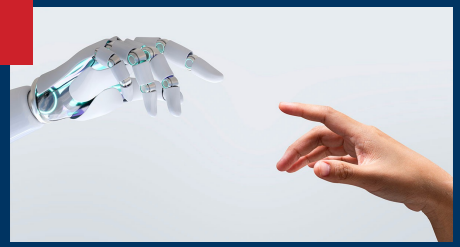
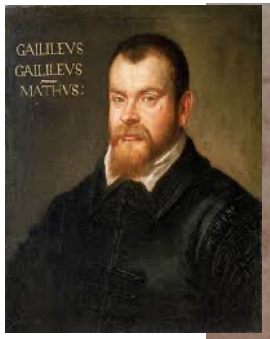


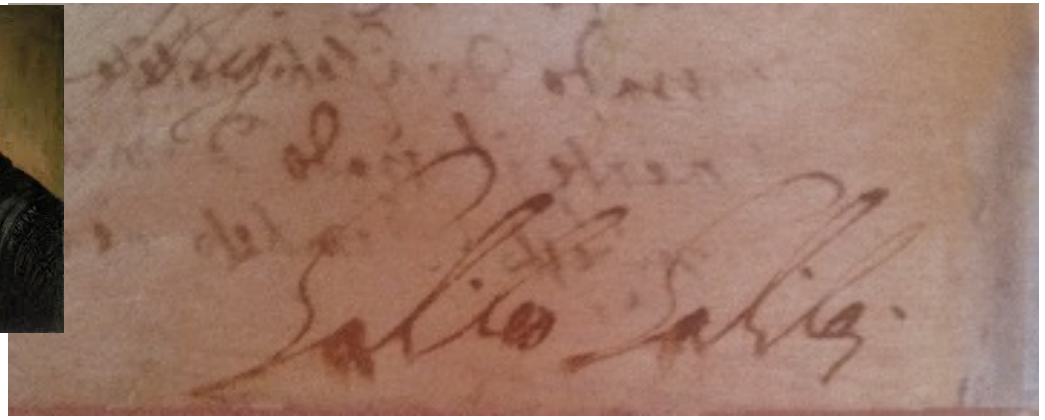
Shells to Machine Learning: Empowering e-Students' skills

Isabella Marini
President of National Association of Natural Science Teachers
Liceo Scientifico 'Dini' Pisa

12th July 2024 IBO2024 ASTANA, KAZAKHSTAN
EDUCATIONAL CONFERENCE

AGENDA





0 Introduction

Didactic innovation in Italy **1** PNSD, PNRR, EFT **2** Digital issues and tools to teach Science

The proposal **3** IBL **4** A walk on the beach **5** At school

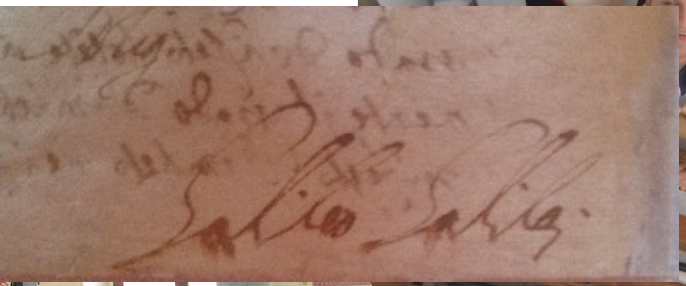
IA a scuola **6** Teachable Machine at work **7** Conclusion

0

INTRODUCTION

ANISN, EFT, LICEO DINI

LICEO SCIENTIFICO "ULISSE DINI" - Pisa



President
National Association of Natural Science Teachers

45 years of activity
24 Regional Sections
14 IBSE-ANISN Centres

Quality science education
Widespread scientific culture

1500 teachers of all school levels

MIM
Ministero dell'Istruzione e del Merito

Accredited by the Italian Ministry of Education and Merit for teacher training and the **valorisation of excellence**

