Signal processing systems

Jan Bergmans
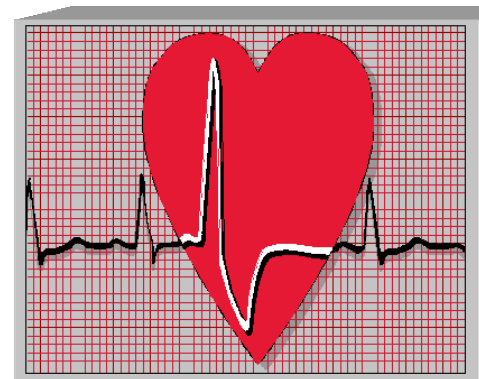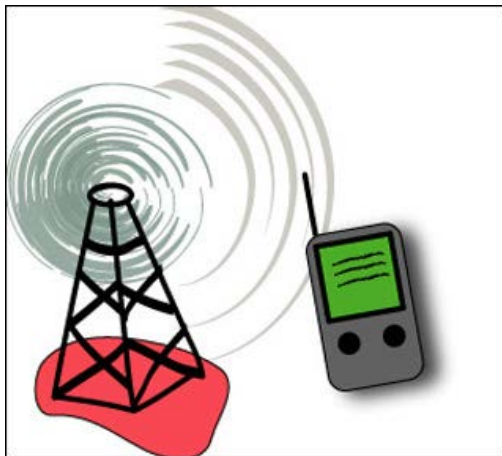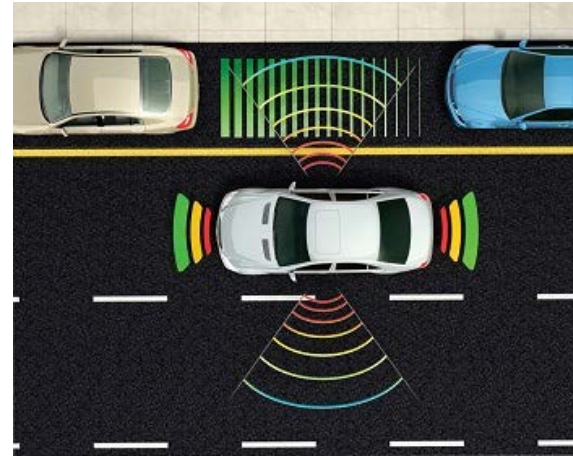**May 2017**
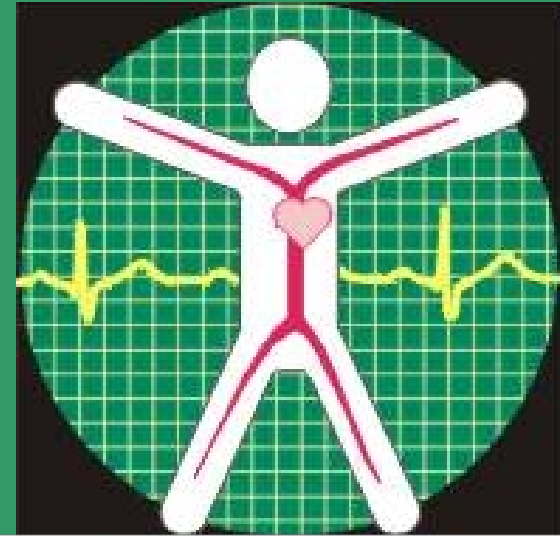
Signal Processing Systems

Technische Universiteit
Eindhoven
University of Technology

SPS Research palette

Perceptive SP	SP for Comms	Medical SP
Acoustic	Wireless comms	Clinical diagnostics
Video/Images	Coded light	Personal health systems
Automotive	Biometry	

FOUNDATIONS

Signal theory

Information theory

Data science / machine learning

4

TU/e Technische Universiteit Eindhoven University of Technology

SPS scientific staff

Alex Alvarado: information theory, digital communications, fiber optics and wireless.
Jan Bergmans: signal processing for communications.
Egor Bondarev: video system architectures.
Pierre Cluitmans: neuromonitoring, medical signal processing.
Gijs Dubbelman: automotive intelligence, mobile perception systems.
Massimo Mischi: medical signal and image processing.
Chiara Rabotti: medical signal processing.
Piet Sommen: adaptive array signal processing, acoustic communication.
Tjalling Tjalkens: information theory, source coding.
Rik Vullings: medical signal processing, machine learning.
Frans Willems: information theory, digital communications and coding, authentication.
Peter de With: video coding and analysis, embedded system architectures.
Sveta Zinger: video content analysis, brain image analysis.

Part-time professors:
Ronald Aarts (Philips):   medical signal processing, audio signal processing.
Bert Aldenkamp (Kempenhaeghe):   neurology, imaging and cognition in epilepsy.
Johan Arends (Kempenhaeghe):   epilepsy monitoring.
Erik Korsten (Catharina hospital):   peri-operative signal and information processing.
Jean-Paul Linnartz (Philips Lighting):   digital communications, intelligent lighting.
Guid Oei (Maxima Medical Center):   perinatal monitoring, medical simulation.
Sebastiaan Overeem (Kempenhaeghe):   sleep monitoring.
Bert de Vries (GN ReSound):   machine learning, hearing aids
Hessel Wijkstra (AMC-TU/e):   prostate cancer ultrasonography.

