Teaching TinyML and supervising capstone projects

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Workshop on Widening Access to TinyML Network by Establishing Best Practices in Education

Prof. Ronald Criollo

- Lecturer at Faculty of Electrical and Computer Engineering, ESPOL.
    - Computer Science (Undergraduate)
        - Coordinator of Computer Science Capstone Course
    - Master in Telecommunications (Graduate)
        - Internet of Things
- Researcher at Center for Industrial Digital Transformation, CTD-ESPOL.
- Coordinator of track "IoT Machine Learning", Workshop for Latin America and the Caribbean, Foundation EsLaRed.
- Tutor of an open source community "KOKOA", ESPOL.
- Instructor at Cisco Networking Academy.

How to motivate undergraduate/graduate students to learn TinyML?

Methodology

- Undergraduate (Computer Science Program)

Motivate and involve students in learning TinyML

workshops, webinars

As tutor of open source community

Teaching TinyML

- Tutor of open source community "KOKOA"

Teaching TinyML (open source community)

Challenges

Motivate students of first semesters
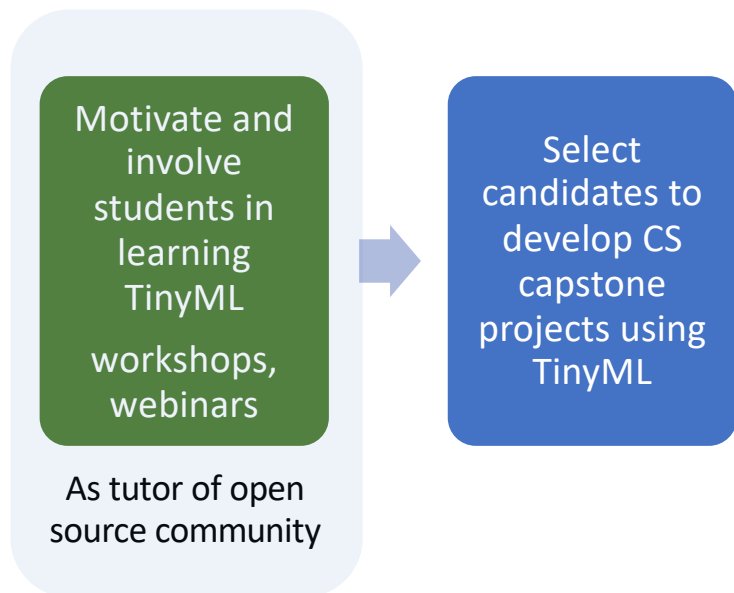
Variety of the students backgrounds

Opportunities

Increase members of the student club

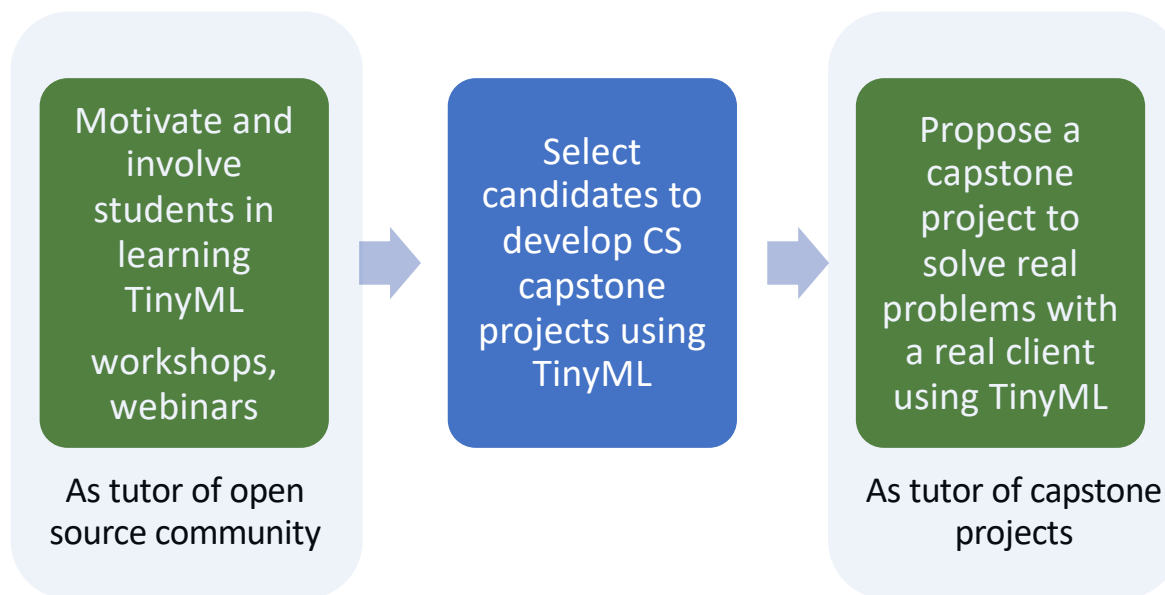Recruit future students to develop capstone projects using TinyML

