

Potencializando Desenvolvimento de Software com o Modelos Open Source Granite-Code e **watsonX**

Alan Braz

AIware Latam 2024
<https://link.pullrecast.dev/aiware>



Agenda

- IBM Research Intro
- Plataforma watsonx
- IBM Granite Models
 - Granite Code Models
 - Granite for Function Calling

IBM Research

A community of 3,000

Hybrid
Cloud

Physical
Sciences

Artificial
Intelligence

Mathematical
Sciences

Quantum
Computing

Computer
Science

Semiconductors
and Systems

Security and
Cryptography



6 Nobel Laureates



10 Medals of Technology



5 National Medals of Science



6 Turing Awards



Using AI technologies to strengthen Indigenous Languages



Paulo
Cavalin



Pedro
Domingues



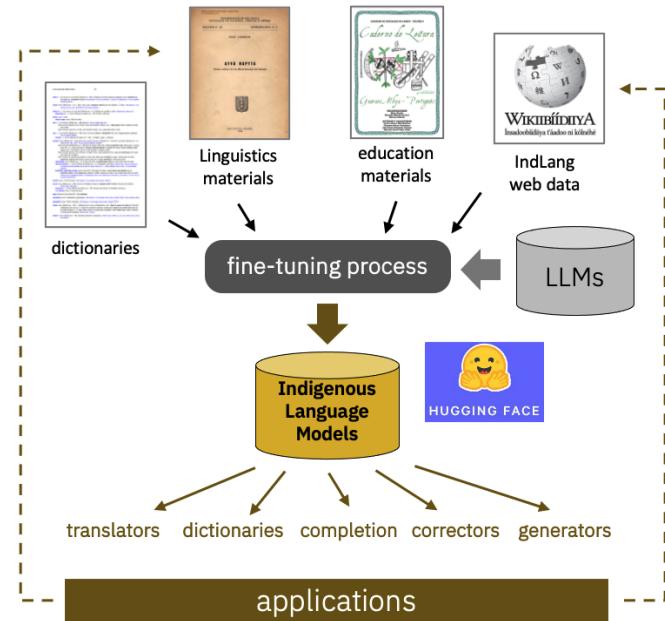
Claudio
Pinhanez



Julio
Nogima

*Technical strategy: Fine-Tuning LLMs with Linguistic Data to Create **Indigenous Language Models***

- To deconstruct dictionaries to generate high-quality lexical and translation datasets.
- To collect data from linguistic thesis, webpages, documents **to create monolingual datasets**.
- To use the high-quality datasets as guides to **expand with synthetic data** the monolingual and translation datasets.
- To avoid the need of detailed linguistic knowledge to create supporting tools by using a single FM.
- To **explore related languages** to enlarge training sets (multilingual approach).
- To make all **data, code, and models** available in open-source such as Hugging Face, under the control of the Indigenous communities.



Supporting the Discovery of Sustainable Materials

Technology Driven by the Use Cases



Eduardo Soares
Emílio Vital Brazil

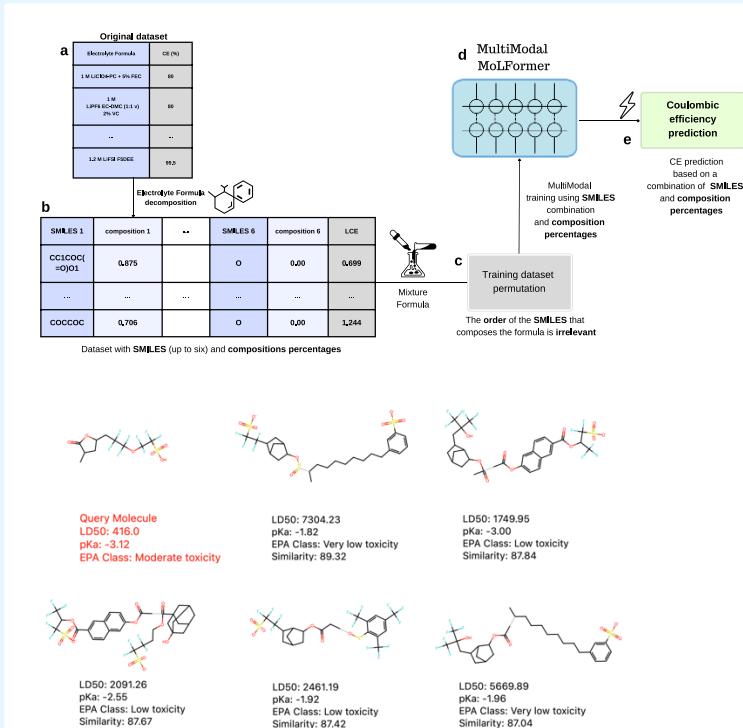
- Three challenging Sustainable Materials problems:
PFAS - A very useful material but toxic; how to replace it
Energy Storage - Find efficient materials that are safer
MoF - Discover new materials to clean pollution
- Foundation Models for properties prediction:
MOLFormer and **RHIZOME** – Molecule based models trained more than **1 Billion** of **Molecules** and finetuned to tenths of downstream tasks related with the use cases
- Related papers:

Improving Molecular Properties Prediction Through Latent Space Fusion

Capturing Formulation Design of Battery Electrolytes with Chemical Large Language Model

Beyond Chemical Language: A Multimodal Approach to Enhance Molecular Property Prediction

