

# DJW-Symposium: How AI Challenges Our Economies

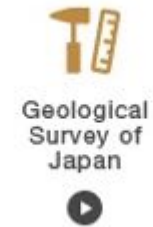
Dr. Lorenz Granrath, Düsseldorf, 16.4.2018



- **Introduction AIST-AIRC**
- **Examples of Research and Development**
- **Outlook**



# Artificial Intelligence Research Centre AIRC



- **AIRC** is the one of the largest and rapidly growing centers/institutes in AIST
- started 2015, now 460 staff
- Director of AIRC is Dr. Junichi Tsujii, a prominent AI researcher.



# AIRC Organisation & 12 Teams



Department of Information Technology and Human Factors  
(Director-General: Satoshi Sekiguchi)

Artificial Intelligence Research Center (AIRC)  
Director: Jun-ichi Tsujii

Advisor

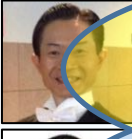
Planning Team Leader



NEC-AIST AI Cooperative  
Research Laboratory  
Leader: Takashi Washio



Knowledge and Information Research  
Team  
Team leader: Hiroya Takamura



Service Intelligence Research Team  
Team leader: Takuichi Nishimura



Prob: **Text/Explainable AI** Ability

Social Intelligence Research Team  
Team leader: Masaki Onishi



Data Platt  
Team leader:

Living Intelligence Research Team  
Team leader: Yoshifumi Nishida



Artificial  
Research  
Team leader:

