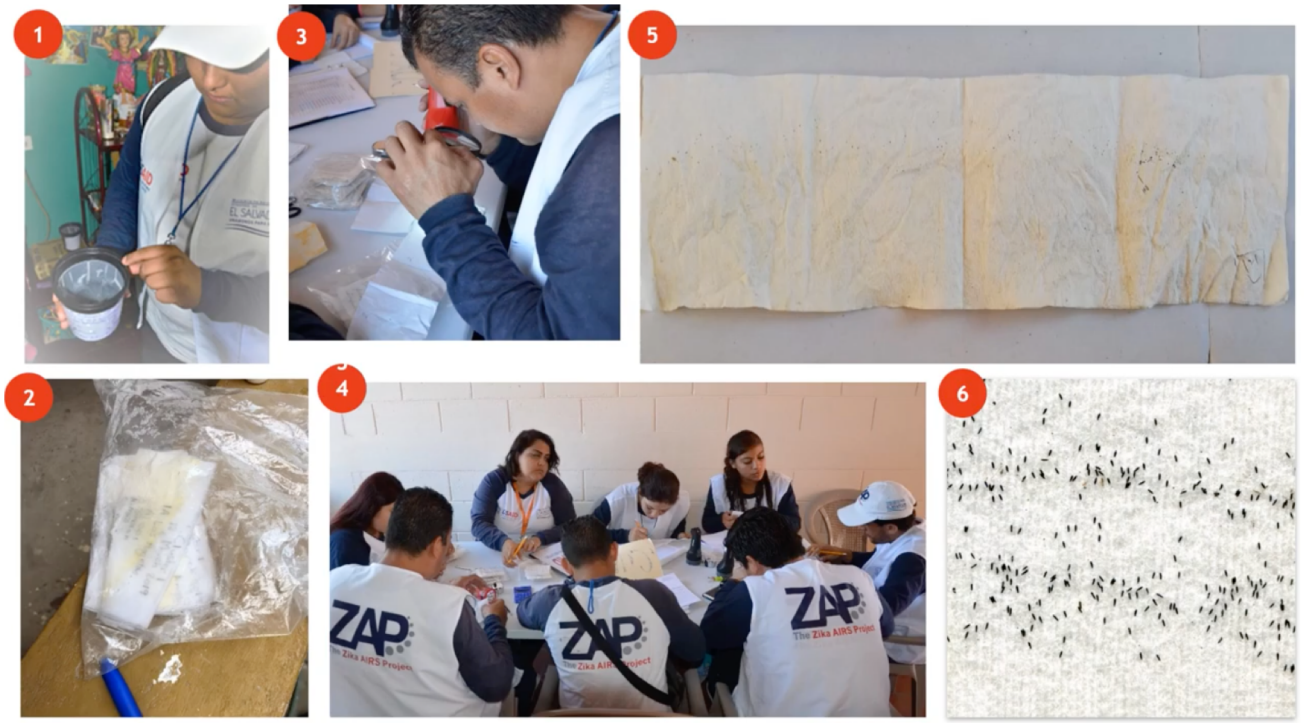
Another example: Receipt scanning and classification (De Wolf, Schouten 2021)

	RECDESC	Price	Amount	Pay-mode	Shopname	Date	Coicop_class	Coicop_class_name	Coicop_class_prob
0	junbo kersttas. 2019 dado	0.0	1	card	Jumbo	21/12/2019	09.3.1.2	Speelgoed en feestartikelen	90
1	jmb mesclun melange	1.65	1	card	Jumbo	21/12/2019	01.1.7.1	Verse of gekoelde groenten behalve aardappelen...	100
2	jumbo komkommer	0.85	1	card	Jumbo	21/12/2019	01.1.7.1	Verse of gekoelde groenten behalve aardappelen...	64
3	peterselie	1.08	1	card	Jumbo	21/12/2019	01.1.9.2	Zout, specerijen en keukenkruiden	84
4	jumbg peper rood	1.19	1	card	Jumbo	21/12/2019	01.1.7.1	Verse of gekoelde groenten behalve aardappelen...	74
5	jumbo alfalfa	2 39	1	card	Jumbo	21/12/2019	01.1.7.1	Verse of gekoelde groenten behalve aardappelen...	99
6	jumbo kortander	0.0	1	card	Jumbo	21/12/2019	01.1.1.3	Brood	75
7	jmb geitenk bolletje	1.09	1	card	Jumbo	21/12/2019	01.1.8.3	Chocolade	96
8	jumbo rode uien	0.66	1	card	Jumbo	21/12/2019	01.1.6.1	Vers of gekoeld fruit	74
9	jumbo bio knoflook	0.69	1	card	Jumbo	21/12/2019	01.1.7.1	Verse of gekoelde groenten behalve aardappelen...	90
10	bio snoeptomaatjes	1.50	1	card	Jumbo	21/12/2019	01.1.7.1	Verse of gekoelde groenten behalve aardappelen...	100
11	: kesbeke augurkblokje	1.15	1	card	Jumbo	21/12/2019	01.1.7.3	Gedroogde groenten, andere bereidingen en cons...	100
12	avocado	1.29	1	card	Jumbo	21/12/2019	01.1.6.1	Vers of gekoeld fruit	82

https://massworkshop.org/wp-content/uploads/sites/374/2021/05/2021_MASS-De-Wolf-Schouten.pdf

Field research: additional information (Link 2020)

- Goal: Tracking mosquito populations to reduce incidence of infectious diseases
- Hand-counting mosquito eggs VS.
- Progressive Web App (website functioning locally like an app, offline) + Computer Vision (object recognition within pictures)



Watch Link's BigSurv20 conference presentation on Youtube:
https://www.youtube.com/watch?v=nLAjaXxExK8&t=655s

Extracting information from images

Social Science Computer Review
2019, Vol. 37(5) 669-683

DOI: 10.1177/0894439318791515
journals.sagepub.com/home/ssc
SAGE

Answering Mobile Surveys With Images: An Exploration Using a Computer Vision API

Oriol J. Bosch[1], Melanie Revilla[1], and Ezequiel Paura[2]

- Compared Google Vision to a human coder (1. taking a picture of "what you see right now", 2. uploading an image from stored images, "something that made you laugh")
- 52-65% of tags by Google Vision similar to tags of human coders

Try the API

Objects | Labels | Logos | Text | Properties | Safe Search

Poster	74%
Clothing	72%