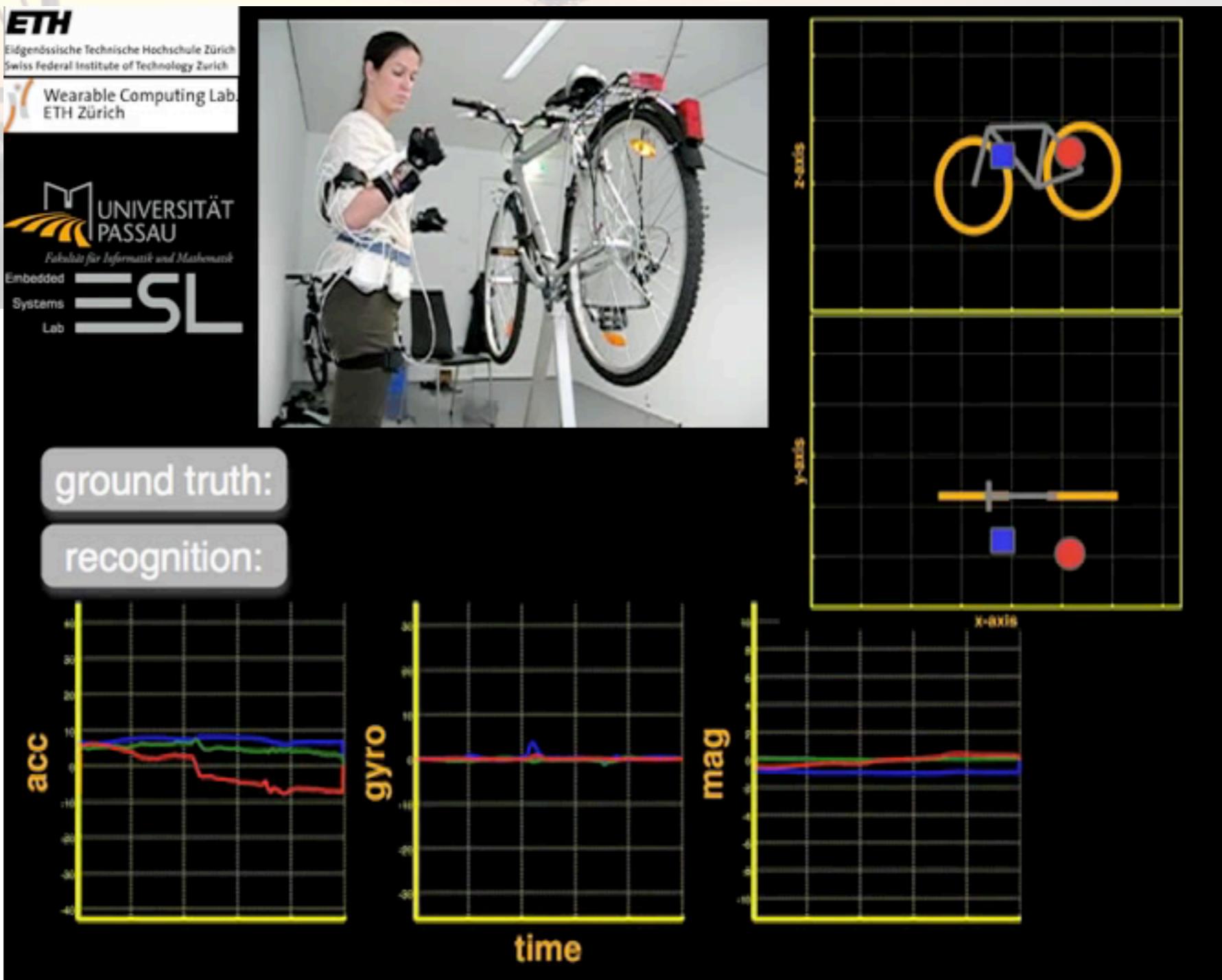




Cognitive Activity Recognition in the Large Using Big Data to Revolutionize Learning