A Framework for Toxic PFAS Replacement based on GFlowNet and Chemical Foundation Model



Foundation Models de IA para clima e tempo

Bluetalks:
Foundation Models de
IA para clima e tempo

Speakers
Daniel Salles Civitarese
Research Scientist

Data
7 de agosto de 2024

Horário
18h - 19h

IBM Research Brasil Apoio: **inovabra**



huggingface.co/ibm-nasa-geospatial

Hugging Face Search models, datasets, users... Models Datasets Spaces Posts Docs Pricing

IBM NASA Geospatial Community

Watch repos

AI & ML interests
Geospatial foundation models using HLS2 data

Team members 38

Organization Card

NASA and IBM have teamed up to create an AI Foundation Model for Earth Observations, using large-scale satellite and remote sensing data, including the Harmonized Landsat and Sentinel-2 (HLS) data. By embracing the principles of open AI and open science, both organizations are actively contributing to the global mission of promoting knowledge sharing and accelerating innovations in addressing critical environmental challenges. With Hugging Face's platform, they simplify geospatial model training and deployment, making it accessible for open science users, startups, and enterprises on multi-cloud AI platforms like Watson. Additionally, Hugging Face enables easy sharing of the pipelines of the model family, which our team calls Prithvi, within the community, fostering global collaboration and engagement. More details on Prithvi can be found in the joint IBM NASA technical paper.

Watch Prithvi end to end demo

More information: [NASA Blog post](#), [NASA Veda system](#), [IBM Press/Blog post](#), [EIS Code](#)

https://videos.netshow.me/t/2FqLo_jHbHM



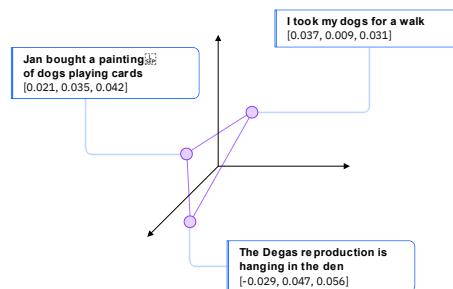
watsonx Platform Engineering

- Time global de Engenharia de Software em Research
- Faz a ponte entre pesquisa e produto (IBM Software e Red Hat)
- Temas do grupo no Brasil 

