

**Telemedisin-teknologi og helse**  
Tromsø Telemedicine Laboratory

Professor Gunnar Hartvigsen

*Medical Informatics and telemedicine group,  
Institutt for informatikk, Universitetet i Tromsø*

**8 partners**

IBM, DIPS, UNN, Helse Nord IKT, Norut IT, telenor, NST

NST | Nasjonalt senter for telemedisin  
UNIVERSITETSSYKEHUSET NORD-NORGE  
WHO Collaborating Centre for Telemedicine

**TTL Vision**

**Vision TTL**

To become a world leading centre for research and innovation in the field of advanced telemedicine and eHealth systems for chronic, age, and lifestyle related diseases.

**TTL spredning av resultater**

**Spredning av resultater 2007-2010**

- *Vitenskapelige foredrag:*
  - 67 foredrag på internasjonale konferanser
  - 55 artikler i vitenskapelige tidsskrifter
  - 35 populærvitenskapelige artikler
- *Posters:* 18 posters på internasjonale konferanser
- *Arsrapporter:* 2007, 2008, 2009. 24 sider.
- *Web-side:* Presentasjon av forskere.
- *Grafisk profil:* logo, PowerPoint template, Word template. roll-up med norsk tekst.
- *Forskningsdagene:* 2008, 2009, 2010.
- *Video:* Few Touch applikasjonen for Diabetes (2008). (Youtube)
- *Media:* 117 artikler i media om TTL prosjekter.

**NTT Norwegian Centre for Telemedicine**  
**Tromsø TELEMEDICINE LABORATORY**  
 Center for Research-based Innovation

**We welcome**  
 Tromsø Telemedicine Laboratory

**Naee Tatara**  
 Name and home country  
 Naee Tatara, Japan

Place of education and previous work

- NTT microsystem Integration Laboratories, Apr. 2003 - Oct. 2007
- Master of Science in Engineering, Keio University (Integrated Design Engineering), 2003
- Bachelor of Science in Engineering, Keio University (Mechanical Engineering), 2001

**Why I study telemedicine...**  
 When I started working at NTT microsystem Integration Laboratories, I was assigned to a task favor working on the research and development of a wearable multi-biosensor device, which was aimed to be used as a part of future telemedicine service.

Since then, I worked mainly on the research and development of various wearable sensors, but in the last three years, I was engaged in the development of tele-consultation system using TV phone for the people with chronic diseases at home.

Through these works there, I became more interested in the user side of the telemedicine system, how to motivate patients to utilize the sensors for their health management and how to design healthcare service with ease usability. This is the reason why I study telemedicine from the users' perspective.

**I am currently working on...**  
 An PhD project is titled "Designing mobile patient-centric self-help terminals for people with diabetes". In this project, I will study the impact of usability of mobile terminal-based self-help application on the self-management of diabetes.

Due to its ubiquitous characteristic, evolving technology used, and pervasiveness, a mobile device is considered to be a key to a realization of self-help telemedicine.

**Årsrapporten for 2009**

**TTL - Tromsø Telemedicine Laboratory**  
 Centre for Research-based Innovation

**Annual report 2009**

Innovative and sustainable technologies for genetic, chronic, and lifestyle related diseases