7 PostDocs, ca. 100 PhD students.

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Video coding and architectures

Web site: vca.ele.tue.nl

Peter de With   Sveta Zinger Egor Bondarev Gijs Dubbelman

3D & Multi-view coding
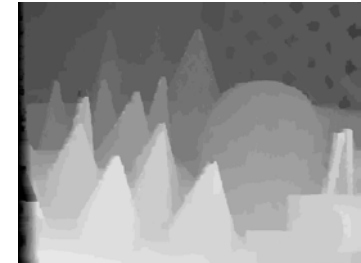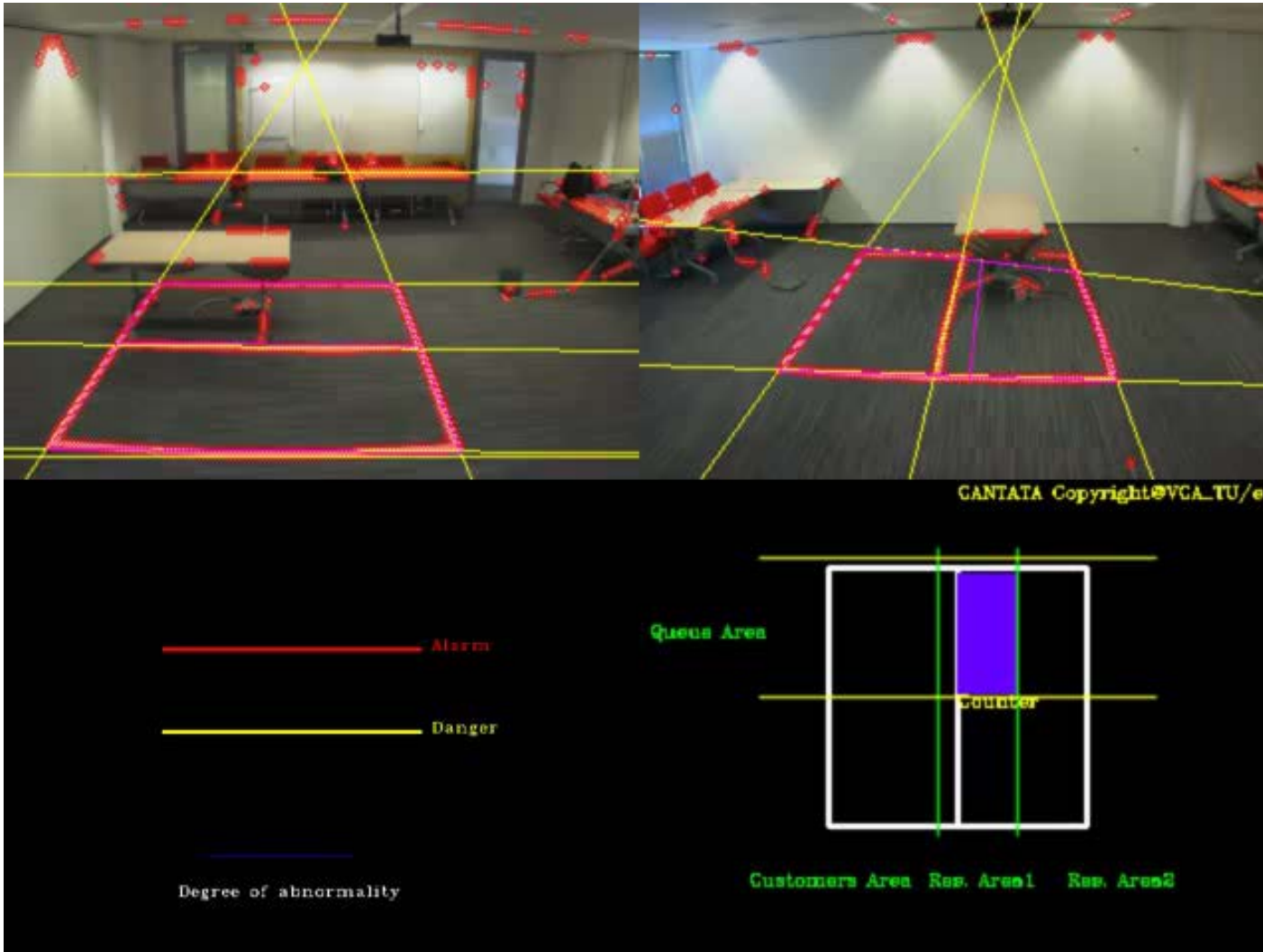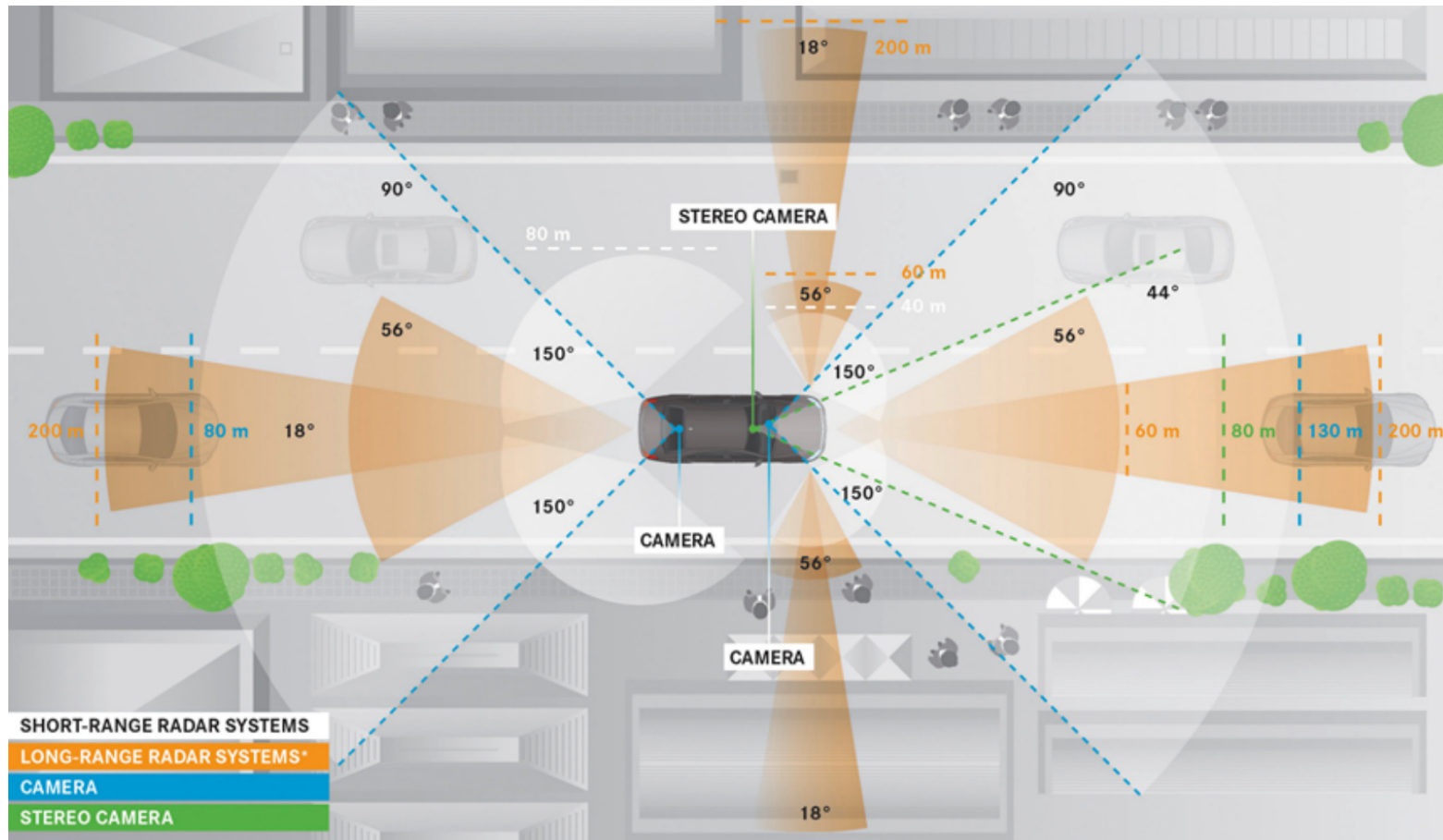
Real-time architectures

