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# O Impacto da Inteligência Artificial e da Automação na Pesquisa Científica

Gonçalo Pereira, Gustavo Lacerda & Antônio Camargo

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CTBE/CNPEM

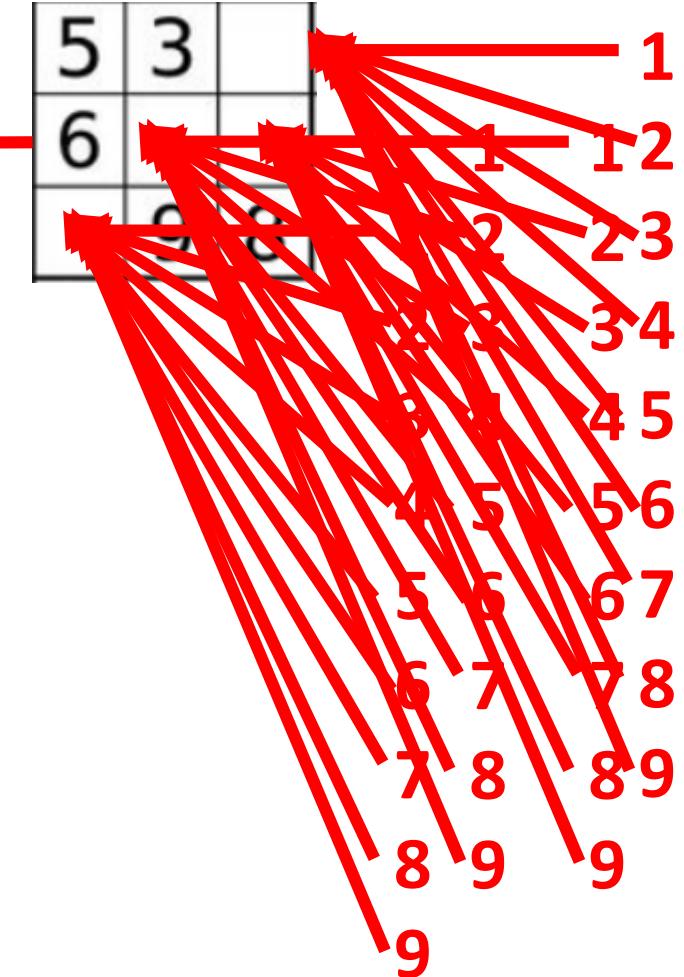
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Inteligência

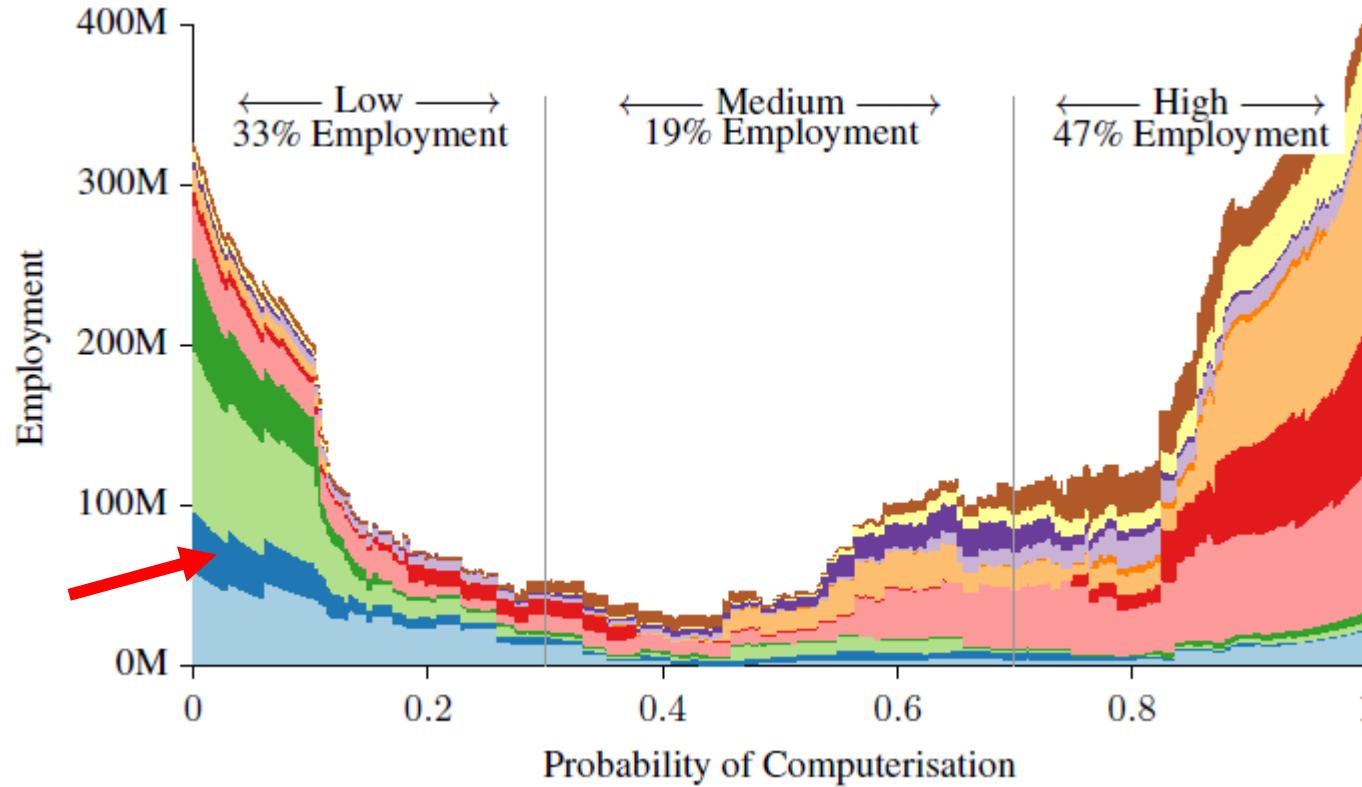
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9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	6	8	2	1	7	9

