Avanços em Inteligência Artificial
e a sua aplicação à região do Algarve

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Avanços em IA

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Geração de vídeo

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Geração de vídeo

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Modelos generativos (Humanos Virtuais)

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Modelos generativos

- Modelos generativos são muito úteis para geração de dados sintéticos

- Depois de verem exemplos de uma distribuição
  - São capazes de gerar novos exemplos da mesma distribuição

ScribbleGen: Generative Data Augmentation Improves Scribble-supervised Semantic Segmentation

Jacob Schnell[1] Jieke Wang[2] Lu Qi[2] Vincent Tao Hu[3] Meng Tang[2]
[1]University of Waterloo [2]University of California, Merced [3]CompVis Group, LMU Munich

Work done during an internship at UC Merced.
Published at workshop on SyntaGen - Harnessing Generative Models for Synthetic Visual Datasets at IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2024.

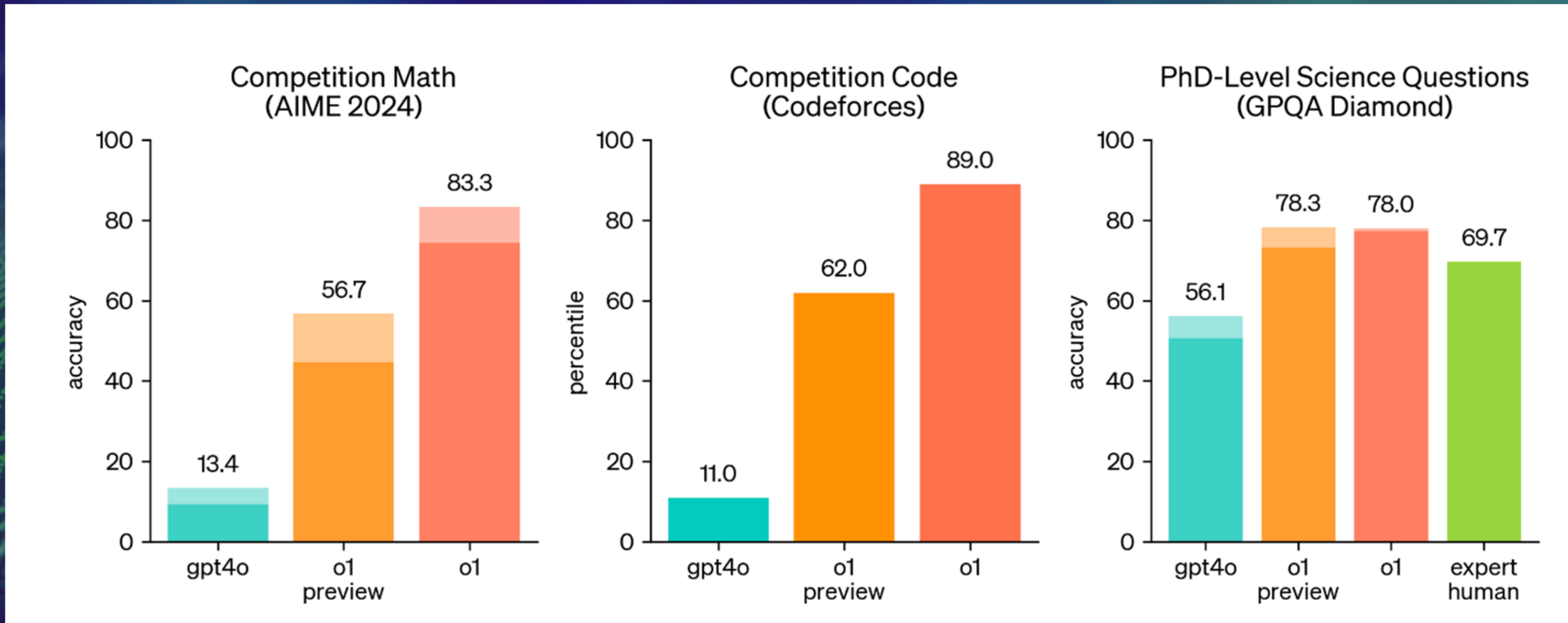
Abstract

Recent advances in generative models, such as diffusion models, have made generating high-quality synthetic images widely accessible. Prior works have shown that training on synthetic images improves many perception tasks, such as image classification, object detection, and semantic segmentation. We are the first to explore generative data augmentations for scribble-supervised semantic segmentation. We propose ScribbleGen, a generative data augmentation method that leverages a ControlNet diffusion model conditioned on semantic scribbles to produce high-quality training data. However, naive implementations of generative data augmentations may inadvertently harm the performance of the downstream segmentor rather than improve it. We leverage classifier-free diffusion guidance to enforce class consistency and introduce encode ratios to trade off data diversity for data realism. Using the guidance scale and encode ratio, we can generate a spectrum of high-quality training images. We propose multiple augmentation schemes and find that these schemes significantly impact model performance, especially in the low-data regime. Our framework further reduces the gap between the performance of scribble-supervised segmentation and that of fully-supervised segmentation. We also show that our framework significantly improves segmentation performance on small datasets, even surpassing fully-supervised segmentation. The code is available at https://github.com/mengtang-lab/scribblegen.

Modelos de Linguagem em Grande Escala

- Large Language Models (LLMs)
- Revolução a partir da introdução do conceito de “transformer” em 2017
- Mecanismo de atenção (dependente do contexto)

Capacidades de LLMs



- **Setembro 2024**, Modelo ChatGPT o1 – Open AI
- Classificação Top 500 alunos nas olímpiadas da matemática dos Estados Unidos