IBO

1

PNSD, PNRR, EFT

Didactic and Digital Innovation in Italy

Educational Conference

Digital Life Sciences

Artificial Intelligence and Machine Learning in Biology Education

Isabella Marini 12th July 2024 IBO2024 ASTANA

Digital School National Plan

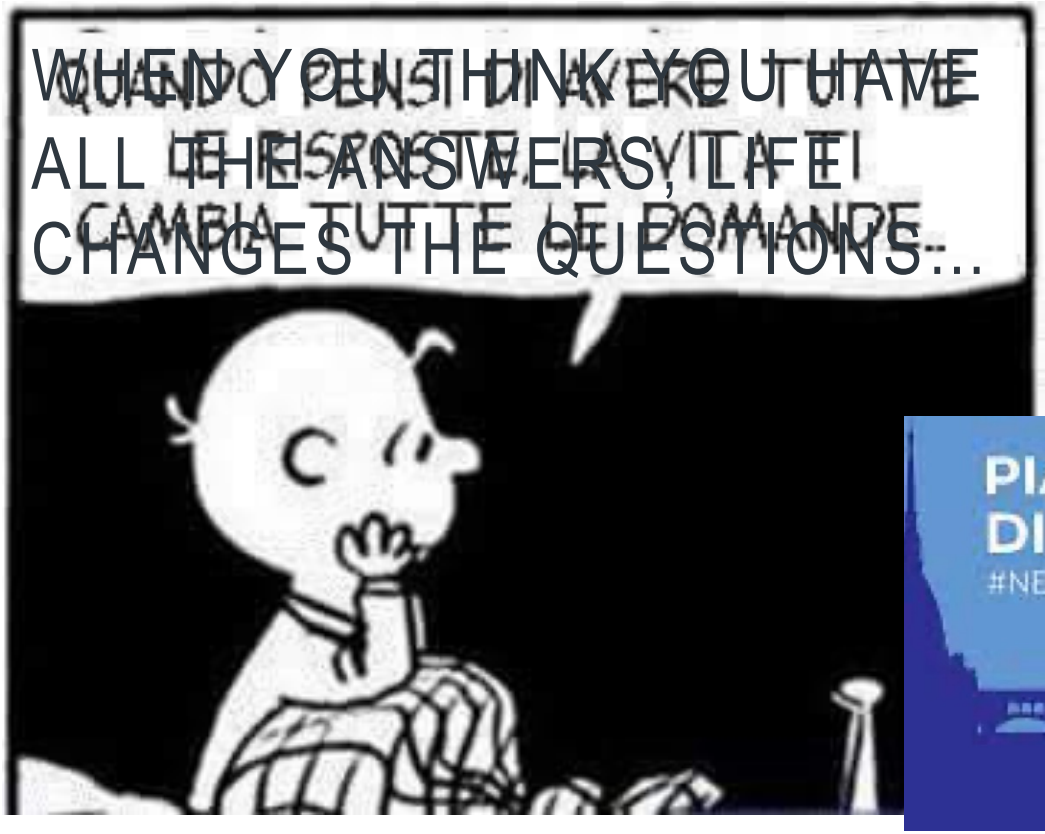
2015

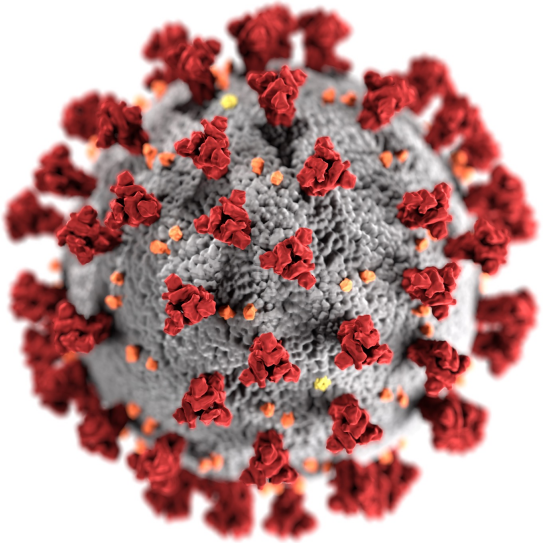
MIM
Ministero dell'Istruzione
e del Merito

Équipe
Formativa
Toscana

100 expert teachers selected at national level to improve regionally innovation and digital skills of colleagues (EFT: territorial training equipes)

COVID19 pandemic…
educational emergency…





National Recovery and Resilience Plan

A problem…a challenge…an opportunity

Mater artium necessitas

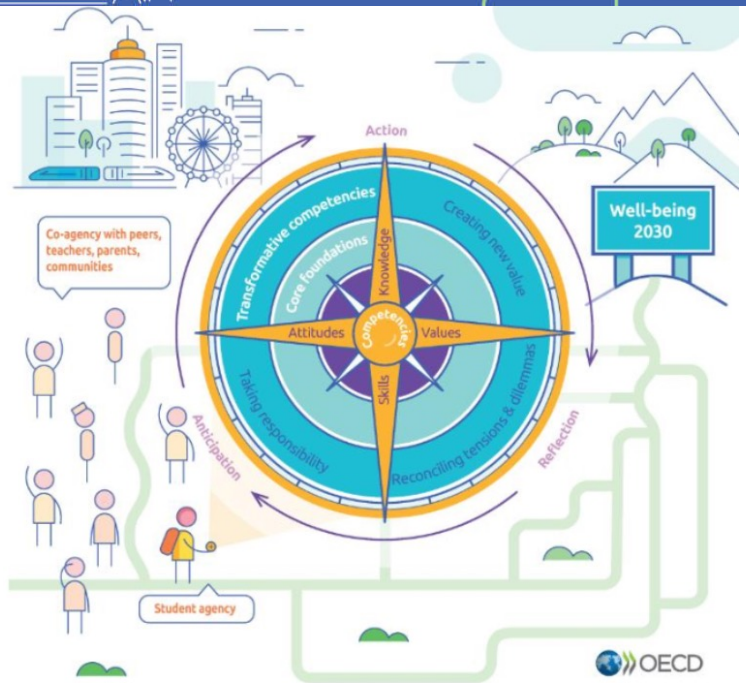
Necessity is the mother of invention

2

DIGITAL ISSUES AND TOOLS TO TEACH SCIENCE

Didactic and Digital Innovation in Italy

OECD FUTURE OF EDUCATION AND SKILLS 2030



How can we prepare students for jobs that have not yet been created, to tackle societal challenges that we can't yet imagine, and to use technologies that have not yet been invented?

- 7. Critical thinking/ problem-solving
- 8. Creativity
- 9. Communication
- 10. Collaboration

IBSE

PhET INTERACTIVE SIMULATIONS
University of Colorado Boulder

hhmi BioInteractive

NC COMMUNITY COLLEGES | BIONETWORK

Simulators… digital tools to learn from d

OLABS
Funded by MeitY
Ministry of Electronics and Information Technology

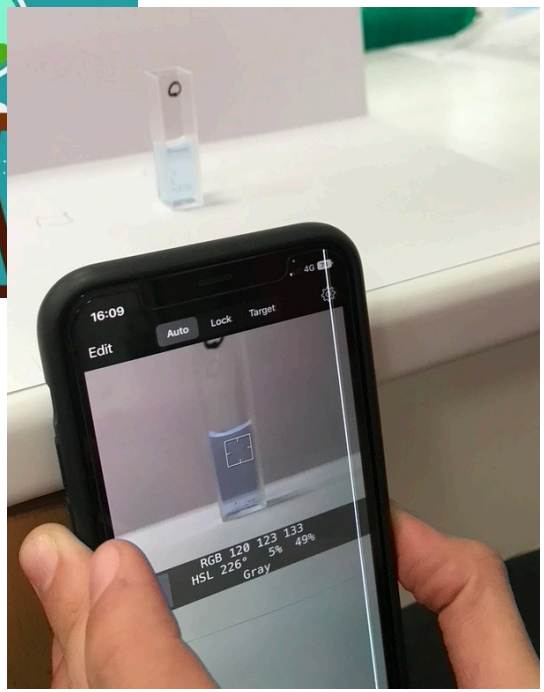
GO-LAB

HTWINS.NET

Technology can amplify great teaching but great technology cannot replace poor teaching

