



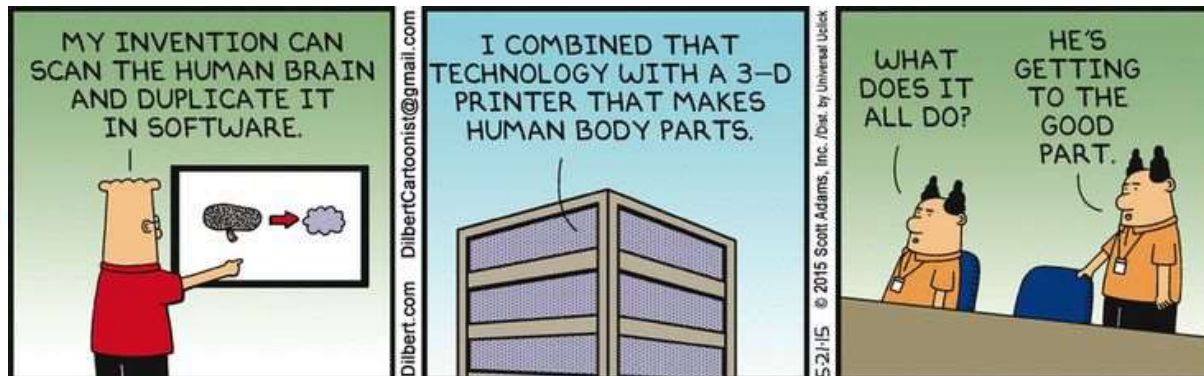
UiO : Department of Informatics
University of Oslo

Mikro visit – March 2017

Robotics and Intelligent Systems group

University of Oslo

Jim Tørresen – e-mail: jimtoer@ifi.uio.no



Department of Informatics

Master programs

- Informatics: nanoelectronics and robotics
- Informatics: design, use, interaction
- Informatics: programming and networks
- Informatics: language and communication
- Informatics: technical and scientific applications
- Network and System Administration
- Application deadline: 15 April

Informatics: Robotics and Intelligent Systems

New study program from autumn 2018 (tentative)

Master	Master's project (internal/external)			free selection
	Master's project (internal/external)			
	<i>Rapid prototyping</i>	<i>(Deep) Machine learning for image analysis</i>	<i>Machine Vision</i>	
	<i>Advanced AI</i>	<i>Adv. Machine learning</i>	<i>Distributed autonomy</i>	
Bachelor	AI & Machine learning	Software eng.	Philosophy	mostly fixed selection
	Entrepreneurship	Software engineering	Operating systems	
	Robotics	Dig. Sys. Des. (FPGA)	Img. Proc / Mech.	
	Algorithms	Comp. Arch.	Mathematics 3	
	Programming 2	Mechatronics Intro	Mathematics 2	
	Programming 1	Hardware Intro	Mathematics 1	

Funding for Student Exchange (2017-2019) Norway ↔ US, Brazil and Japan

- Collaboration on Intelligent Machines
 - Short term mobility stay for meeting
 - Long term mobility stay (master and/or PhD-level or above)
 - Intensive course/student workshop
 - Workshop/conference org activities
 - New collaborations/guest lectures
- **Funding:** 3.5 MNOK