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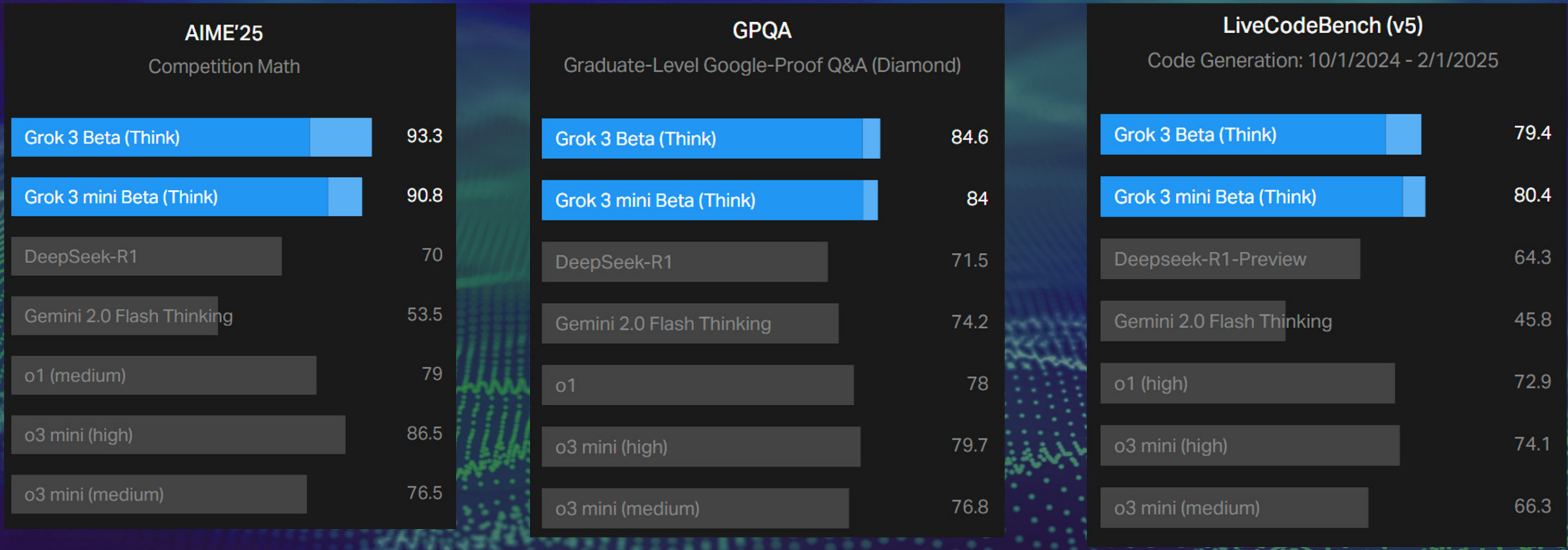
Capacidades de LLMs



- **19 feveiro 2025**, Modelo Grok 3 – X

Capacidades de LLMs – raciocínio em cadeia

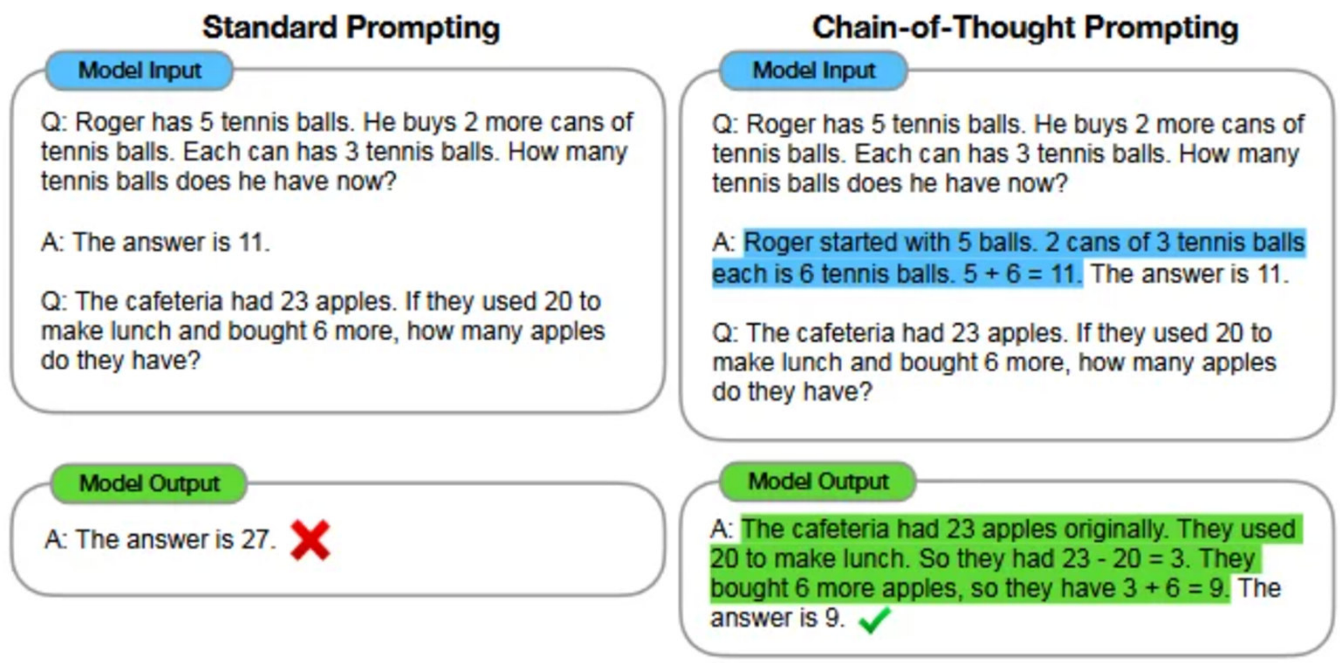


Figure 1: Chain-of-thought prompting enables large language models to tackle complex arithmetic, commonsense, and symbolic reasoning tasks. Chain-of-thought reasoning processes are highlighted.

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Has AI surpassed us? Not so fast

Dimitris Papailiopo... @DimitrisPapail Follow

Researcher @MSFTResearch, AI Frontiers Lab; Prof @UWMadison (on

AIME I 2025: A Cautionary Tale About Math Benchmarks and Data Contamination

AIME 2025 part I was conducted yesterday, and the scores of some language models are available here:
matharena.ai thanks to @mbalunovic, @ni_jovanovic et al.

I have to say I was impressed, as I predicted the smaller distilled models would crash and burn, but they actually scored at a reasonable 25-50%.

That was surprising to me! Since these are new problems, not seen during training, right? I expected smaller models to barely score above 0%. It's really hard to believe that a 1.5B model can solve pre-math olympiad problems when it can't multiply 3-digit numbers. I was wrong, I guess.

I then used openai's Deep Research to see if similar problems to those in AIME 2025 exist on the internet. And guess what? An identical problem to Q1 of AIME 2025 exists on Quora:
quora.com/In-what-bases-...

I thought maybe it was just coincidence, and used Deep Research again on Problem 3. And guess what? A very similar question was on math.stackexchange:
math.stackexchange.com/questions/3548...

Still skeptical, I used Deep Research on Problem 5, and a near identical problem appears again on math.stackexchange:
math.stackexchange.com/questions/3146...

I haven't checked beyond that because the freaking p-value is too low already. Problems near identical to the test set can be found online.

