Thesis Project thematic

The needs

Nowadays, agriculture need a particular attention to avoid misusage of pesticid and water for example. To be able to get through this, the farmer has to know what he can and cannot do. This thesis has the pretention to be a bridge between the gap from the farmer and informatician knowledge. In this way we need to integrate the farmer knowledge and serve something as far easy to help him to be an end user of such thematics like AI or LoRa. It is a loss that, from now, he can't use theses technologies as long they would be a really helpful tools to supervise and take action for his fields.

How to contribute to thoses needs

1 - Introduction As long as we accept that agriculture had and will have 5 majors steps

- 1.0 Birth
- 2.0 Genetics crossing (Mendel 19th Century)
- 2.1 Organics Geneticly modified
- 3.0 Processes Industrialisation
- 4.0 Data Processing
- 5.0 UI/UX for the end-user (the farmer)

Proposed solution : APOGÉ - l'intelligence Artificielle en Périphérie pOur l'aGriculture de prÉcision (Border Artificial Intelligence for precision agriculture)

The choosen process in our study for use, collecting data and interfacing with sensors and actionners went to EDGE-IA. With thoses methods grabbing data et orders to different sensors is decentralized. To say that we prefer to avoid the cloud. With this resilience outcome less energy consuming by the process and at the end cost less. Connected Objects choose with their own resources and informations. The stakes are to put a proactive monitoring and innovating which optimize the efficiency of resources used for this, i.e. less water consume with an opportunistic use for a significative biomass gain. Another way to say maximize production with minimizing primary resources to preserve global ecosystem et grant a return on invest for the farmer concerned. This project is in adequation with our geographic position ("Occitanie, France") affected more and more by water restrictions.

2 - Process : We have choose to use a drone to fly over the farmer's fields and check for his plantations. NVIDIA's Jetson for the data processing with AI using Edge to avoid the most possible the needs of cloud usage. In fact Jetson should be enough for a first view of this project. And also as long it is embedded electronics the power dissipation of it should be less than a tradional computer and we can put it on the drone.

The communication ways will be done by WiFI and LoRa :
- WiFi for huge data grabbing
- LoRa to treat precise and targeted requests

The sensors :
- A weather Station
- A tension-sensor

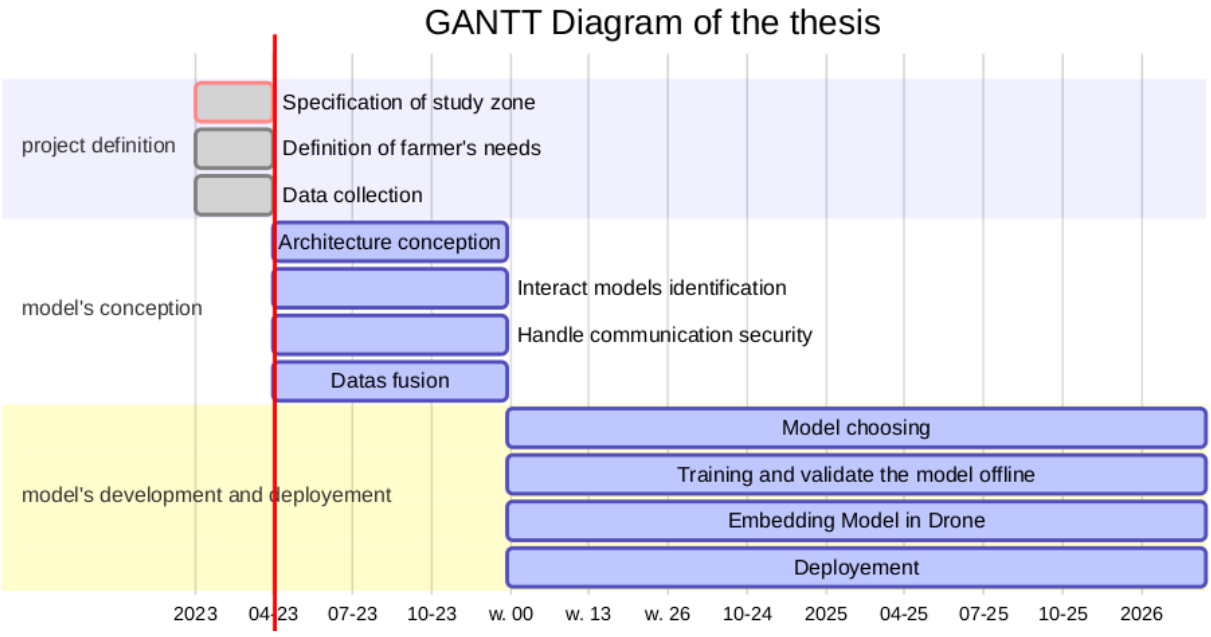
Last part the cloud architecture :

We are gonna use for this studie WeeNat's cloud service (https://weenat.com/)

Stakes and anticipations :

- The monitoring and use of an farmer's field by EDGE-IA will permit to down the costs for the user.

- Preserve the ecosystem (With Diseases Detection the farmer can avoid to use pesticides and treat only the disease which affect his parcels)
- Share his data in exchange of money or another data.
- Put a label that he didn't use pesticides and that his cultures are healthy.



Motivations

Passionate of Radio-Telecommunication since 10 years, I would be grateful to share my knowledge with people able to hear it. I have skills in Mobile Telecommunication (GSM -> 5G-SA) and in LoRa. Thus make me a good candidate for this subject. Indeed there are not many people who can get through those protocols. This make me have uncommon point of view of the theme proposed.
My situation with my disablility had me having to work in a way not "academic" and from it I am autonomous in my research and I have learn from many years.
I also have transverse skills which shake Electronics and Informatic. The subject treats about embedded electronics which is exactly the research field of my skills.
I like to be front of new challenges and I think I can raise this one.
I have worked with cheap hardware since years like chineese electronic clones and I am used to make them work with few documentation. I also do retro-compatibility to make old software working.
There is a part of the thesis talking about security in radio-telecommunication which is exactly that passionate me. I prefer this than the field of TCP/IP security treated by people more skilled than me. Instead of this radio is not wide studied by most of people. I can listen a phone up to LTE (Long Term Evolution) and Android 11 from the only reason that the phone his in my radio-frequencies area.
Linux passionate since years also (it comes with telecommunications). I am skilled in bash, C and networks. From telecommunication I had learn how to read long code and be able to deal with theses.
I have also how to deal with many architecture 32bits, AMD64, ARM, ARM64, RISC-V, ESP32, Arduino Microcontrollers, STM32 and I think the Jetson Nano (ARM64) will be not too hard to use for me. Like I said I am autonomous and I don't need many support as long I have worked without for years. I don't have too much worked with AI but I am able to use it. I have tested few python scripts using Kaggle. I have also teaching skills cause I was teacher at the Lycée Déodat de Severac of Céret. And I have also made few presentation at the University of Perppignan via Domitia. I want to be a PhD since many years now and my disease didn't help me to this but from these I have been resilient and have learn to not be too proud (I have made a a CAP : Certificat d'Aptitude Professionnelle in Electricity after my Licence in Electronics and I have even learn from it).
Now I talk to highly-skilled persons in telecommunication. So I can say it is not determinant.
I have multiple field of experience and skills and I have some old diploma that were (I think) more difficult to obtain than now.

From all of these I hope you will accept my thesis project.
I will be an honor to try to do my best to have it.

With regards, Bastien Baranoff