**TTL - Tromsø Telemedicine Laboratory**  
 Centre for Research-based Innovation

**Annual report 2009**

**Research and innovation in telemedicine**

**A long way from research to service**

**Inspiring each other**

**Tracking infection on an interactive map of Norway**

**IBM**

**Den nye verden**

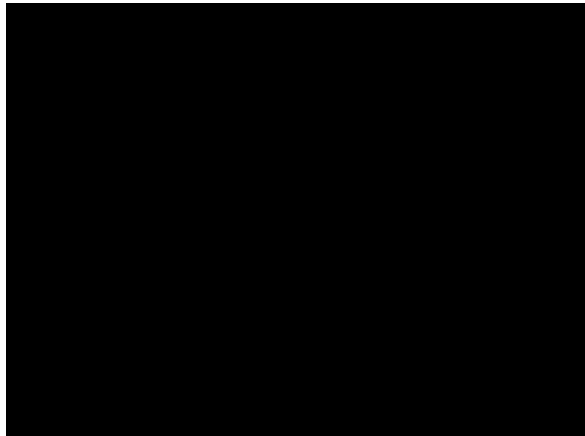
**Et av de mest spennende initiativene finner man i Tromsø, ved Tromsø Telemedicine Laboratory (TTL). Hensikten er å drive frem innovasjon innen telemedisin til beste for helsevesenets innsats for kroniske sykdommer og for alders- og livsstilsrelaterte sykdommer. Man ser seg dramatisk bedre muligheter for å tidlig avdekke sykdomsrisiko for store pasientgrupper. Det gjelder f.eks. diabetes, fare for blodpropp og fare for fedme/kk-kreft. Dette skjer ved at data fra ulike måleapparater kan sendes fra pasienter til helsepersonell uten at pasientene behøver å være fysisk til stede på et sykehus eller legekontor.**

**Dette er verktøy som kan bidra til et mer effektivt helsevesen, forbedre pasienters livskvalitet og levetid, samt redusere kostnader. Helseregionene i Norge har et reisebudsjett på flere milliarder kroner i året. Ved at en del reiser blir overflødige kan det spares store beløp som trengs på andre områder i helsesektoren.**

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ifølge og samarbeidet er det fremtidsrettet og vil bli videreført i samarbeid med andre TTL i Norge. I tillegg har IBM og TTL etablert et samarbeid som skal bidra til å utvikle og implementere nye løsninger innen telemedisin. IBM vil bidra med forskning, utvikling og lokale og internasjonale konsulenter i dette arbeidet. Prosjektet skal sikre helsevesenets fremtidige behov for innovasjon. Det er derfor også et viktig samarbeid mellom IBM og TTL for å sikre helsevesenets fremtidige behov for innovasjon.

# Prosjekter



### The Few Touch application Concept

### FTA – Setting Goals

### Physical Activity Sensor Systems

### Manual registration



### Nutrition Habit Registration System

The screenshot shows a mobile application interface for a nutrition habit registration system. On the left is a Samsung phone displaying a menu with icons for 'Aktivitet', 'Mål', 'Blod', 'Tips', 'Mat', and 'TIF'. The main screen shows a grid of food and drink items with icons and numbers: 'Lav karb. snacks' (0), 'Lav karb. snacks' (3), 'Lav karb. måltid' (1), 'Lav karb. måltid' (3), 'Lav karb. drikke' (0), and 'Lav karb. drikke' (3). Below the grid are buttons for 'Slett', 'Ok', and 'Meny'. On the right, a summary screen shows 'Lav karb. snacks' with 'I dag: 2' and 'Mitt mål: 3', 'Måltider' with 'I dag: 2' and 'Mitt mål: 5', and 'Lav karb. måltider' with 'Denne uke: 0' and 'Mitt mål: 3'. Buttons for 'Mer' and 'Meny' are at the bottom.

### General information

The screenshot shows three HTC phones displaying the 'EASY HEALTH DIARY' app. The first phone shows a menu with 'STEPS', 'MY GOALS', 'BLOOD GLUCOSE', 'TIPS', 'FOOD', and 'PHONE'. The second phone shows a 'Tip of today' screen with the text: 'A large plate of spaghetti contains more carbohydrates, and will lead to a higher blood glucose than two boiled potatoes. Carbohydrates are converted into glucose in the blood.' Below the text are 'More tips' and 'Menu' buttons. The third phone shows a similar 'Tip of today' screen with the text: 'Think of housework as an extra chance to exercise. Vacuuming briskly can be a real workout.' Below the text are 'More tips' and 'Menu' buttons.

### Overview of food map

The diagram illustrates the zooming process in the application. It starts with a 'Zoom by browser' showing a circular 'Overview of food map' with various food items. A 'Zoom by browser' step leads to a 'Rough category' showing a grid of food product images. A final 'Zoom by browser' step leads to 'Every product in a category' showing a detailed view of a product with nutritional information: 'Brie', 'Energy: 365 kcal', 'Protein: 17 g', 'Fett: 33 g', and 'Karbon: 10g'. Arrows indicate the zooming sequence, and a 'Zoom in browser' label is also present.

### Screen transition

The diagram shows screen transitions between different product categories. A 'Screen transition' arrow points from a 'Zoom up' window (blue frame) to three categories: 'Bread area', 'Milk product area', and 'Oil, fat product area'. Each category contains images of products. A 'Window (blue frame)' is shown zooming into the 'Milk product area'.

