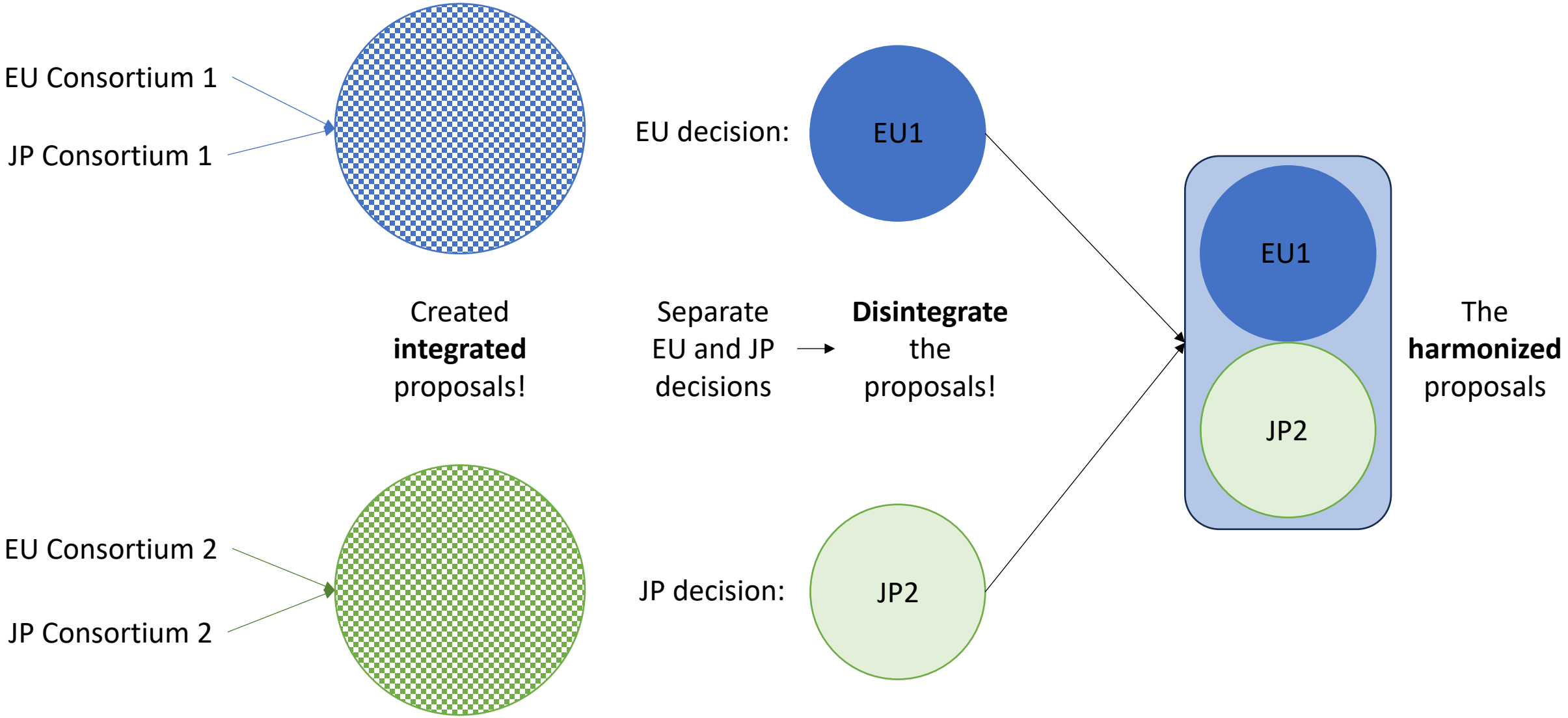
Co-funded by the European Union

6GSNS

Project number: 101192369

HORIZON-JU-SNS-2024-STREAM-B-01-05

Note #1 The process of forming the EU-JP project



Note #2 Who is NOT fundable in EU-JP?

- EU logic: EU funds companies who pay tax in the EU
  - Including e.g., Apple Germany
  - Not including e.g., Ericsson Japan
- Japan logic: Japan funds Japanese founded/owned companies
  - Not including e.g., Ericsson Japan

Ericsson Research Japan does Europe – Japan collaboration every day!
But it is not fundable . . .