Geoinformation Science Team  
Team leader: Ryosuke Nakamura



Artificial Intelligence Cloud Research  
Team  
Team leader: Hiroataka Ogawa

Elderly Care  
Innovative Retailing  
Smart Living

Computational Omics Research Team  
Team leader: Totai Mitsuyama



Machine Learning  
Team leader: Jun-ichi Tsujii

Bio-Medical AI

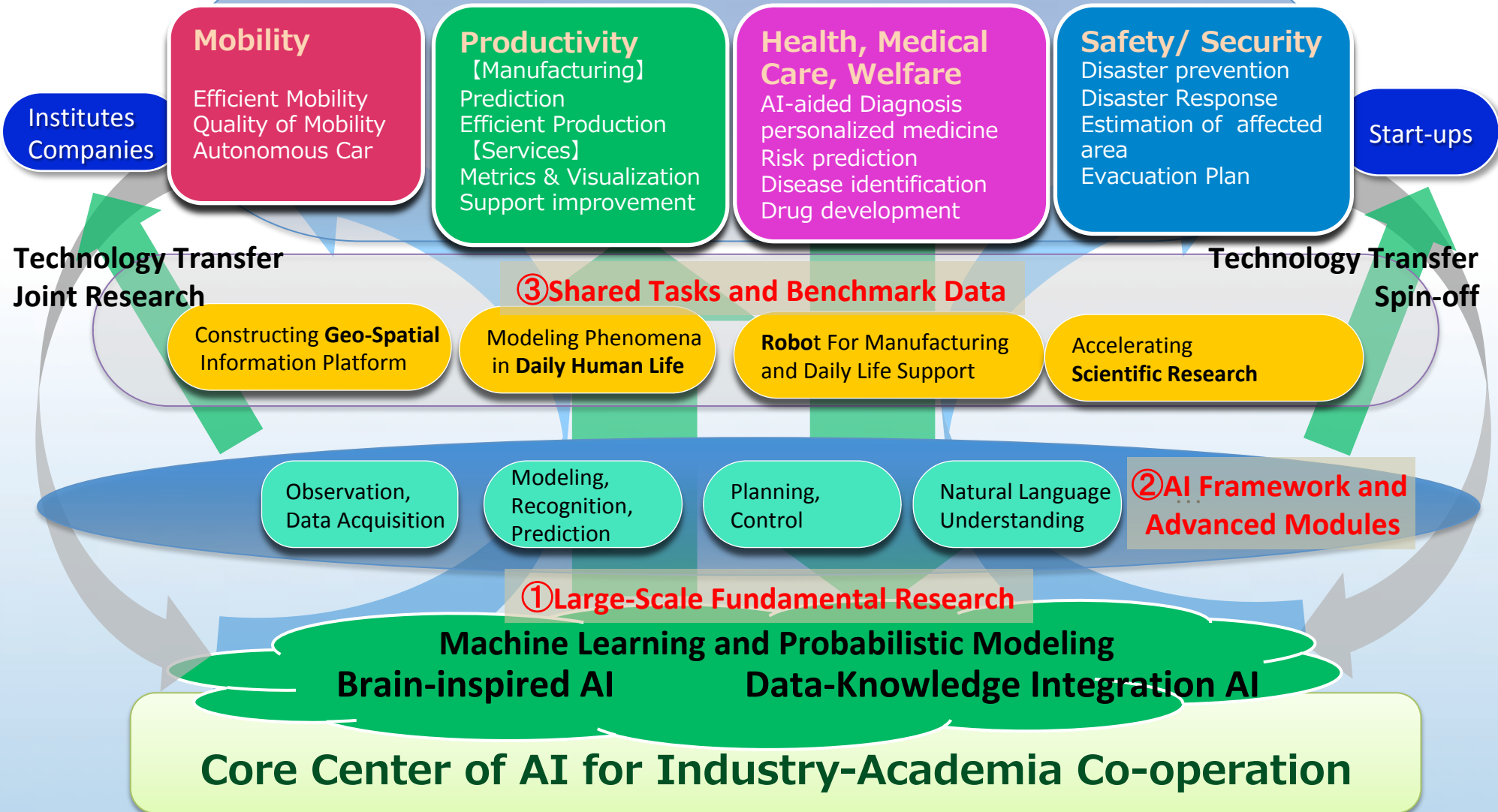


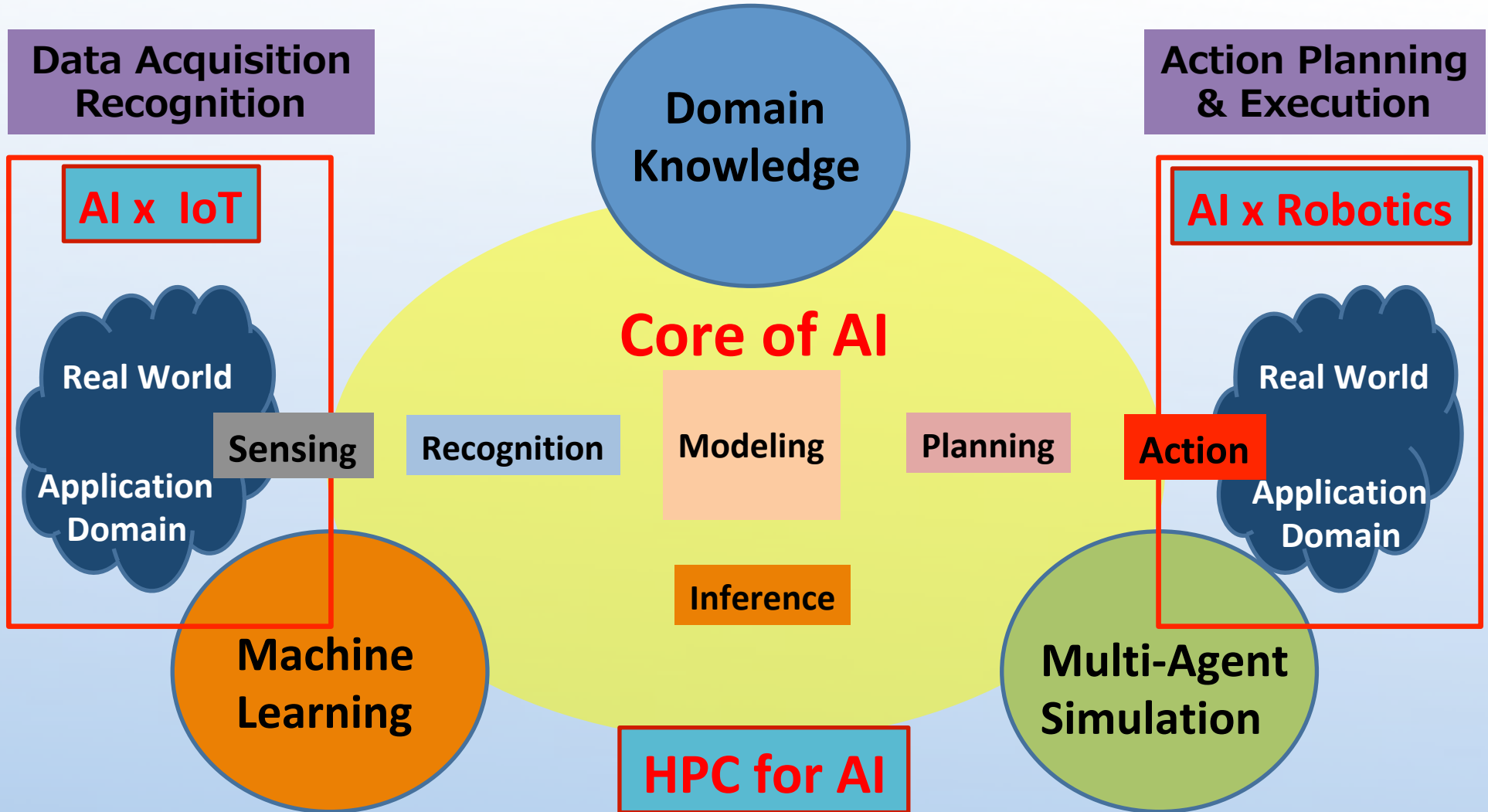
Intelligent Bioinformatics Research Team  
Team leader: Kentaro Tomii