Limitações de LLMs

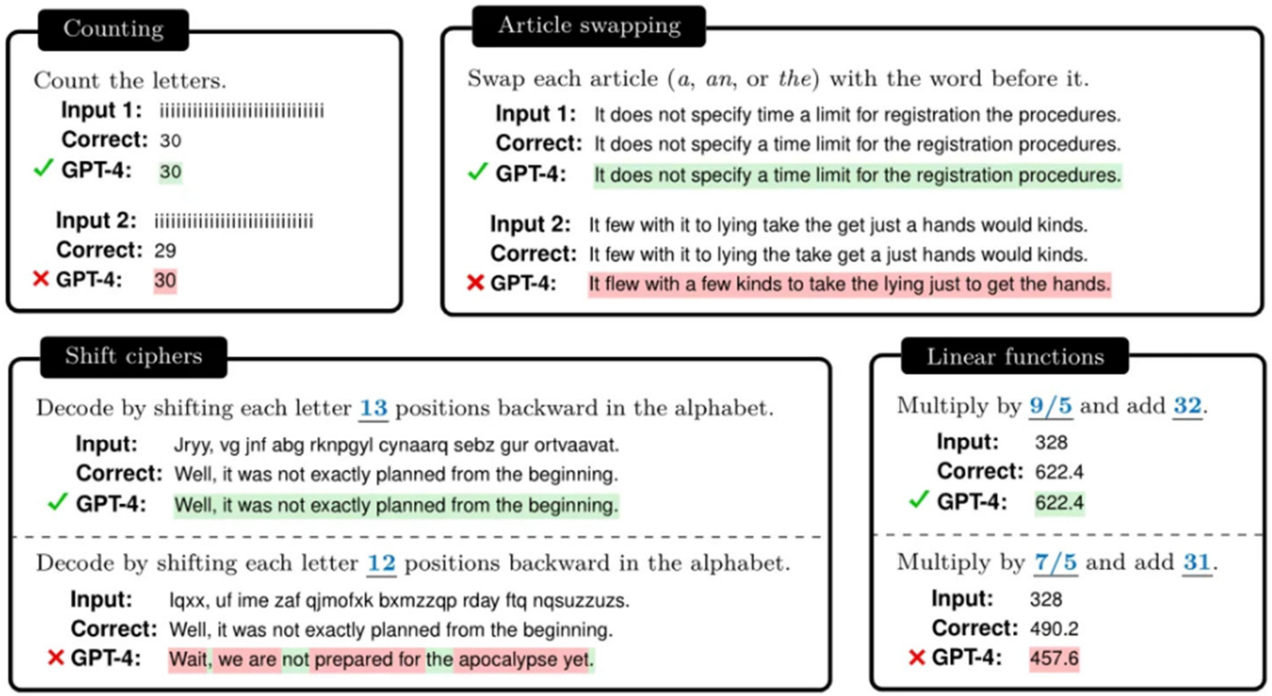

Fig. 2. GPT-4 struggles on some seemingly simple tasks such as counting, article swapping, shift ciphers, and linear functions. In the counting and article swapping examples, GPT-4 fails in the cases where the correct output is a low-probability piece of text (for the counting example, we refer to 29 as low-probability because it occurs much less frequently in natural corpora than 30 does). In the shift cipher and linear function examples, GPT-4 performs well on the task variants that are common in Internet text but poorly on the variants that are rare (note that the shift cipher with a shift of 13 is over 100 times more common in Internet text than the shift cipher with a shift of 12; and the linear function $f(x) = (9/5)x + 32$ is common because it is the Celsius-to-Fahrenheit conversion, while the other linear function has no special significance). The GPT-4 predictions were obtained using `gpt-4-0613` on the OpenAI API; other model versions (e.g., the online chat interface) may give different predictions.

Limitações

- LLMs são na sua essência modelos probabilísticos de predição da próxima palavra
  - São muito enviesados a devolver respostas mais prováveis
  - Mesmo que a resposta mais provável não seja a resposta correta