OECD, 2015

Revisit 'classic' experiments: the biuret lab



desmos

Gamification
Inquiry
Storytelling
Tinkering
Hackaton

Équipe Formativa Toscana

Robotics

Making & Coding

Artificial Intelligence

Metaverse: augmented & virtual reality

InnovaMenti+

InnovaMenti+ TECH

SCUOLA FUTURA

PIANO SCUOLA 4.0

FUTURA LA SCUOLA PER L'ITALIA DI DOMANI

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3

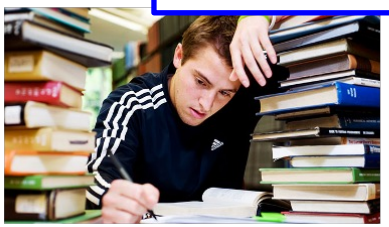
INQUIRY BASED LEARNING

Some hints…

Bologna University-
Lectio, 1300

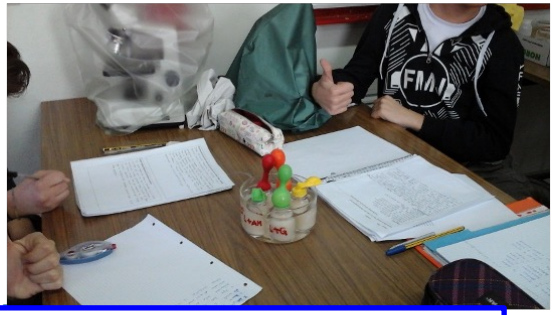
LESSON

STUDY



ASSESSMENT

CONCLUSION



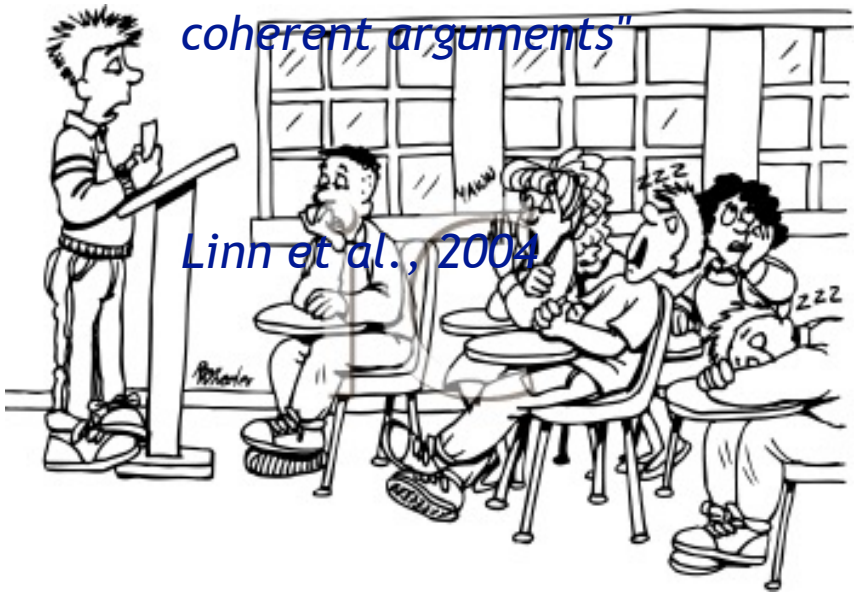
CHALLENGE
ENGAGE

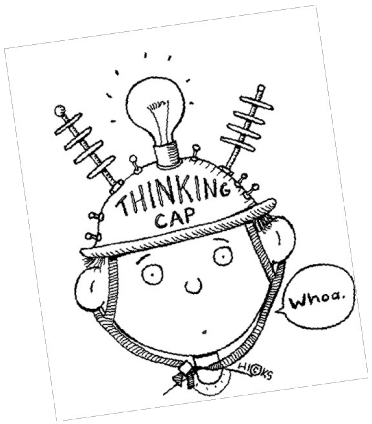
WORK

*a series of processes **implemented by students in an intentional way** such as:*

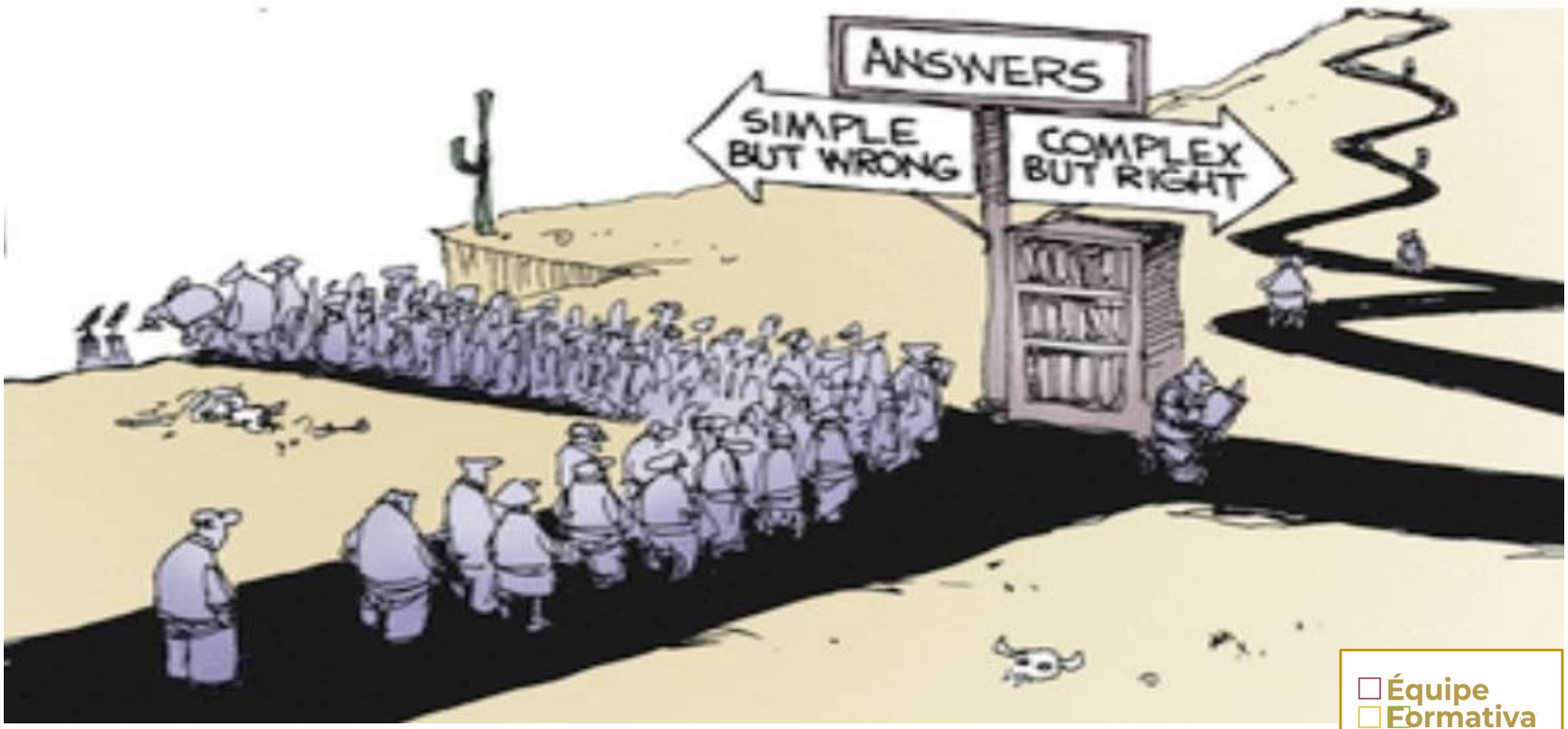
know how to diagnose problems, critically commenting on experiments and identify alternative solutions, know how to plan an investigation, formulate conjectures, search for information, elaborate models, discuss with peers with coherent arguments"

Linn et al., 2004





*If your goal is to engage students in **critical thinking**… you need to present **interesting challenges** to solve, rather than **simply explaining** how other smart people have already solved those challenges...*