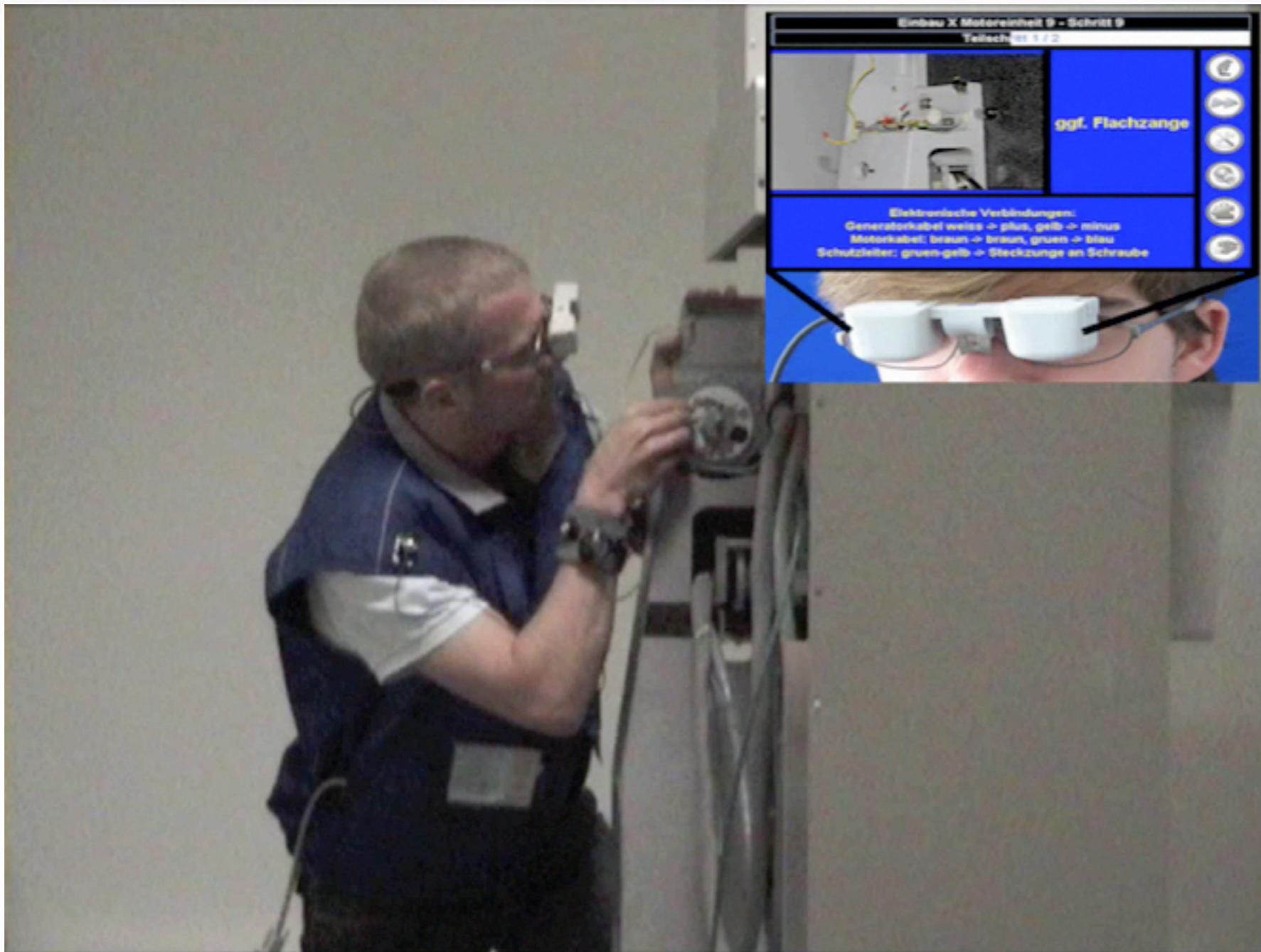
Koichi Kise, Kai Kunze
Osaka Prefecture University