Exemplos de aplicações

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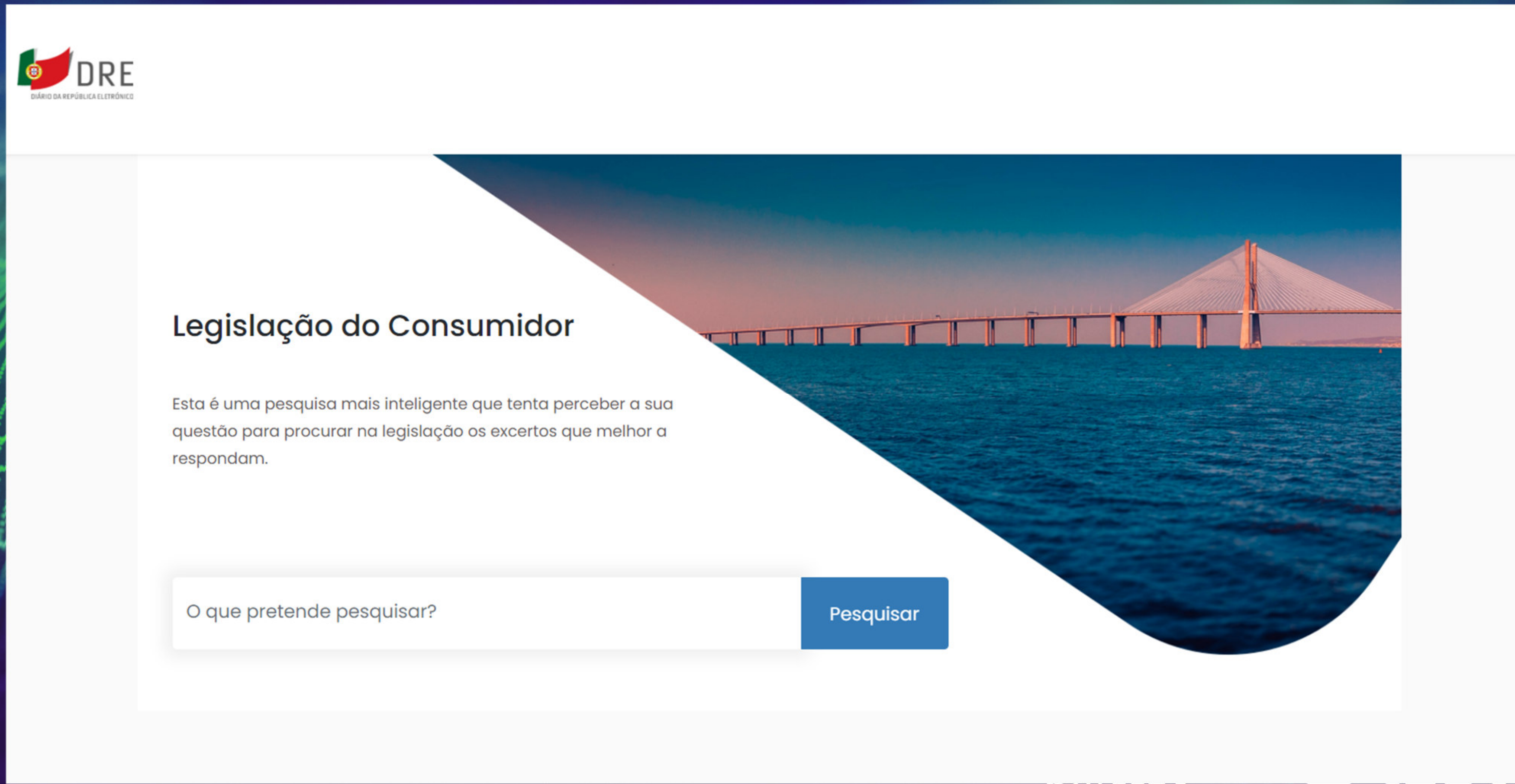
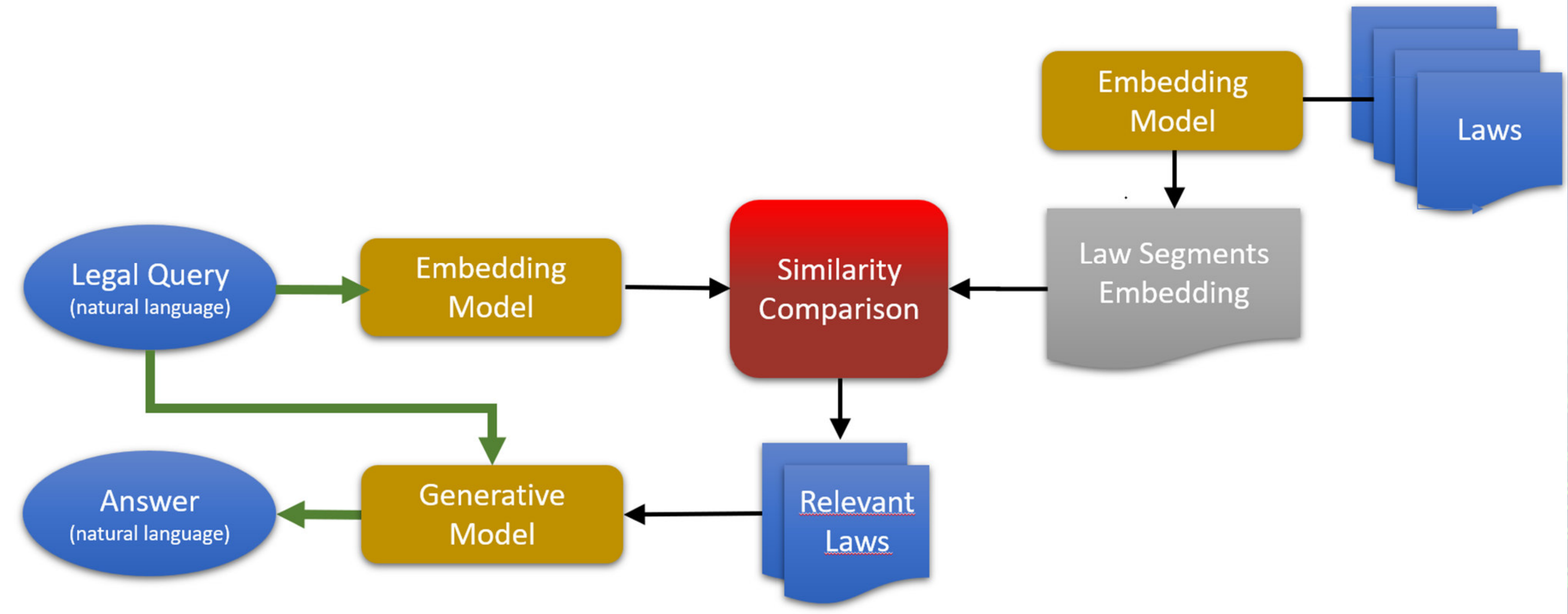
LLM’s aplicados a sistemas legais

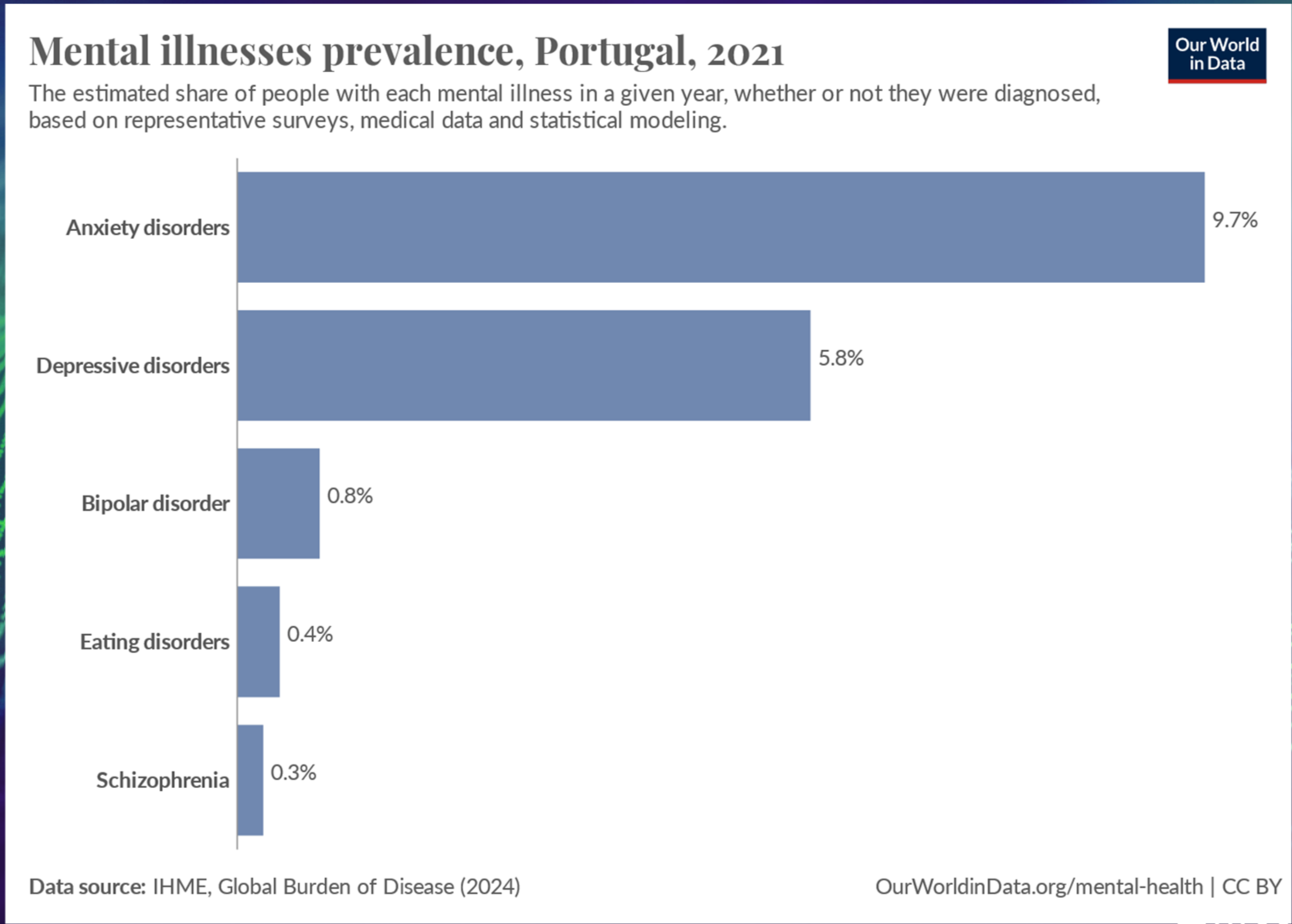


LLM’s aplicados a sistemas legais (Projeto AILA)

