Chiara Caputi

Tutor: Prof. Leopoldo Angrisani

XXXIV Cycle - I year presentation

Enabling technologies for continuous monitoring of well-being and healthiness in the agri-food chain

Università degli Studi di Napoli
Federico II

OUTLINE

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- Problem
- Research activities
- Products
- Next year

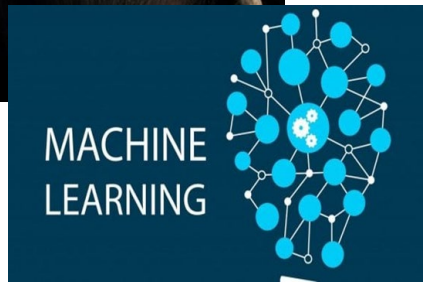
Backgorund

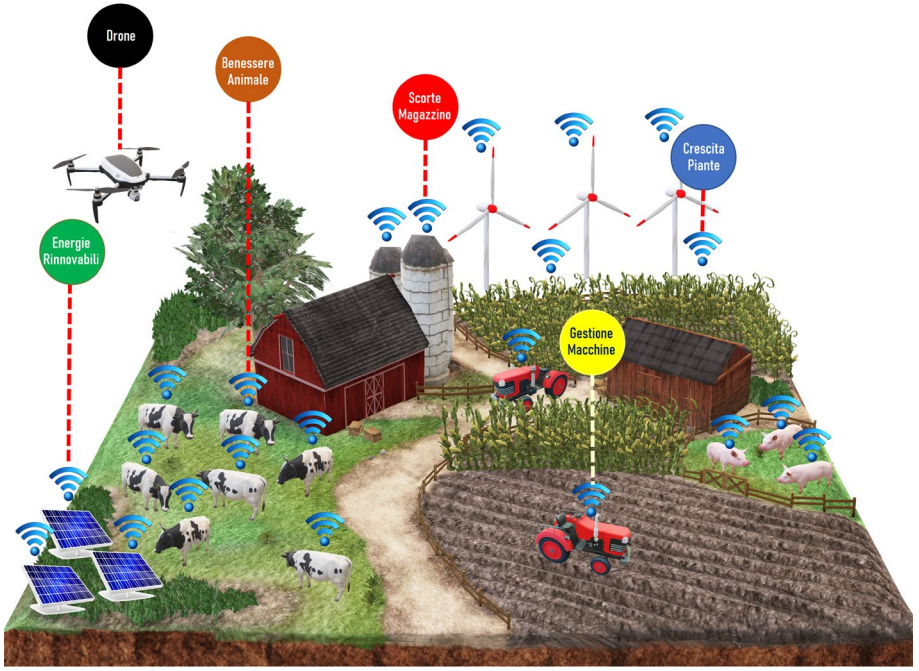
- M.Sc. degree in Electronic Engineering at the University of Naples, Federico II, "*LoRa technology for communication between devices on the medium voltage network*".
- Co.Co.Co. at Ce.S.M.A. "Realizzazione del sistema informativo di monitoraggio e gestione informatica dei dati di una stazione di misura per il controllo remoto di parametri chimici".
- Information Engineering.
- IEEE member.
- IEEE Stundent Branch member.
- Ph.D. Student of XXXIV cycle in Information Technology and Electrical Engineering (ITEE): "*Enabling technologies for continuous monitoring of well-being and healthiness in the agri-food chain".*
- Cooperation with Department of Veterinary.