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Eindhoven
University of Technology

Video content analysis

Sveta Zinger

Peter de With

Technische Universiteit
Eindhoven
University of Technology

Mobile perception systems

Web site: www.gijsdubbelman.com

Gijs
Dubbelman

TU/e Technische Universiteit Eindhoven University of Technology

Deep learning for scene parsing
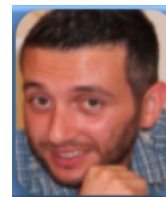

Philips Stadion area
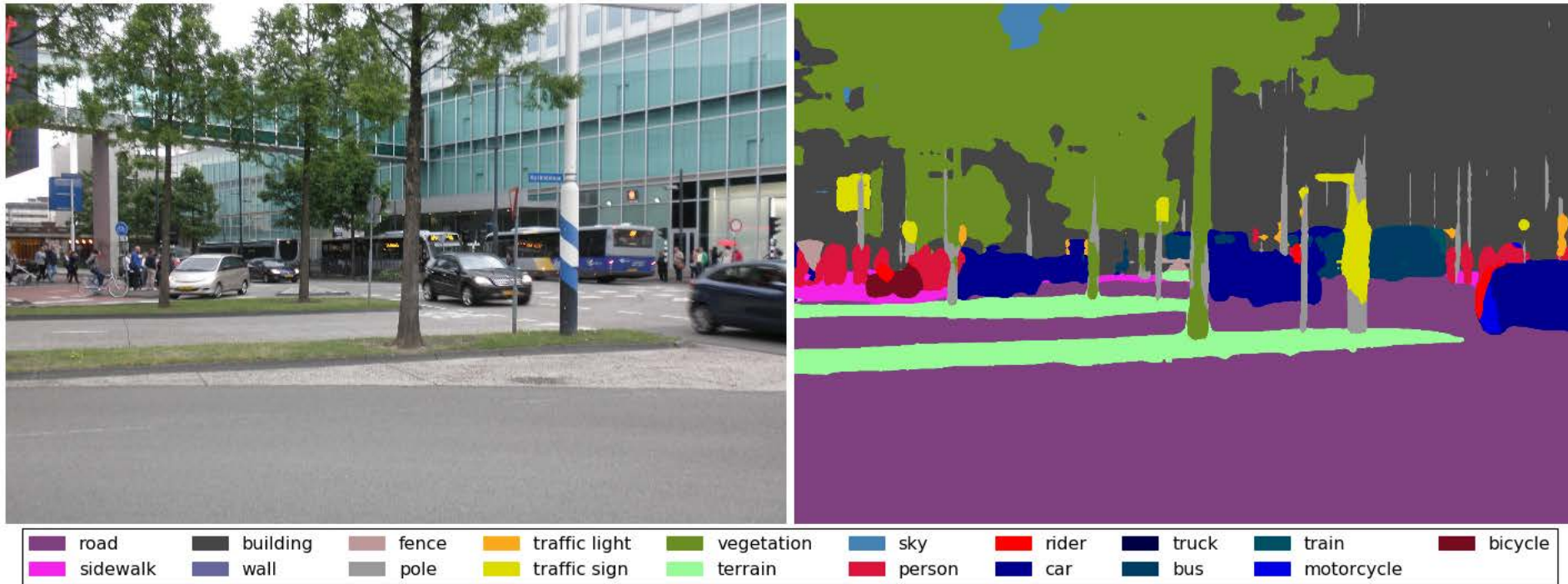
Signal processing for communications