General Information

- AI-native 6G air interface and RAN architecture
- Concept validation and pre-alignment for standardization
- Start April 2025, 36 months, budget of 3 MEuro (6G-MIRAI - EU part)
- 9 partners in EU, 7 partners in Japan
- Collaboration between EU (6G-MIRAI) and Japan (HARMONY)

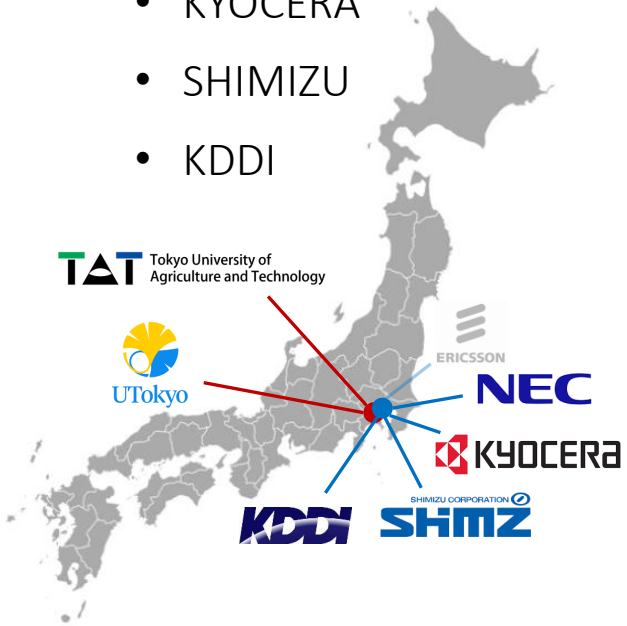
Collaboration EU-JAPAN

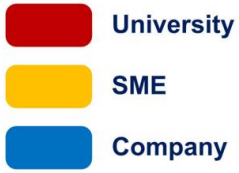
EU (6G-MIRAI project)

- Ericsson (Project Lead)
- Fraunhofer (Technical Lead)
- Apple (Communication Mgr)
- CNIT
- University Pisa
- KU Leuven
- IS-Wireless
- Telefonica
- Sequans

Japan (HARMONY project)

- The University of Tokyo (Project Lead)
- Tokyo University of Agriculture and Technology
- NEC
- KYOCERA
- SHIMIZU
- KDDI





Japanese Partners

UTokyo

A prestigious Japanese national university renowned for its research and education across a wide range of academic disciplines.

TAT Tokyo University of Agriculture and Technology

A specialized university in Japan focusing on agriculture and engineering, committed to innovation and sustainability.

NEC

A leading Japanese multinational corporation providing IT and network solutions, including systems integration, cloud computing, and telecommunications.

KYOCERA

A Japanese multinational company known for its diverse range of products, including ceramics, electronics, and office equipment.

SHIMIZU CORPORATION SHIMZ

A major Japanese construction and civil engineering firm with a global presence, known for its cutting-edge architectural and infrastructure projects.

KDDI

A prominent Japanese telecommunications operator offering a wide array of mobile, internet, and communication services.

European Partners

ERICSSON	A leading Swedish telecommunications company specializing in providing infrastructure, software, and services for communication networks globally.
Apple	An American multinational technology company known for its innovative consumer electronics, software, and services, including the iPhone, iPad, and Mac.
Fraunhofer HHI	A leading German research institute within the Fraunhofer Society, specializing in mobile and optical networks, as well as multimedia technology and image signal processing.
cnit	National Inter-University Consortium for Telecommunications: An Italian consortium of universities that conducts advanced research in telecommunications and related fields.
Università di Pisa	One of Italy's most prestigious universities, recognized for its strong emphasis on research and education in science, engineering, and the humanities.
KU LEUVEN	A renowned Belgian research university with a rich history, offering comprehensive programs in diverse academic disciplines while emphasizing innovation and research excellence.
is-wireless™	A Polish company specializing in developing and providing advanced wireless communication technologies and solutions.
Telefónica	A major Spanish multinational telecommunications company offering a wide range of fixed and mobile communication services across Europe and Latin America.
SEQUANS	A French company specializing in the design and development of 4G and 5G semiconductor solutions for IoT and broadband applications.

Goal & Objectives

Overall goal: 6G-MIRAI aims at developing reliable and robust AI-native wireless communication systems that enable the practical exploitation of the full potential of the latest physical layer technological advances, especially cell-free massive MIMO, and of next-generation virtualized and potentially disaggregated radio access networks.

O1: Reliable and robust AI/ML techniques for future wireless communications,

O2: Practical AI-native design of next-generation radio access networks,

O3: Common platform for data, benchmarking, and validation,

O4: Aligned strategy on future standardization efforts.

AI and Machine Learning in RAN

AI and Machine Learning will play an important role in 6G

- Hard-to-model problems, non-linear effects, …

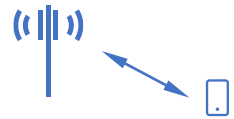
Need to account for

- ***complexity***
- ***energy consumption***
- ***reliability and robustness***

EXAMPLES

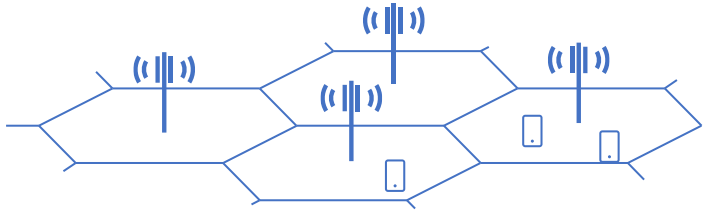
- guarantee robust performance against model mismatches (channel, HW, etc.),
- imperfect synchronization and reciprocity calibration,
- insufficient resources for signaling and channel estimation,
- limited computational capabilities,
- the difficulties in acquiring the necessary training data