HPC for AI

# Strategy for AI Research

## AI embedded in the Real World





# Sensing and Recognition

# Sensing and Recognition for Multiple Views

## Robot Platform Deep Learning Robot

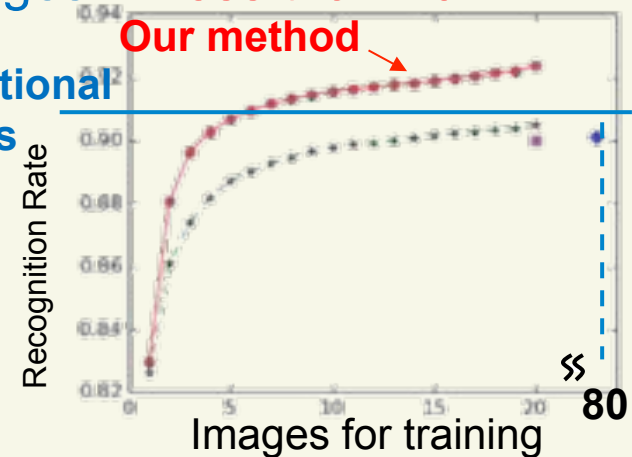


Competition of 3D object identification at  
Stanford (SHREC2017): best Performance!!

Better recognition rates with  
less training images

90%  $\Rightarrow$  92%  
80 images  $\Rightarrow$  less than 20

Conventional  
Methods



★ 12 categories, 132 objects, trained by 21,120 images of objects in everyday life