Physical Activity Recognition



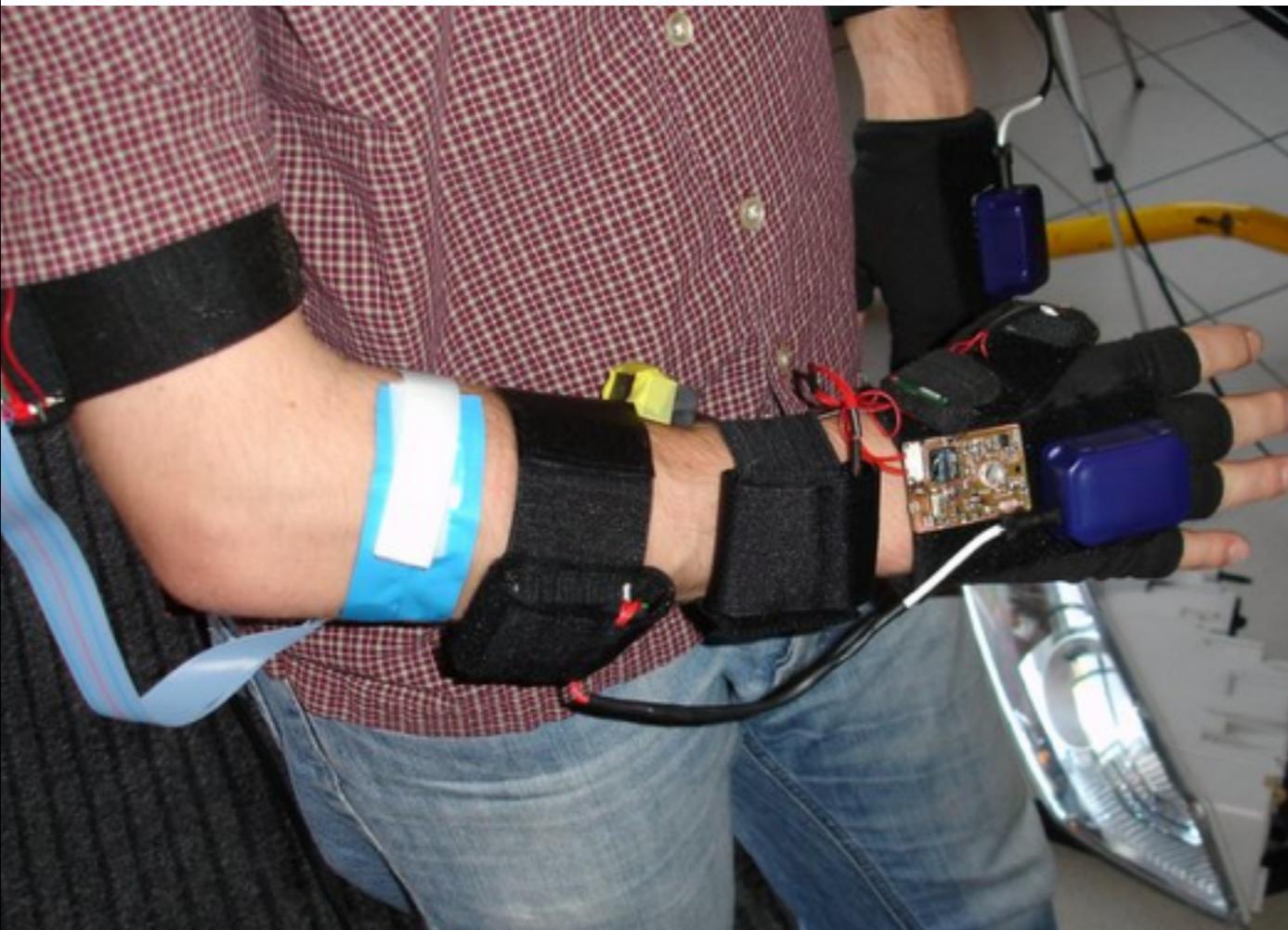
Research by: Georg Ogris, Thomas Stiefmaier

Physical Activity Recognition



Kunze, K., Wagner, F., Kartal, E., Morales Kluge, E., and Lukowicz, P. Does Context Matter ? - A Quantitative Evaluation in a Real World Maintenance Scenario. In *Proceedings of the 7th international Conference on Pervasive Computing Nara, Japan*, May 11 - 14, 2009.

Can you imagine your grandmother wearing this?