Funding: *INTPART*
Research Council of Norway
28% of prop. funded



**The Research Council
of Norway**

New Department Building from Jan 2011

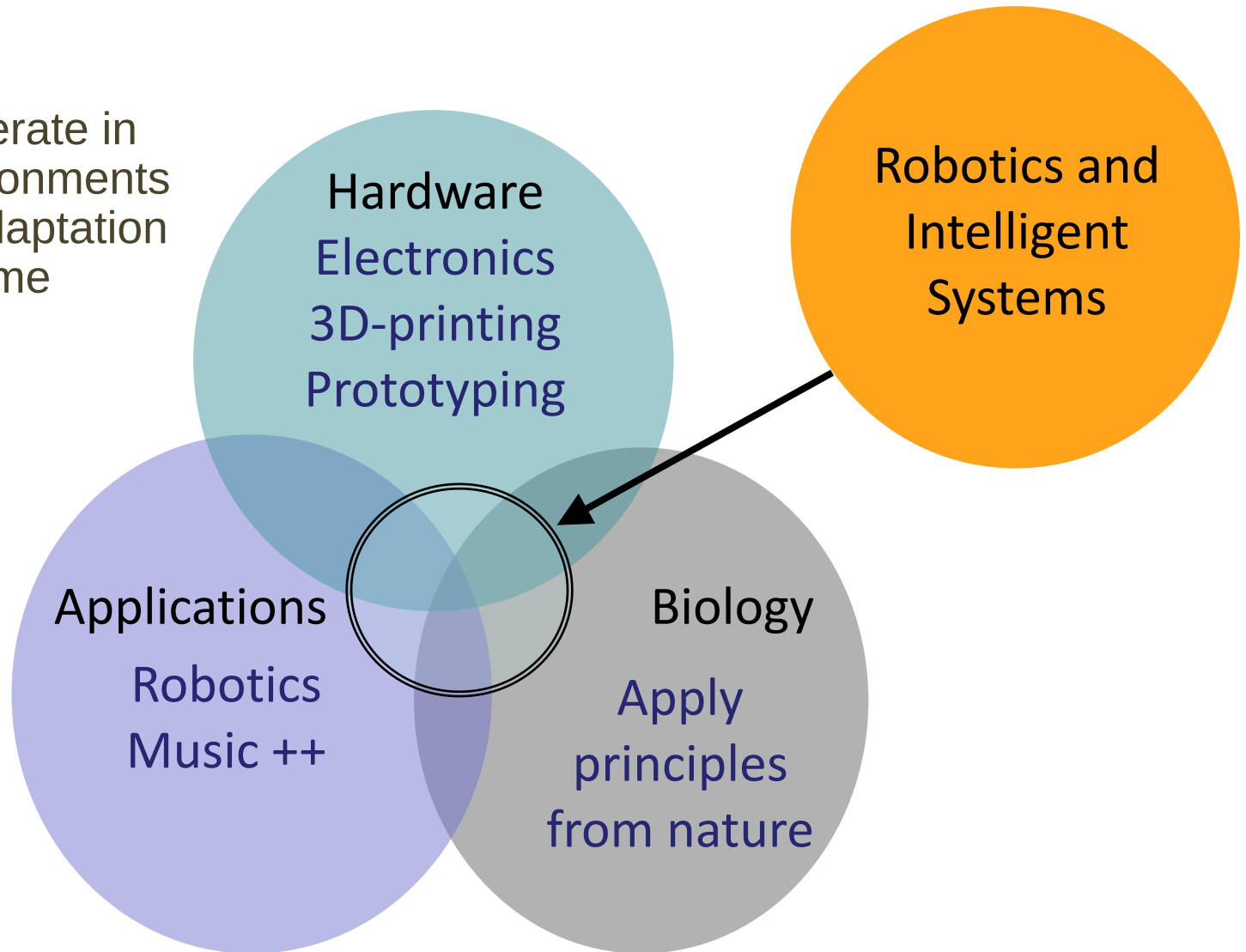
Robotics and Intelligent
Systems



Robotics and Intelligent Systems group

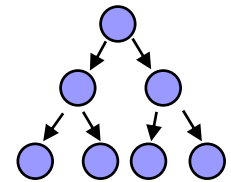
ROBIN

Systems operate in
dynamic environments
demanding adaptation
at run-time



Major Mechanisms in Nature

- **Evolution:** Biological systems develop and change during generations.
- **Development/growth:** By cell division a multi-cellular organism is developed.
- **Learning:** Individuals undergo learning through their lifetime.
- **Collective behavior:** Immune systems, flocks of birds, fishes etc
- **Sensing and motion**



What is the Machine Learning/Artificial Intelligence about?

- Inspired from biology/nature
- Technology that can adapt through learning
- Systems that can sense, reason (think) and/or act/respond
- Increase intelligence in both single node and multiple node systems



Who are in ROBIN?

Robotics and Intelligent Systems



Jim Tørresen
Professor, Group leader



Mats Høvin
Assoc. Prof.



Kyrre Glette
Assoc. Prof.



Yngve Hafting
Support engineer

Adjunct positions (20%):

Alexander Wold (assoc.prof.)
Jørgen Norendal (lecturer)
Roar Skogstrøm (lecturer)
Ole Jakob Elle (assoc.prof.)