4

A WALK ON THE BEACH…

Per studenti, docenti e istituzione scolastica

ENGAGE- A walk on the beach…

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Materials from plants

A flower at the bottom of the sea: *Posidonia oceanica*

5

SHELLS…

Engage and…

SHELLS…

Learning goals

- recognition, classification, and prediction
- problem solving and planning
- reasoning and inference
- data mining
- scientific process

Project Steps

- sort and classify sea shells based on visual attributes
- discover patterns in data and make predictions
- elaborate a dichotomous key (in group)
- Web surfing to explore digital tools for sea shell classification
- create a Machine Learning model to recognize sea shells
- apply Machine Learning to sort and recognize sea shells based on visual attribu

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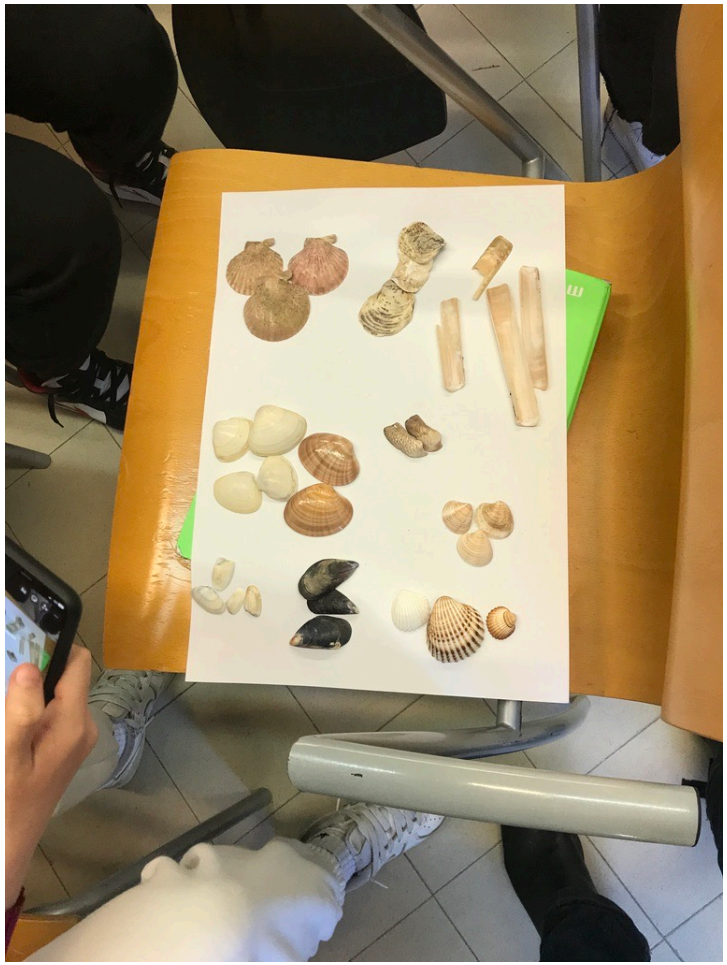
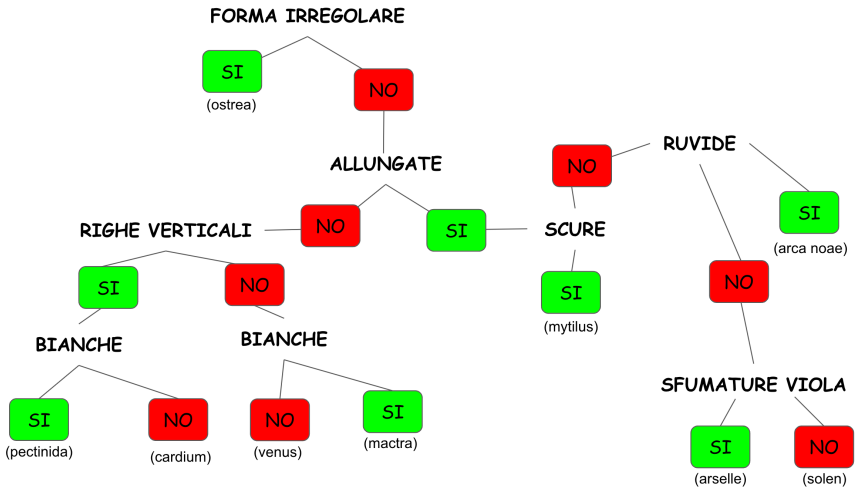
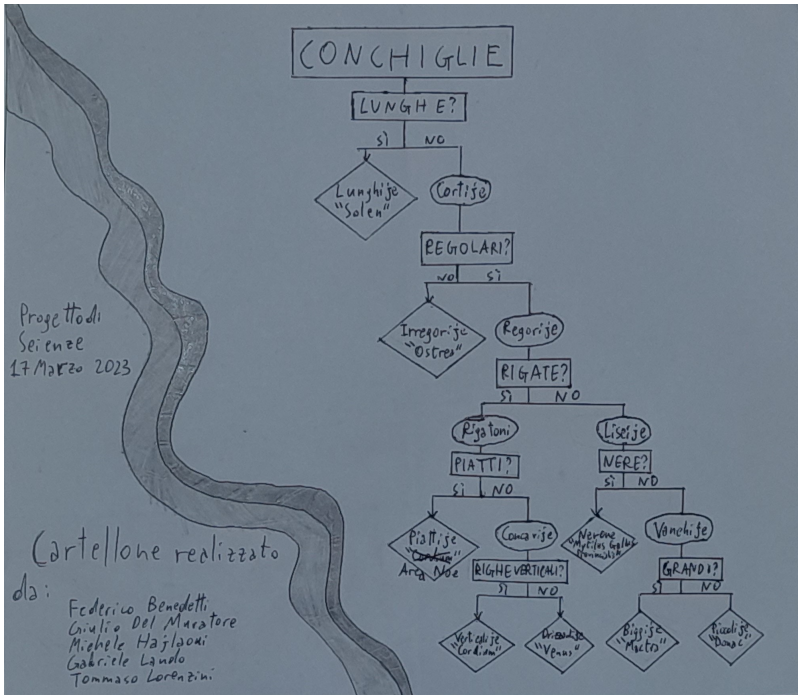
An old shell collection made by Liceo Dini students many years ago