### Quotes – after 4 months

The slide features three screenshots of users using the app. Below them are three quotes:
 

- "My doctor thinks this is great, but he asked for a function to identify the fasting blood glucose values."
- "I eat in a healthier way now than before. I eat five times a day and I eat more fruits and vegetables."
- "The system is very simple – which is important, and I think it should be kept that way."

 A large quote at the bottom reads: "The system is very simple – which is important, and I think it should be kept that way."









### Mole cancer

The slide describes a computer-aided diagnostic system for mole cancer. It includes a list of points:
 

- Increasing number of malignant melanoma
- Close to 100% become healthy when early detection
- Limited resources for screening of risk patients
- Need for computer-aided diagnostics (CAD)

 The diagram shows a 'Feedback to patient' loop where 'Pictures from cellular phone cameras are sent to' a computer system for 'Computer-aided diagnostic for image segmentation (asymmetry, color, contour and diameter)'.



Normal Mole	Melanoma	Sign	Characteristic
		Asymmetry	when half of the mole does not match the other half
		Border	when the border (edges) of the mole are ragged or irregular
		Color	when the color of the mole varies throughout
		Diameter	If the mole's diameter is larger than a pencil's eraser

Photographs Used By Permission: National Cancer Institute <http://www.nci.nih.gov/ncicinfo/ncihist/docs/a-mole-book-06-1001>



**ITK** Nyheter TV Radio Starveer

Vitenskap og teknologi

### PC stiller kreftdiagnose



Et PC som stiller kreftdiagnose, det er målet med et prosjekt som for tiden pågår ved Helsekontor sentor for Internettidrett i Trondheim. Enkelte digitale bilder av mistenkelige flekker skal kunne legges inn på fastlagte PC. Et dataprogram vil så analysere bildet med asymmetri, ujevnheter, farge og størrelse.

**Test deg selv**

Asymmetri  
Hvorvidt det er symmetrisk  
Farge  
Hvorvidt det er jevnt  
Størrelse  
Hvorvidt det er større enn en blyertspiss

**Nyheter fra Næringslivet**

Appl. vektet til bruk av mobiltelefoner  
Forskningsprosjekt  
Ny digitaliseringsstrategi for SSB  
Ny digitaliseringsstrategi for SSB  
Forskningsprosjekt for SSB  
Forskningsprosjekt for SSB

**Nyheter fra Forskning.no**

Utsatte barn  
Sjanseløst - hva gjør vi nå?  
- Skal lære av katastrofer som krever all oppmerksomhet  
Vestlig vest - nye kyster  
Omsetningsprosjekt - hva er det?

**Kvalitet i forskning**

Et forskningsprosjekt  
Sjanseløst - hva gjør vi nå?  
Sjanseløst - hva gjør vi nå?  
Sjanseløst - hva gjør vi nå?  
Sjanseløst - hva gjør vi nå?

**Lyd og video**

PC som stiller kreftdiagnose  
17:09

**Medisin og forskning**

Et PC som stiller kreftdiagnose  
17:09

**10 gode tips til debutforfatter**

Hva er det som er viktig  
Hva er det som er viktig  
Hva er det som er viktig  
Hva er det som er viktig

**Context sensitive systems for mobile communication in hospitals**

### Today vs. tomorrow

### Research problem

- The primary research problem
  - How to design a context-sensitive system for multi-modal mobile communication in hospitals that supports:
    - text,
    - voice,
    - and paging services,
    - While maximizing efficiency of communication and effectively managing interruptions



### Our mission

**To detect the spread of contagious diseases before the people infected know that they are infected.**

### Early detection

- BG could be used for the early detection of infections in diabetics
- BG can be easily collected and evaluated with a DS system that could:
  - Collect BG data, e.g. with sensors
  - Transmit them to the central repository
  - Analyze with a Disease Surveillance Model
  - Identify possible outbreak
  - Trigger alarms for the authorities