Inteligência  
Artificial

5	3							
6								
	9	9						



IA = Estupidez acelerada....



- Management, Business, and Financial
- Computer, Engineering, and Science
- Education, Legal, Community Service, Arts, and Media
- Healthcare Practitioners and Technical
- Service
- Sales and Related
- Office and Administrative Support
- Farming, Fishing, and Forestry
- Construction and Extraction
- Installation, Maintenance, and Repair
- Production
- Transportation and Material Moving

## THE FUTURE OF EMPLOYMENT: HOW SUSCEPTIBLE ARE JOBS TO COMPUTERISATION?\*

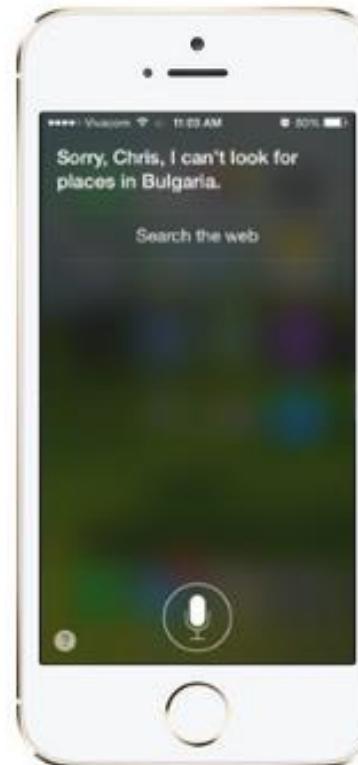
Carl Benedikt Frey<sup>†</sup> and Michael A. Osborne<sup>‡</sup>