Guardrails



Embedding



Performance na inferência

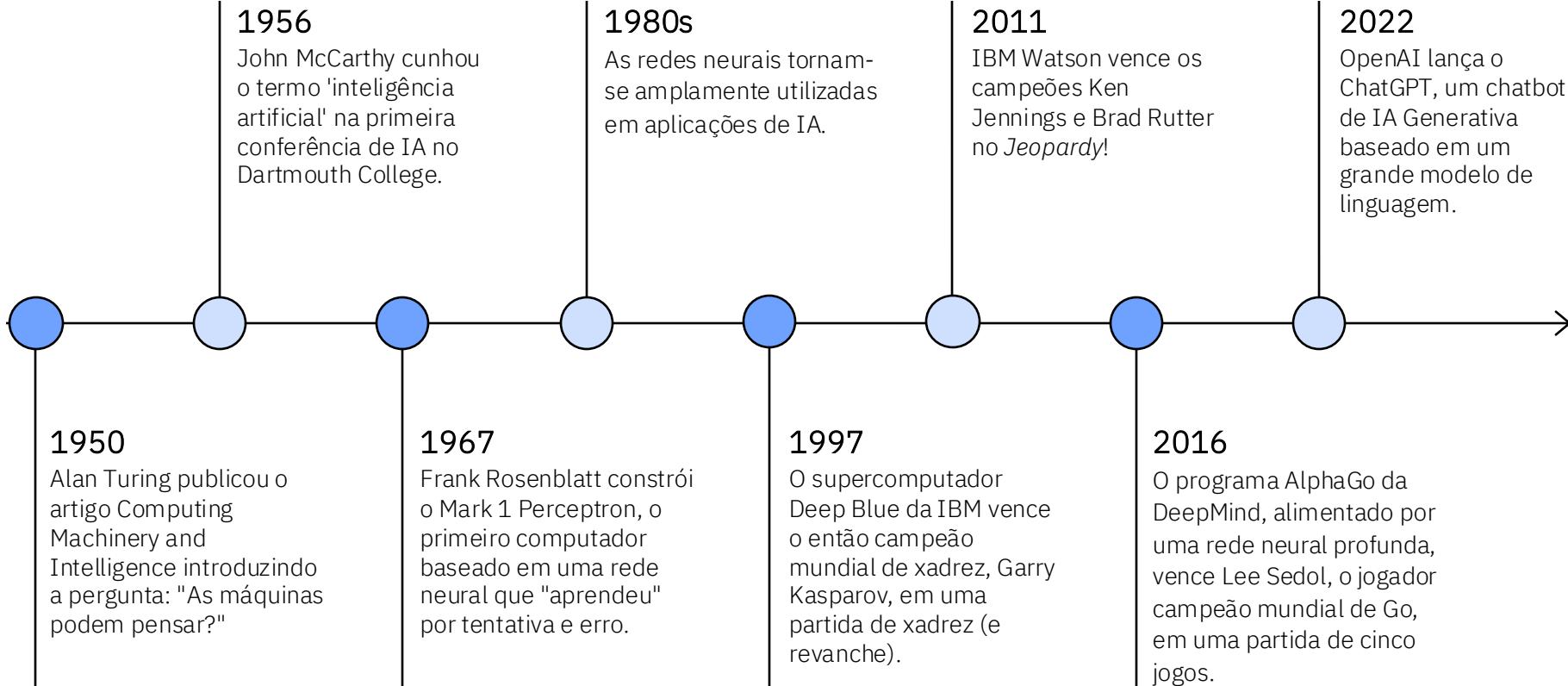
 **VLLM**
TGI

Inferência em AIU



<https://research.ibm.com/blog/ibm-artificial-intelligence-unit-aiu>

Marcos da IA



Deep Blue 1997



Ei! 2013/2014



2019

O Boticário lança 1ºs perfumes feitos com ajuda de inteligência artificial

Em investida inédita no mundo, fragrâncias foram desenvolvidas em parceria com a IBM e chegam ao mercado no dia 27. Conheça em primeira mão a novidade



Marco na perfumaria: fragrâncias criadas com ajuda de "robô" chegam dia 27. (Grupo Boticário/Divulgação)

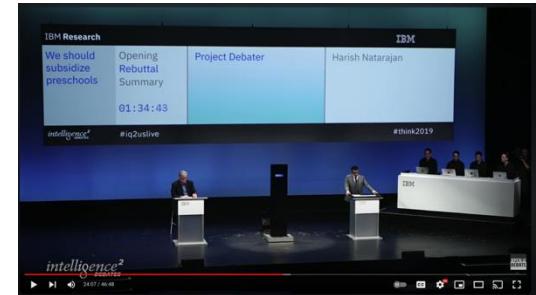
Watson 2011



Chef Watson 2017



Project Debater



IBM POV:

Quatro princípios fundamentais para adaptar a IA generativa para empresas

Aberta

- Baseado nas melhores tecnologias de IA e nuvem disponíveis
- Dar acesso à inovação da comunidade aberta e a múltiplos modelos



Focada

- Projetado para casos de uso de negócios direcionados, que desbloqueiam um novo valor
- Incluindo modelos selecionados que podem ser ajustados a dados proprietários e diretrizes da empresa

Confiável

- Construído com IA e governança de dados, transparência e ética que suportam as crescentes demandas de conformidade regulatória
- Fornecer orientação sobre modelos apropriados para alavancar para criar valor comercial real com confiança

Capacitante

- Em uma plataforma para trazer seus próprios dados e modelos de IA que você ajusta, treina, implanta e controla
- Execução em qualquer lugar, projetado para escala e adoção generalizada para realmente criar valor empresarial

<https://link.pullrecast.dev/ceo-guide-genai>

Tecnologia e experiências de IA Generativa da IBM

AI assistants



Capacite os indivíduos a trabalhar sem conhecimento especializado em uma variedade de processos e aplicativos de negócios.

watsonx Code Assistant
watsonx Assistant
watsonx Orchestrate

SDKs and APIs



Incorpore a plataforma watsonx em assistentes e aplicativos de terceiros usando interfaces programáticas.

Ecosystem integrations

AI and data platform



Aproveite a IA generativa e o aprendizado de máquina, ajustados aos seus dados, com responsabilidade, transparência e explicabilidade.

watsonx
watsonx.ai
watsonx.governance
watsonx.data

Foundation models

IBM models | Granite
3rd party models
| *Meta, Mistral AI*
| *Hugging Face*

Data services



Defina, organize, gerencie e forneça dados confiáveis para treinar e ajustar modelos de IA com serviços de malha de dados.

Cloud Pak for Data
watsonx Discovery

Hybrid cloud AI tools



Construa sobre uma base consistente e escalável baseada em tecnologia de código aberto.