Postdocs:

Charles Martin
Kai Olav Ellefsen
Md. Zia Uddin
Weria Khaksar



PhD students:

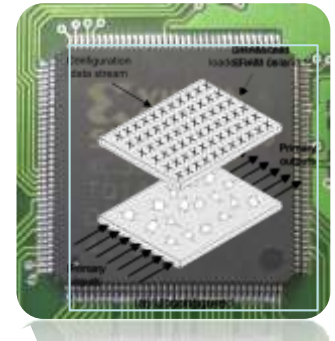
Arash Ahmadi (MedFak)
Asbjørn Danielsen (HiN)
Eivind Samuelsen
Flavia Dias Casagrande (HIOA)
Justinas Miseikis
Jørgen Nordmoen
Kim Mathiesen
Sondre Engebråten (FFI)
Tønnes Nygaard

Master students: ~30

Students hired on hourly basis

Teaching and Research

- Bio-inspired systems and machine learning
 - Evolutionary computation
 - Ant colony optimization/swarm intellig.
 - Neural Networks/Deep Learning
- Robotics
 - Custom built robots (3D-printing/milling)
 - Self-learning of body and control
 - Robot surgery
- Reconfigurable logic (FPGA)
 - Dynamic change of configuration
 - Self-learning and adaptive systems
 - Development of remote teaching labs
- Music technology
 - Analyze motion for flexible music control
 - Develop active music systems (apps)



Master Student

Short project

1.Semester	Course (30 sp)
2.semester	Course (30 sp)
3.Semester	Course (30 sp)
4.Semester	Project (30 sp)

Long project

1.Semester	Course (30 sp)
2.semester	Course (20 sp) Project (10 sp)
3.Semester	Course (10 sp) Project (20 sp)
4.Semester	Project (30 sp)

Most students do a long master project but
some short projects are also offered

Themes ROBIN Master Projects

- **Robotics**
 - Prototyping: Simulation, 3D printing / milling
 - Use: Sensing – reasoning – control
- **Machine learning** (optimization, prediction, etc)
- **FPGA**
 - Partial reconfiguration of active systems
 - Development of distance learning for FPGA
- **Interactive Music Systems**
 - Creating systems where music expression can change with movements and interaction
 - Cooperation with musicology
- **External projects** in industry/FFI
- **Own defined project** (good idea ??)

ROBIN Master Program

- Focus on tight follow up with supervisor(s)
- Integrate students in ongoing research projects
- Successful master projects ends up with paper in international conference or nomination to best master thesis awards (relevant for FPGA-projects)

Active Master student supervision



Where do former ROBIN students work



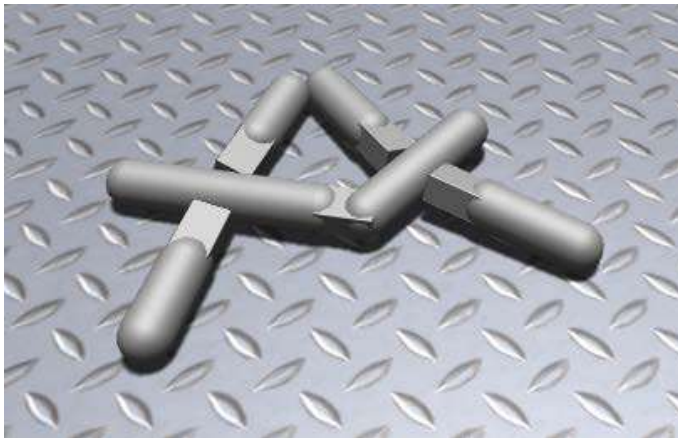
Rapid Prototyping Facilities

- 3D printers and milling machines
- Large potential for developing innovative robot systems.