Problem

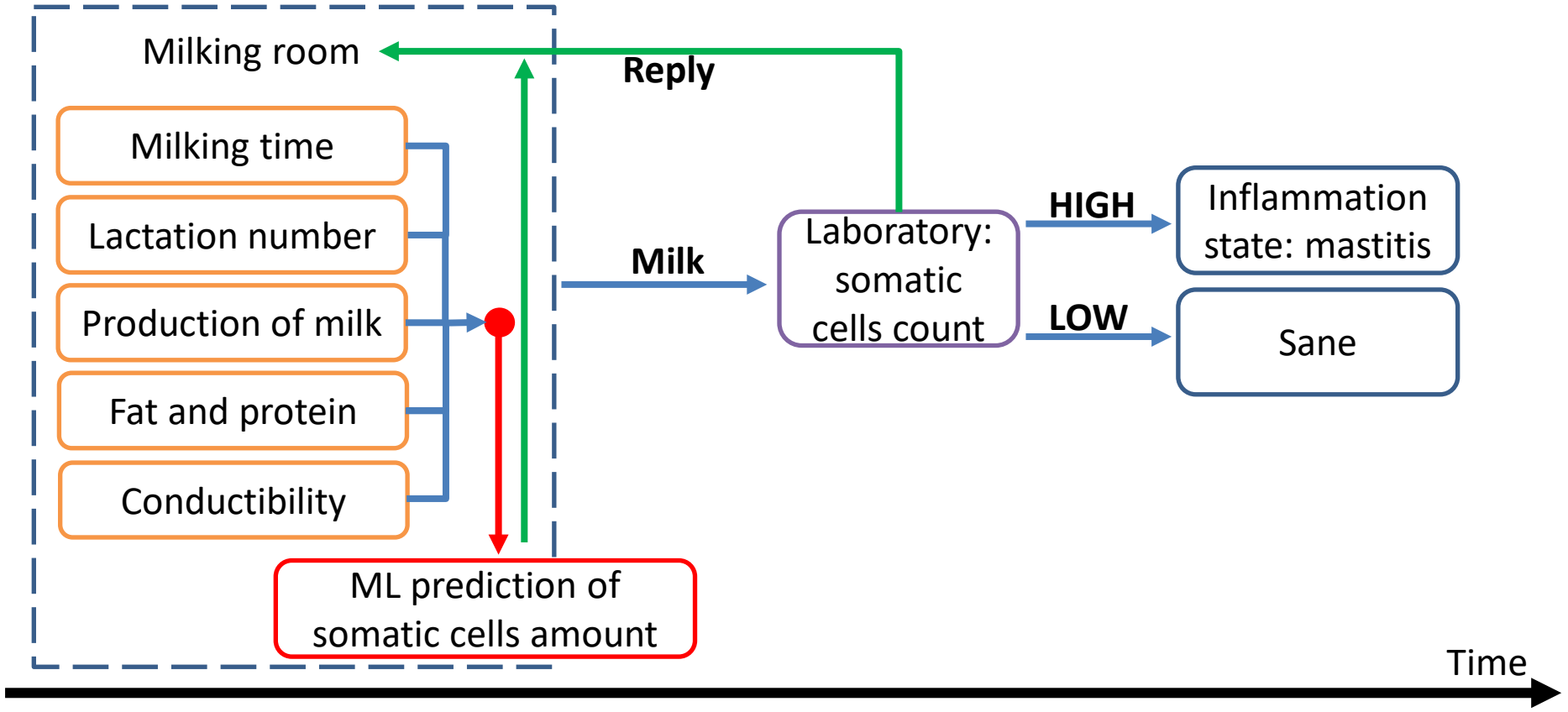
Smart agriculture in one-health solution:

1. Early mastitis pathology identification: mastitis is one of the most expensive diseases in the dairy industry in terms of production, quality and human health. Correlations with electric conductibility and somatic cells.
2. Innovative communications technology: starting point for the realization of automatic technological platforms. Long range and low power: LoRa protocol.





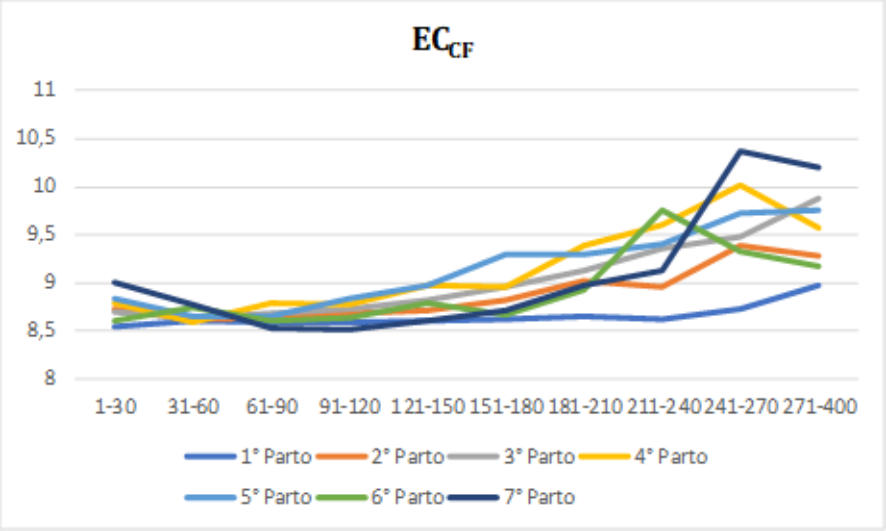
Research activities (1/2)



Data was collected in one-year period at buffalo breeding “Improsta”.