Web site: www.sps.tue.nl/ictlab
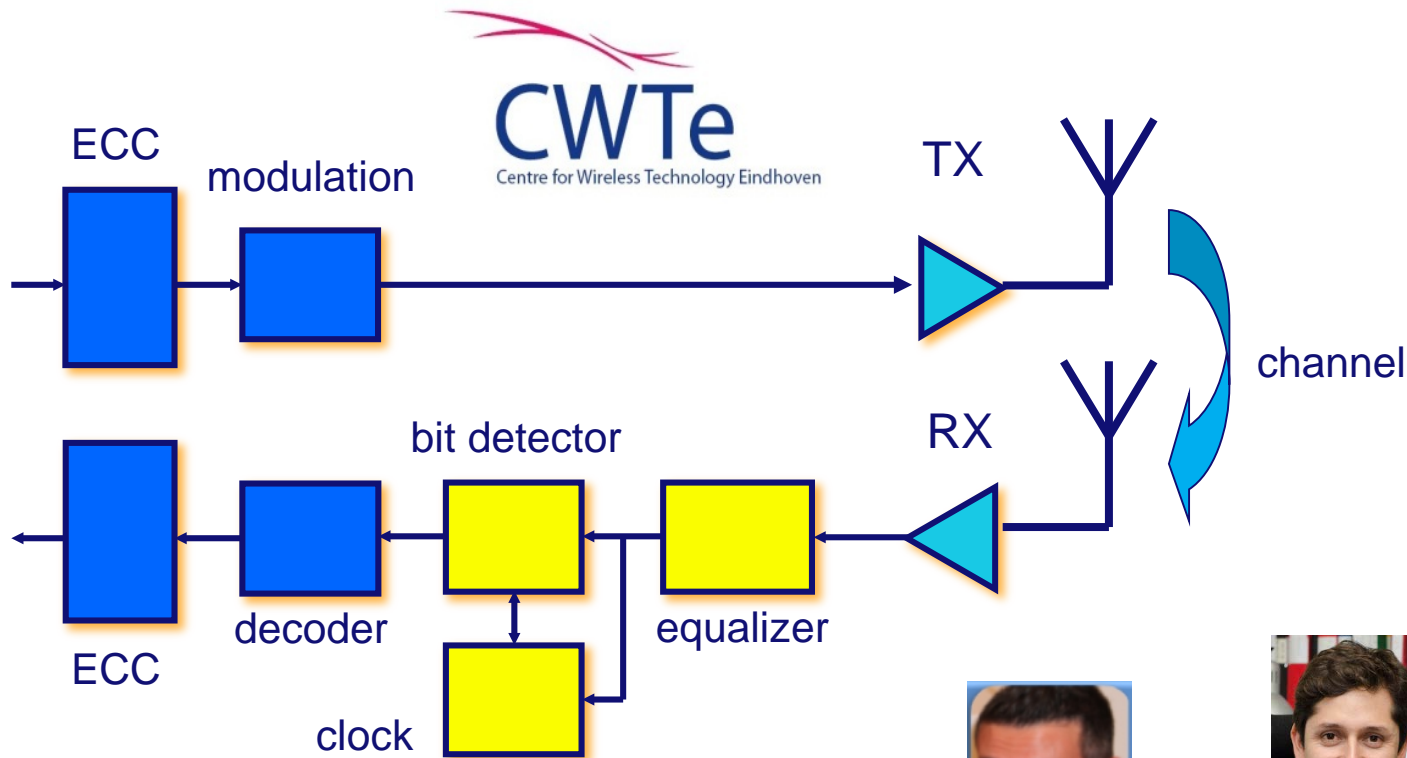
Jean-Paul Linnartz
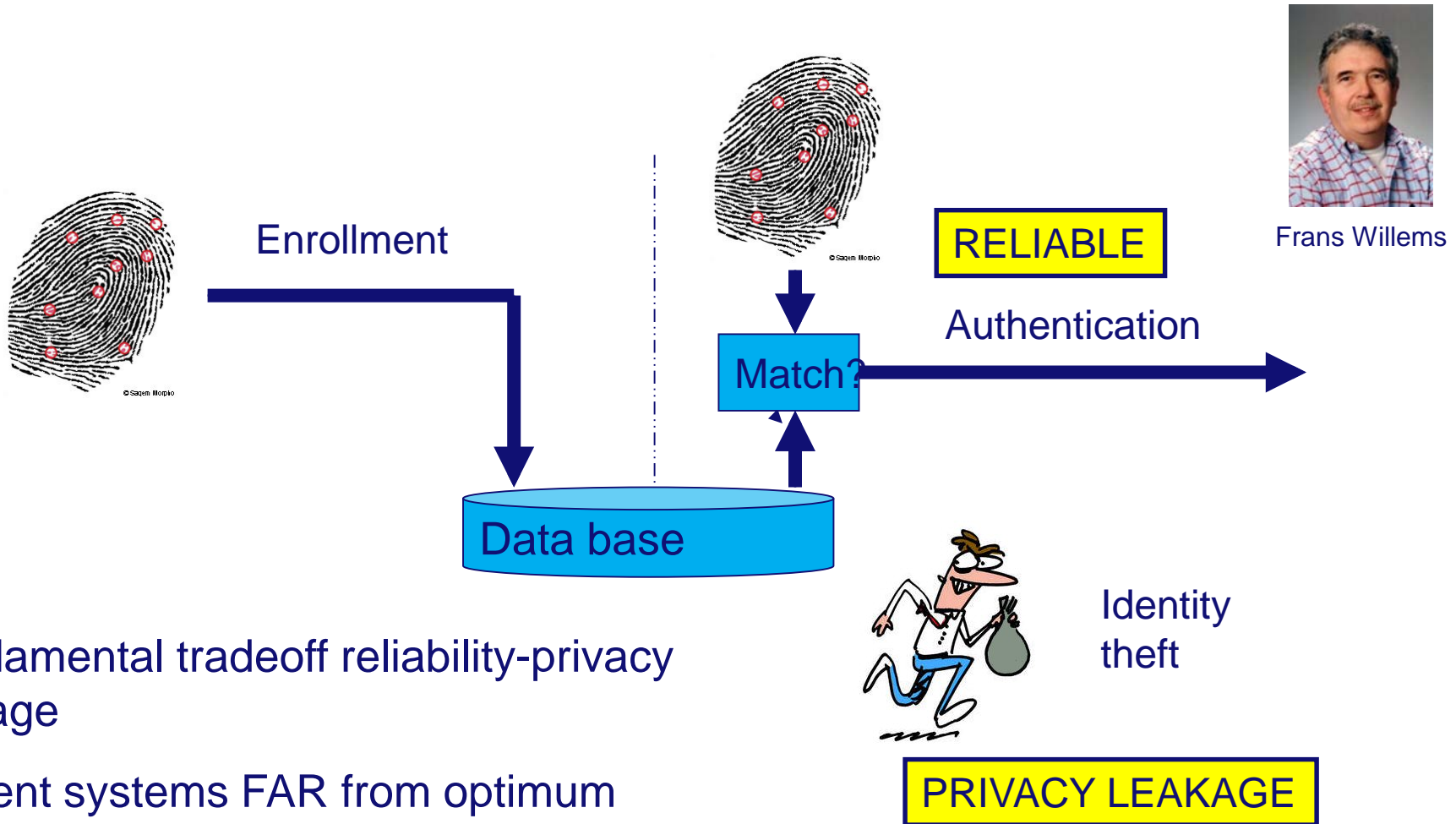
Frans Willems