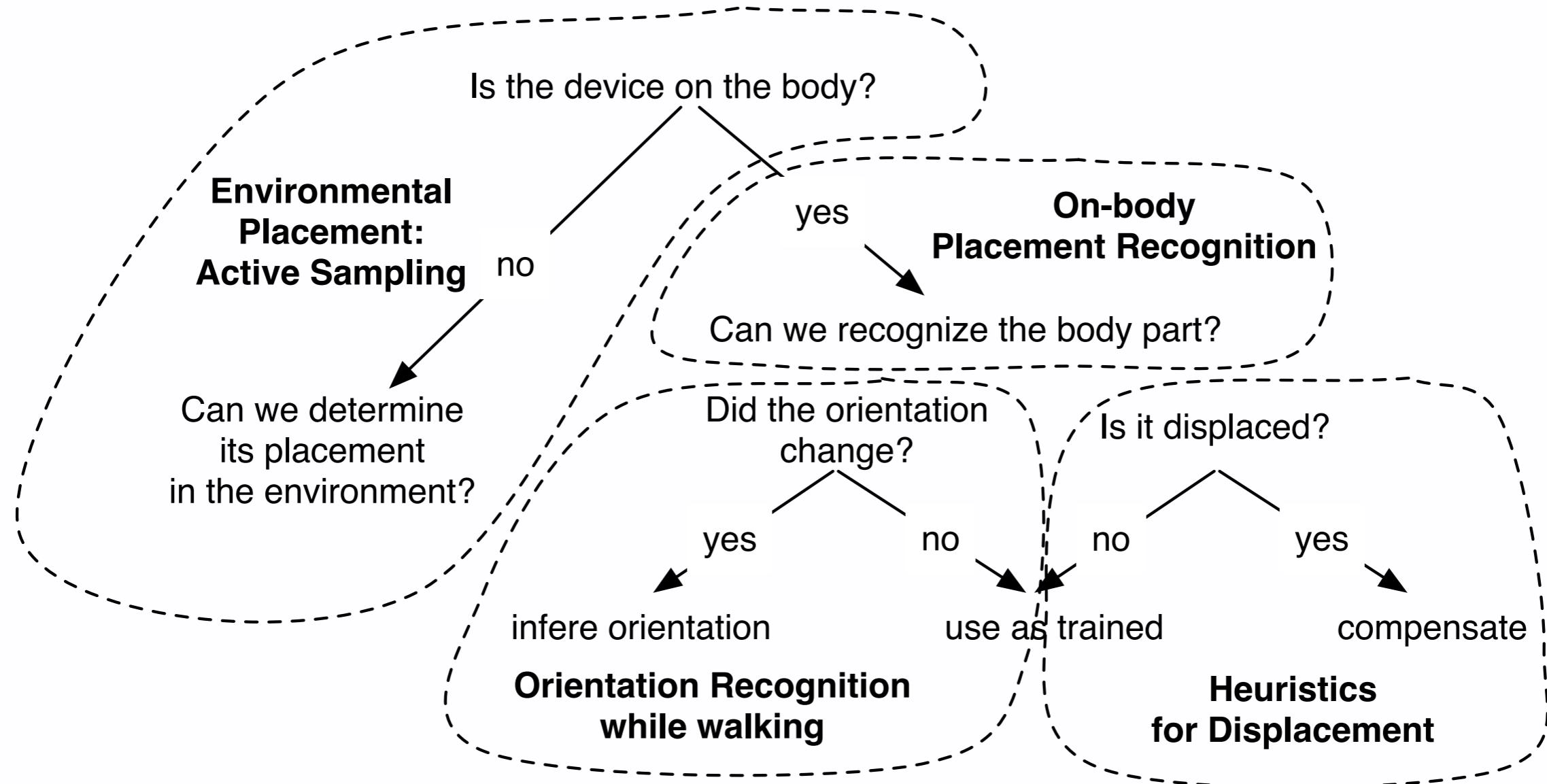


Maybe ...

... if you are a phD. student
in Wearable Computing



Dealing with Displacement in Physical Activity Recognition



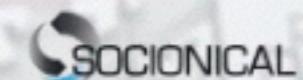
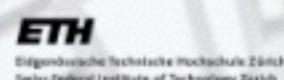
Kunze Kai. Compensating for On-Body Placement Effects in Activity Recognition, 2011.

“Democratizing Big Data”

Crowd-based Mobile Phone Sensing for SOCIONICAL, FuturICT



Sensor Data recorded during a Socionical Experiment at the 2011 Lord Mayor's Show in London



Tracking Reading Habits

Tracking Reading Habits:

How much do you read? How fast? How often?
What do you read?
How much do you understand?



Quantified approach to reading (knowledge acquisition)

“Can I copy the habits of my thesis advisor to become a better researcher?”

higher general knowledge [1]

If you give quantified feedback people can improve their habits

similar to apps/devices that track fitness and health

they have been shown to improve physical fitness



Very Few In-Situ Studies

[1] A. Cunningham and K. Stanovich. What reading does for the mind. *Journal of Direct Instruction*, 1(2):137–149, 2001.

[2] A. Bulling, J. A. Ward, and H. Gellersen. Multimodal Recognition of Reading Activity in Transit Using Body-Worn Sensors. *ACM Trans. on Applied Perception*

The Wordometer

Experimental setup

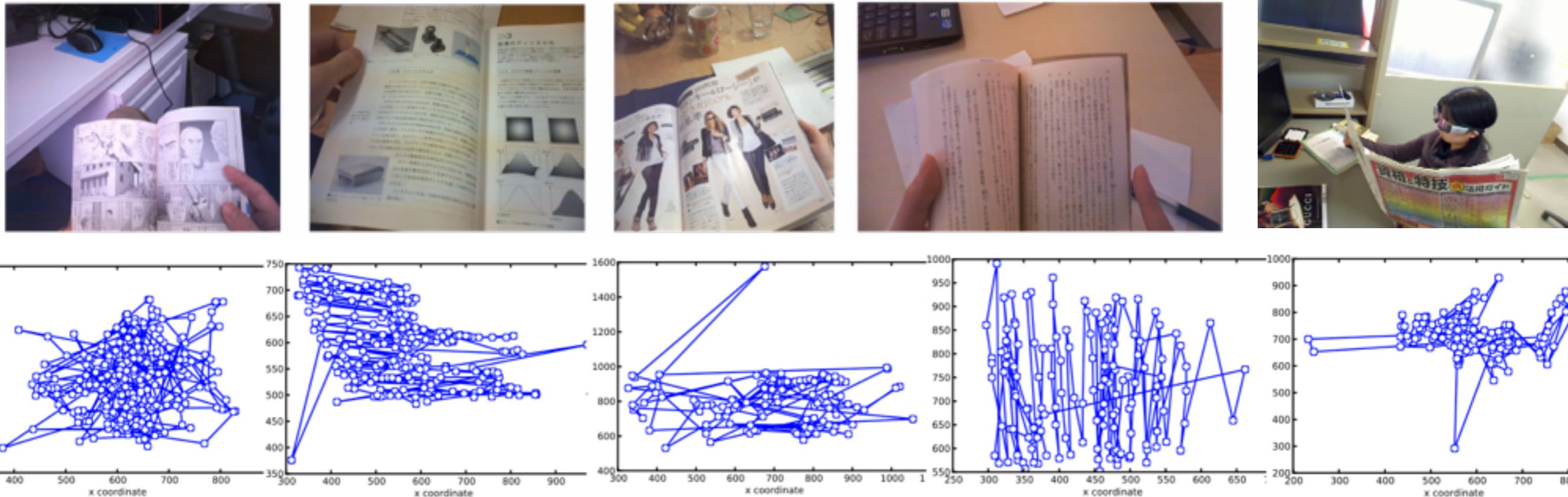


Gaze overlaid on the document using
Document image retrieval
Accuracy around ~8 %