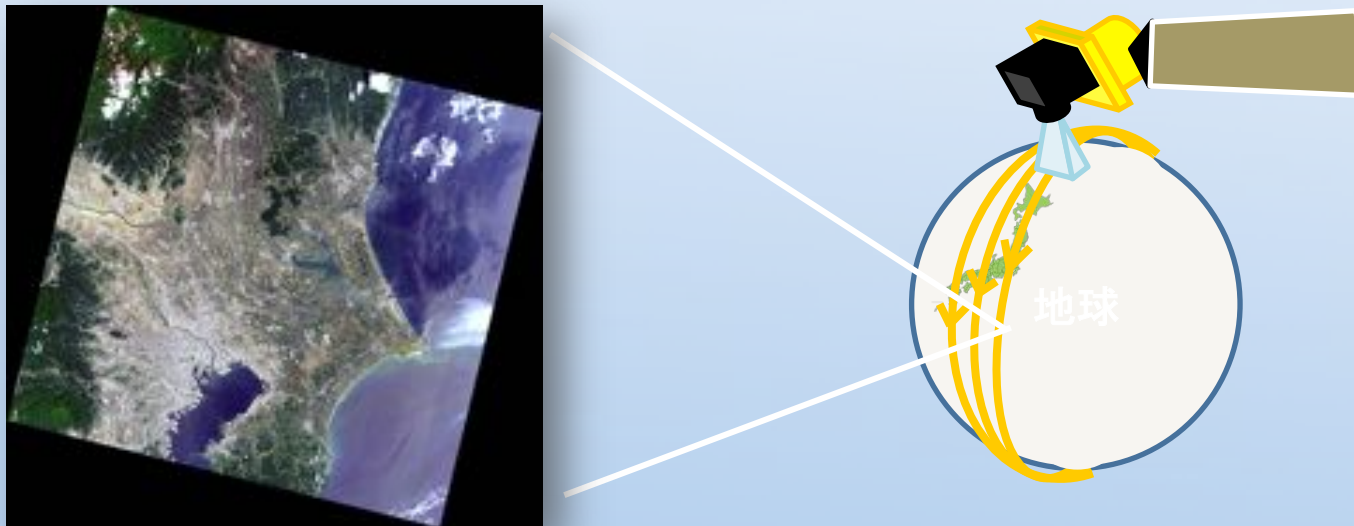




# Geo-Spatial AI/Mobility

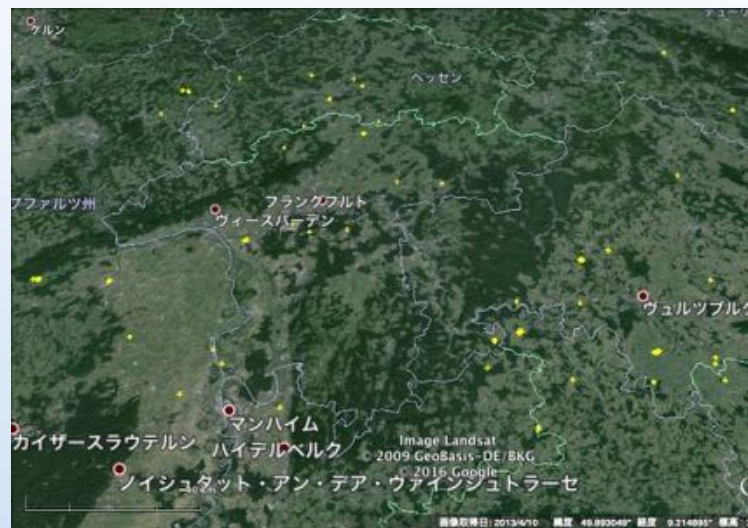
# Open Source Sattelite Images

- ASTER archive at AIST
  - Covers the whole world from 1999 to present. The cumulative data volume is about 1 PB
- Amazon offers satellite imagery free of charge in the West.
  - Landsat8 (USA) : from 2013, 300TB
  - Sentinel-2(EU):from 2015, Several TB / day
- Both are open data that anyone can use freely, but the volume is enormous, so **exhaustive analysis by humans is difficult.**



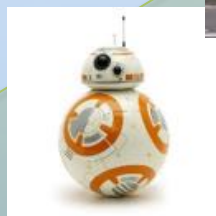
# Applying AI to Solar Panel Detection

We can measure the power demand capability by solar light not only in Japan but also in the world.



# Construction of a Multiscale Geospatial Information Platform

- Maps can be created by various moving bodies other than satellites
- Recording more accurate changes by using multi-scale map