Francesco Laghezza   Alex Alvarado   Tjalling Tjalkens
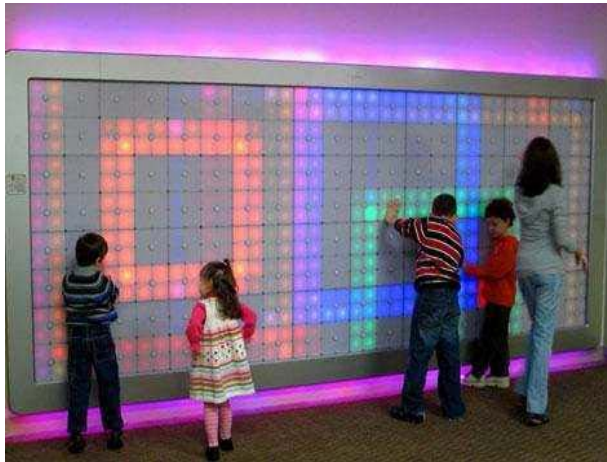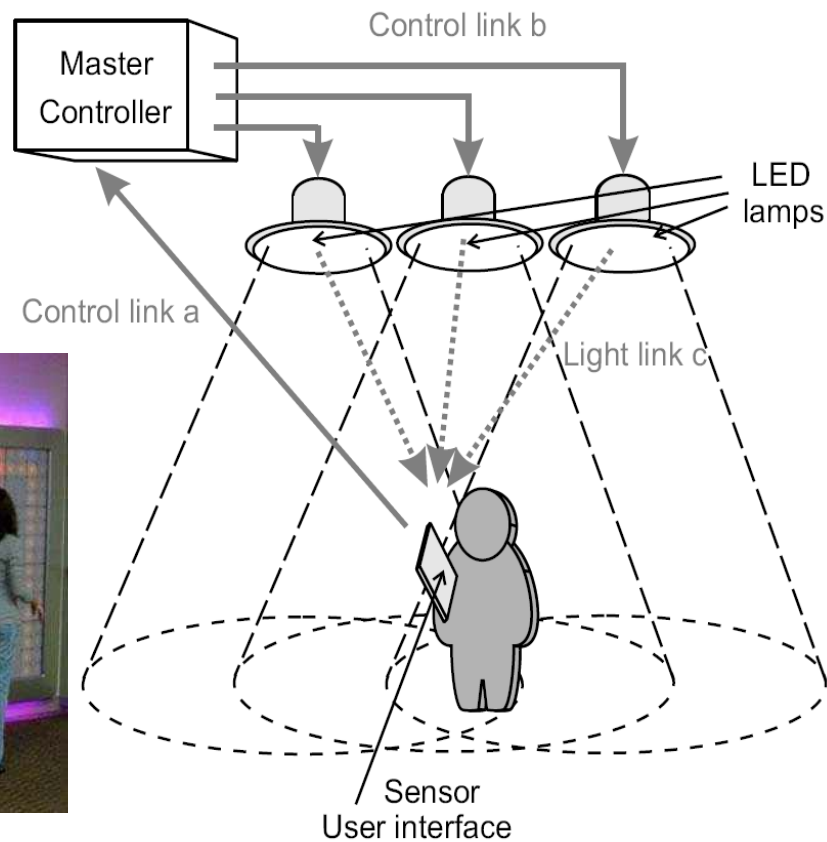
Biometric privacy leakage