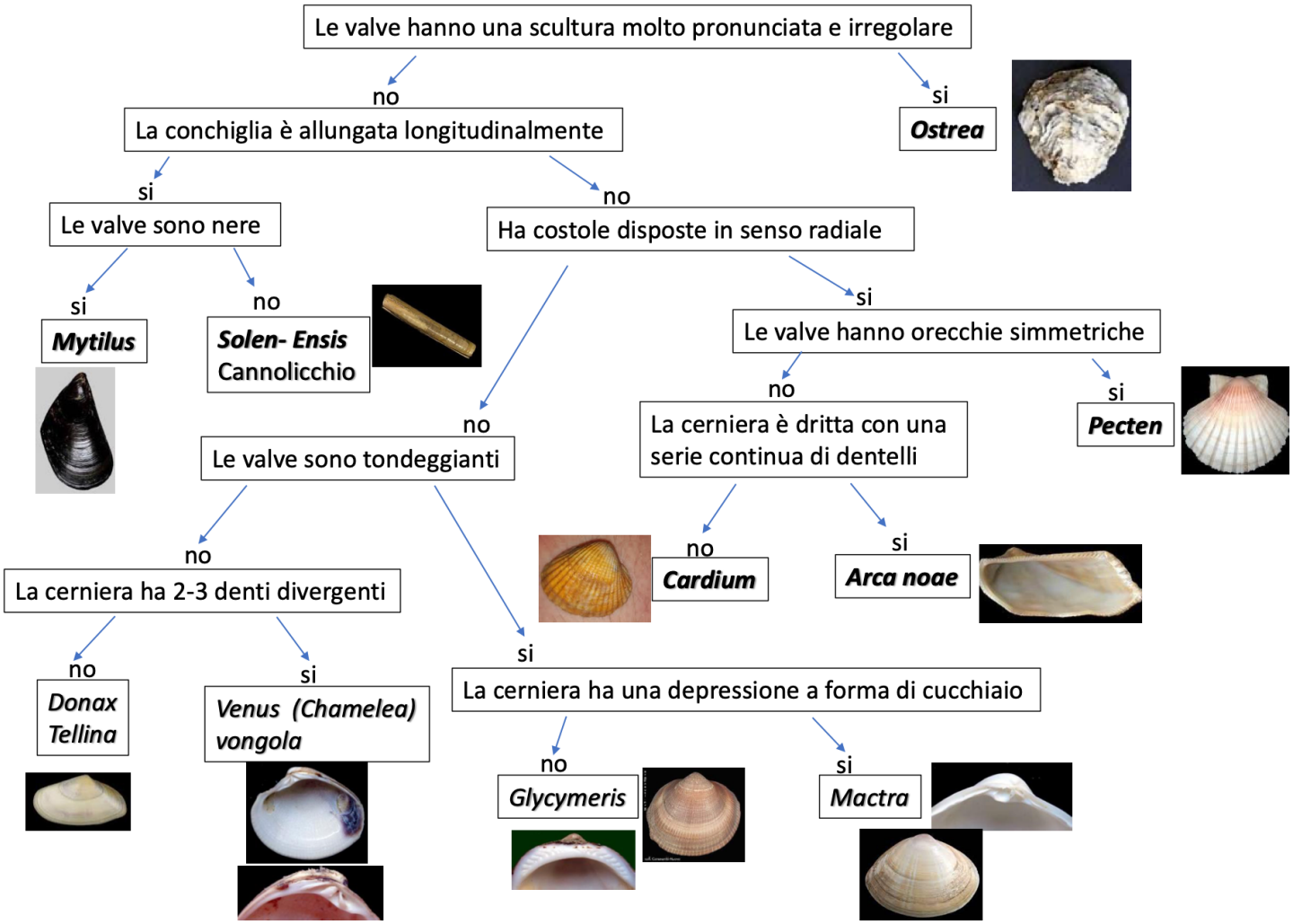


Your dichotomous key…

- list down the characteristics; observe and list the main shell characteristics (I.e shape, colour, texture, etc)
- organize the characteristics in order
- divide into two groups the specimens on the basis of statements or questions (Y/N)
- draw a dichotomous key diagram
- test it out to see if it works
- repeat the last step with the dichotomous keys developed by two other groups



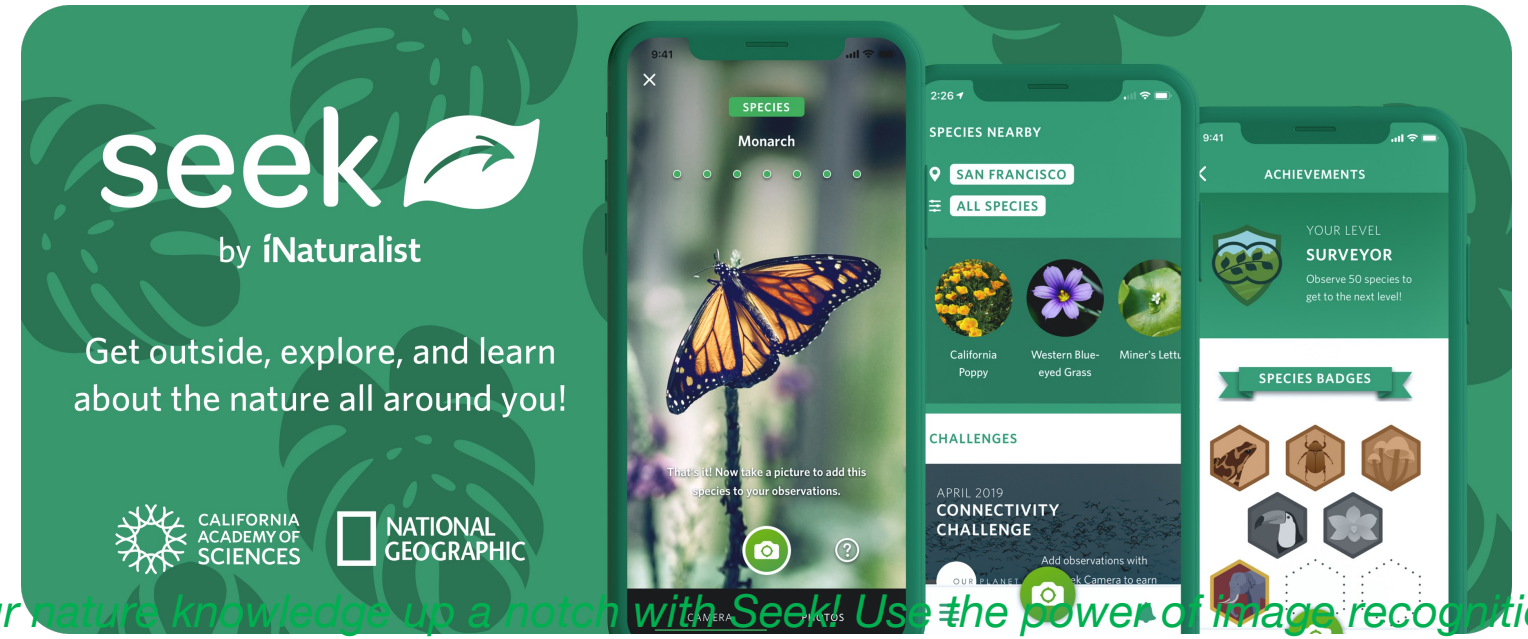



Le valve hanno una scultura molto pronunciata e irregolare
no
si
Ostrea
La conchiglia è allungata longitudinalmente
si
no
Le valve sono nere
Ha costole disposte in senso radiale
si
no
si
Mytilus
Solen- Ensis
Cannolicchio
Le valve hanno orecchie simmetriche
no
si
no
La cerniera è dritta con una serie continua di dentelli
Pecten
Le valve sono tondeggianti
no
si
Cardium
Arca noae
no
La cerniera ha 2-3 denti divergenti
si
no
si
Donax
Tellina
Venus (Chamelea) vongola
La cerniera ha una depressione a forma di cucchiaio
no
si
Glycymeris
Mactra

Surfing the web…

…automated identification
…looking for web Apps or mobile phone Apps to identify sea shells; think and discuss how they work.

https://www.inaturalist.org/pages/seek_app
Seek, a mobile app that uses the power of image recognition technology to identify plants and animals.