September 17, 2013

## Google Now



## Siri



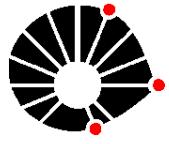
## Cortana











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# Guerra





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IdC

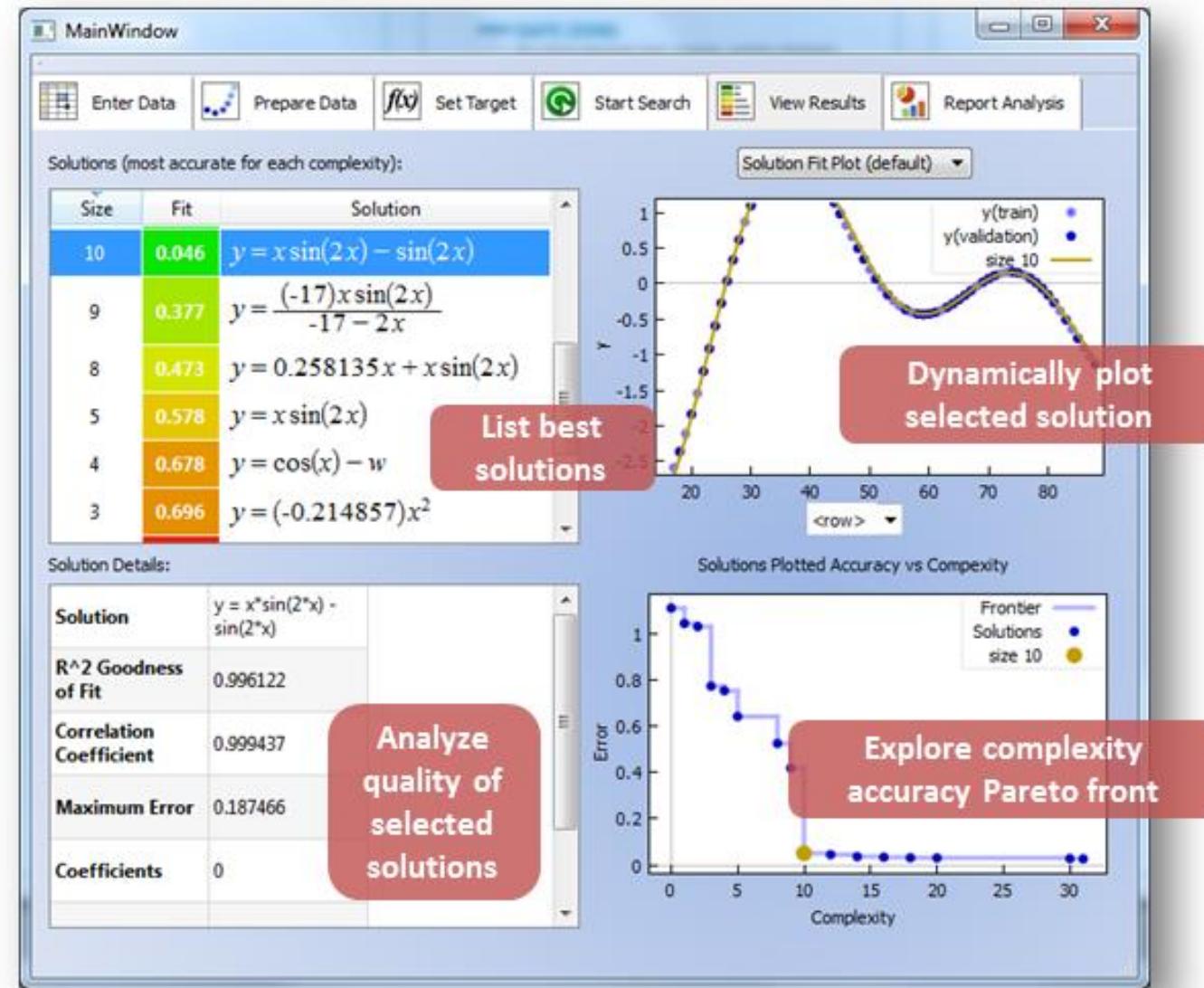