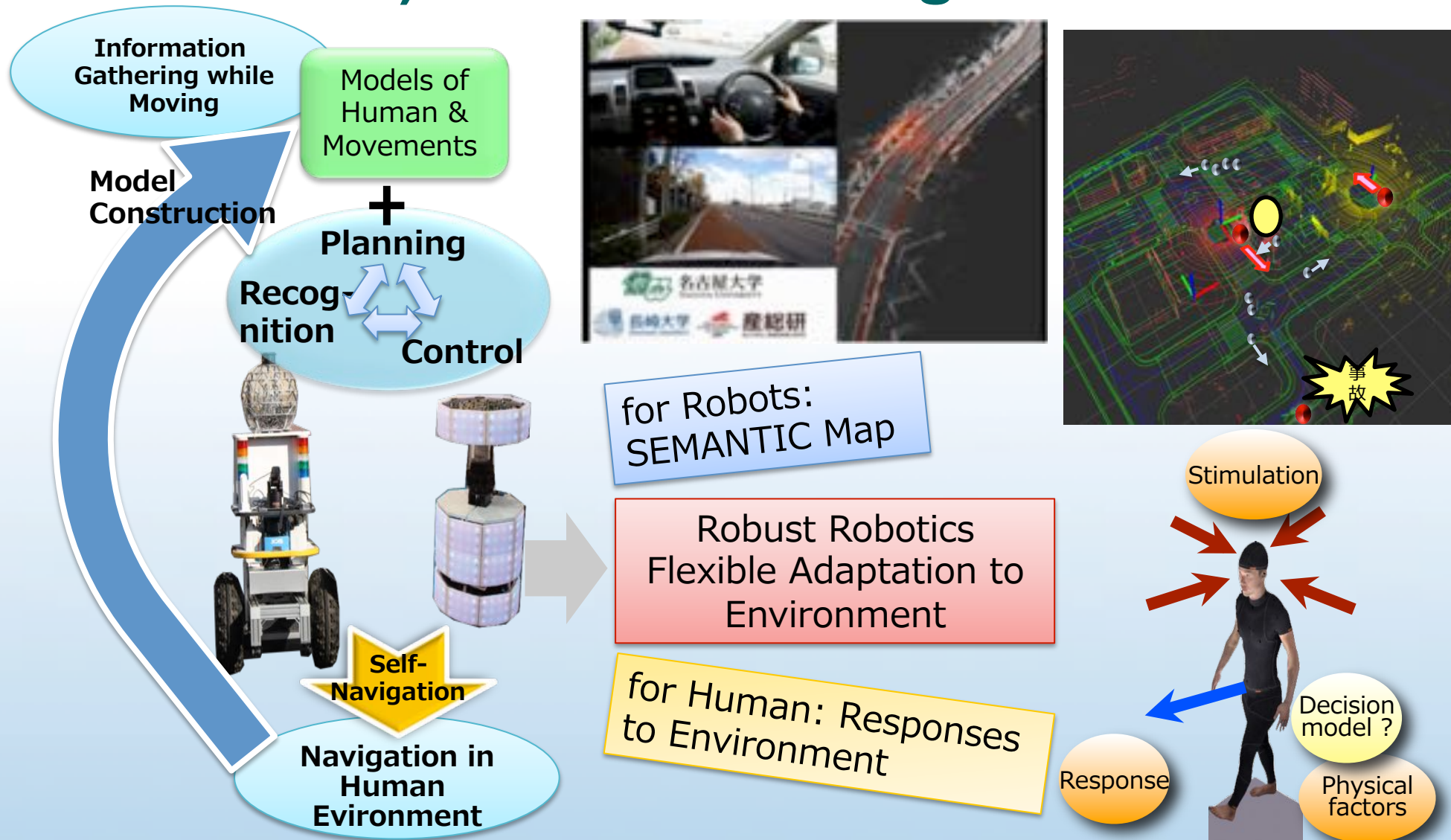
Local



Global

- Real-time copy of real space built on cyber space
- Common functions at all scales: object recognition / change detection and dynamic update

# Self-Navigating Robot (Elderly Care) and Self-Driving



# Explainable AI

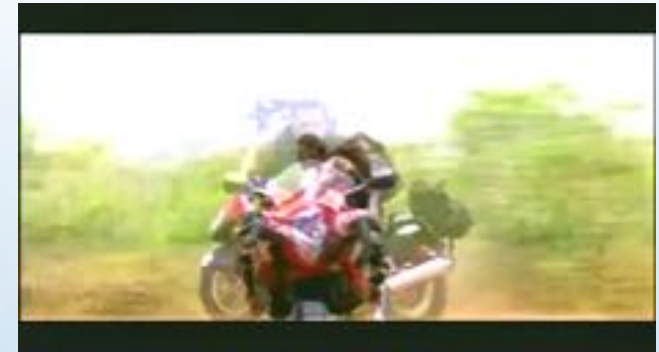
# Video Captioning

**Recognition of sequences of actions with fine-grained object detection**  
**Significant error reduction by sequence recognition**



Baseline method: a man is drinking.  
Proposed method: a girl is doing makeup.

Baseline Method: a dog is playing with a dog.  
Proposed Method: a boy is playing with a dog.