Methodology

- Undergraduate (Computer Science Program)

| Motivate and involve students in learning TinyML workshops, webinars | → | Select candidates to develop CS capstone projects using TinyML |

As tutor of open source community

Methodology

- Undergraduate (Computer Science Program)

Motivate and involve students in learning TinyML

workshops, webinars

As tutor of open source community

Select candidates to develop CS capstone projects using TinyML

Propose a capstone project to solve real problems with a real client using TinyML

As tutor of capstone projects

Methodology CS Capstone Course

Organization	Course Name	Date of Course	Target Audience	Language of Instruction	Language of Materials	Links
edX	edX tinyML Specialization by Harvard University	Launched 2020-2022	Everyone	English	English	Course 1-3 Website Course 4 Website All Materials All Colabs Arduino Library
	Embedded Machine Learning on Coursera by Edge Impulse	Launched 2021-2022	Everyone	English	English	Course 1 Course 2 All Materials
	ESE3600: Tiny Machine Learning by the University of Pennsylvania	Fall 2022	Undergraduate and Graduate Students	English	English	Website and Materials
MIT	MIT 6.S965 TinyML and Efficient Deep Learning	Fall 2022	Graduate Students	English	English	Website Materials
	UNIFEI IESTI01 TinyML - Machine Learning for Embedding Devices	Jan 2021 – Present	Undergraduate Students	Portuguese	English	2022.1 Website and Materials 2021.2 Website and Materials 2021.1 Website and Materials
	Harvard CS249r Tiny Machine Learning	Sept 2020 – Present	Graduate Students	English	English	2022 Website and Assignments 2020 Website 2020 Assignments

Desing Thinking   +   TinyML Edu resources

Supervising Capstone Projects

- Audio processing to prevent possible femicides
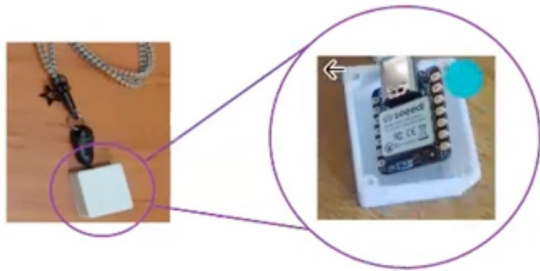
Xiao BLE Sense
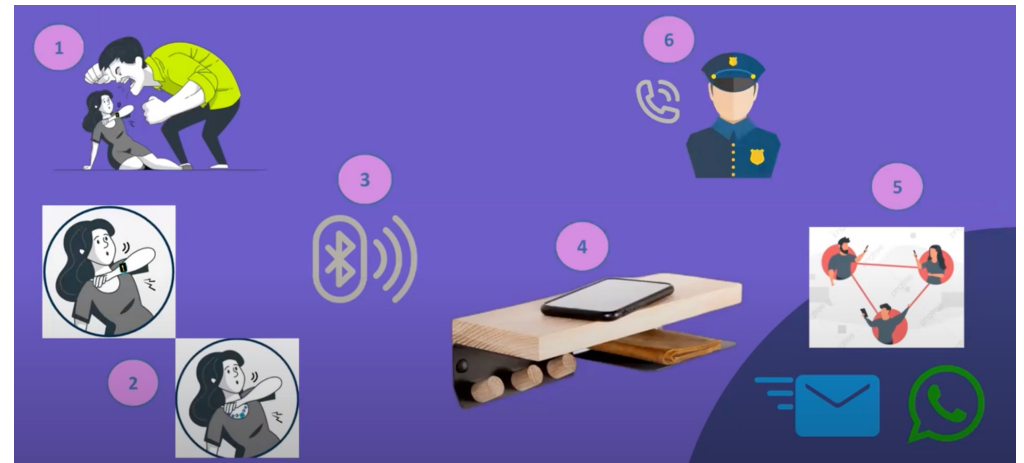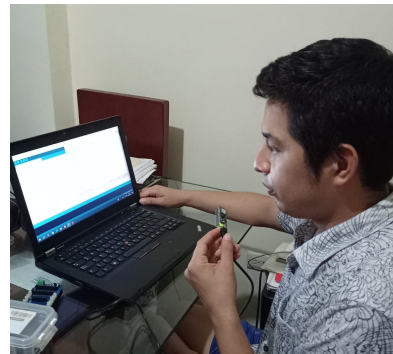
Supervising Capstone Projects

