Machine Learning

Introduction

Emanuele Rodolà
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SAPIENZA
UNIVERSITÀ DI ROMA

2nd semester a.y. 2023/2024 · March 04, 2024

Logistics

- **Lecturer:** Prof. Emanuele Rodolà
- **Assistants:** Dr. Adrian Minut

  Coding sessions, project support, technicalities

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- **Office Hours:** Drop me an email!

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Official website: https://erodola.github.io/ML-s2-2024/

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The course is hosted on Github at the url:

https://github.com/erodola/DLAI-s2-2024

Note: Webpage and repository are your main source of information, and replace completely the need for a mailing list. Check them often!

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We will cover all the mathematical background required for the course.

Recipe for success

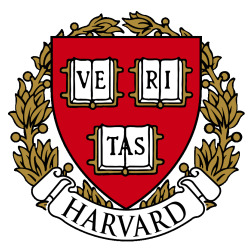
Try to enjoy the course!

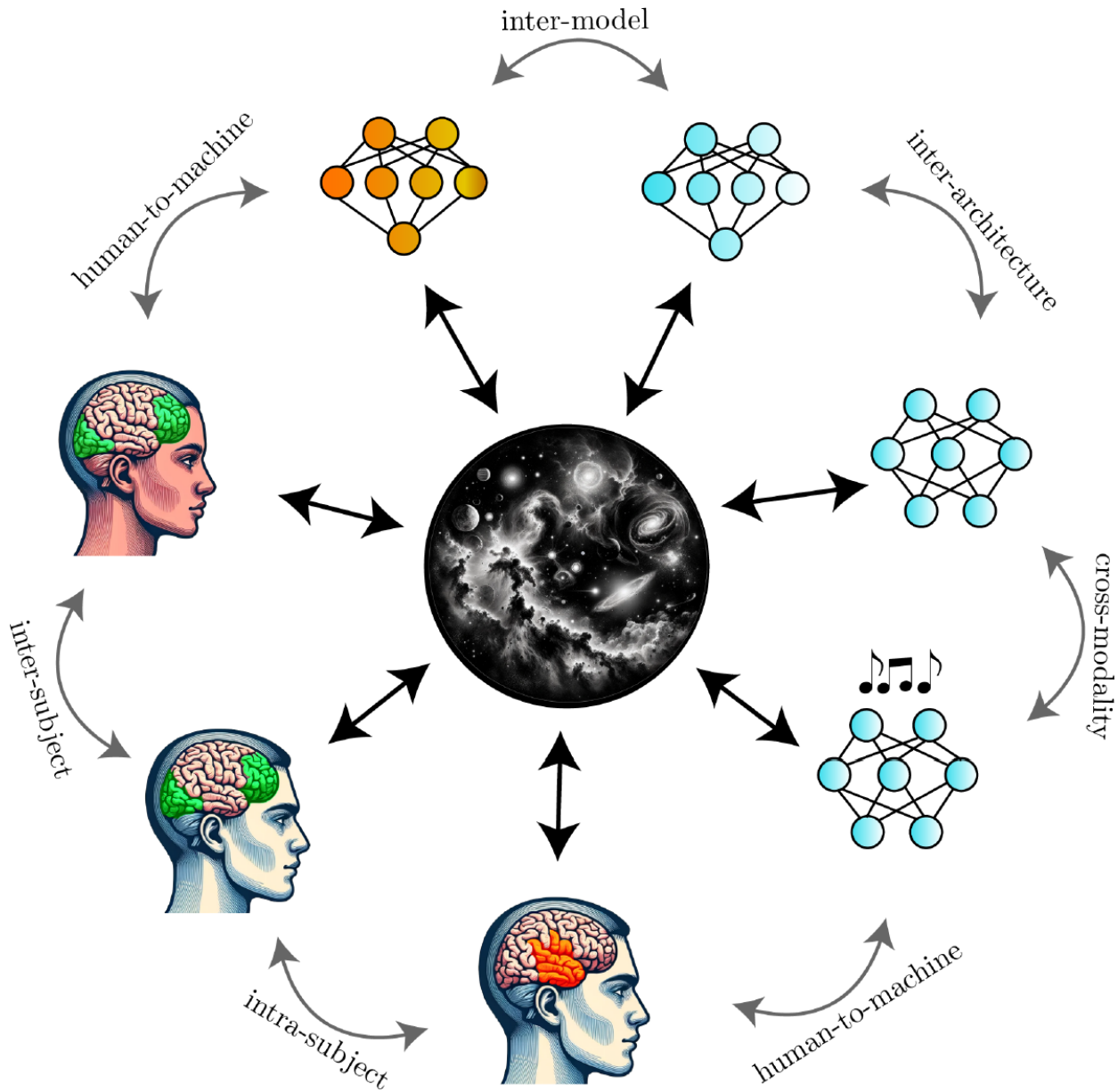
Take this as an opportunity to learn in depth.