Enrollment

Match?

RELIABLE

Authentication

Data base

Frans Willems

Identity theft

PRIVACY LEAKAGE

Fundamental tradeoff reliability-privacy leakage

Current systems FAR from optimum

Several awards/nominations

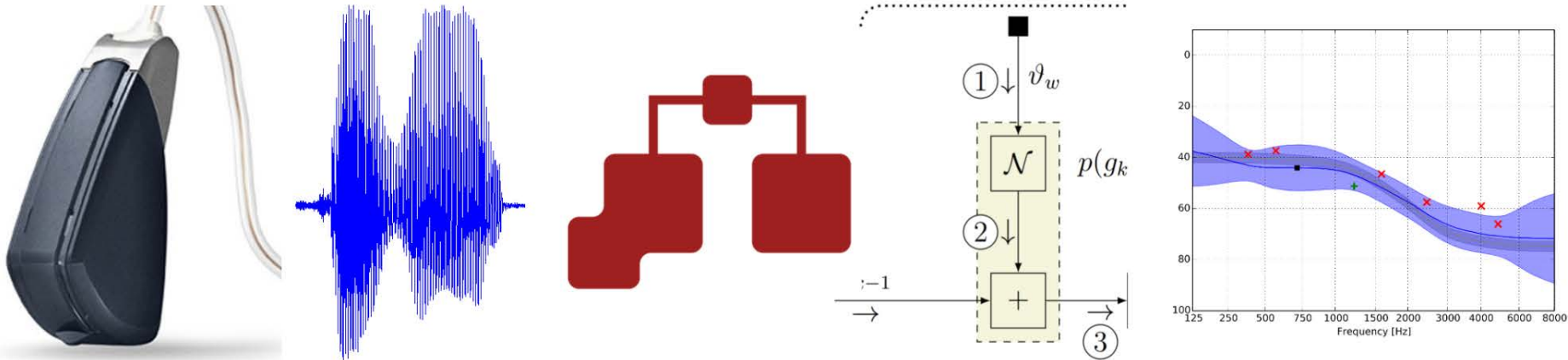TU/e Technische Universiteit Eindhoven University of Technology

Coded Light

Jean-Paul Linnartz

Probabilistic Sensor Signal processing

Core: probabilistic graphical models, inspired by:
- Bayesian machine learning
- Computational neuroscience

Highly generic/powerful approach for IOT sensor signal processing
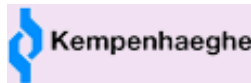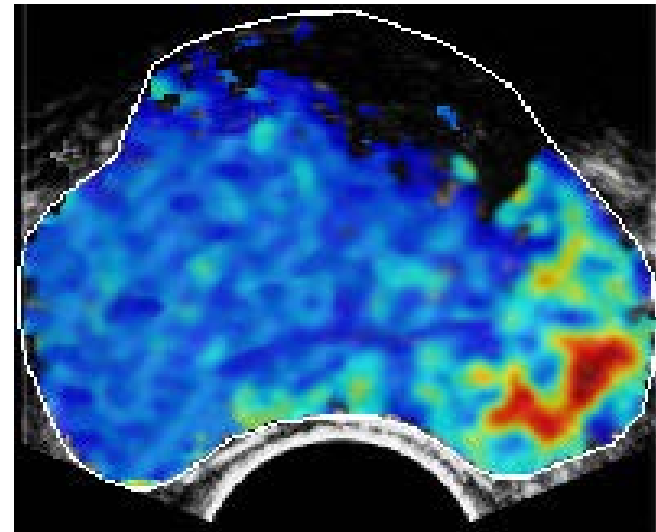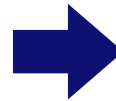