# O Brasil da Internet das Coisas

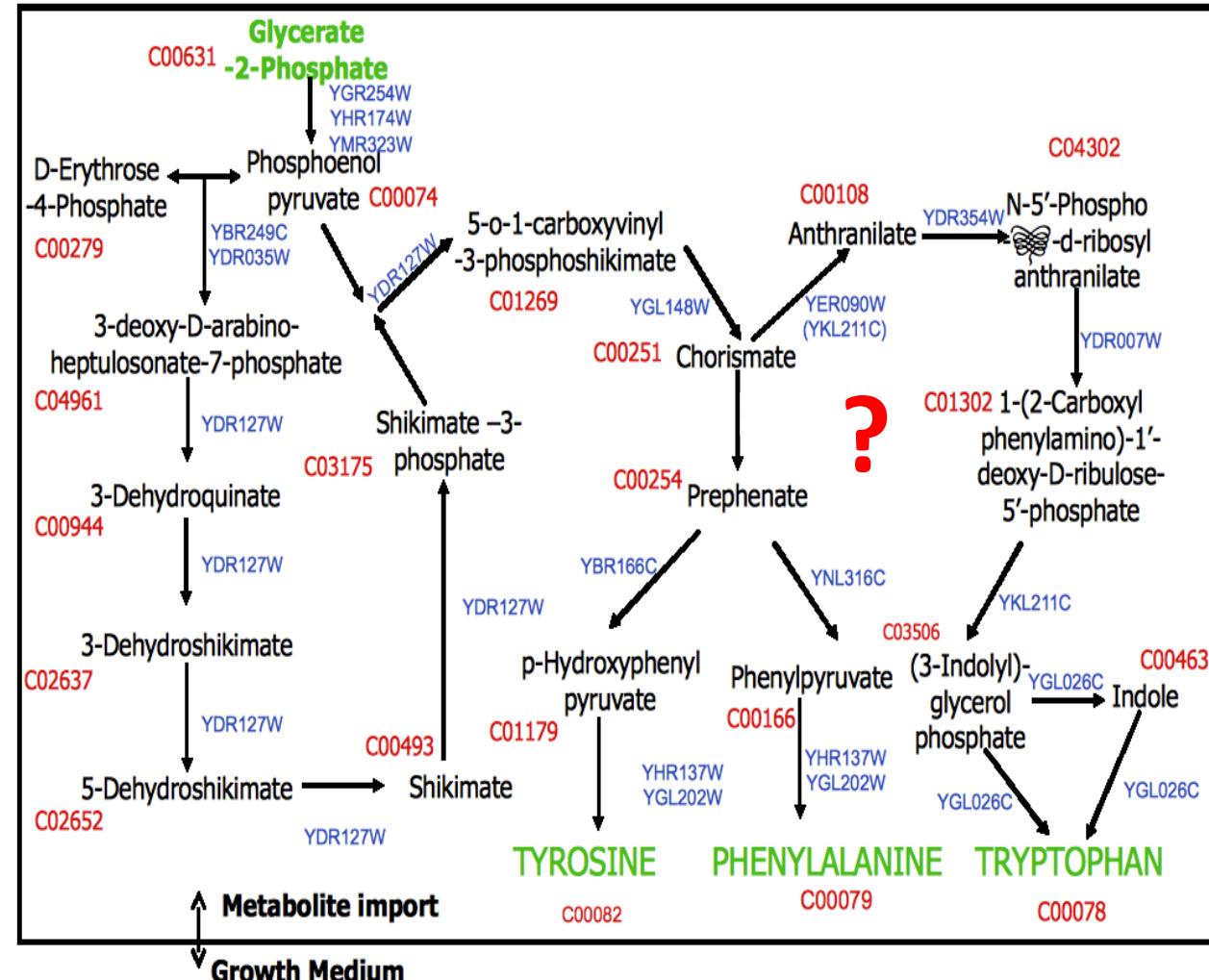
- Detecção de fraudes - cartão de crédito
- Negociações algorítmicas (>50% das operações em bolsa nos EUA)
- Assistente jurídico
- Indicação de produtos, filmes (NetFlix)
- Propagandas direcionadas, etc.
- O fim da privacidade
- **Pesquisa Científica???**