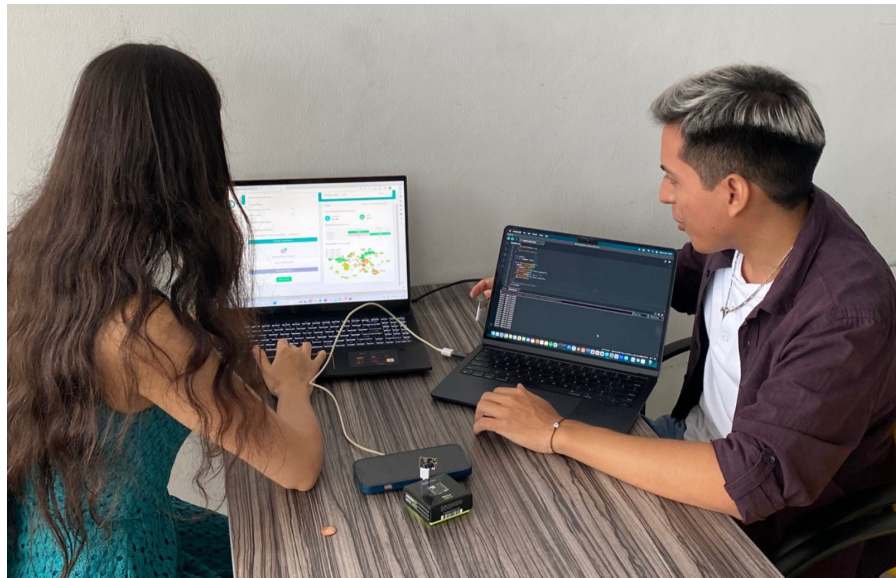• Audio processing to detect possible speaking problems in children