Ask questions when in doubt.

Who am I?

- Had research positions at U Tokyo, TU Munich, U Lugano and visiting positions at Harvard, Stanford, Ecole polytechnique, Technion among others
- Fellow of ELLIS and the Young Academy of Europe
- Research: representation learning, geometry, ML for audio
- Team: ∼25 members from physics, engineering, computer science **GLADIA** group of Geometry, Audio, Learning and AI
- Approach us for projects / theses!



Notable Top 5% at ICLR 2023

Pre-requisites and reading material

No official textbook.

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Pre-requisites:

- **Programming fundamentals**. We will use Python
- Linear algebra, calculus

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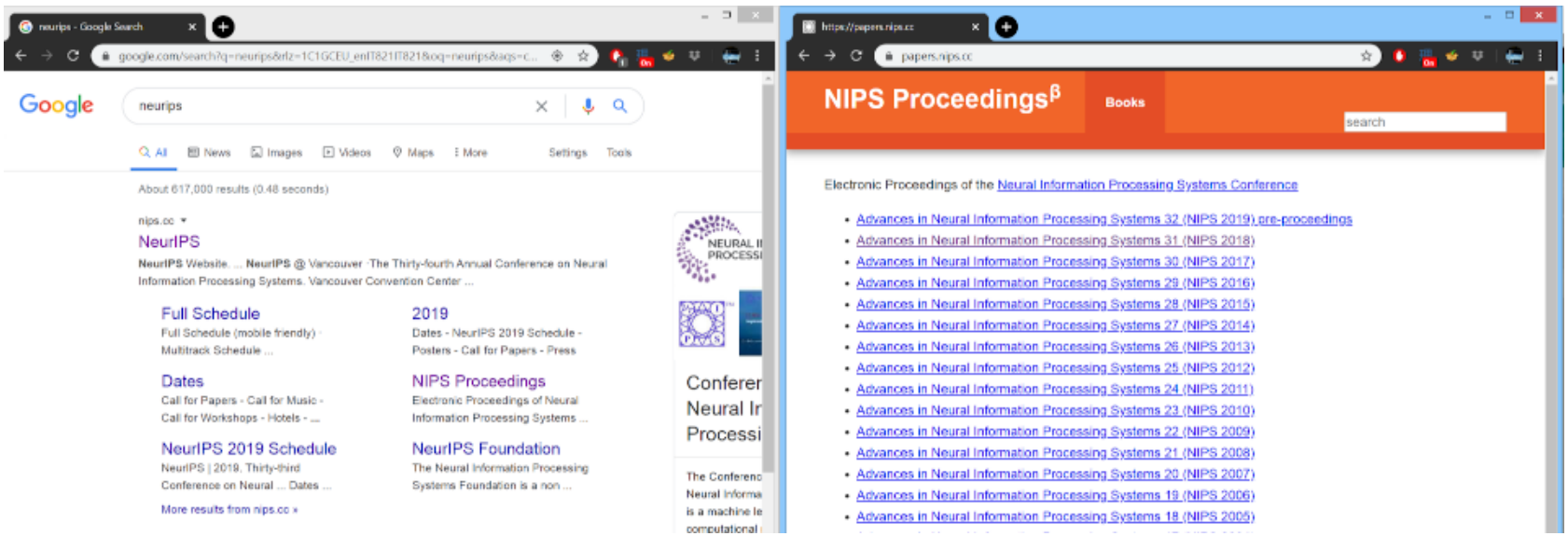
Main source: specialized conferences and journals:

NeurIPS, ICML, ICLR, JMLR, CVPR, etc.



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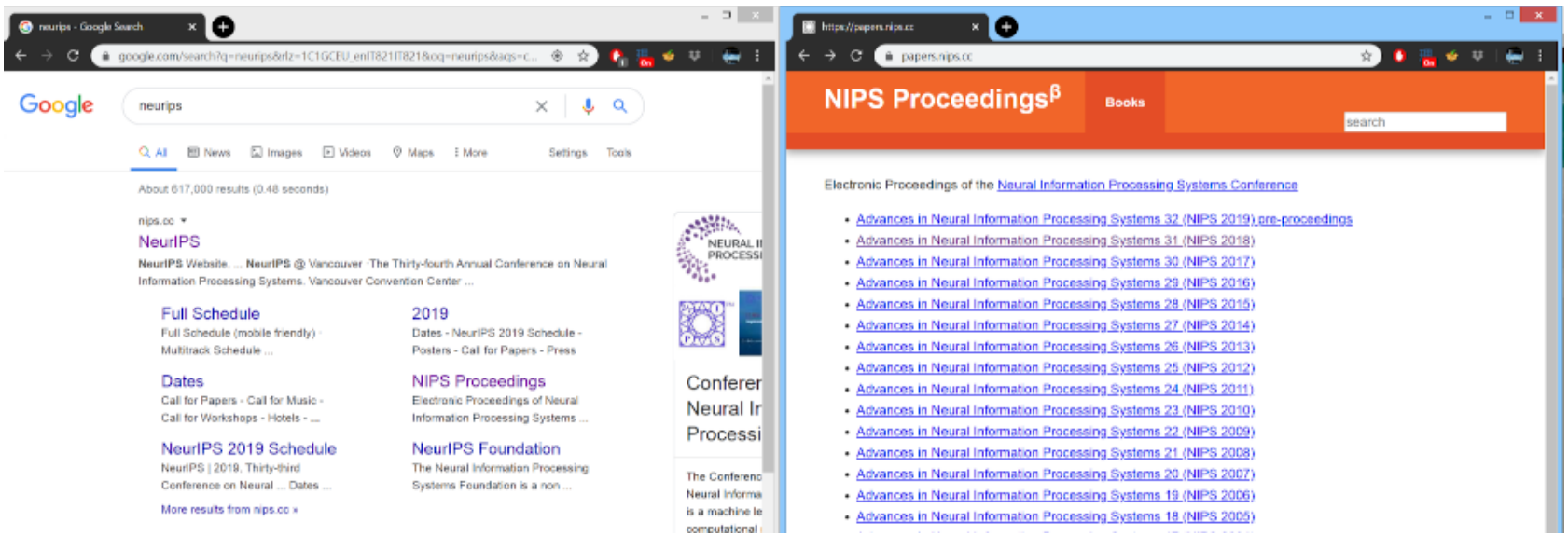

Applications: we'll mostly illustrate things in the areas of computer vision, geometry processing, graphics, social networks, audio.