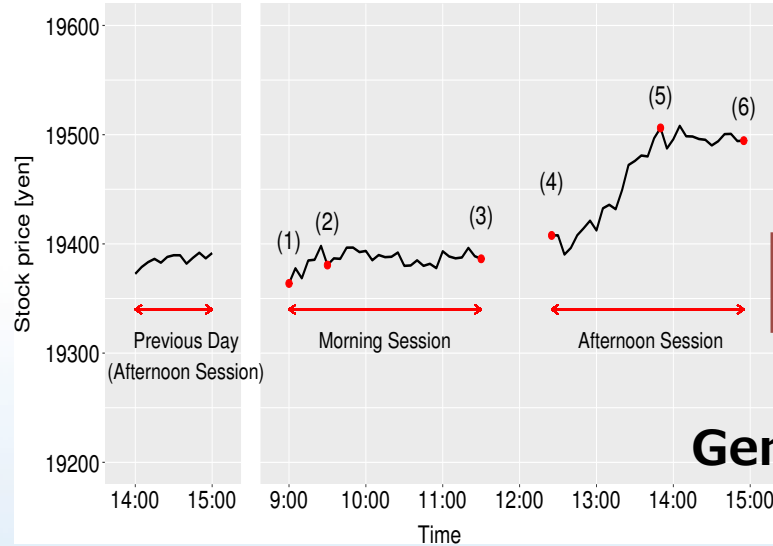
Baseline Method : a man is riding a car.  
Proposed Method: a woman is riding a boat.

Baseline Method: a man is riding a bicycle.  
Proposed Method : a man is riding a bike.

# Stock Market Report Generation

=> AI: towards multimodal analysis

Time Sequence of Nikkei Average



Reports by human

(1)	09:00	日経平均、 <b>続落</b> で始まる
(2)	09:29	日経平均、 <b>上げ</b> に転じる
(3)	11:30	日経平均、 <b>続落</b> 前引けは <b>5円</b> 安の <b>19386円</b>
(4)	12:30	日経平均、 <b>午後</b> は <b>上昇</b> で始まる
(5)	13:54	日経平均、 <b>上げ幅</b> <b>100円</b> 超える
(6)	15:00	日経平均、 <b>反発</b> <b>大引け</b> は <b>102円</b> 高の <b>19494円</b>

## Characteristics of Market Reports

1. Changes in short term and long term affects choices of expressions
2. Context (Time of the day) affects choices of expressions
3. References to actual figures