Wio Terminal

Supervising Capstone Projects

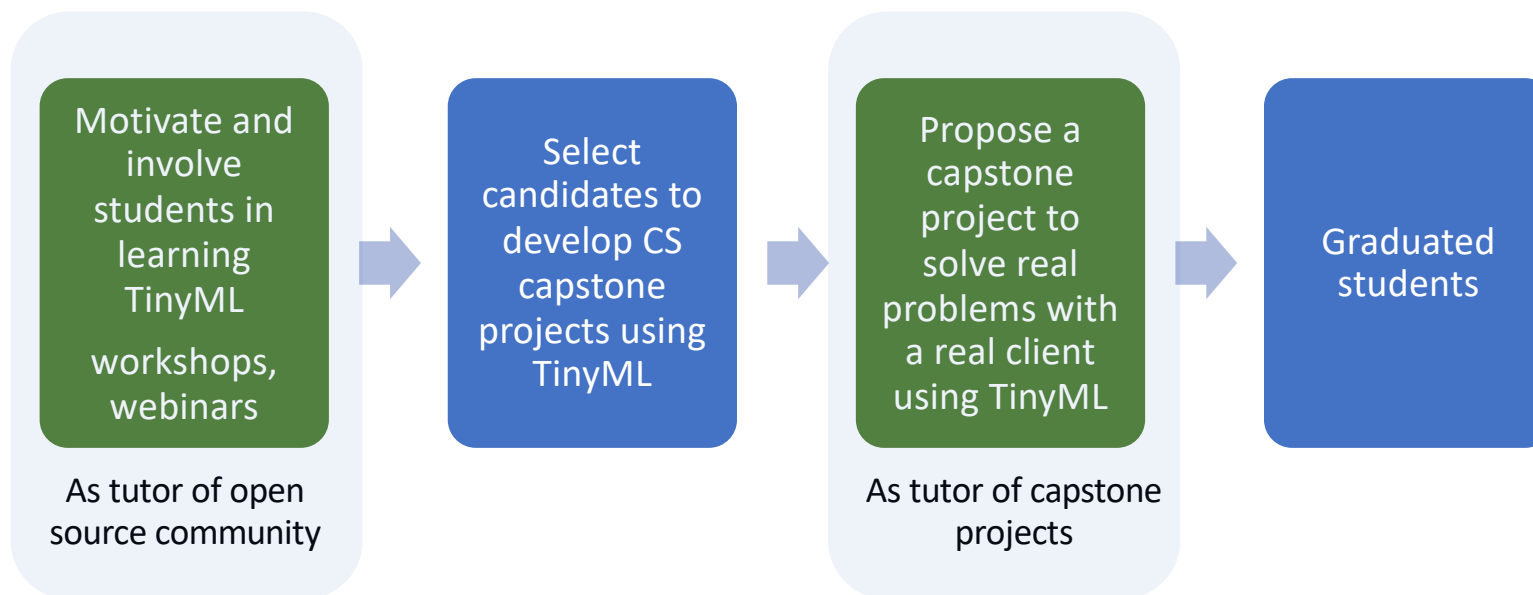- Audio processing to send instantaneous notification for safety issues
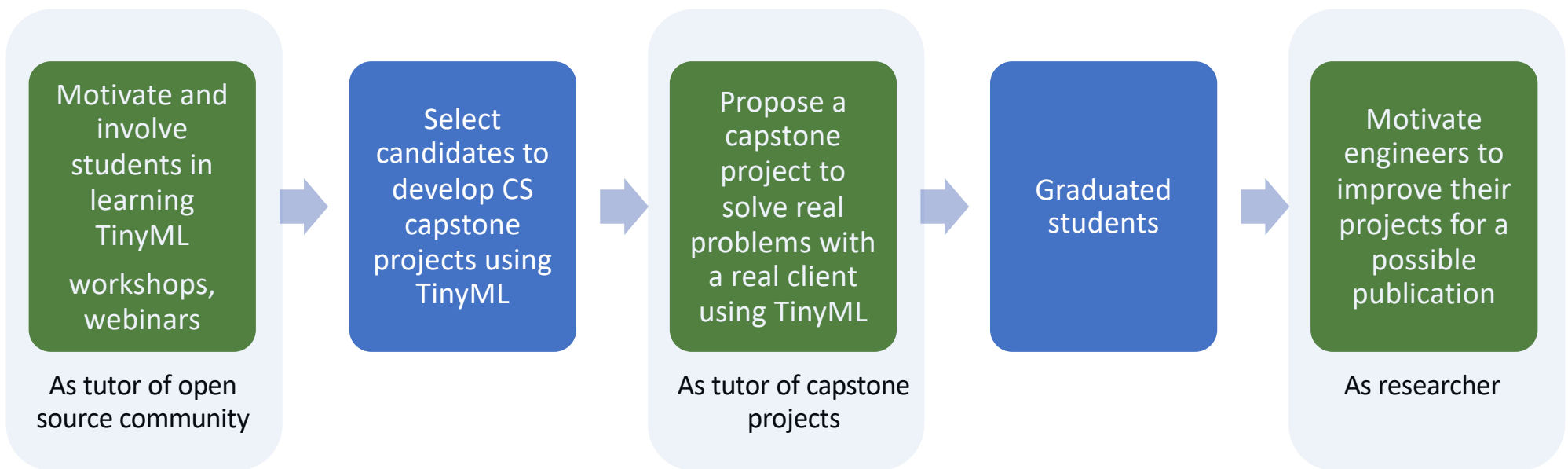