Research activities (1/2)

- A statistic analysis for correlation was performed for verify the existence of a correlation between the number of somatic cells and electrical conductivity:



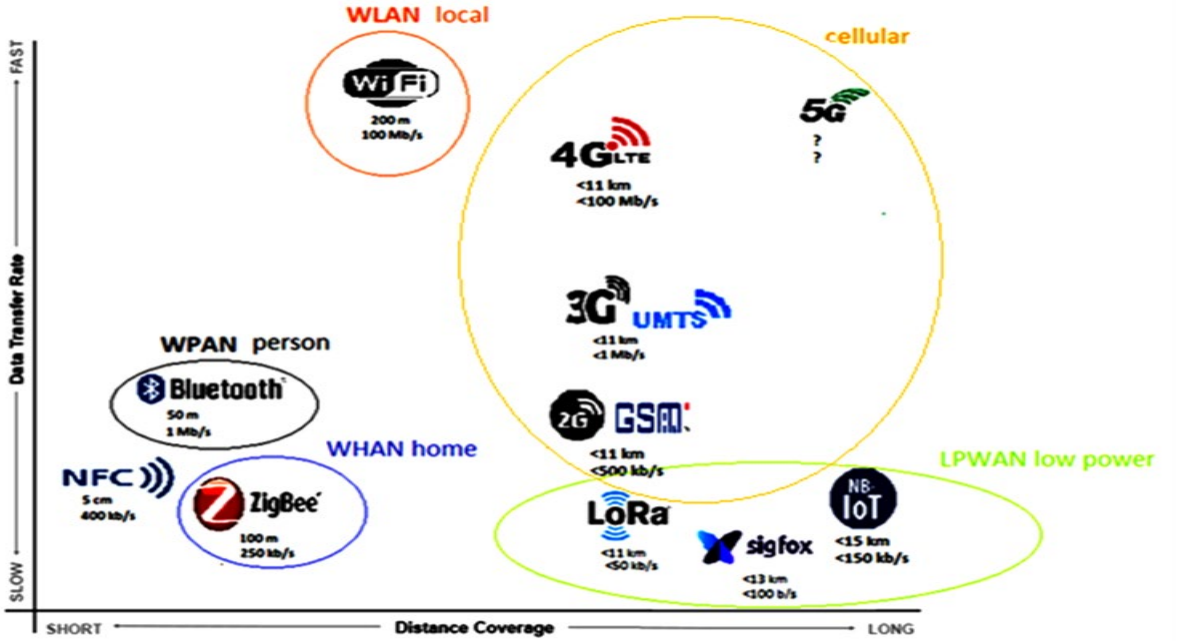
- correlation coefficient (r = 0.195), ECCF was significantly (P <0.001) correlated to the number of somatic cells.

- A machine learning algorithms was preliminary tested using Knime and random forest algorithm seems to obtain the best results.

Research activities (2/2)

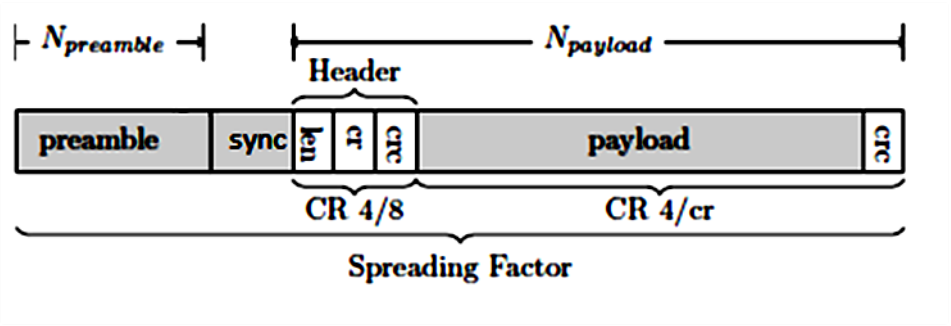
- Starting from the thesis work, LoRa protocol was analyzed and tested in real conditions: in long range distance for verify the constraints in open space.
- Its possible to transfer easily knowledge and hardware in Smart agriculture.