Artificial Intelligence Legal Assistant



LLMs aplicados a saúde mental e bem estar



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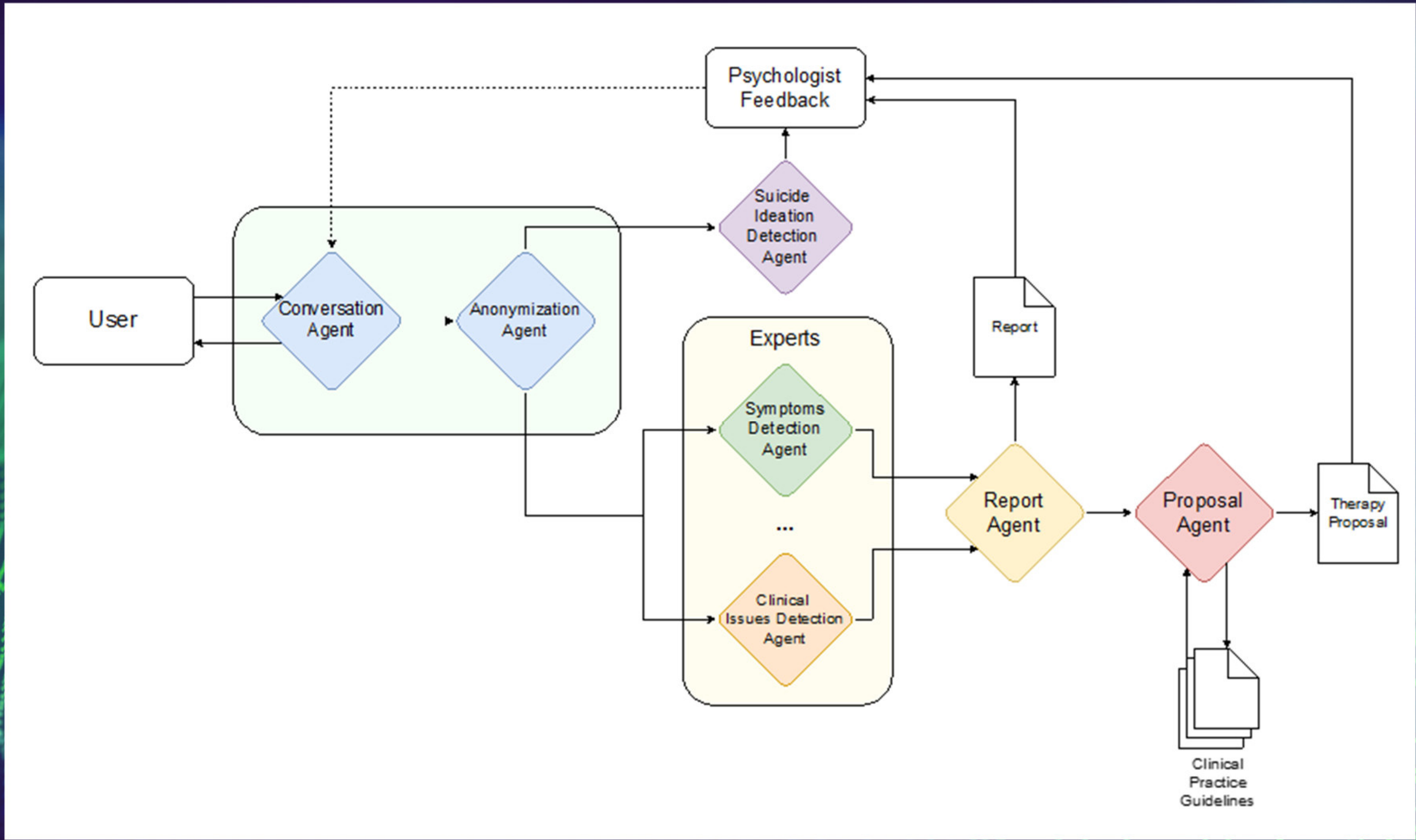
MentalRAG

AI-based framework with seven specialized agents designed to assist mental health professionals.

These agents, powered by LLMs, help with tasks like patient interaction, anonymization, diagnosis, and therapy proposals



Projeto NON-CONSPIRA-HATE!

- Objetivo
  - detetar e mapear automaticamente discursos de ódio nas redes sociais contra refugiados, imigrantes e pessoas LGBTI, assim como teorías de conspiração anti-vacinas do COVID-19.