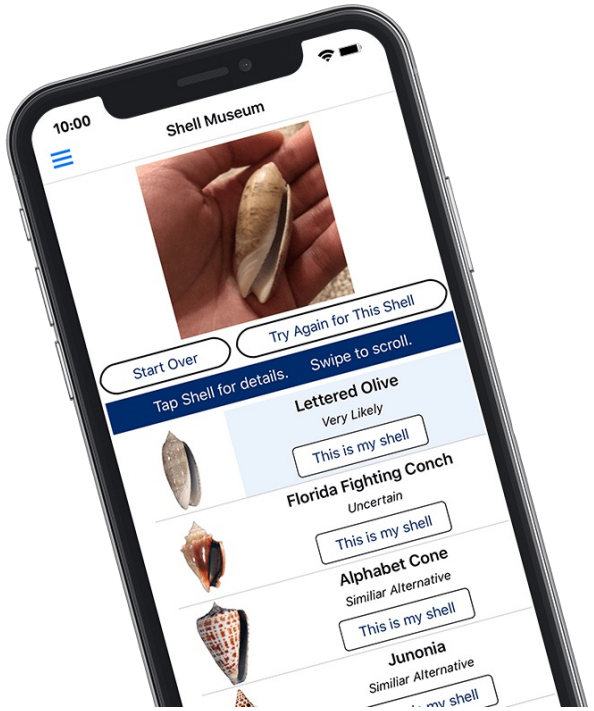
Take your nature knowledge up a notch with Seek! Use the power of image recognition tech

Surfing the web…

…looking for web Apps or mobile phone Apps to identify sea shells; think and discuss how they work.

https://www.shellmuseum.org
The App from the Shell Museum to identify (Florida, USA) sea shells with a phone and a photo.

Bailey-Matthews
National
Shell Museum
& Aquarium



How do they work?

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6

TEACHABLE MACHINE AT WORK

Teachable Machine

https://docs.google.com/document/d/1e9wx9oBg7CR0s5C
VmX7H7pnITfoDxNdrSGkp60/view#heading=h.1et5vs39qky

Google

- Web tool
- create ML classification models
- no coding required
- train to recognize **images**, sounds, and poses
- empowered people to learn, teach, and explore ML concepts
- intuitive and easy to use

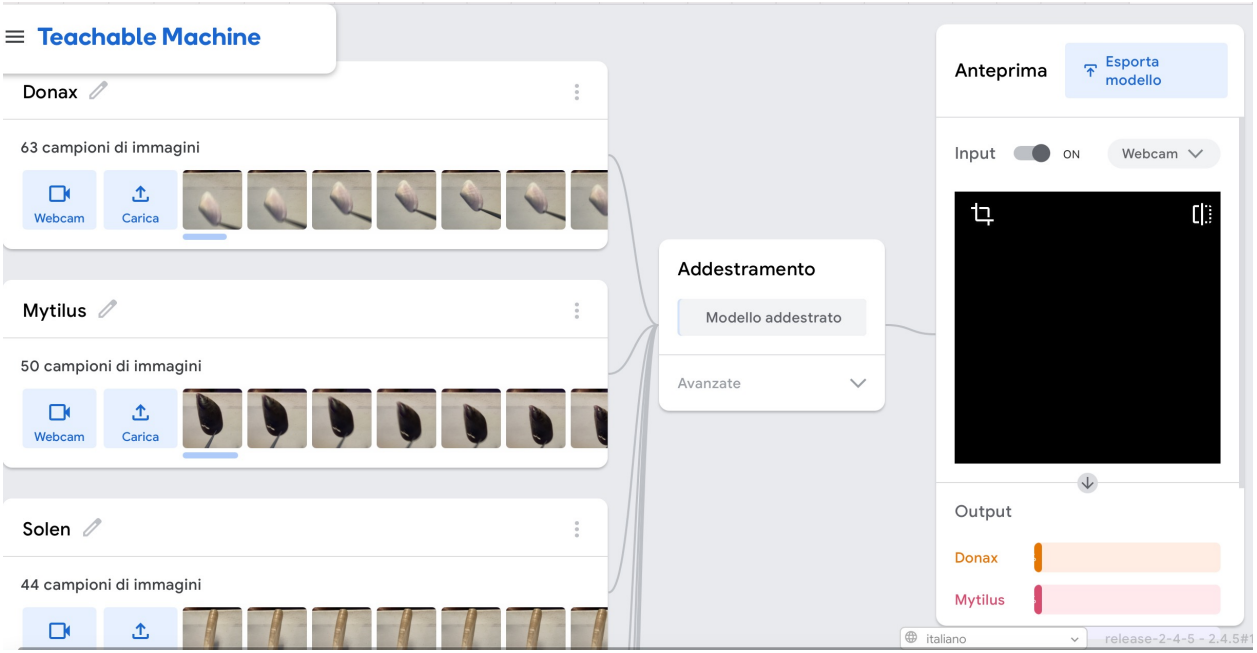
- Gather data
- Train your model
- Export your model