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In class, be prepared:

- Download/print the slides beforehand
- Take notes: not everything will be on the slides
- Bring your laptop: we'll do live coding sessions

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(if you study)

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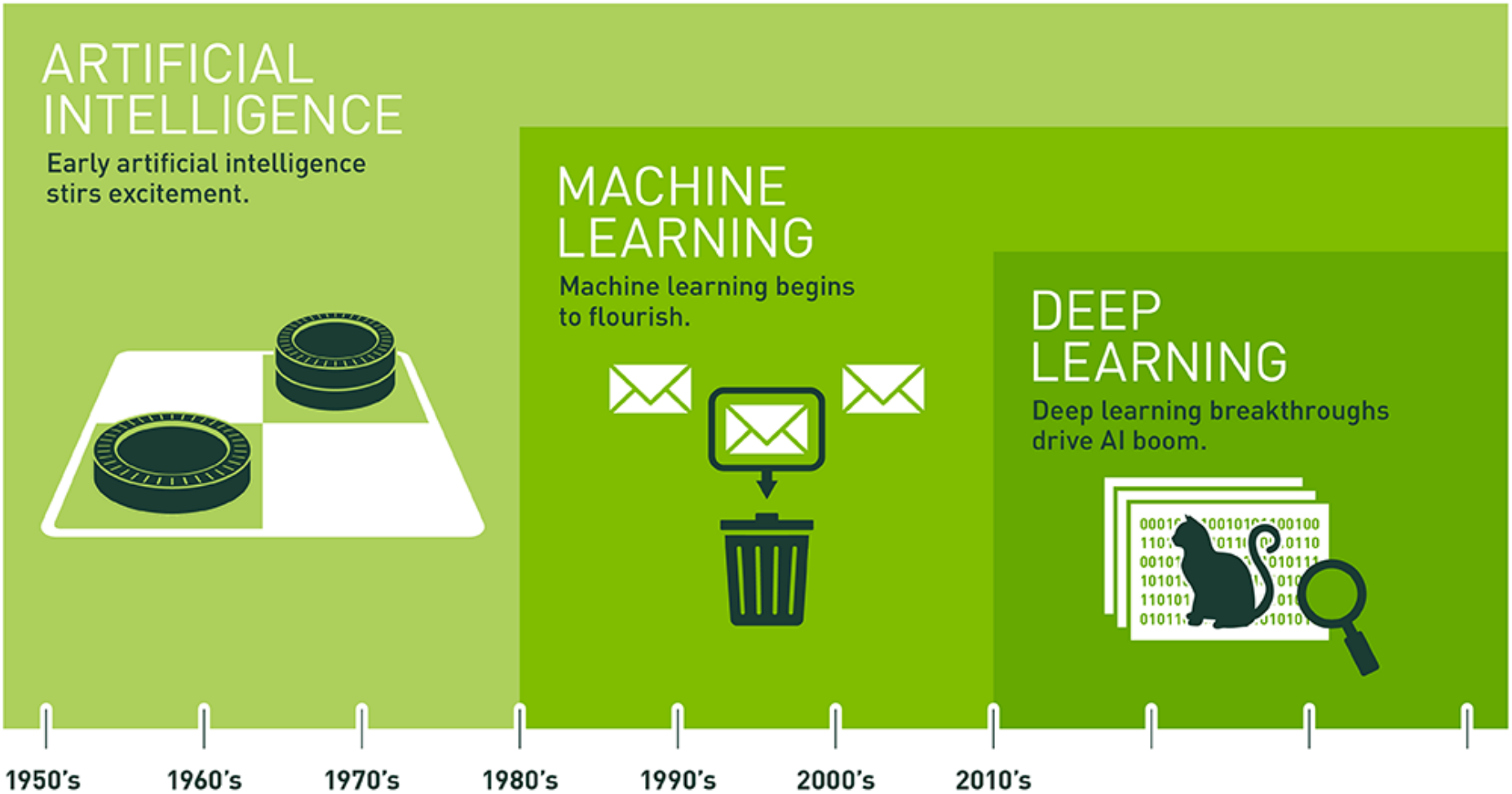
- You will be able to grasp and elaborate on more advanced topics published in the top machine learning venues
- You will get practical development expertise on applied problems

Mathematical tools

- Linear algebra
- Calculus
- Optimization
- Discrete mathematics
- Probability & statistics
- Metric and differential geometry

Not an easy path, but results will speak for themselves!