Abstract
~~All positive examples are alike, each negative example is negative in its own way.~~
~~During interactive multimedia information retrieval, the number of training samples fed-back by the user is usually small, furthermore, they are not representative for the true distributions—especially the negative examples. According to the difficulties is the non-linearity in real-world distributions. Existing solutions fail to address these problems in a principled way. This paper proposes biased discriminant analysis and transforms specifically designed to address the asymmetry between the positive and negative examples, and to trade off generalization for robustness under a small training sample. The kernel function, namely “BiasMap”, is derived to facilitate non-linear biased discrimination. Extensive experiments are conducted for performance evaluation as compared to the state-of-the-art methods.~~

K. Kunze, H. Kawaichi, K. Yoshimura, K. Kise. The Wordometer – Estimating the Number of Words Read Using Document Image Retrieval and Mobile Eye Tracking ICDAR 2013. Best Paper Award

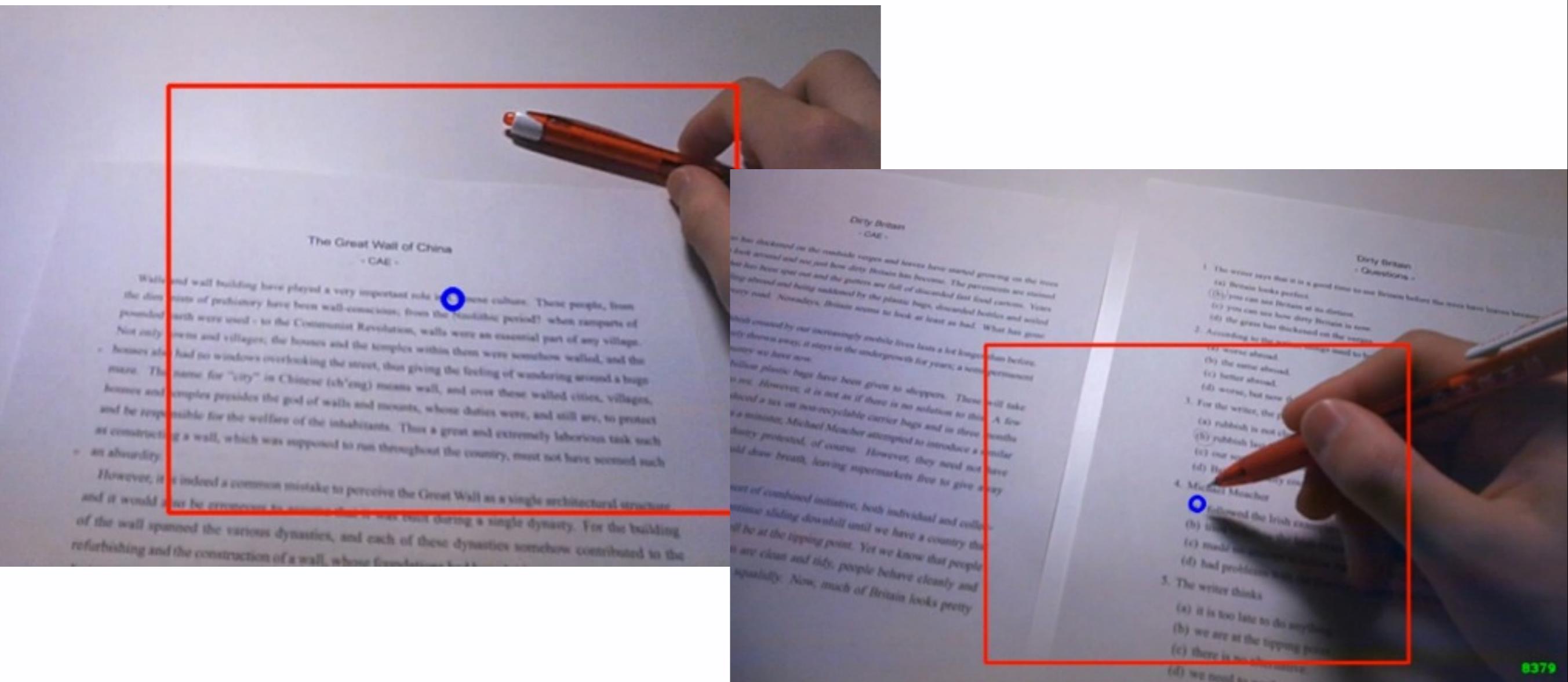
Recognizing Document Types



72 % user independent recognition (10 users, 5 document types, 5 environments)