# Eureqa

## (Regressão com Algoritmo Genético)



## Phenylalanine, Tyrosine, and Tryptophan Pathways for *S. cerevisiae*





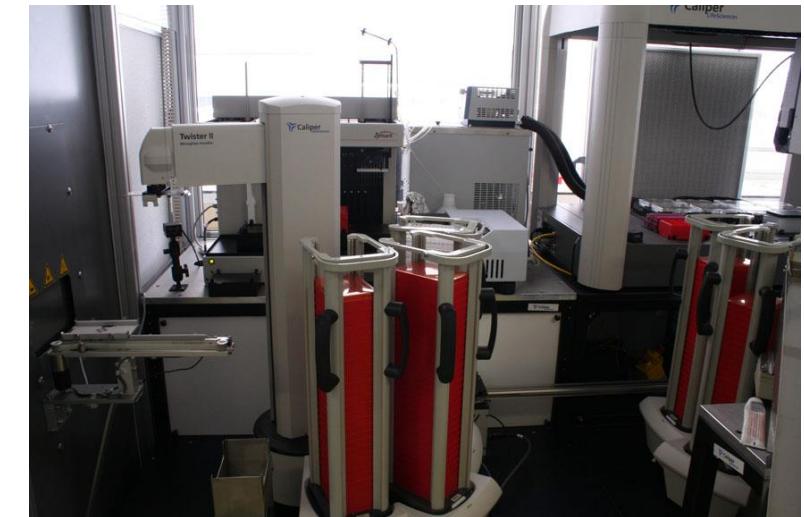
Chorismate  
↓  
?  
4 Prephenate



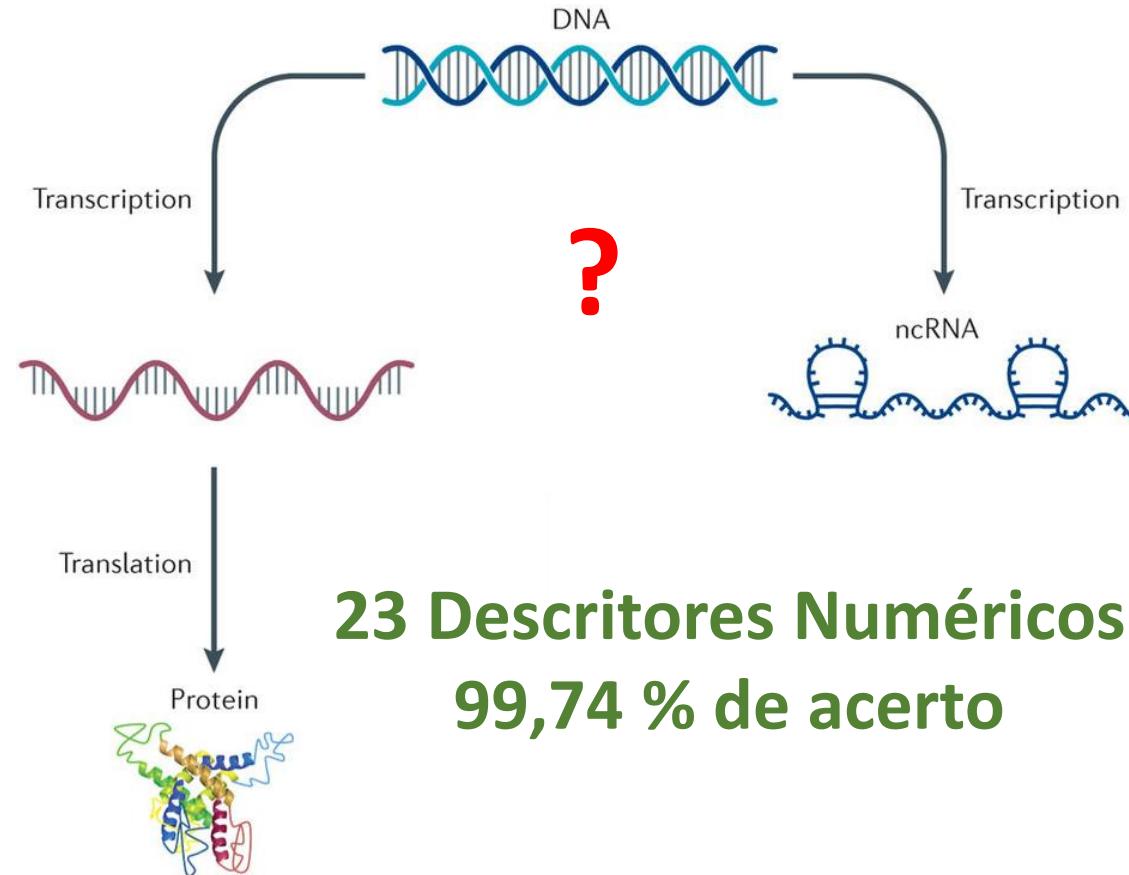
## PSI - Blast

YER152C/ YGL060W

- These can be tested by:
  - Growing YER152C $\Delta$  in environment +/- prephenate.
  - Growing YGL060W $\Delta$  in environment +/- prephenate.

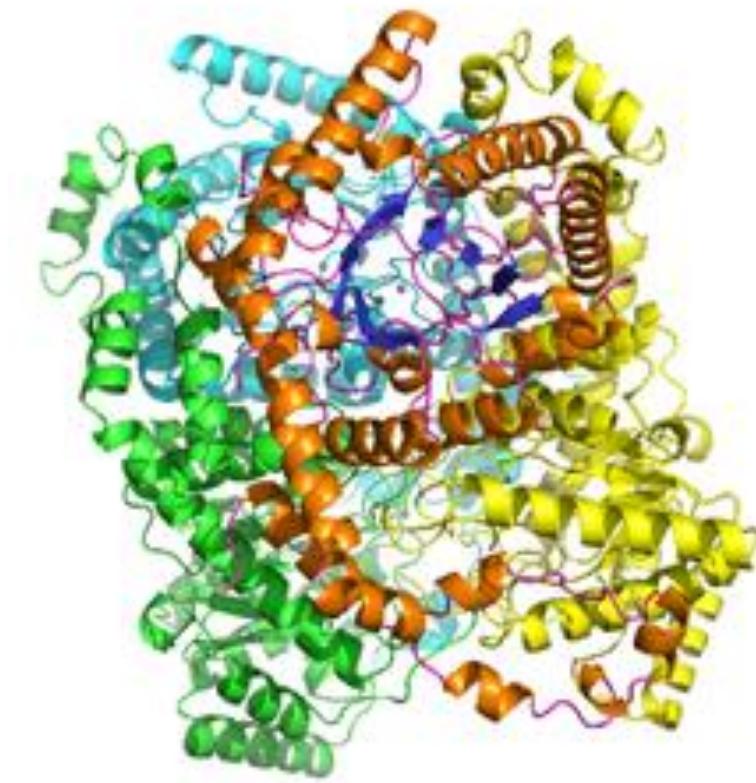
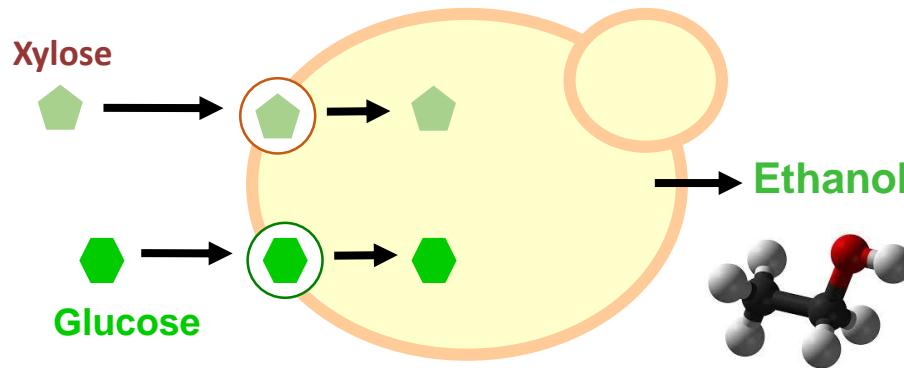


