- 日本―フランス 国際共同研究 「エッジ AI」 2023 年度 年次報告書		
研究課題名(和文)	無線通信とセンシングを連携させたスマート工場向け省 電力軽量エッジ AI 技術	
研究課題名(英文)	Lightweight Edge Artificial Intelligence for Sensing and Wireless Communications in Connected Factories (LIGHT-SWIFT)	
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所属・役職	国立情報学研究所 アーキテクチャ科学研究系・教授	
研究期間	2023年12月1日 ~ 2027年11月30日	

## 1. 日本側の研究実施体制

氏名	所属機関・部局・役職	役割
Megumi KANEKO	Professor, Information Systems Architecture Science	JP-side Project Leader WP0, WP4 main coordinator
	Research Division, National Institute of Informatics (NII)	WP1, WP5 member
Yasushi	Executive manager, Senior	Main collaborator
TAKATORI	distinguished researcher,	WP1, WP4, WP5 member
	Wireless access systems	
	project, Access network	
	service systems	
	laboratories, Nippon	
	telegraph and telephone	
	corporation (NTT)	
Yousef	Project Researcher,	WP4 coordinator
SHNAIWER	Information Systems	WP1, WP4, WP5 member
	Architecture Science	
	Research Division, National	
	Institute of Informatics (NII)	
Tomoaki	Group Leader, Wireless	WP1, WP5 member
OGAWA	access systems project,	

	Access network service systems laboratories, Nippon telegraph and telephone corporation (NTT)	
Kenichi	Senior Research Engineer,	WP1 coordinator
KAWAMURA	Wireless access systems	WP4, WP5 member
	project, Access network	
	service systems	
	laboratories, Nippon	
	telegraph and telephone	
	corporation (NTT)	
Daisuke	Senior Research Engineer,	WP5 coordinator
MURAYAMA	Wireless access systems	WP4, WP1 member
	project, Access network	
	service systems	
	laboratories, Nippon	
	telegraph and telephone	
	corporation (NTT)	

## 2. 日本側研究チームの研究目標及び計画概要

During the first phase of this project, we will establish the global framework of our collaboration, by defining our general consortium agreement, and by coordinating the scientific objectives and tasks between all Japanese and French members.

During the period Dec. 2023~March 2024, we will investigate the required applications of Industrial Internet of Things (IIoT) and the specific technical issues related to wireless communication quality in the industry (e.g., data rates, latency, performance requirements in noisy and obstructed environments, etc.). In particular,

- we will perform an in-depth study of the state-of-the-art, in order to identify the key requirements of Industry 4.0, and envisioned future applications in the context of Beyond 5G and 6G.

-we will examine the needs of industry in terms of wireless communications and sensing capabilities, by leveraging the industrial expertise and connections of NTT as well as Wavely.

-we will establish the specific IIoT applications and use cases for smart factories targeted in this project, and their technical issues in terms of wireless communications and sensing. This study will serve as the basis for the different objectives and performance targets of the upcoming workpackages (WP2, 3, 4).

## 3. 日本側研究チームの実施概要

During the period Dec. 2023~March 2024, we have mainly advanced on the following two aspects.

Firstly, we have established the global framework of our collaboration, by defining our general consortium agreement, establishing our digital repository tools, and by coordinating the scientific objectives and tasks between all Japanese and French members. The Japanese team members have also attended the SICORP Edge AI general kickoff meeting at ANR in Paris, where they presented their project on March 18<sup>th</sup> 2024. On March 19<sup>th</sup> 2024, the first face-to-face Light-Swift workshop was also held at ANR Paris.

Secondly, we have conducted investigations regarding the major applications of Industrial Internet of Things (IIoT) for Industry 4.0, and the technical issues related to Edge AI for IIoT. Moreover, we have focused on specific use cases and major Key Performance Indicators (KPIs) related to sound sensing and wireless communications.

In particular,

- we have conducted an in-depth literature survey, and identified general IIoT target applications such as massive sensing, robot/drone motion control or high definition video transfer.

-we have examined the requirements of key use cases especially in terms of wireless communications capabilities, and identified the requirement targets we will be focusing upon.

-we have investigated the state-of-the-art techniques for reducing AI power consumption, and have been discussing the roadmap to follow in order to achieve our envisioned target of low power Edge AI for sound sensing and wireless communications.

-we have started the write-up of our first deliverable D.1.1 "*Report of IIoT applications and technical issues*", and started discussing the contents of the second deliverable D.1.2 "*Application requirements statement*".

The outcomes of this first phase will serve as the basis for the different objectives and performance targets of the upcoming workpackages (WP2, 3, 4).