We will have to develop ways to evaluate, visualize, and quantify what we are doing. Going blind-folded and regarding learning models as black boxes will not bring us very far!



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

Image: Michael Copeland, NVIDIA

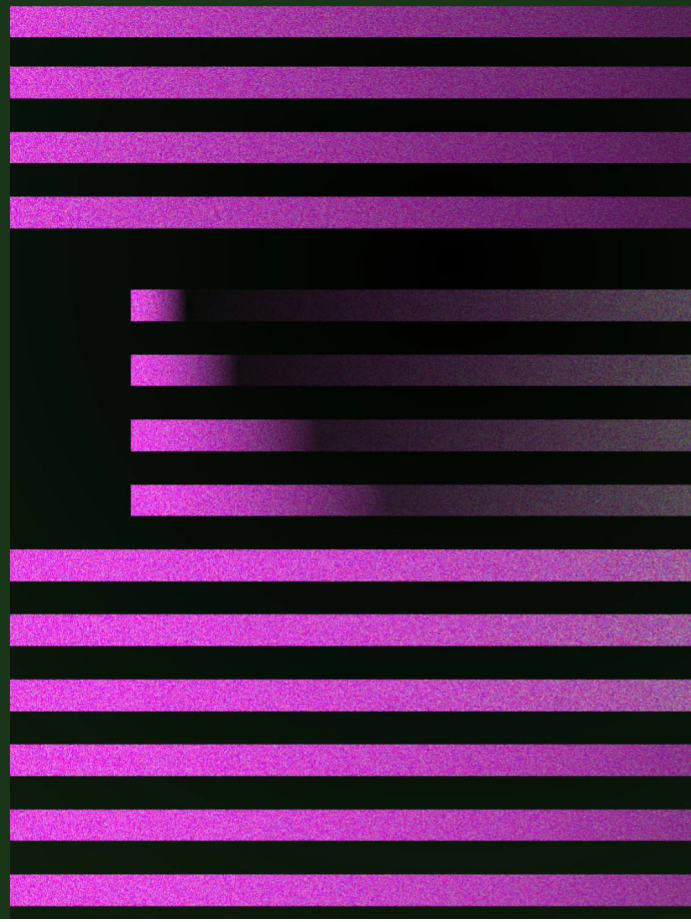
Machine learning is
everywhere!

OpenAI

Blog

Introducing ChatGPT

We've trained a model called ChatGPT which interacts in a conversational way. The dialogue format makes it possible for ChatGPT to answer followup questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests.



BOT Midjourney Bot **archaeopteryx in a cartoon cel from the golden age of animation by walt disney studios drawn by walt disney**

Midjourney Bot BOT Oggi alle 08:50

archaeopteryx in a cartoon cel from the golden age of animation by walt disney studios drawn by walt disney circa 1939 --ar 16:9 --no close up, zoom in --s 20 - Image #4 @gabagool6

Upscale (Subtle) | Upscale (Creative) | Vary (Subtle) | Vary (Strong) | Vary (Region)

Zoom Out 2x | Zoom Out 1.5x | Custom Zoom | Make Square

Web

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Resurrect an ancient library from the ashes of a volcano.

Win $100,000. Make History.