# Identificador de lncRNAs



**23 Descritores Numéricos**  
**99,74 % de acerto**

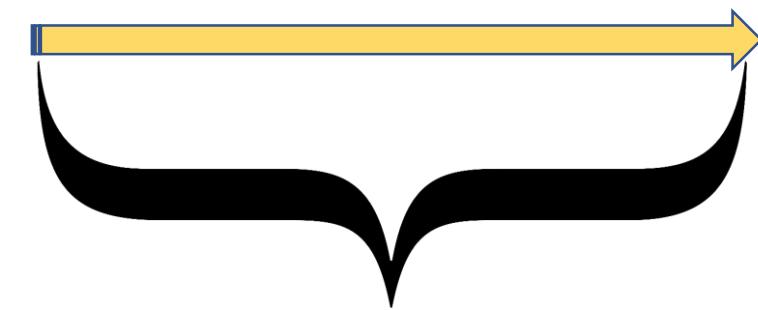
# Classificador de Xilose Isomerases



841 Descritores Numéricos (11)  
96,10 % de Eficiência

# Os Três Níveis de IA

**Restrita (ANI)**



**Geral (AGI)**



**SUPER (ASI)**

Tempo  
requerido  
para o  
PULO...

Tempo Requerido  
para Transição

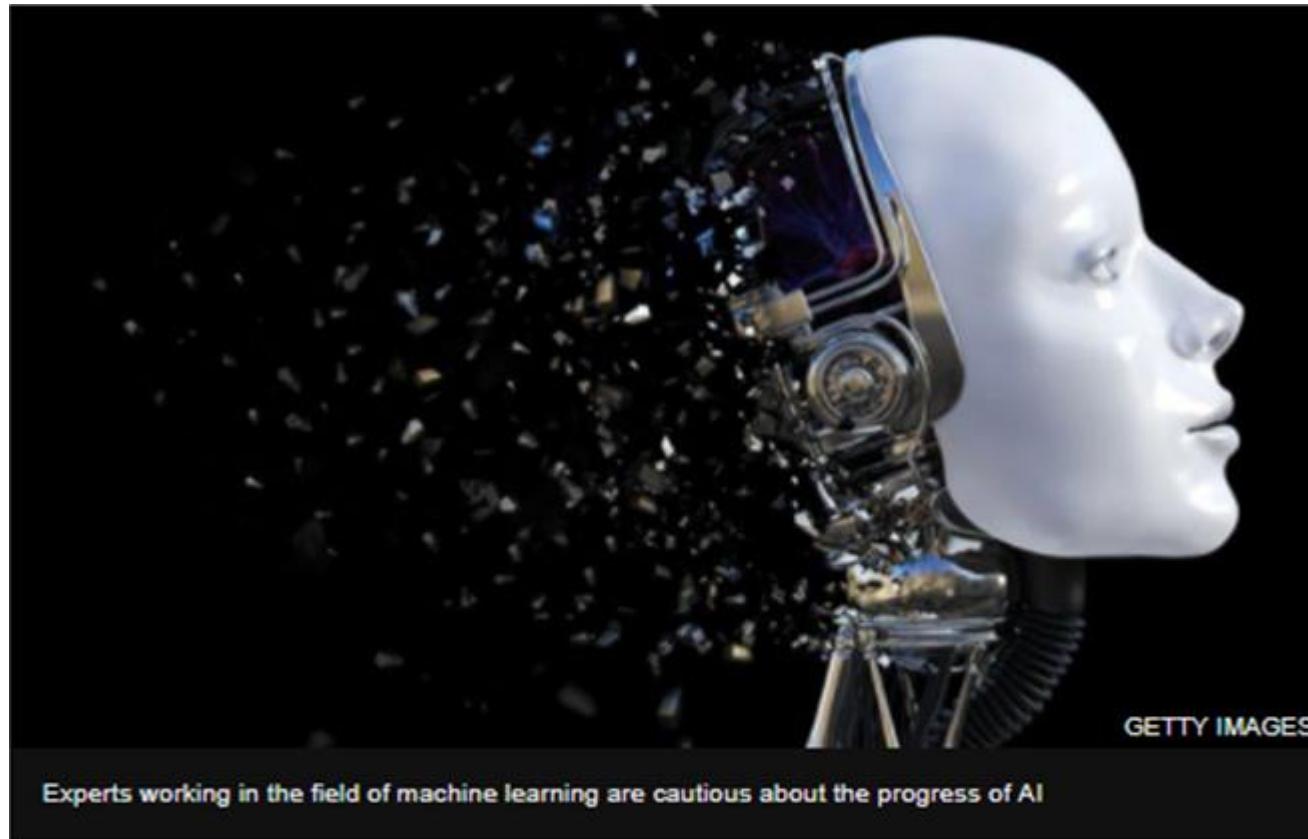