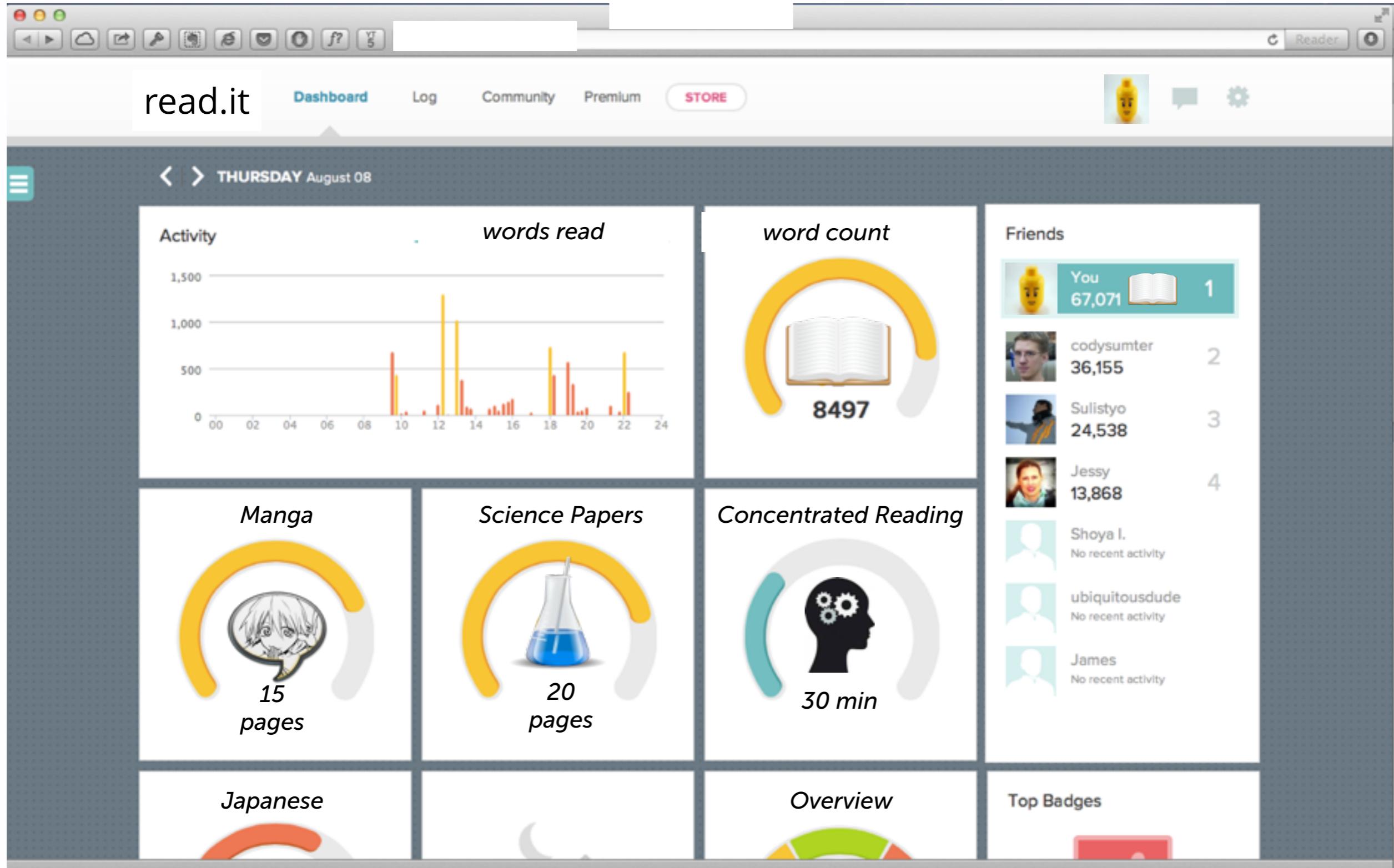
Kai Kunze, Andreas Bulling, Yuzuko Utsumi, Koichi Kise. I know what you are reading – Recognition of document types using mobile eye tracking, ISWC 2013, Zurich.