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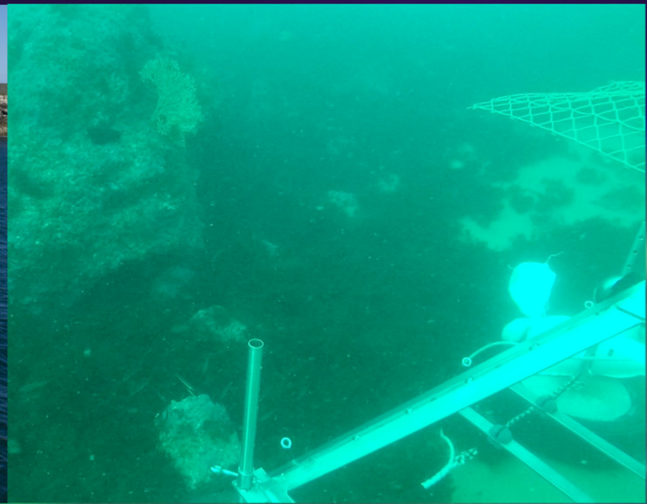
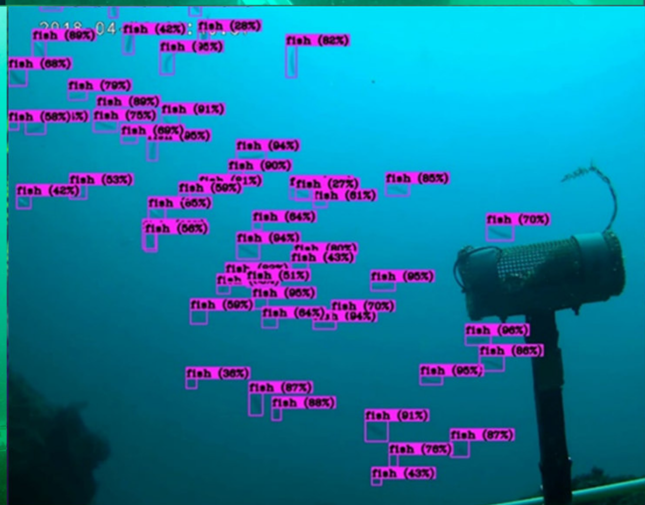
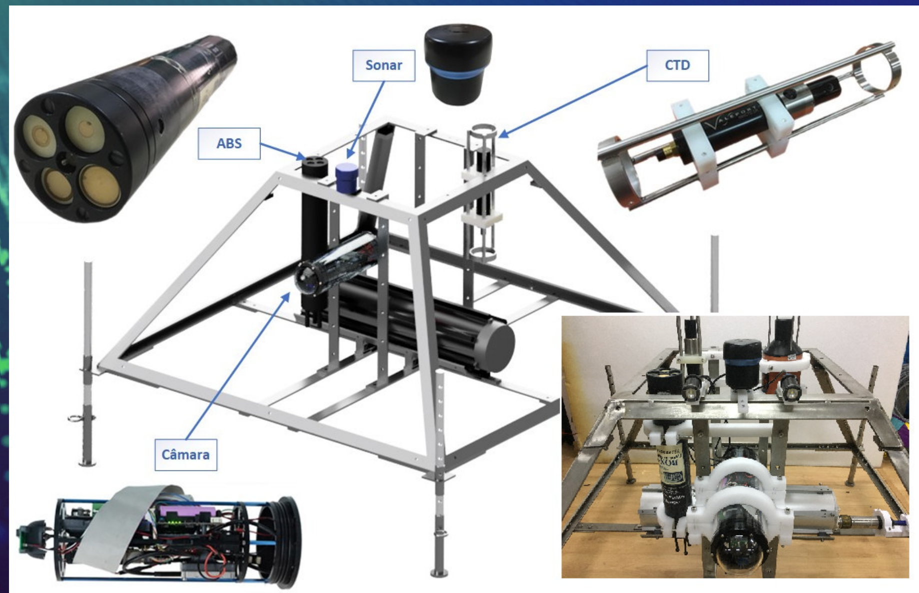
Real-time Underwater Observatory in Sagres

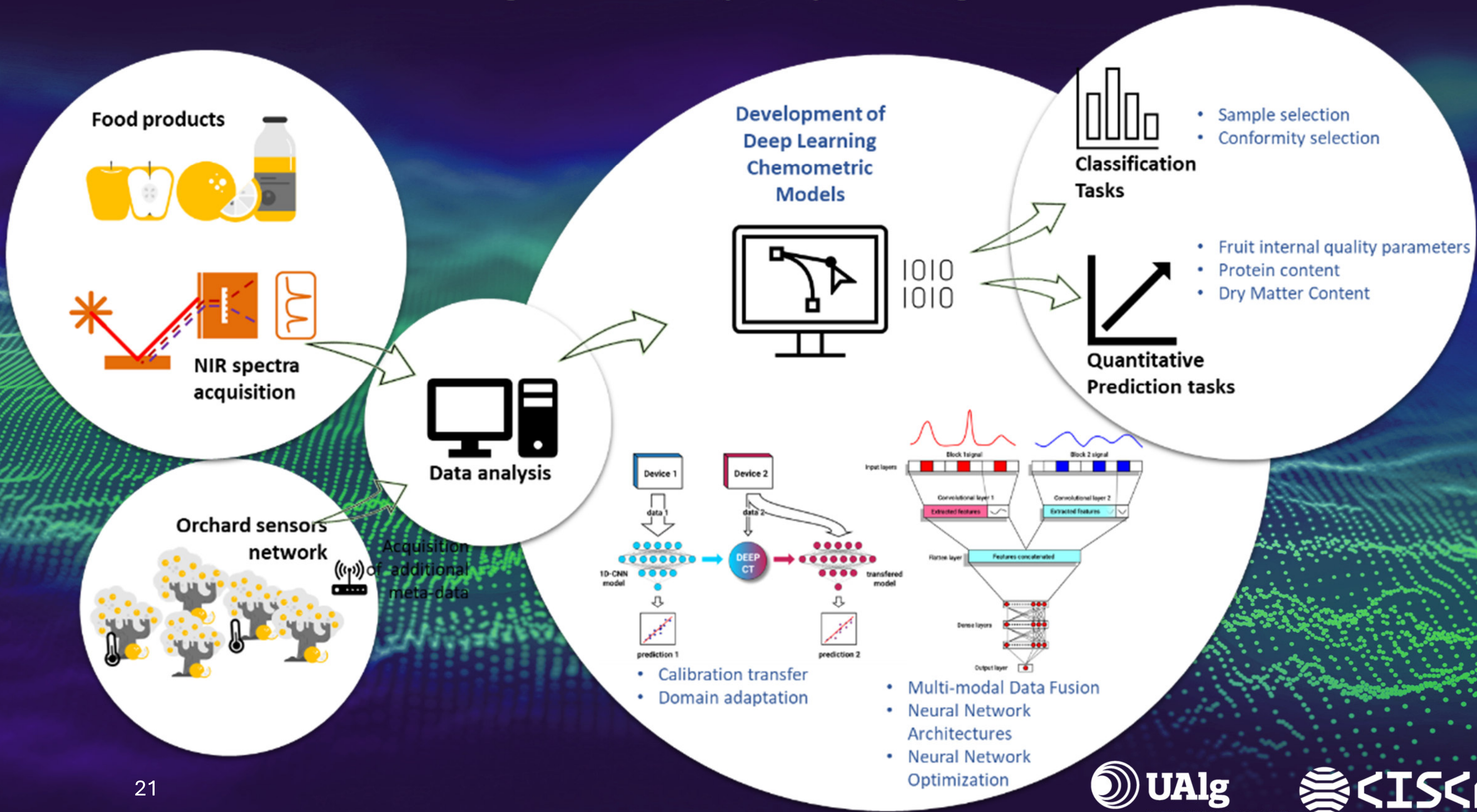




- Transmit in real-time
- **Detect fishes and count them**
- **Indentify species with AI**