Machine Learning and shell recognition

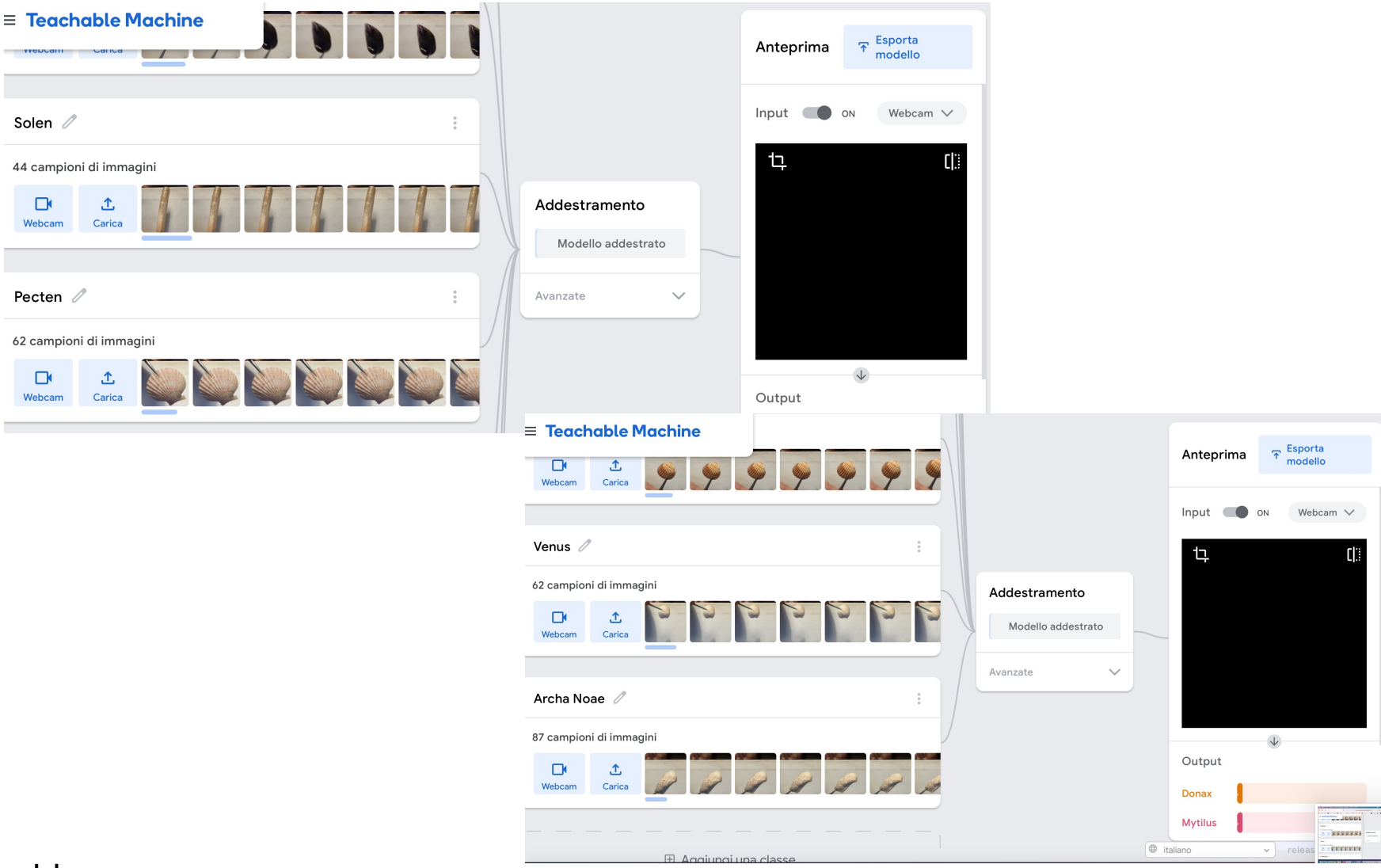
Introduction to AI basics and Teachable Machine https://teachablemachine.withgoogle.com

Train a model with the same sea shells used to elaborate the dichotomous key (labelled data for which the outcome is known) in order to identify and predict the name of other sea shells. Test the ML model out to see if it works.

https://teachablemachine.withgoogle.com/models/fbKsUQTT5/



Machine Learning and shell recognition



hh

Machine Learning and shell recognition

https://teachablemachine.withgoogle.com/models/fbKsUQTT5/

How does it work?

Machine learning models are trained on examples (e.g., images, sounds, poses) gathered by the creator. Their results depend on the data they've been trained on.

Want to use this model in your project?

See this link to learn how to use Teachable Machine models in your projects.

Report this model:

If you have concerns about this model, report it using this form.

This model:

teachablemachine.withgoogle.com/models/fbKsUQTT5/

/model.json

The model architecture, used by TensorFlow.js library

/metadata.json

Contains the model metadata, for example class labels

Preview this model live

Output

Donax

Mytilus

Solen

Pecten

Cardi... 96%

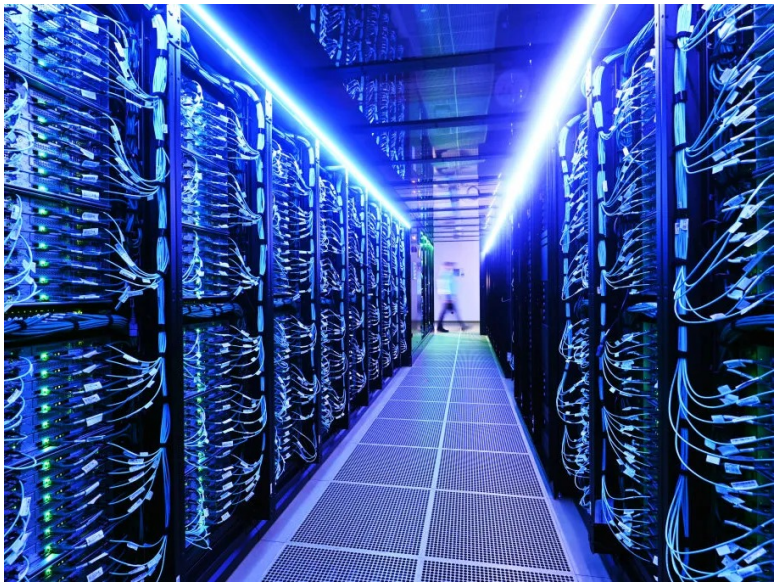
Venus

Archa Noae

7

AI AND CONCLUSION…

Why this explosion now?