Inferring Expertise Level

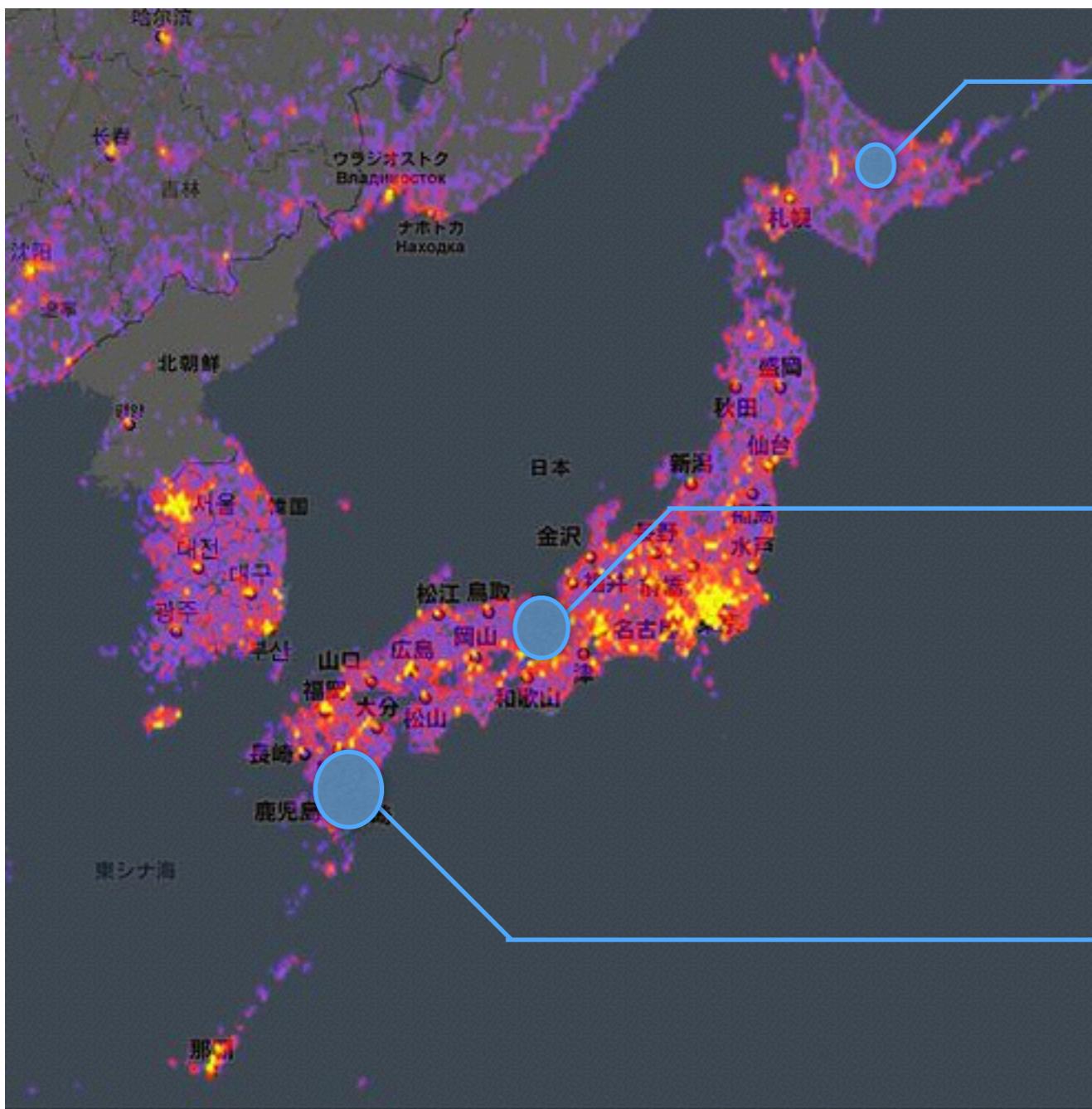


K. Kunze, H. Kawaichi, K. Yoshimura, K. Kise. Towards inferring language expertise using eye tracking. accepted as Work in Progress at ACM SIGCHI Conference on Human Factors in Computing Systems, Paris, France 2013.

Quantified View on Learning



Large Scale Reading/Comprehension Patterns



Also possible in temporal or other domains:

Most experts in X have read book 1,2,3 and 4 ...