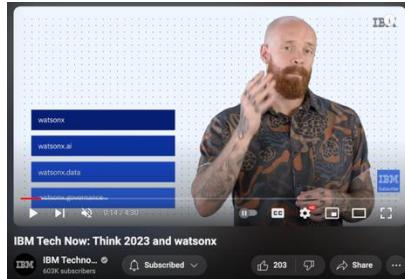
Red Hat OpenShift AI

RHEL AI
Granite Foundation Models
InstructLab

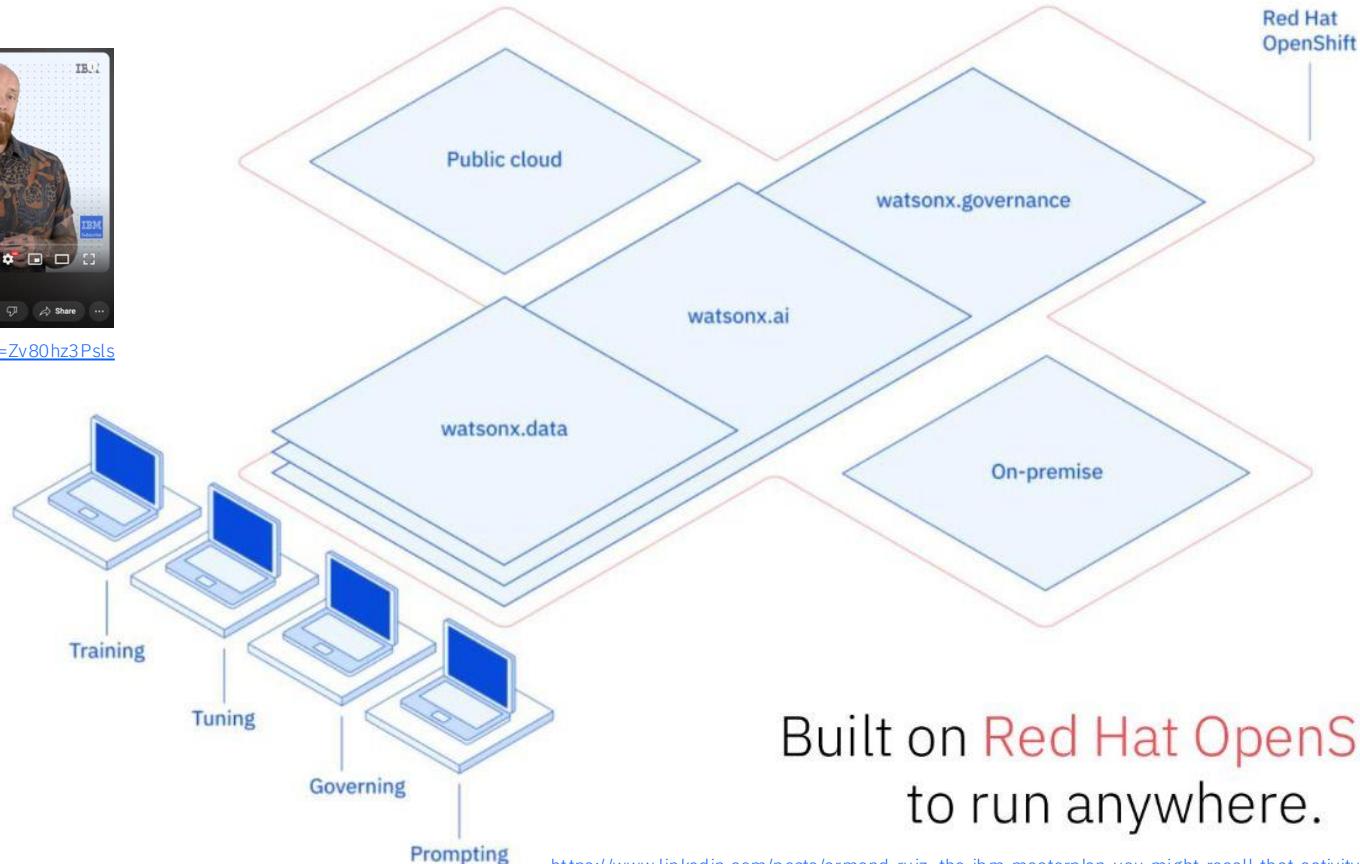
Consulting
Generative AI strategy, experience, technology, operations

Ecosystem
System Integrators, Software and SaaS partners, Public Cloud providers

Putting AI to work on Hybrid Cloud



<https://www.youtube.com/watch?v=Zv80hz3PsIs>



<https://link.pullrecast.dev/wx-chat>

Experimentar a nova
interface de chat gratuita:
múltiplos modelos
granite, llama, mixtral
testar português

Trial: 50,000 tokens/mês
22 modelos, parâmetros,
API, SDK, AutoAI

IBM watsonx.ai demo

30 trial days left Try watsonx.ai for free → ⚭

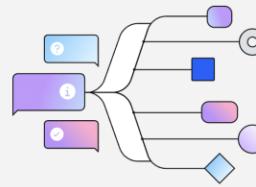
0 / 20,000 tokens ⓘ

AI Model: llama-3-70b-instruct New chat +

watsonx 12:18 PM

Hello! Are you ready to chat?

You chat with the single large language model. This demo does not include agents, simultaneous chat with multiple models, multi-modal models, or other functionality to enhance results. Models might not have knowledge of recent events.



Quick start samples

- Describe generative AI with emojis.
- Write a Python function, which generates a sequence of prime numbers.
- Create a chart of the top NLP use-cases for foundation models.
- How can generative AI help my enterprise business?

Type something... ➤



IBM Granite Models

Granite for Code

Trained on 116 programming languages, Granite code models (3b, 8b, 20b, 34b) are optimized for enterprise software development workflows. These models have a range of uses, from simple code completion to complex application modernization tasks and on-device memory constrained use cases.

Granite for Time Series

Granite Time Series is a family of lightweight, pre-trained models for time-series forecasting trained on a collection of datasets spanning a business a range of business and industrial application domains. We have optimized Granite Time Series to run efficiently across a range of hardware configurations, meaning you can start using them today with a laptop.

Granite for Language

Granite language models (7b open-source, 13B English, 20b **multilingual**, 8b Japanese) demonstrate high accuracy and throughput at low latency, while consuming only a fraction of GPU resources.

Granite for GeoSpatial

NASA and IBM have teamed up to create an AI Foundation Model for Earth Observations, using large-scale satellite and remote sensing data, including the Harmonized Landsat and Sentinel-2 ([HLS](#) (link resides outside of ibm.com)) data. By embracing the principles of open AI and open science, both organizations are actively contributing to the global mission of promoting knowledge sharing and accelerating innovations in addressing critical environmental challenges.