AI within the air interface



Channel estimation/prediction, beam management, positioning, HW impairments, …

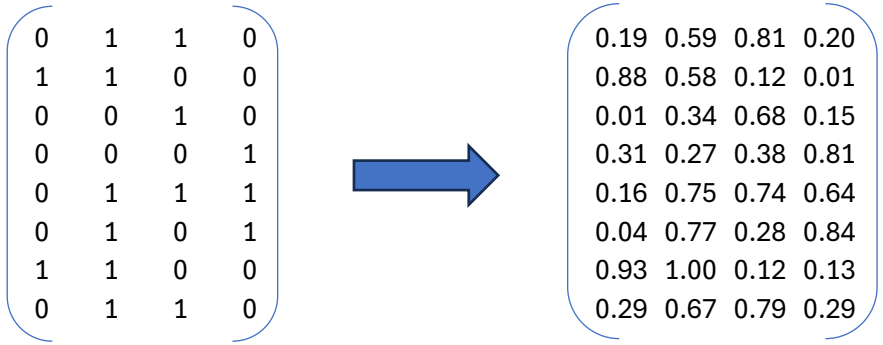
AI within the RAN

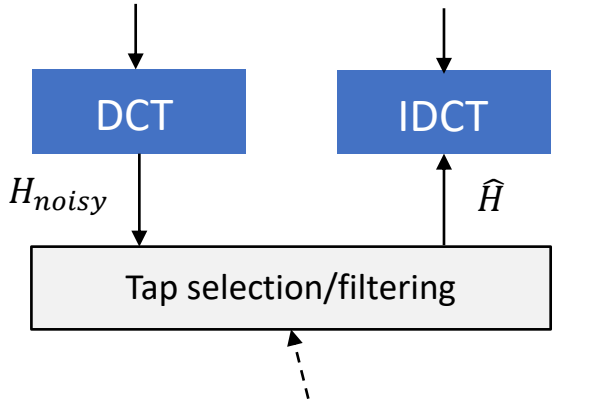


Radio-resource management, deployment, management and orchestration, …

AI is a natural evolution of algorithm research

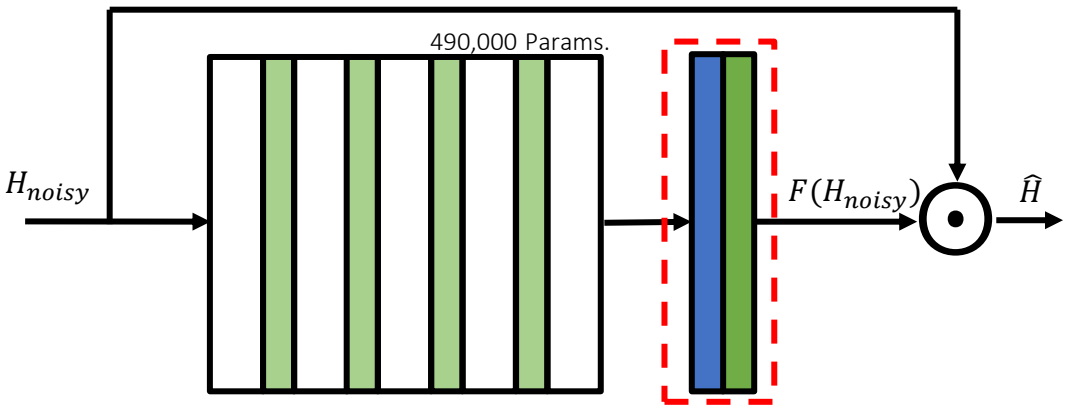
- AI is *differential programming* at its heart
  - Design algorithms (potentially with many params)
    - Use *data + gradient descent* to optimize params.
  - Deep integration with legacy algorithms.
- Physics inspired AI (e.g., build on domain knowledge)





- A "**bitmap mask**" to keep/reject taps.
- Manual parameter tuning

AI-based tap selection/filtering enabling **weighting instead of selection**



Internship with Japanese students from **UEC** and **IST**

Workpackages

6G-MIRAI (EU)		HARMONY (Japan)
WP1: AI-native practical 6G air interface WP2: AI distributed 6G RAN architecture & control	⟷	WP1: AI-Native and User-Centric RAN Architecture WP2: Harmonization of Multi-AI Networks WP3: AI-Native RAN
WP3: Scenarios & data, validation & benchmarking	⟷	WP4: Architecture and Component Technology Evaluation via Testbed Demonstrations
WP4: Cooperation, dissemination and impact WP5: Project management	⟷	Dissemination Project management

Contacts

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Communication Manager: Henning Sanneck, h_sanneck@apple.com

Webpage: http://6g-mirai-harmony.eu/ (to come)

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or SNS JU. Neither the European Union nor the granting authority can be held responsible for them.

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