### Current sources for syndromic surveillance signals

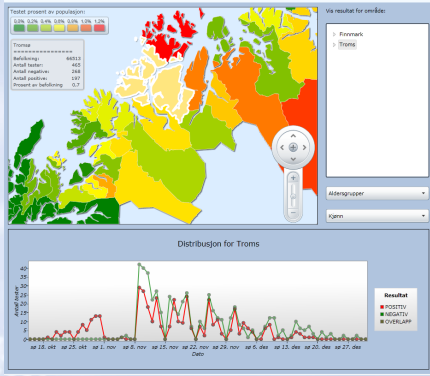
### Our system proposal:

Example: epidemiological curve for pertussis

# SNOW-prosjektet

## Epidemiologisk oversikt

### Er det noe som går?

## My health station

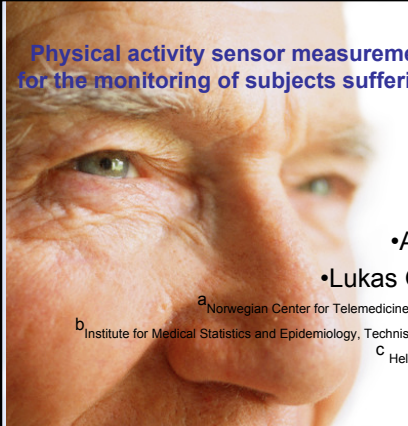
- Seniors with COPD, diabetes or kidney failure
- 50% above 65 years old don't use PC – simpler GUI needed
- Improved individual care

Individual care based on, e.g., glucose data, oxygen saturation in blood

Discussion with health care personnel and discussion with patients with chronic illness

Text-based training  
Group-based teaching/discussions  
Lectures, physical training program

## Physical activity sensor measurements as means for the monitoring of subjects suffering from COPD



- André Dias<sup>a,b</sup>
- Lukas Gorzelnik<sup>b,c</sup>

<sup>a</sup> Norwegian Center for Telemedicine & Universitetet i Tromsø  
<sup>b</sup> Institute for Medical Statistics and Epidemiology, Technische Universität München  
<sup>c</sup> Helmholtz Zentrum München

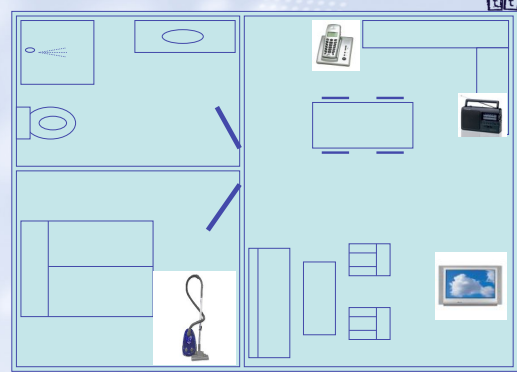
## Medical Questions

- Is it possible to build robust models for COPD patients [or chronic illness]?
  - Predict events
  - Know physical activity profiles
  - Classification of severity
  - Reduce the impact of the vicious circle
- Robust cohort studies
  - Dependable data
  - Simple acquisition and handling



**Chronic Diseases**  
 180 subjects from Kora cohort

- 30 COPD patients in recovery clinic Bad Reichenhall
- 10 Cystic Fibrosis in Klinik. LMU
- Daily life
- Can we contribute for lifestyle changes in other chronic diseases?

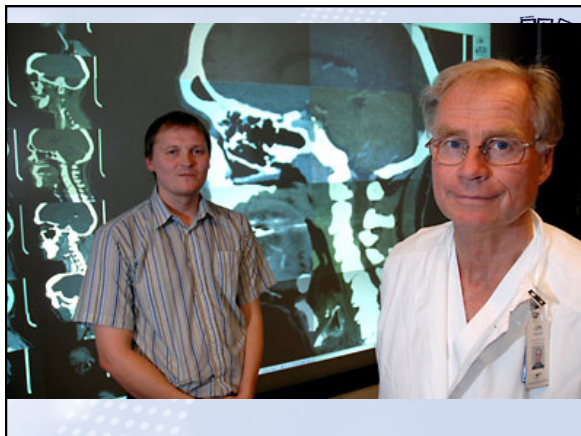



Senior citizens' home of today



Senior citizens' home of tomorrow

**Displayvegg-teknologi innen helse**



**Large, high-res displays for radiology conferences**



230 inches tiled display  
 7168 x 3072 pixels