Nicla Voice

Methodology

- Undergraduate (Computer Science Program)

Motivate and involve students in learning TinyML

workshops, webinars

As tutor of open source community

Select candidates to develop CS capstone projects using TinyML

Propose a capstone project to solve real problems with a real client using TinyML

As tutor of capstone projects

Graduated students

Methodology

- Undergraduate (Computer Science Program)

Motivate and involve students in learning TinyML

workshops, webinars

As tutor of open source community

Select candidates to develop CS capstone projects using TinyML

Propose a capstone project to solve real problems with a real client using TinyML

As tutor of capstone projects

Graduated students

Motivate engineers to improve their projects for a possible publication

As researcher

Methodology

- Graduate (Master in Telecommunications)
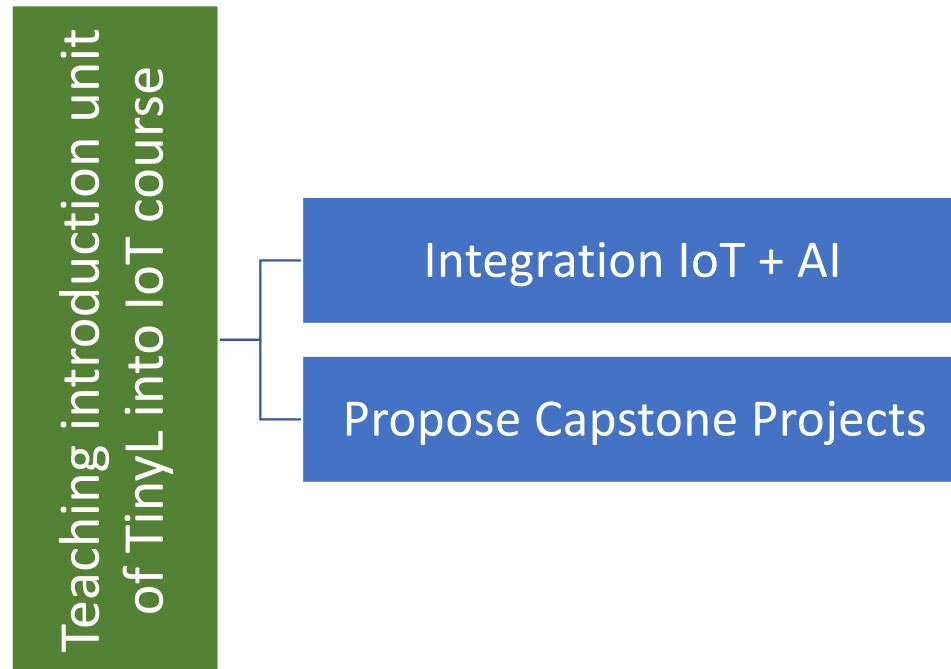
Teaching TinyML

- Master in Telecommunications

Future Research
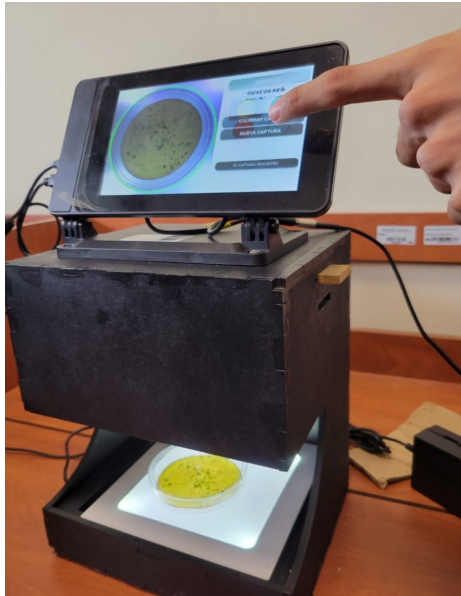
Counting microorganisms in petri dish

Portable radar speed camera

Low cost analyzer of mango quality

Conclusions

- The experience using resources like TinyML Edu empower the students in the rapid prototyping of proof of concepts.

- It is absolutely possible to involve students in the early stages of their careers developing proof of concepts using TinyML.

- The participation of students into open source communities or academic clubs during early stages of their careers could give them an overview of their future profession.

Thanks

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