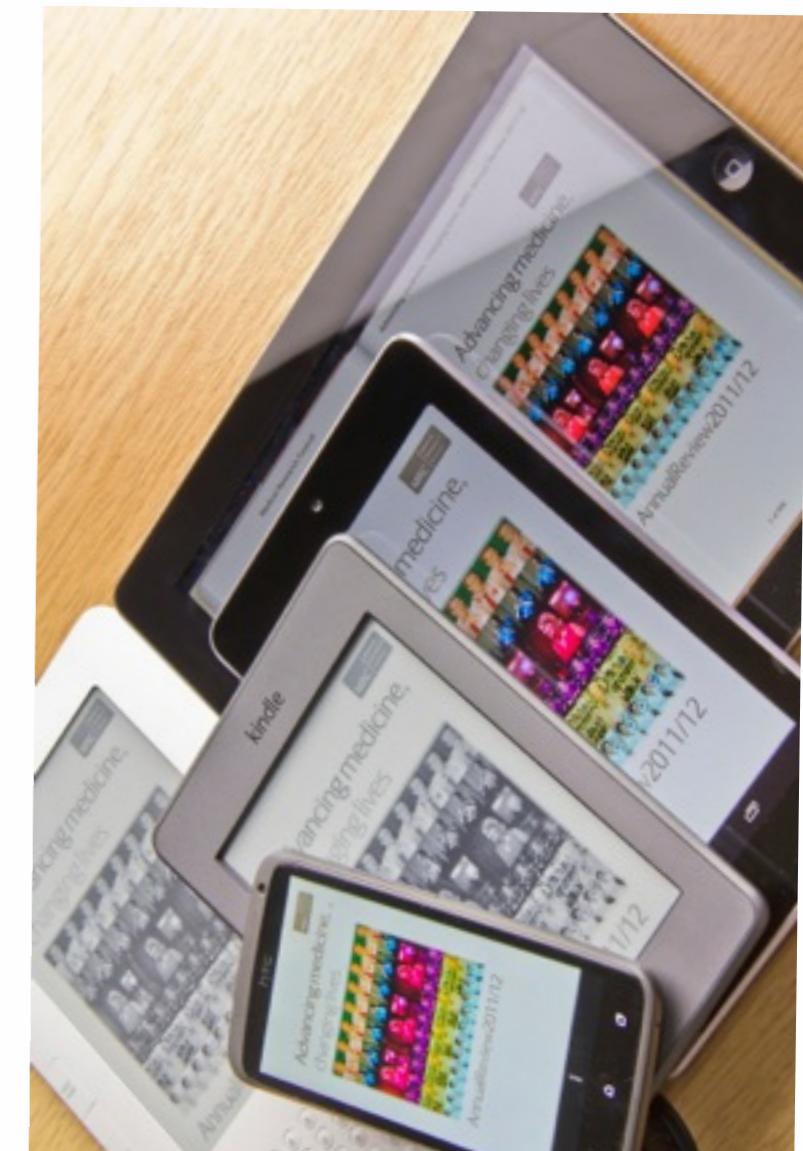
... but eye tracking hardware is expensive



Come on, even my grandparents use Glass ;)



True, yet might change with the next version of glass ...



Can't we use commodity devices for low-cost low fidelity eye tracking?

Backup video (in case demo fails ...)

Improving Comprehension

Expertise Analysis

Bastian Pfleging (phD. student from Albrecht Schmidt)
Andreas Bulling (Max Plank, Saarbruecken)

Speed Reading App

Tilman Dilinger (phD. student from Albrecht Schmidt)

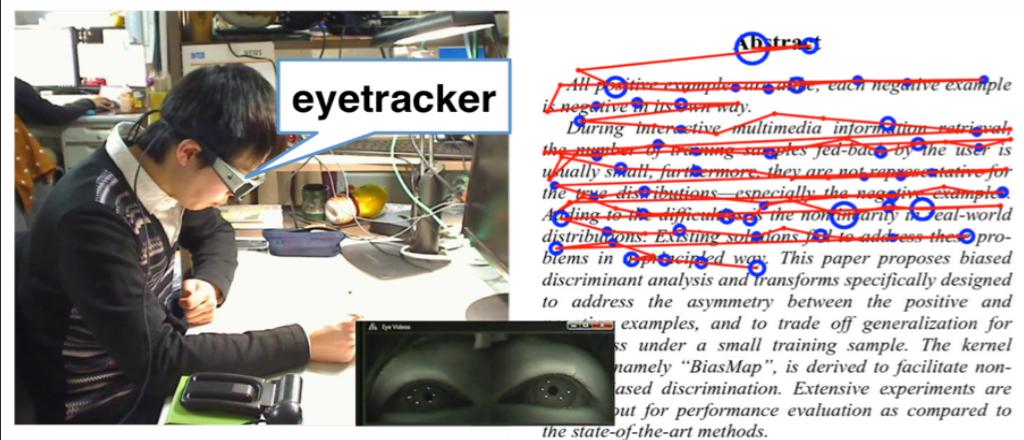
Augmenting Documents

Takumi Toyama (phD. student from Andreas Dengel DFKI)

Long Term Tracking of Knowledge Activities

Shoya Ishimaru visiting Paul Lukowicz and Andreas Dengel

Crowdsourcing reading habits ...



Can we crowdsource
scientific studies about reading?



questions, remarks, violent dissent?

<http://kaikunze.de>

twitter: @k_garten

facebook: kai.kunze

app.net: @kkai

kai.kunze@gmail.com

<https://github.com/kkai/>



Shameless Advertisement(s):
Augmented Human 2014, Kobe
<http://bit.ly/augmented2014>
Paper Deadline: Jan 11, 2014
Conference: March 7-9, 2014



Big Data for Social Good Workshop
and Challenge at Ubicomp 2014
organized by Nuria Oliver and
Daniel Gatica-Perez

Talk at the Chaos Communication Congress
30C3 in Hamburg (27.12. -31.12.2014)