Reference to the historical context

Reference to the context of utterances

Reference to numerical values

The 23rd Annual Convention of the Society of Language Processing

# Recognition, Model of the World, Action



# Revolution in Science/Engineering

# Big Mechanism (AI for Science)

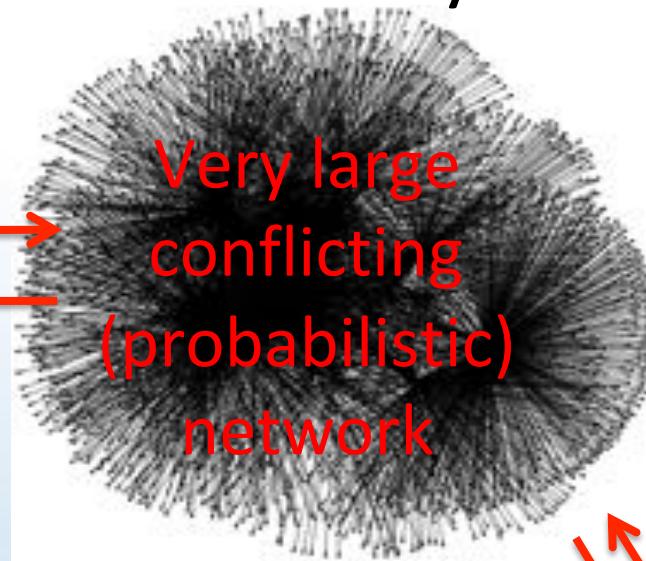
Robot Scientist



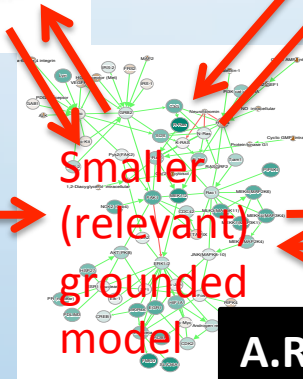
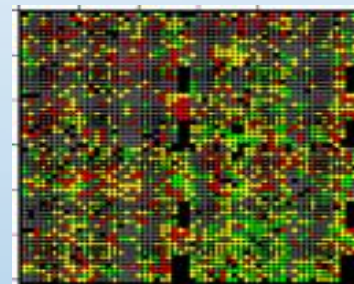
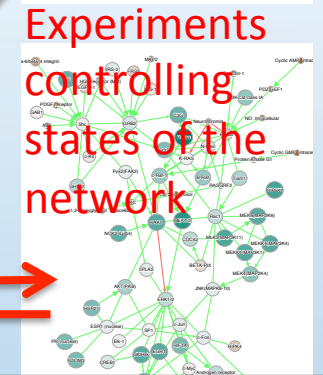
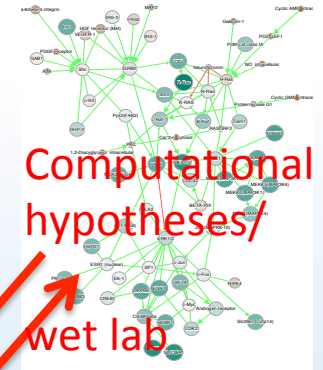
Reading



Assembly



Explanation



**A.Rzhetsky (U.Chicago)**

## Bio research robotics

Expert skill work  
by humanoid  
type robot



Demonstrated improvement of drug discovery productivity through AI robot bio-scientist development  
**Goal: R & D expenses such as drug discovery to 1/10!**

## Retail store mock environment



Material handling with AI x robot  
**Target: Labor saving of store management**

## Factory Robotics

Demonstrate advanced model of distribution of products and information by linking various processing machines and robots and optimizing them by AI technology.



Processing  
(Bending, cutting etc.)



manipulation  
(Assembly, picking, transportation)



optimizing by AI

**"Shared testing factory"**  
verification of  
"connecting factory"

# Outlook



## 【RIKEN & NICT】

- Priority based on “AI Technology Strategy”
- Consistent from basic to deployment

## 【Research Labs.】

- Cooperation with **National Cancer Center Japan**
- Cooperation with national labs of MLIT, MOAA etc

## 【Industries】

- **Joint laboratories w/ NEC etc.**
- Cooperative researches w/ industries : **~40** (Total ~80)
- AI Technology Consortium: **~150** firms participated

## AIST/AI Research Center



## 【Domestic Univ.】

- Network with **university researchers: more than 80** (~20 domestic universities, national labs, basic private research institutes)
- Students attended **~80**

## 【Overseas Labs.】

- **Invite Excellent researchers from overseas** (U of Manchester from this fall)
- Cooperation w/ CMU, TTI-C, DFKI, UCSD, etc.
- Cooperation w/ Asian Univs./Institutes
- Foreign FT researchers : **~30%**, foreign researchers & students: **~60** (from 20 countries)

## 【Outreach - Diffusion & HR dev.】

- **Conference for start-ups (5x)**
- AI seminar – 25 times in total, Lecturers at various kinds of seminars.
- Cooperation w/ universities for HR resources development

# Economic Focus: Change

Jeremy Rifkin (“Third Industrial Revolution”): great economic changes, when convergence between energy, communication, mobility

	Communication	Energy	Mobility
19 <sup>th</sup> century	Steam powered Book printing Telegraph	<b>Cheap coal</b> Steam engines	Steam trains
20 <sup>th</sup> century	Telephone, TV, Radio	<b>Cheap Oil</b> Centralised Electricity	Cars
21 <sup>st</sup> century	Communication <b>Internet</b> (5G, IoT)	Renewable Energy <b>Internet</b>	Automated Transportation <b>Internet</b>

Centralised  
power



Lateral  
power

⇒ Democratization of economic life; **new business models**

**Discussion: job replacement through AI?!**

Source: businessinsider, Interview with Jeremy Rifkin, 6/2017

# Economic Focus: New Business Models

- Sellers & Buyers -> Providers & Users
- Markets -> Networks
- Ownership -> Access
- Consumerism -> Sustainability
- Capitalism -> Sharing Economy

=>

=> Japan and Germany not very active!

Source: businessinsider, Interview with Jeremy Rifkin, 6/2017

Thank you for your attention!