Overview of Wireless enabling technology

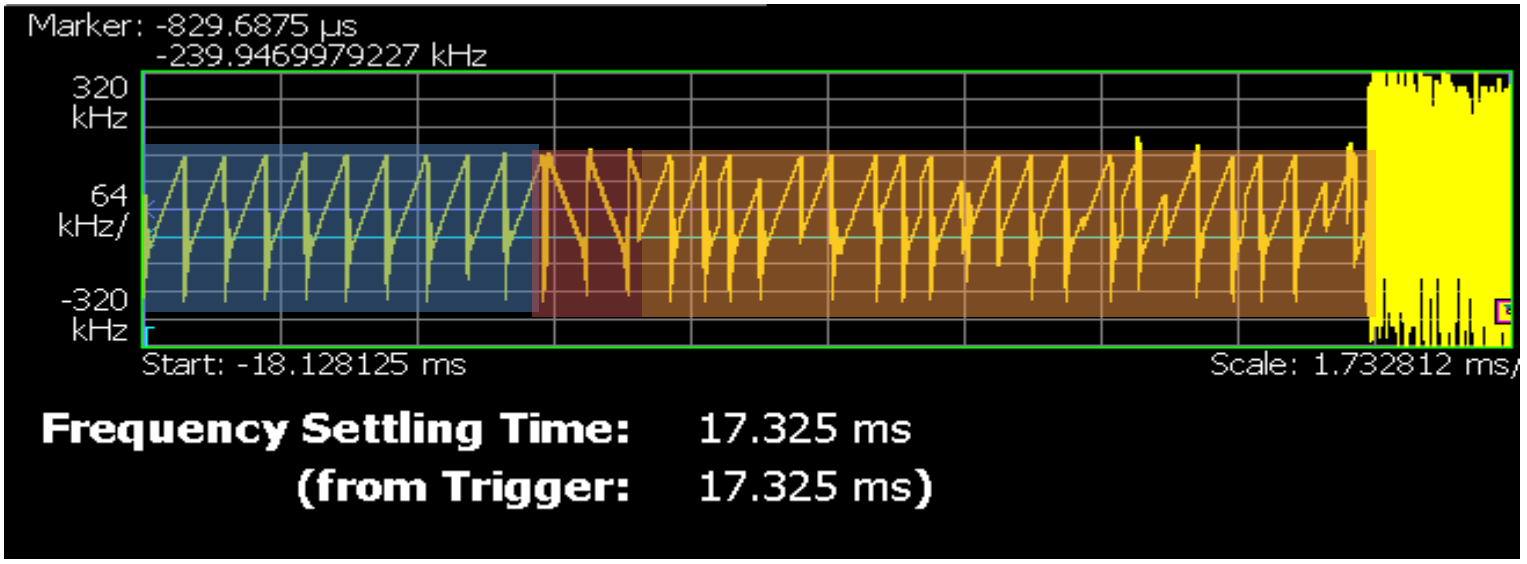


- Higher data rates → higher communication speeds
- Low data rates → energy saving
- Band fired ie:
  - high monthly connection fees due to the telephone company;
  - call interruption depends on the operator

Research activities (2/2)



- Preamble
- Header
- Payload



Products

- Bonavolonta F.,Caputi C., Liccardo A., Teotino A., “Protection of MV smart grid based on IoT technology” 2019 MetroInd4.0&IoT IEEEXplore.

- Metrology for Industry 4.0 and IoT, Naples 2019“ Protection of MV smart grid based on IoT technology” was presented and demonstration session was attended (*speaker*). **“Best Live Demonstration” awards.**

Next year

Research activities:

- Performing machine learning algorithm and evaluated the results obtained with a more data of electric conductibility and somatic cells retrieved in long-time period also with thermal images;
- Develop an automated system with LoRa communications.

Conferences and expected publications:

- RTSI (Research and Technologies for Society and Industry) conference;
- Metrology IoT and Industry 4.0;
- ACTA IMEKO.

Credit summary:

Student: Chiara Caputi	Tutor: Leopoldo Angrisani	Cycle XXXIV
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	Credits year 1								Credits year 2								Credits year 3									
		1	2	3	4	5	6			1	2	3	4	5	6			1	2	3	4	5	6			
	Estimated	bimonth	bimonth	bimonth	bimonth	bimonth	bimonth	Summary	Estimated	bimonth	bimonth	bimonth	bimonth	bimonth	bimonth	Summary	Estimated	bimonth	bimonth	bimonth	bimonth	bimonth	bimonth	Summary	Total	Check
Modules	20	9,4	1,2	3	0	0	4	18	10							0	0							0	18	30-70
Seminars	5	2,4	0,5	3,4	0	0	0	6,3	5							0	0							0	6,3	10-30
Research	35	7	8	8	7	8	8	46	45							0	60							0	46	80-140
	60	19	9,7	14	7	8	12	70	60		0	0	0	0	0	0	60	0	0	0	0	0	0	0	70	180