Research on AI methodologies to develop deep learning chemometric models



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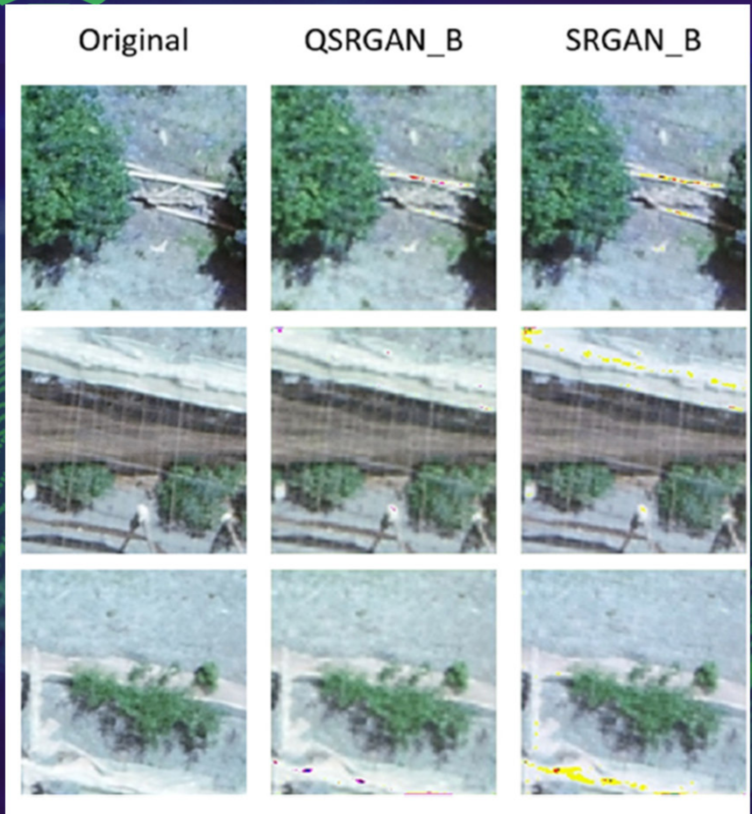
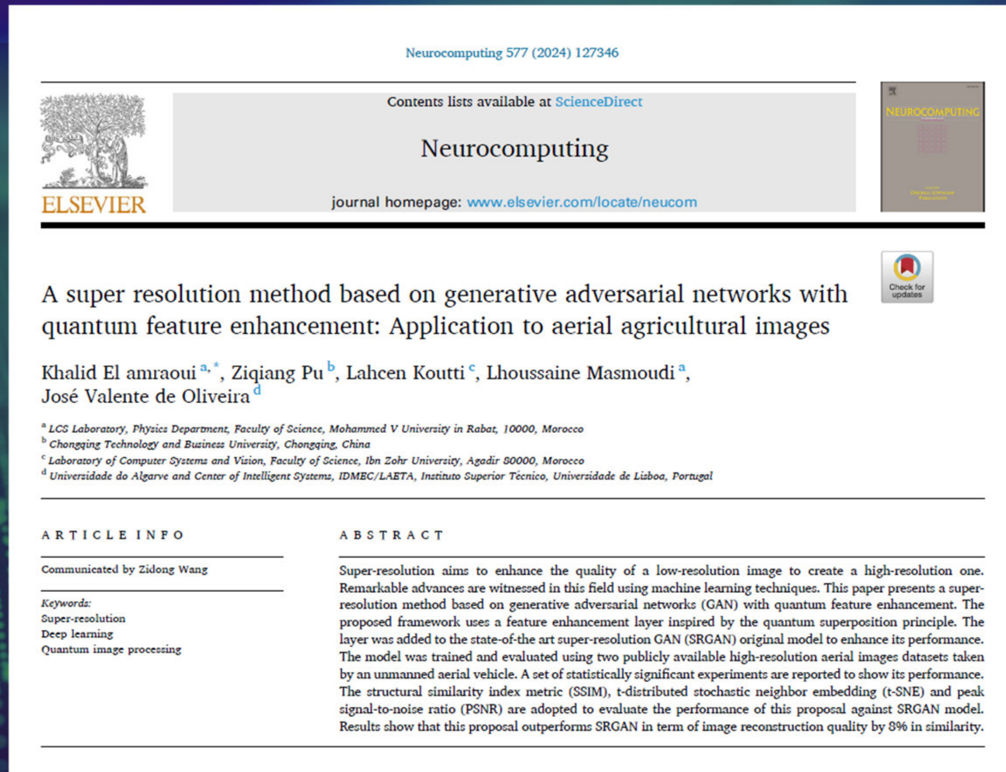
Geração de imagens de alta resolução

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A super resolution method based on generative adversarial networks with quantum feature enhancement: Application to aerial agricultural images

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ABSTRACT

Super-resolution aims to enhance the quality of a low-resolution image to create a high-resolution one. Remarkable advances are witnessed in this field using machine learning techniques. This paper presents a super-resolution method based on generative adversarial networks (GAN) with quantum feature enhancement. The proposed framework uses a feature enhancement layer inspired by the quantum superposition principle. The layer was added to the state-of-the art super-resolution GAN (SRGAN) original model to enhance its performance. The model was trained and evaluated using two publicly available high-resolution aerial images datasets taken by an unmanned aerial vehicle. A set of statistically significant experiments are reported to show its performance. The structural similarity index metric (SSIM), t-distributed stochastic neighbor embedding (t-SNE) and peak signal-to-noise ratio (PSNR) are adopted to evaluate the performance of this proposal against SRGAN model. Results show that this proposal outperforms SRGAN in term of image reconstruction quality by 8% in similarity.

- Trabalho do colega José Valente de Oliveira

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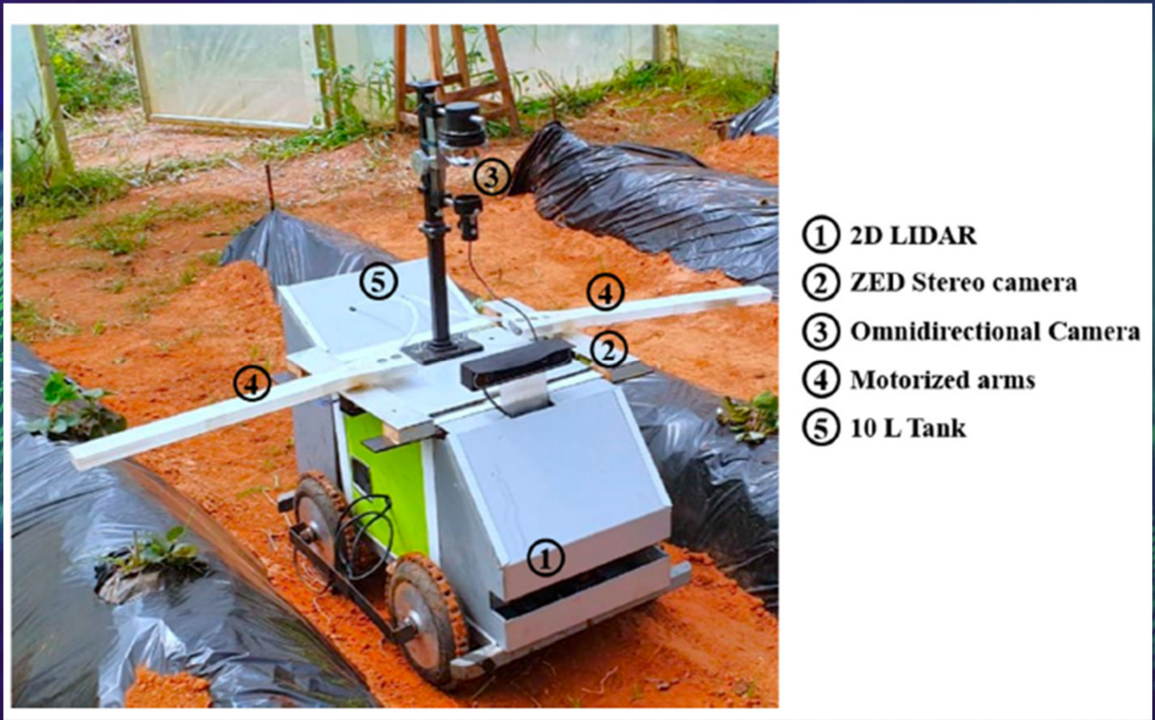
Deteção de morangos num robot aspersor de insecticida