<https://research.ibm.com/blog/granite-code-models-open-source>

Open Source

<https://huggingface.co/ibm-granite>

 Hugging Face 

 **IBM Granite** Company
 IBM-Granite Watch repos

 **AI & ML interests**
LLMs for language and code + Time series and geospatial foundation models

 **Team members** 18


 **Organization Card**  Community  About org cards

IBM ❤️ Open Source AI
IBM is building enterprise-focused foundation models to drive the future of business. The Granite family of foundation models span a variety of modalities, including language, code, and other modalities, such as time series.

We strongly believe in the power of collaboration and community-driven development to propel AI forward.

Open Source LLMs

Acesso	Descrição	Exemplos
Fechado	<ul style="list-style-type: none">• Acesso por API, sem acesso direto aos pesos do modelo ou ao código• Licença específica do provedor	<ul style="list-style-type: none">• GPT4• Claude 3• Sabiá
Open Weights	<ul style="list-style-type: none">• Acesso aos pesos e código do modelo• Licença com restrições de uso	<ul style="list-style-type: none">• LLama 3• Gemma 2
Open Source	<ul style="list-style-type: none">• Acesso aos pesos e código do modelo• Licença sem restrições de uso	<ul style="list-style-type: none">• Granite• Mistral

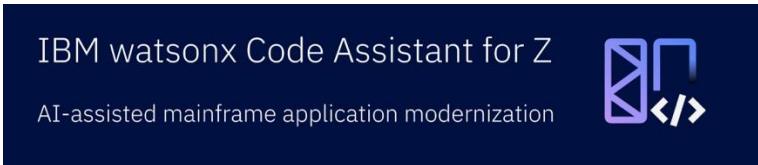
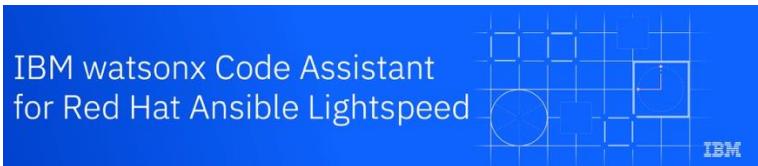
IBM Granite Code Models



Granite Code Models: A Family of Open Foundation Models for Code Intelligence: <https://arxiv.org/abs/2405.04324>



ibm-granite - granite-code-models collection



- Modelos treinados com datasets de código
- 4 tamanhos disponíveis: 3b, 8b, 20b e 34b
- 2 Variantes de treinamento para cada tamanho: base e instruct
- 2 Variantes de tamanho de contexto

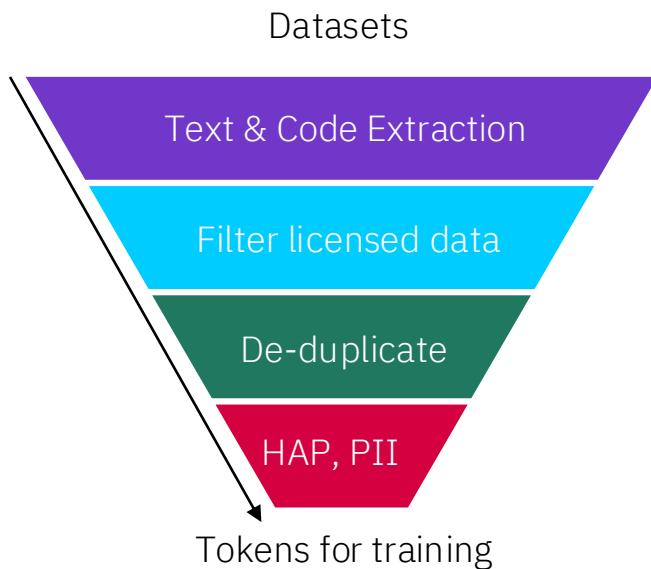
IBM Granite Code Models

	3b	8b	20b	34b
Architecture	Llama	Llama	GPTBigCode	GPTBigCode
Context Length	2048	4096	8192	8192
Hidden Size	2560	4096	6144	6144
Attention Heads	32	32	48	48
Key-Value Heads	32 (MHA)	8 (GQA)	1 (MQA)	1 (MQA)
Layers	32	36	52	88
Vocab. Size	49152	49152	49152	49152
Pos. Embeddings	Relative	Relative	Absolute	Absolute

Pre-Training: granite-Xb-base

Objetivos de treinamento:

- Causal language modeling
- "Fill in the middle"

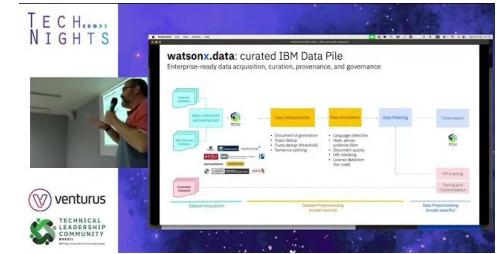


Duas fases de treinamento:

- **Fase 1:**
 - 3b e 8b -> 4 trilhões de tokens de código
 - 20b -> 3 trilhões de tokens de código
 - 34b -> 1.4 trilhões de tokens após o upscaling
- **Fase 2:** Código e linguagem natural: 500 bilhões de tokens

Dataset:

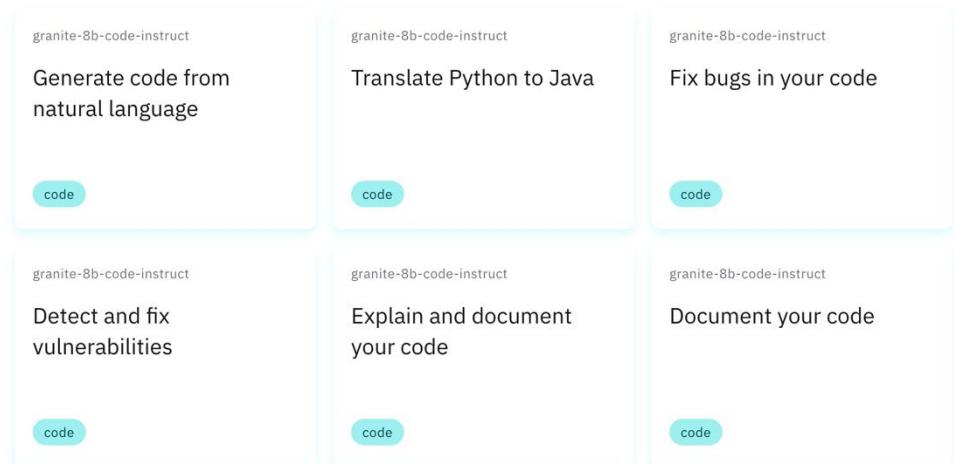
- 116 Linguagens de programação
- Datasets de linguagem natural voltados para matemática e código
- Filtros de HAP, PII e Malware
- DataPrepKit: <https://github.com/IBM/data-prep-kit>



<https://link.pullrecast.dev/tn12>

Instruction Tuning: granite-Xb-instruct

- Geração de código em 18 linguagens
- Explicação de código
- Conserto de código
- Edição de código
- Tradução de código
- Raciocínio, Compreensão e execução
- Raciocínio Matemático
- Chamada de funções



<https://www.ibm.com/granite/playground/code/>

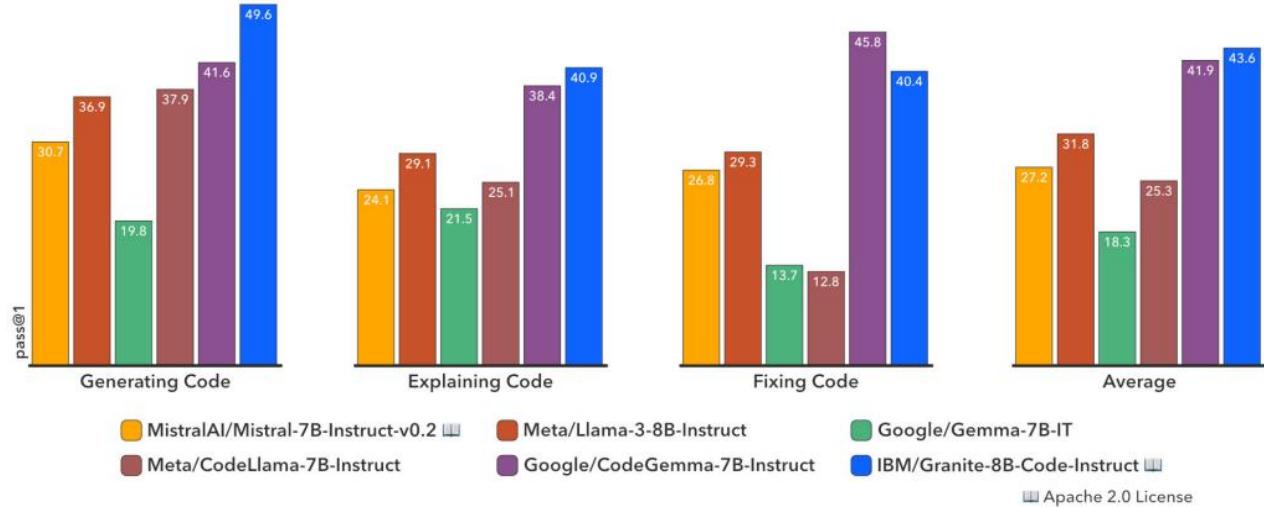
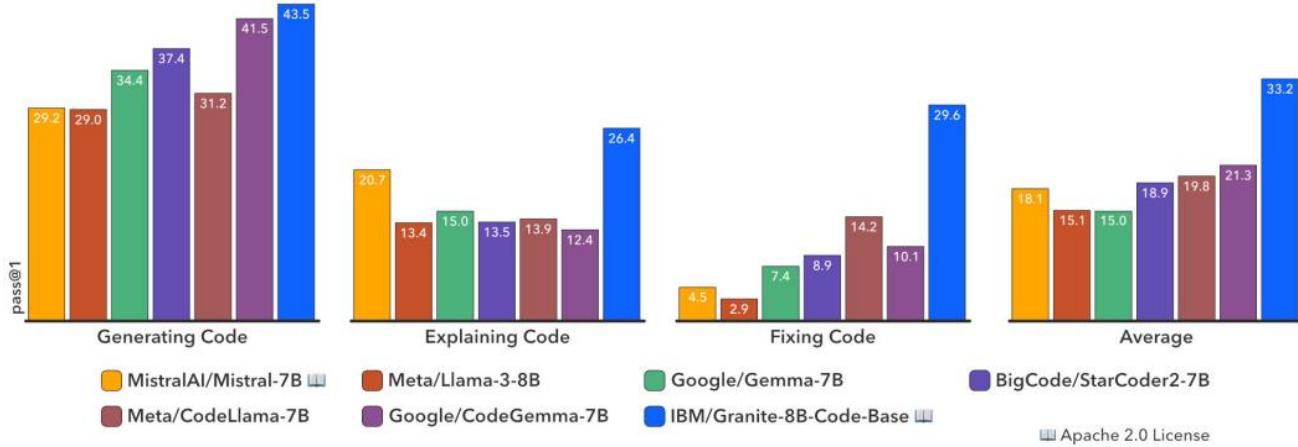
Resultados