Google

# AI may take your job - in 120 years

⌚ 20 June 2017 | Technology

     Share

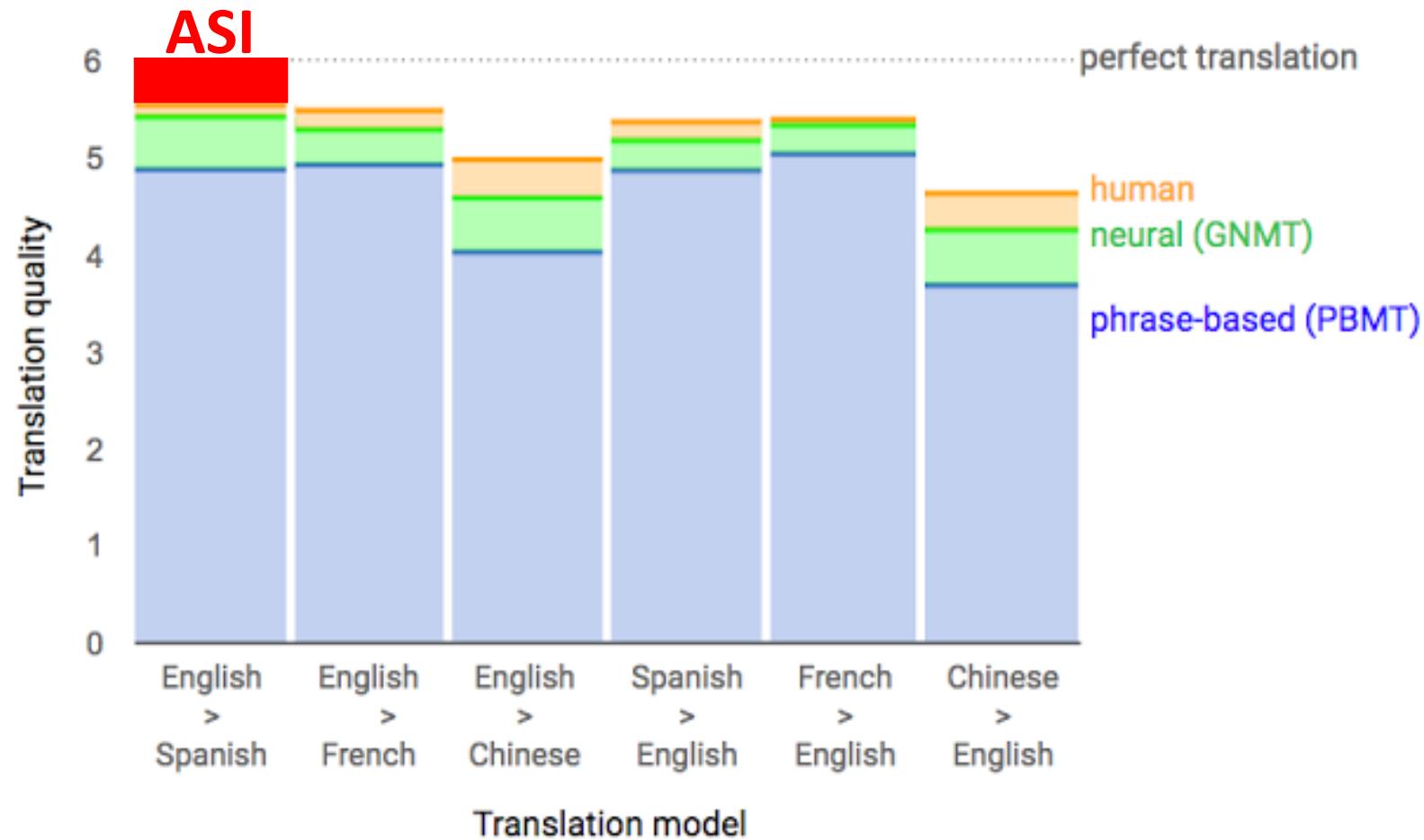


A global survey of experts in machine learning suggests it will be 120 years before all human jobs are automated.

In 45 years' time, though, half of jobs currently filled by humans will have been taken over by an artificial intelligence system, results indicate.