applied sciences

MDPI

Article

Embedding a Real-Time Strawberry Detection Model into a Pesticide-Spraying Mobile Robot for Greenhouse Operation

Khalid El Amraoui [1], Mohamed El Ansari [2], Mouataz Lghoul [1], Mustapha El Alaoui [1], Abdelkrim Abanay [3], Bouazza Jabri [1], Lhoussaine Masmoudi [1] and José Valente de Oliveira [4,5,*]

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Abstract: The real-time detection of fruits and plants is a crucial aspect of digital agriculture, enhancing farming efficiency and productivity. This study addresses the challenge of embedding a real-time strawberry detection system in a small mobile robot operating within a greenhouse environment. The embedded system is based on the YOLO architecture running in a single GPU card, with the Open Neural Network Exchange (ONNX) representation being employed to accelerate the detection process. The experiments conducted in this study demonstrate that the proposed model achieves a mean average precision (mAP) of over 97%, processing eight frames per second for 512 × 512 pixel images. These results affirm the utility of the proposed approach in detecting strawberry plants in order to optimize the spraying process and avoid inflicting any harm on the plants. The goal of this research is to highlight the potential of integrating advanced detection algorithms into small-scale robotics, providing a viable solution for enhancing precision agriculture practices.

Keywords: agricultural robotics; real-time detection; YOLO; embedded system; greenhouse

check for updates

Citation: El Amraoui, K.; El Ansari, M.; Lghoul, M.; El Alaoui, M.; Abanay, A.; Jabri, B.; Masmoudi, L.; Valente de Oliveira, J. Embedding a Real-Time Strawberry Detection Model into a Pesticide-Spraying Mobile Robot for Greenhouse Operation. *Appl. Sci.* **2024**, *14*, 7195. https://doi.org/10.3390/app14167195

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1. Introduction

Agriculture continues to play a crucial role in economies relying on agricultural activities [1], particularly in countries like Morocco, where it constitutes approximately 10.33% of the Gross Domestic Product (GDP) as of 2022 [2]. This sector is a significant source of employment in Morocco, contributing to nearly 33.3% of jobs and accounting for over 23% of exports [3]. Fresh strawberries are securing their position among the top 10 most exported fruits and vegetables from this country: the revenue earned through strawberry production consistently ranges from USD 40 to USD 70 million almost every year and is still increasing by an average of 3% annually [4]. However, the production of such soft fruits faces a great challenge because of pest infestation and diseases: the costs of managing these can contribute to nearly half of the production costs [5].

Recently, innovative techniques have been developed and used to improve agricultural practices, giving birth to the term "precision agriculture" [6]. The introduction of new tools and technologies, such as sophisticated irrigation systems or modern agricultural machinery, has significantly increased productivity and the ability to feed a growing population. However, plant detection in large areas remains a challenging task for farmers, particularly

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Projeto ATTENTIA

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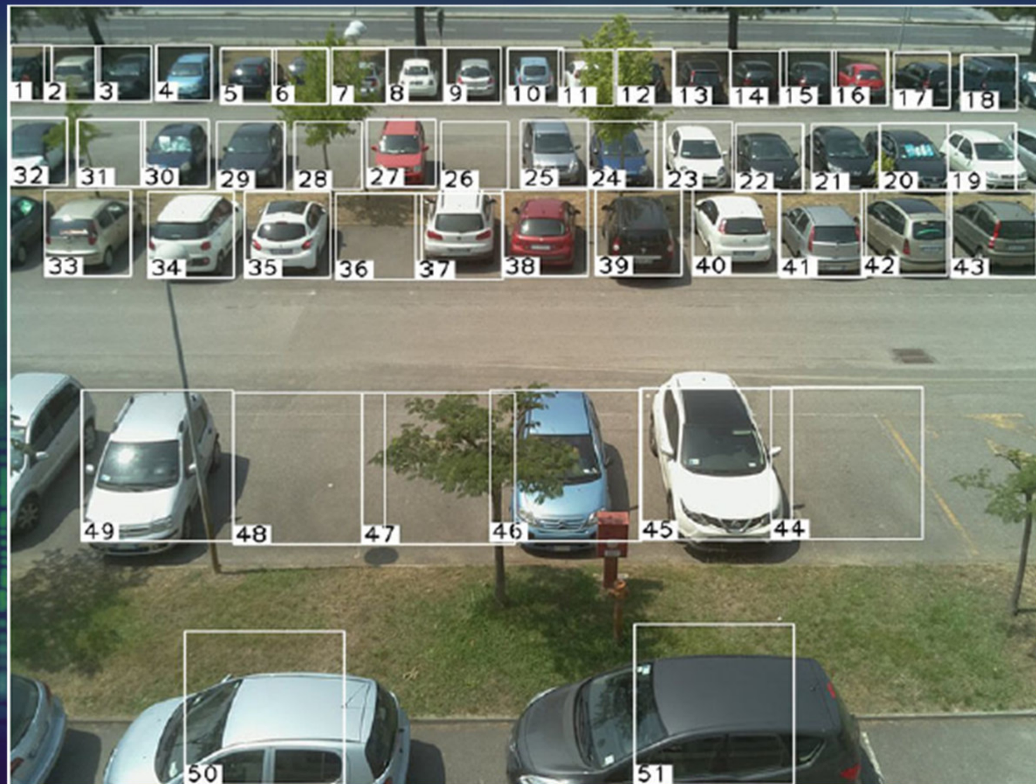
Sistemas de deteção de estacionamento



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- Baidu's Virtual Museum Guide