Bayesian Intelligent Autonomous Systems Lab
http://biaslab.github.io/

Bert de Vries   Tjalling Tjalkens

TU/e Technische Universiteit Eindhoven University of Technology

Medical signal and image processing

Prostate cancer localization

Model-based spatiotemporal analysis
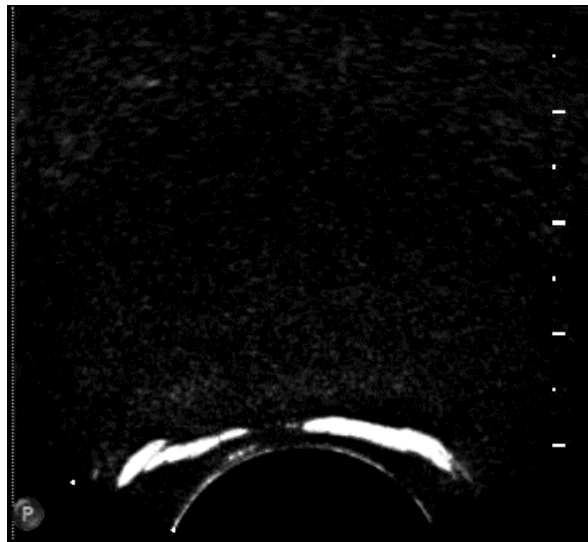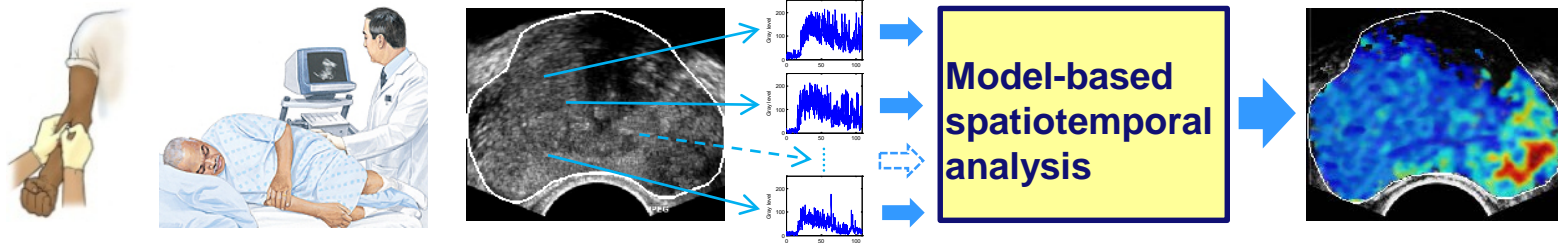
Biomedical Diagnostics lab, www.bmdresearch.nl

Massimo Mischi

Hessel Wijkstra

Technische Universiteit
Eindhoven
University of Technology
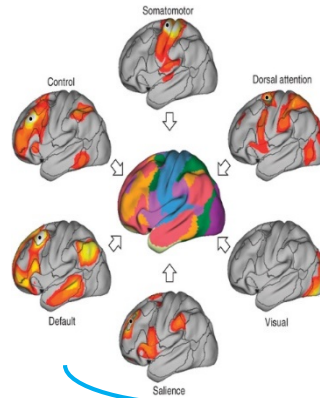
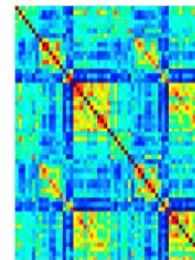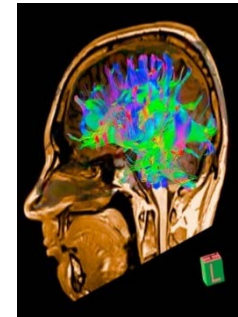# NeuroEngineering
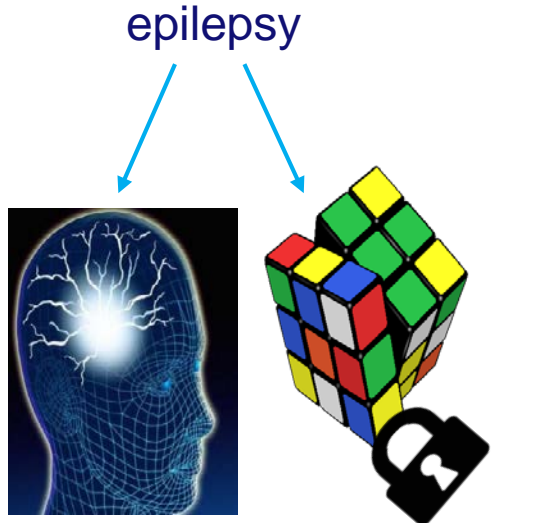
Neurodegeneration

epilepsy
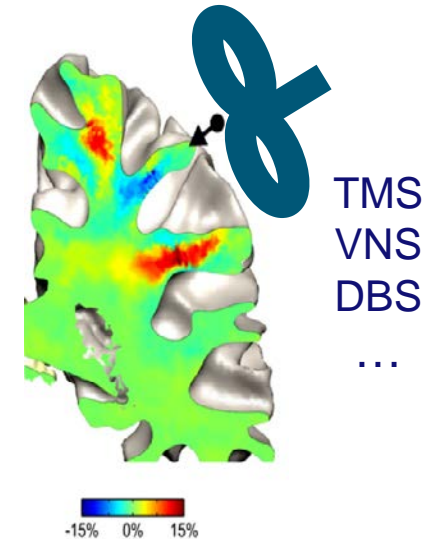

seizures

cognitive impairment

Neuronal networks

functional · structural

network organisation

advanced neuroimaging

Neuromodulation

TMS
VNS
DBS
…

-15% 0% 15%

mechanisms of action
neurophysiological models
EM simulations
neuroplasticity

Bert Aldenkamp · Rene Besseling · Sveta Zinger

Web site: www.neu3ca.org

Unobtrusive sensing

ExG

Accelerometry, movement

Acoustic

Optical (SpO2)

Ronald Aarts (all modalities)
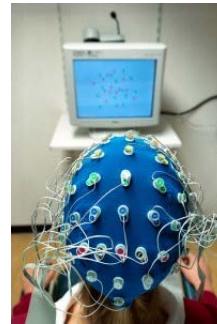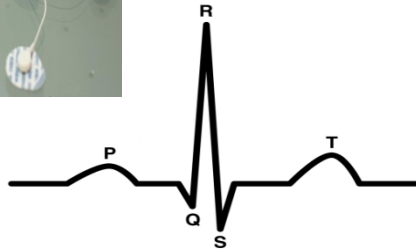
Massimo Mischi (EMG)