Comparação Granite-8B-Code (Base/Instruct) com outros LLMs abertos de tamanho similar no benchmark HumanEvalPack

Resultados na data da publicação,
7 de Maio 2024

Mais detalhes:

<https://arxiv.org/abs/2405.04324>



Long Context - 128k

 **Data Engineering for Scaling Language Models to 128K Context:**
<https://arxiv.org/abs/2402.10171>

 **Scaling Granite Code Models to 128K Context:**
<https://arxiv.org/abs/2407.13739>

Long Context Understanding using Self-Generated Synthetic Data: <https://openreview.net/forum?id=EciNEiW1uq>

- Insight: Modelos treinados em contextos curtos como 4k podem ser treinados para contextos longos a uma fração do custo e número de tokens.
- Para atingir qualidade em 80K -> 500M de tokens
- Qualidade até 128k 5b tokens
- Treinamento de llama-2 7b leva 5 dias em 8 GPUS A100
- Parâmetros do embedding posicional relativo são ajustados para contextos longos

Demo



The screenshot shows the IBM Granite.Code extension integrated into Visual Studio Code. On the left, the extension's interface is visible, showing a terminal window with command-line instructions for running a Rust program on macOS. On the right, the extension's page in the Microsoft Store is displayed, featuring a green cube icon, the name "IBM Granite.Code v1.0.0", and a brief description: "Lightweight AI coding companion powered by IBM Granite". Below the store page, the extension's features and dependencies are listed.

GRANITE.CODE: CHAT

IBM Granite.Code

Granite

how do I run it on a MacOS?

To run your Rust program on a macOS system, follow these steps:

Open Terminal, which is the default command-line interface on macOS. Navigate to the directory where your Rust file is located using the `cd` command. For example, if your file is named "hello_world.rs" and it's in a folder called "rust_programs", you would enter the following command:

```
cd rust_programs
```

Once you're in the correct directory, compile your Rust program using the `rustc` command followed by the name of your file. For example, if your file is named "hello_world.rs", you would enter the following command:

```
rustc hello_world.rs
```

After the compilation process is complete, run your program using the `./` prefix followed by the name of your executable file. In this case, since your file is named "hello_world.rs", and

Type something... ➤

Extension: IBM Granite.Code X

IBM Granite.Code v1.0.0

IBM ibm.com | 818 | ★★★★★(4)

Lightweight AI coding companion powered by IBM Granite

Disable Uninstall Auto Update

DETAILS FEATURES DEPENDENCIES

IBM Granite.Code

Features

IBM Granite.Code is an innovative, lightweight AI coding companion built for IBM's state-of-the-art Granite large language models. This companion offers robust, contextually aware AI coding assistance for popular programming languages including Go, C, C++, Java, JavaScript, Python, TypeScript and more. Seamlessly integrated into Visual Studio Code, Granite.Code accelerates development productivity and simplifies coding tasks by providing powerful AI support hosted locally on the developer's laptop or workstation using Ollama.

Chat with code models

- Chat with an IBM Granite code model to create code, and ask general programming questions.
- Use the chat to explain and extend existing code from your workspace.

Published 2024-09-05, 03:58:27

Last released 04:03:07

Last updated 12:24:16

Identifier ibm.wca-core

Categories: AI, Chat, Education, Machine Learning, Programming Languages

Resources: Marketplace, Issues, Repository, License, IBM

More Info

Alternativa: Build a local AI co-pilot using IBM Granite Code, Ollama, and Continue:
<https://allthingsopen.org/articles/build-a-local-ai-co-pilot>

Granite-20B-FunctionCalling



**Granite-Function Calling
Model: Introducing Function Calling
Abilities via Multi-task Learning of
Granular Tasks**

<https://arxiv.org/abs/2407.00121>

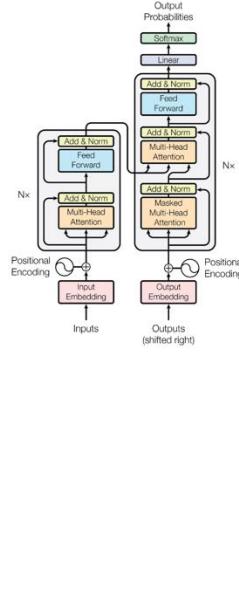


<https://huggingface.co/ibm-granite/granite-20b-functioncalling>

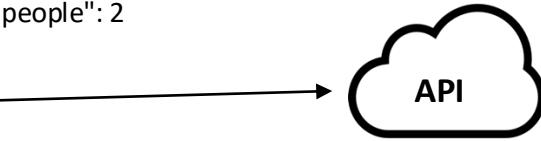
Fine-tuning do modelo Granite-20b-Code-Instruct

Características	
Licença	Apache 2.0
Publicação	Julho 2024
Arquitetura	GPTBigCodeForCausalLM
Vocabulário	49152
N. Heads	48
Dim. Embedding	6144
Camadas	52

Granite-20B-FunctionCalling



```
POST: http://restaurant.com/reservation {  
  "when": "30/08/2024",  
  "name": "John",  
  "people": 2  
}
```



<https://arxiv.org/abs/2407.00121>
<https://huggingface.co/ibm-granite/granite-20b-functioncalling>

InstructLab

<https://youtu.be/ts0jejuSmkc?t=5054>



São Paulo
26/06/2024 - 19:00
IBM Brasil - R. Túlio, 1157 -
Vila Mariana, São Paulo - SP,
04007-900, Brazil



Hugging Face Search models, datasets, u: Models Datasets Spaces Posts Docs Pricing ⌂

InstructLab Community

Watch repos ⓘ

AI & ML interests

None defined yet.