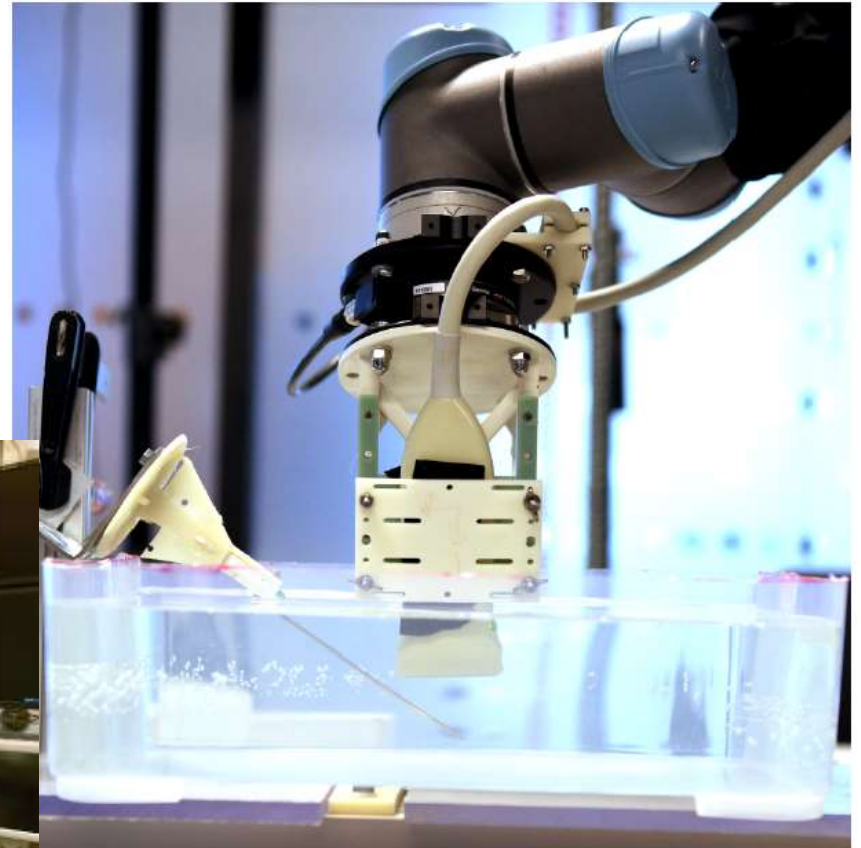


Evolved Robot Design

- Robot bodies could be difficult to design by hand.
- We use evolutionary algorithm to evolve both body and control system simultaneously.



Robot Surgery (National University Hospital)



Environment Aware Robotics System using Multiple Kinect 3D Cameras by PhD student Justas Miseikis



fourMs – an inter-disciplinary lab at UiO

- ROBIN research group (IFI)
- Department of Musicology
- Department of Psychology



Rolf Inge Godøy
Professor
Department of
Musicology



**Alexander Refsum
Jensenius**
Assoc. Prof.
Department of Musicology



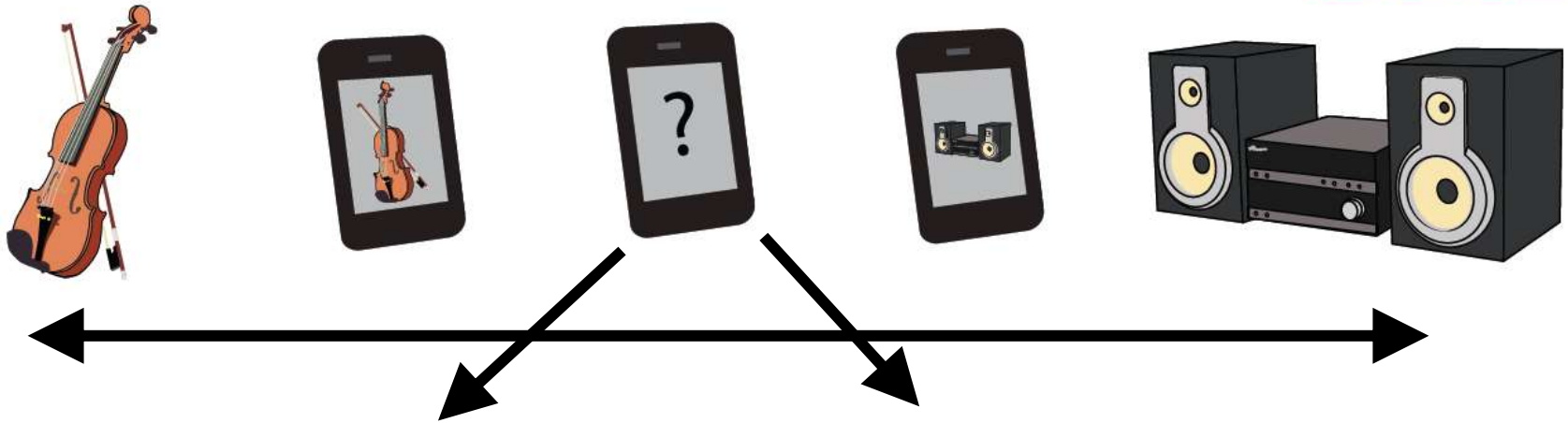
Bruno Laeng
Professor
Department of
Psychology