Chiara Rabotti (EHG)

Rik Vullings (ECG)

Pierre Cluitmans (EEG)

Personal health systems

Virtual doctor

Feedback/ actuation

Sensors → Signal processing/ Decision support

Diagnostic inference

Patient

Remote doctor

HOSPITAL

MIDWIFE

HOME

máxima medisch centrum
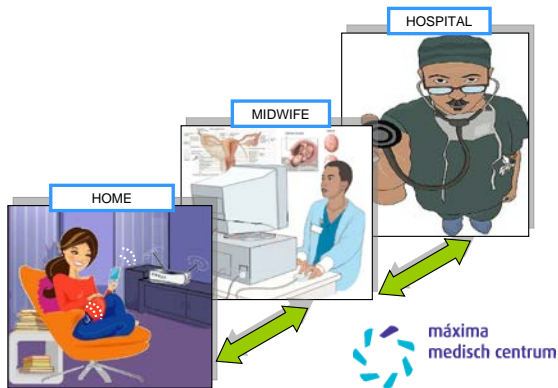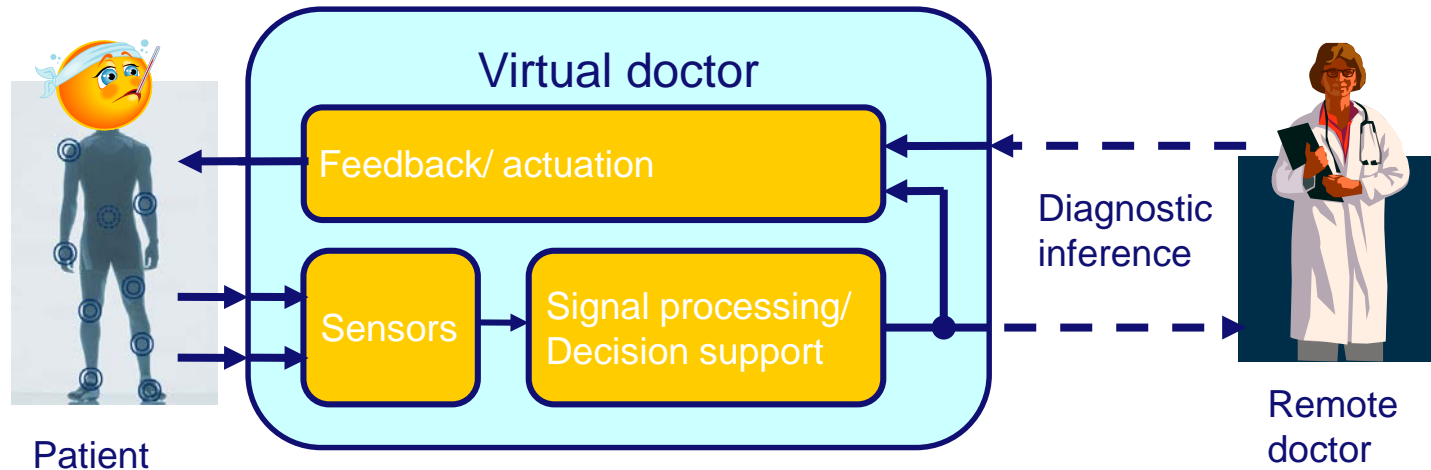
Remote pregnancy management

Home sleep monitoring
PHILIPS
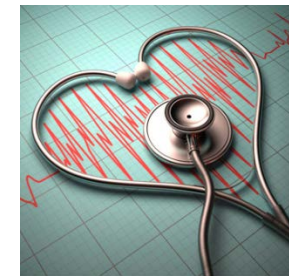
Home screening for atrial fibrillation
PHILIPS

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SPS Master courses

5CRA0	Fundamental Aspects of Random Signals	Tanya Ignatenko
5SSC0	Adaptive Array Signal Processing	Piet Sommen
5SSB0	Adaptive Information Processing	Tjalkens & de Vries
5LSF0	Applications of Information Theory	Willems & Tjalkens
5LSJ0	Image Analysis for Healthcare Technologies	Sveta Zinger
5LSE0	Multimedia Video Coding and Architectures	de With & Zinger
5LSH0	Advanced video content analysis	de With & Zinger
5LSI0	Brain MRI	Rene Besseling
5AUA0	Advanced Sensing using Deep Learning	Gijs Dubbelman
XXX	Signal Processing for Machine Learning	Vullings & van Sloun
YYY	Digital Wireless Communications Exploration Lab	Willems et al.
5LSG0	Neuromonitoring	Pierre Cluitmans
5LSB0	Monitoring of Respiration and Circulation	Pierre Woerlee
5LSC0	Biomedical Sensing Technology	Mischi & Rabotti
5XSD0	Medical Ultrasound	Massimo Mischi

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Traineeships, thesis projects, jobs

Further information

Signal Processing Systems

http://www.tue.nl/sps

www.bmdresearch.nl   http://vca.ele.tue.nl

www.tue.nl/ictlabs   http://biaslab.github.io/

www.gijsdubbelman.com http://neu3ca.org

Contacts:
SPS Mentor : Harrie Kuipers
(H.M.Kuipers@tue.nl, Flux 7.070)

General information on traineeships,
graduate projects:
Tjalling Tjalkens
(T.J.Tjalkens@tue.nl, Flux 7.101).

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