-computational power

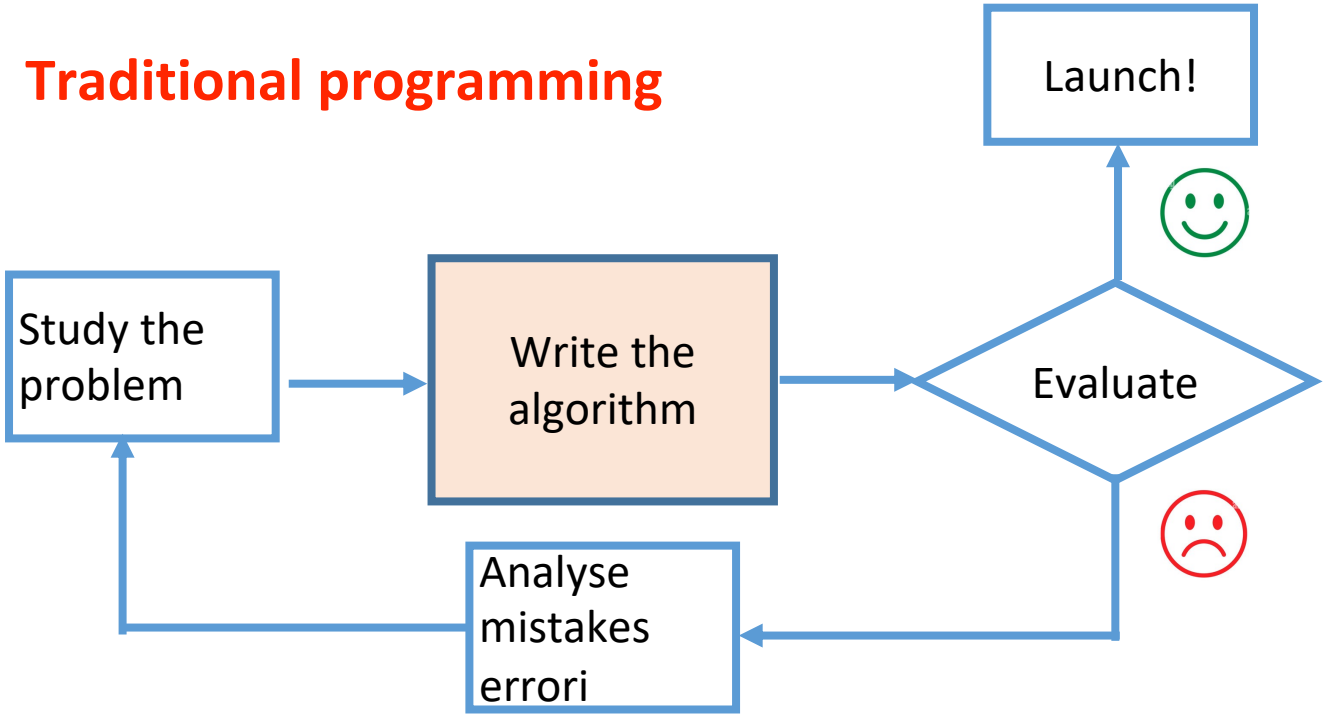
-massive amount of labeled data that we humans have created and uploaded

Elezione papa, notare numero di telefonini

DIGITAL 'Tom Thumb'

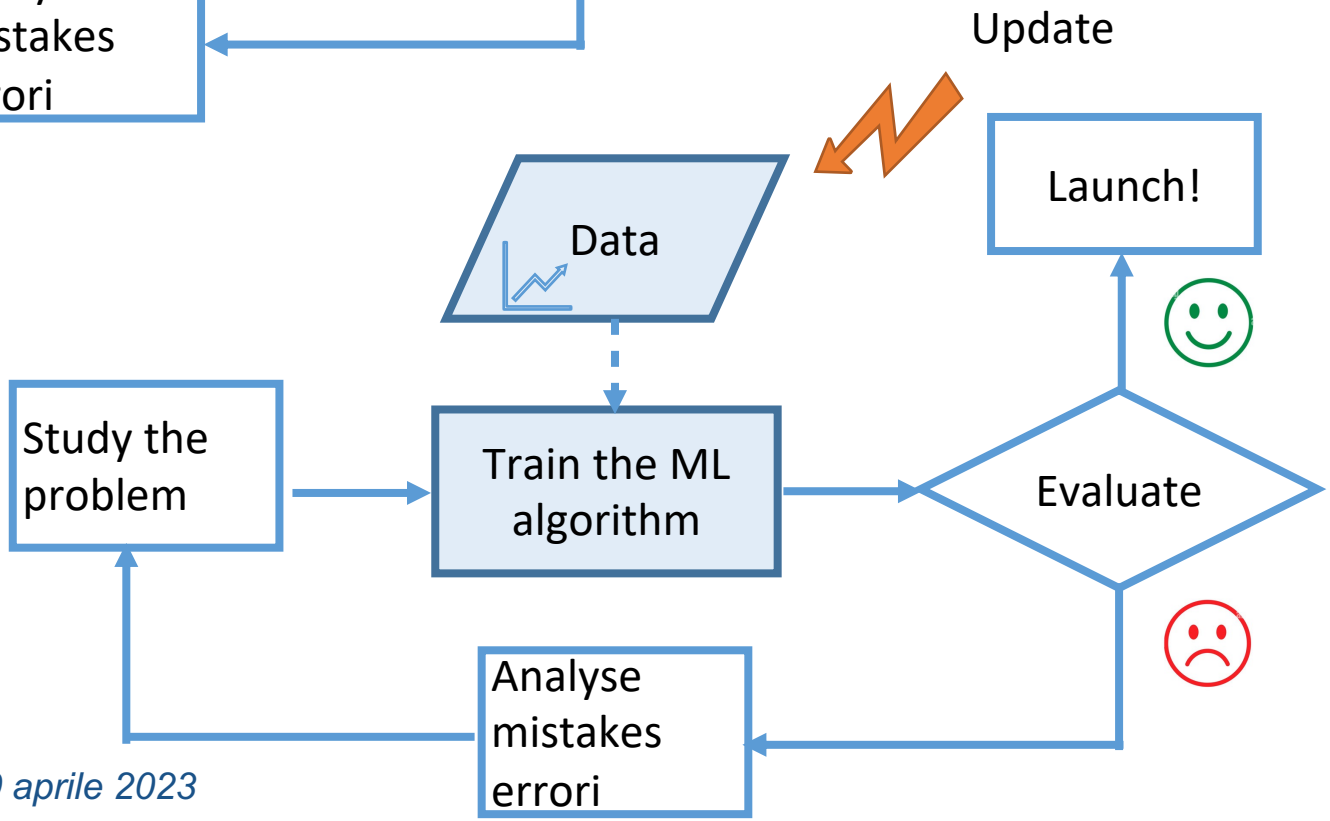
Every day, each person leaves behind more than 5 GB of digital *crumbs*.

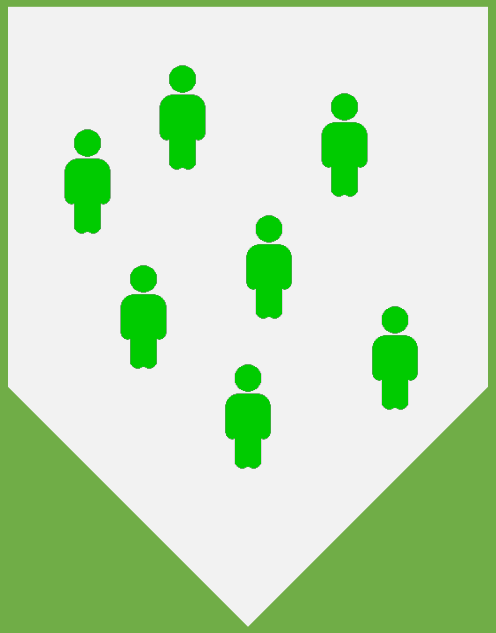
Traditional programming



Machine Learning

ML is a field of AI dealing with models and methods that allow computer to learn from data





THANKS FOR YOUR ATTENTION !