The Vesuvius Challenge is a machine learning and computer vision competition that in **2023 cracked the riddle of the Herculanum Papyri & awarded over $1,000,000 in prizes.**

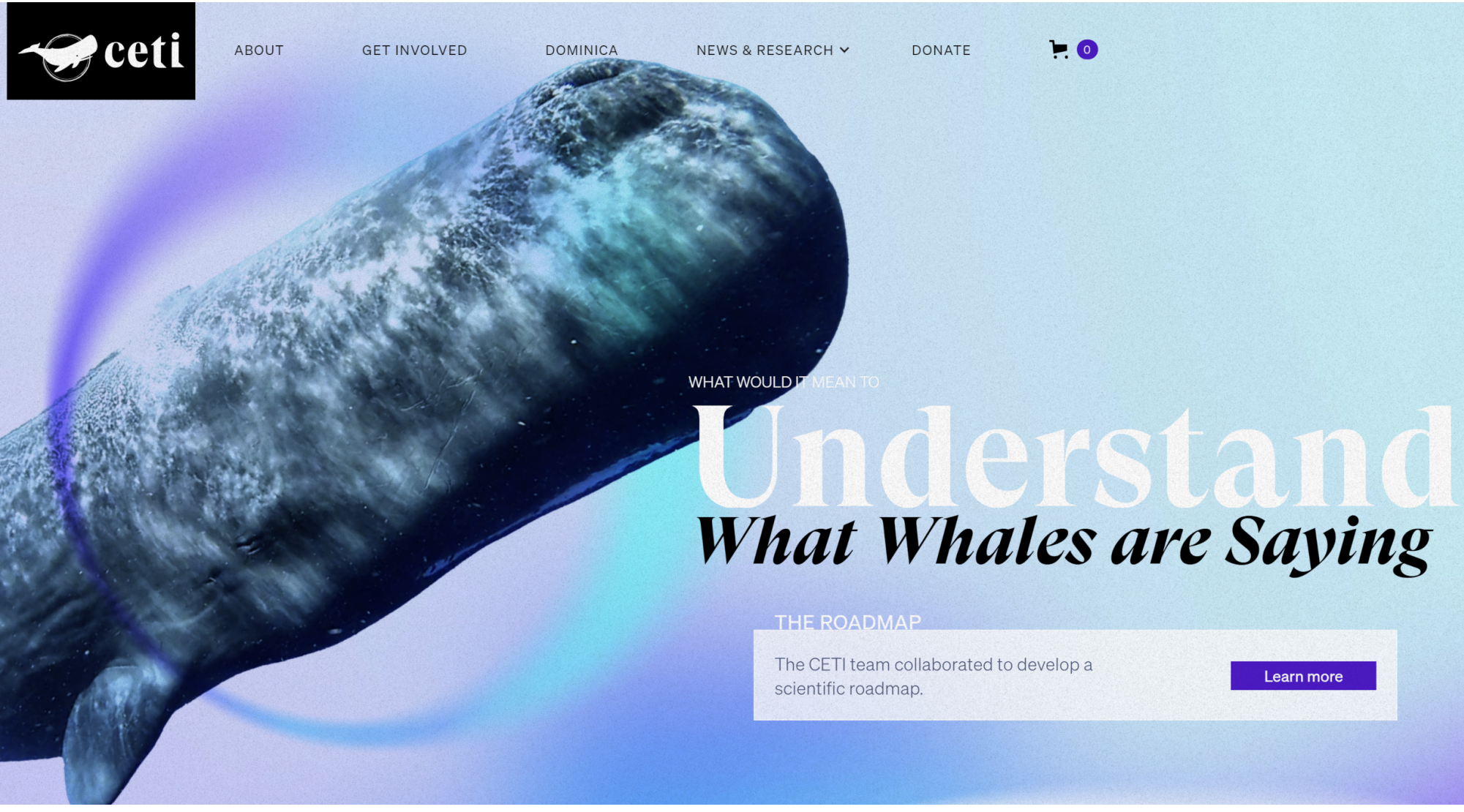
2024's challenge is to go from reading a few passages to entire scrolls.

2023 Grand Prize Won

READ THE ANNOUNCEMENT →

Read the Master Plan

READ THE POST →


ceti
ABOUT
GET INVOLVED
DOMINICA
NEWS & RESEARCH
DONATE
0
WHAT WOULD IT MEAN TO
Understand
What Whales are Saying
THE ROADMAP
The CETI team collaborated to develop a scientific roadmap.
Learn more