What am I building?
What is the goal?

Responsible AI: Human-Centered Design

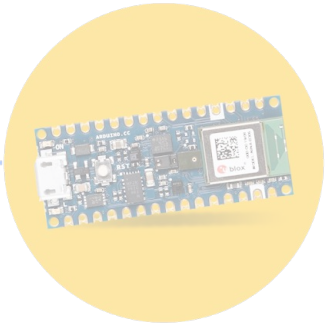
START | **DESIGN** | DEVELOPMENT | DEPLOYMENT | END

Course 1
Fundamentals of TinyML

- **What am I building?**
- Who am I building this for?
- What are the consequences for the user if it fails?

Course 2
Applications of TinyML

Course 3
Deploying TinyML



> “Machine intelligence is the last invention that humanity will ever need to make”

Nick Bostrom
Philosopher, University of Oxford

Source: *“What happens when our computers get smarter than we are?“ TED Talk, March 2015.*

AI is not ***always*** the best solution!

What am I building?

Which one **should** we choose?

Traditional Programming

Pros

- Quicker to build
- Easier to explain
- Easier to debug
- Easier to maintain
- More consistent/stable

```
if (speed < 4) {
    status = WALKING;
}
```

Cons

- Does not scale
- Does not adapt to changes
- Does not work for complex tasks

Machine Learning

Pros

- Complex problems
- Scale
- Adaptable
- Personalization
- Improves over time

```
01010010101001010101
10010101010010111101
01001010100101011001
01010010101001010101

Label = WALKING
```

Cons

- Slower to build
- Harder to explain/interpret
- Harder to debug

What is the goal?

What is the problem?

Why does the problem need to be solved?

How could the problem be solved manually?

Will AI offer **unique** value?

Case Study: Diabetic Retinopathy

What is the problem?

Why does the problem need to be solved?

How could the problem be solved manually?

Will AI offer **unique** value?

Early identification of DR progression from color fundus photographs

Case Study: Diabetic Retinopathy

What is the problem?

Why does the problem need to be solved?

How could the problem be solved manually?

Will AI offer **unique** value?

DR is reaching epidemic proportions, and if people were able to access earlier diagnosis this would allow for intervention and prevention of further DR progression

Case Study: Diabetic Retinopathy

What is the problem?

Why does the problem need to be solved?

How could the problem be solved manually?

Will AI offer **unique** value?

Collect data from retina specialists or trained graders, write rules based on presence of hemorrhages and microaneurysms

Case Study: Diabetic Retinopathy

What is the problem?

Why does the problem need to be solved?

How could the problem be solved manually?

Will AI offer **unique** value?

Machine learning can improve predictions about the progression of DR for individual patients and identify patterns in images that were previously unrecognized by experts

Defining goals for positive social impact

AI for Social Good

Using artificial intelligence (AI) and machine learning (ML) to help address the world's most pressing challenges

How can we design AI for social good?

There are **17 goals** on the United Nations' 2030 Agenda for Sustainable development, for example:

- Ending poverty and world hunger
- Improving health and education
- Reducing inequality and injustice

Challenges facing **AI4SG**

- Learning from **limited data**
- Geographical **imbalances**
- **Biased** data
- Learning with **limited** memory and computation

Window of Opportunity with **TinyML**

- Learning with limited memory and computation
- Battery-operated
- On-device computing
- Low latency
- Low cost
- Small size