Motion Capture Facilities

- Allows precise tracking of human and robot motion
- Camera-based and on-body motion capture



(Inter) Active Music



Direct Control

- Navigate within the song
- Control certain instruments (e.g. keep playing the chorus drumbeat in the verse)
- Change the tempo of the song

Indirect Control

- Use on-body sensors to adapt the music to the mood of the user
- Listen to music that pushes you to work out harder
- Fuse the musical preferences of multiple users into one song

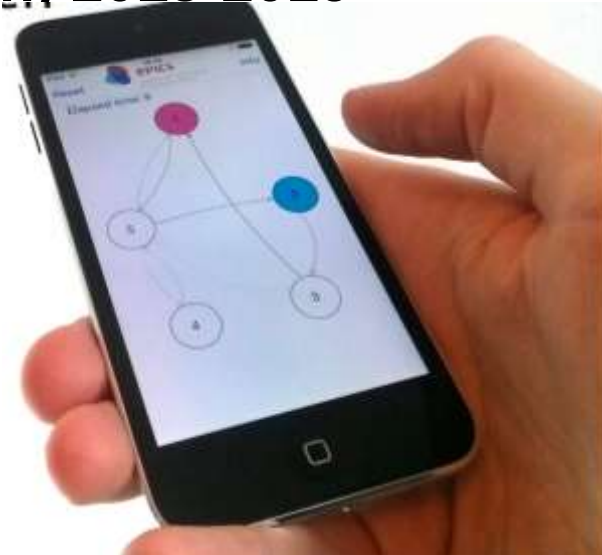
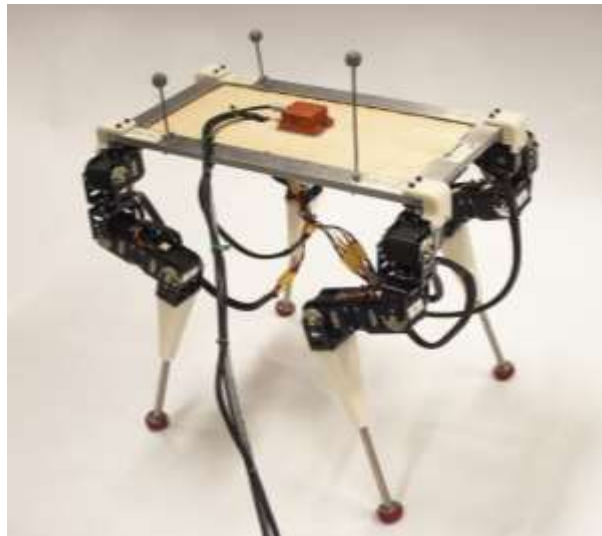
Apple/iOS demo app: **PheroMusic**

[Reuters video](#)



EPEC: Prediction and Coordination for Robots and Interactive Music

1 PhD (Tønnes Nygaard) + 2 post-docs (Charles Martin and Kai Olav Ellefsen) 2015-2019



Goal: *Design, implement and evaluate **multi-sensor systems** that are able to **sense, learn and predict** future actions and events.*

Funding: FRIPRO, Research Council of Norway
(10% of proposals funded)



**The Research Council
of Norway**

MECS: Multi-sensor Elderly Care Systems

1 PhD (Trenton Schulz) + 2 postdocs (2015-2019)

Goal: Create and evaluate multimodal mobile **human supportive systems** that are able to **sense, learn and predict future events.**



Project consortium:

- Robotics and Intelligent Systems group (coordinator)
- DESIGN group (IFI)
- National:
 - Oslo Municipality (Oslo kommune, Gamle Oslo)
 - Norwegian Centre for Integrated Care and Telemedicine (Tromsø)
 - XCENTER AS (3D sensor)
 - Novelda AS (ultra wideband sensor)
- International:
 - University of Hertfordshire
 - University of Reading Whiteknights
 - Giraff Technologies AB

Funding: *IKTPLUS*,
Research Council of Norway
(10% of proposals funded)