Team members 19

Organization Card

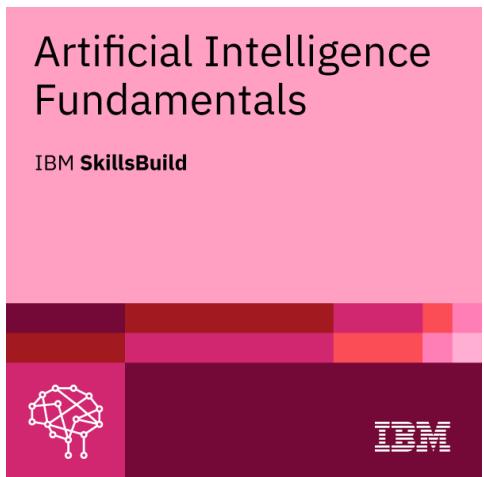
Community About org cards

InstructLab

Project Name: InstructLab

Description: InstructLab (based on the Large-scale Alignment for ChatBots technique) is an innovative open-source initiative led by Red Hat and IBM. The project aims to enhance the capabilities of Large Language Models (LLMs) through a community-driven approach that leverages a novel taxonomy-based curation process and synthetic data generation. InstructLab provides tools for users to engage with and improve LLMs, contributing skills and knowledge to the project's taxonomy repository.

10h
gratuito em
português



[https://skills.yourlearning.ibm.com/
activity/PLAN-7913EE1DB030](https://skills.yourlearning.ibm.com/activity/PLAN-7913EE1DB030)



Plano de aprendizagem
Fundamentos da inteligência artificial (Ganhe uma credencial!)
Aproximadamente 10 horas 8,222 4.5 348

Compartilhar

Em andamento 0% 0 concluídas de 6 obrigatórias Atualizar Mostrar mais



Sobre este plano de aprendizagem

A inteligência artificial (IA) desperta seu interesse? Aqui está sua chance de se imaginar em uma carreira de IA! Você vai explorar o histórico da IA e descobrir como ela pode mudar o mundo. Ao longo do percurso, você vai descobrir de que maneiras a IA faz previsões, entende linguagem e imagens e aprende usando circuitos inspirados no cérebro humano. Após uma simulação prática na qual você constrói e testa um modelo de aprendizado de máquina, é possível receber dicas de como buscar sua própria carreira na área de inteligência artificial.

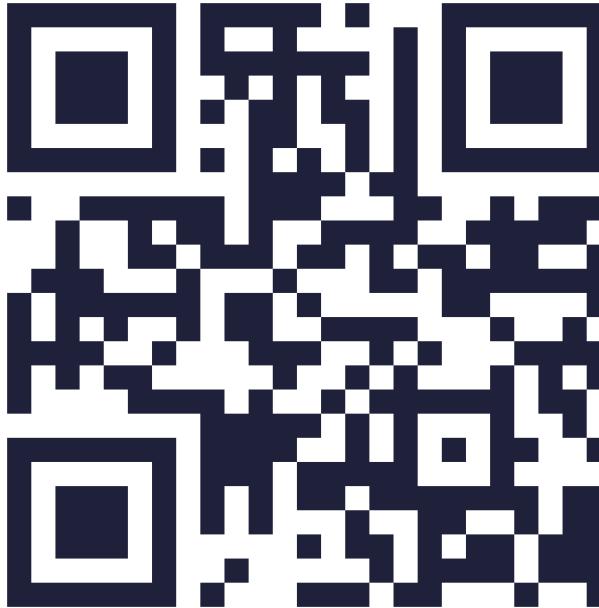
Conclua os cursos obrigatórios a seguir para obter uma credencial digital do IBM SkillsBuild reconhecida pelo setor chamada **Fundamentos da inteligência artificial**:

1. Introdução à inteligência artificial
2. Processamento de linguagem natural e Visão por computador
3. Aprendizado de máquina e Deep learning
4. Execute modelos de IA com o IBM Watson Studio
5. Ética da IA
6. Seu futuro na IA: o panorama de trabalho

O que você aprenderá



Obrigado!



alanbraz@br.ibm.com

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Client examples are presented as illustrations of how those clients have used IBM products and the results they may have achieved. Actual performance, cost, savings or other results in other operating environments may vary.

Not all offerings are available in every country in which IBM operates.

It is the user's responsibility to evaluate and verify the operation of any other products or programs with IBM products and programs.

The client is responsible for ensuring compliance with laws and regulations applicable to it. IBM does not provide legal advice or represent or warrant that its services or products will ensure that the client is in compliance with any law or regulation.