**The Research Council
of Norway**

MECS Project idea: Make a Robot into a Personal Safety Alarm

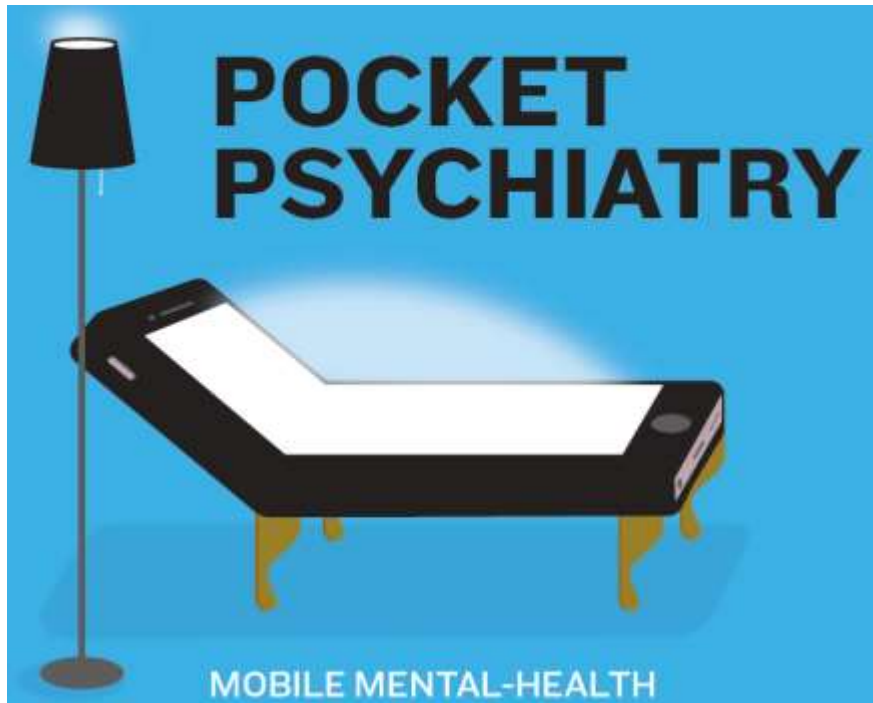


Novelda XeThru



Xcenter RoomMate

INTROMAT: INtroducing personalized TReatment Of Mental health problems using Adaptive Technology (2016-2022)



Goal: Increase access to **mental health** services for common mental health problems by developing **smartphone technology** which can **guide patients**.

Project Manager:
Haukeland Univ. Hospital, Bergen

Funding: *IKTPLUS Lighthouse,*
Research Council of Norway
4% of prop. funded

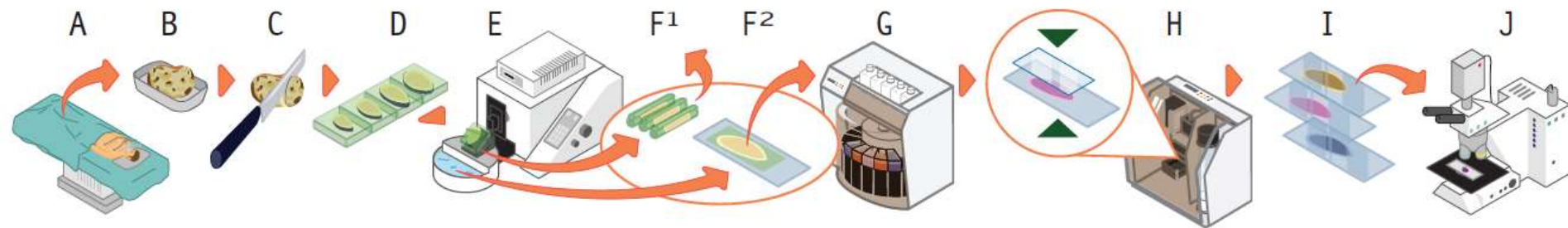


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DoMore!



- **Goal:** Improving diagnosis by utilizing Big Data and software-driven automation of pathology.
- The pathologist are investigating the tumor material removed during surgery.
- Project Manager: Oslo University Hospital
- ROBIN: Clinical Decision Support System
- <http://domore.no>



Funding: IKTPLUSS Lighthouse,
Research Council of Norway
4% of prop. funded



**The Research Council
of Norway**

Much media
attention

Dagens Næringsliv
DN **NRK**
Aftenposten
vårt land

TU Teknisk
Ukeblad





Questions?

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