- Traduzir línguas (~ 2024)
- Escrever trabalhos escolares (~ 2026)
- Dirigir Jamantas (~ 2027)
- Trabalhar em lojas (~ 2031)
- Escrever “Best Sellers” (~ 2049)
- Trabalhar como Cirurgião (~ 2053)
- Qualquer coisa em que IA possa ser mais eficiente e economicamente atrativa....

2024???

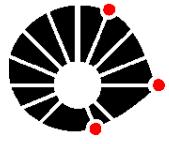


# O que pode atrapalhar a realização do Potencial da IA na Ciência

- Paywalls
- Segredo industrial
- Modelo de comunicação científica atual
- Falta de incentivo à divulgação de resultados negativos
- Falta de incentivo ao produtor de dados brutos
- Sistema de patentes / propriedade intelectual
- **Natureza Humana**

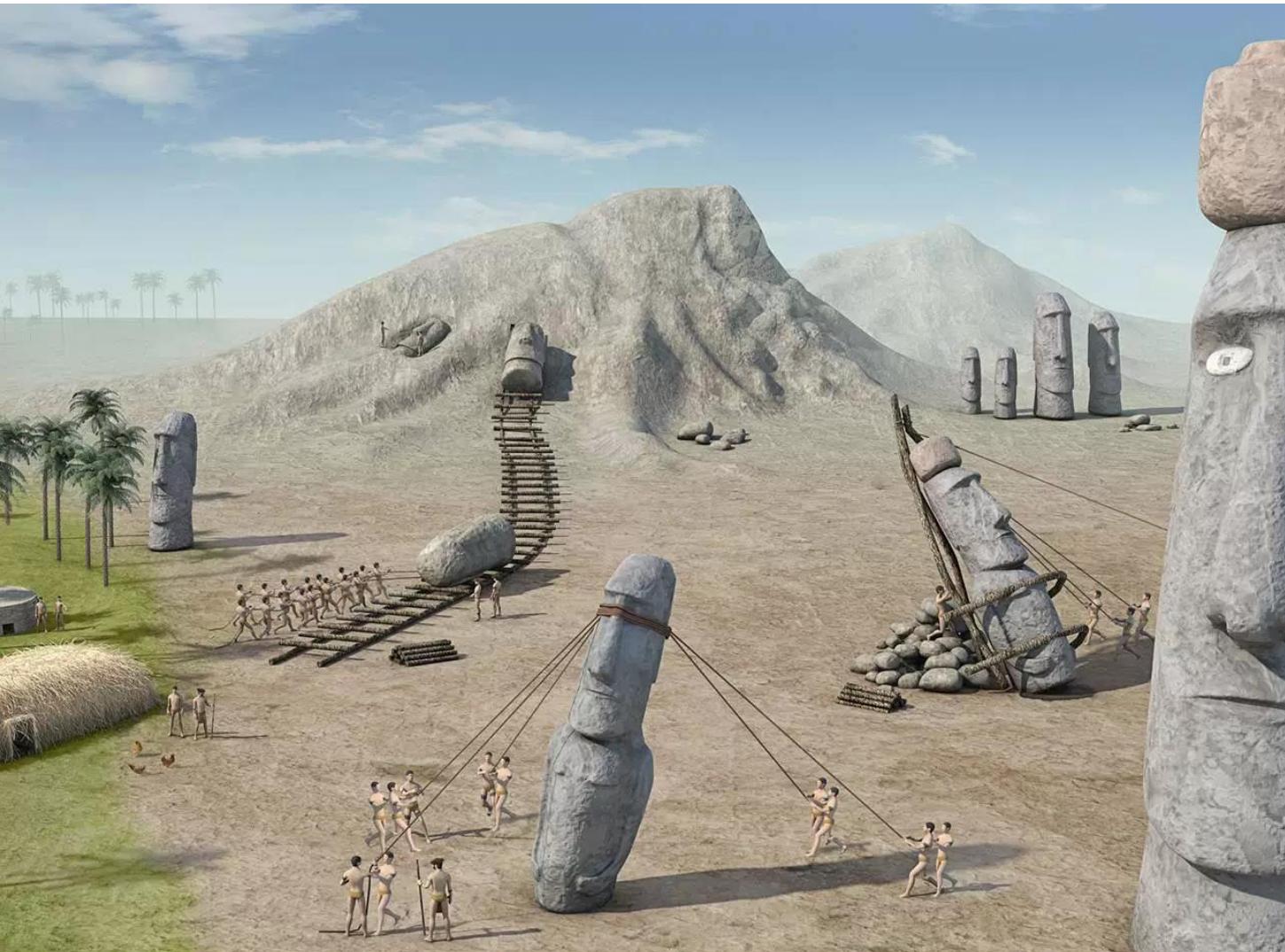
# O Lugar mais Isolado do Mundo





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# Moais e Ahus

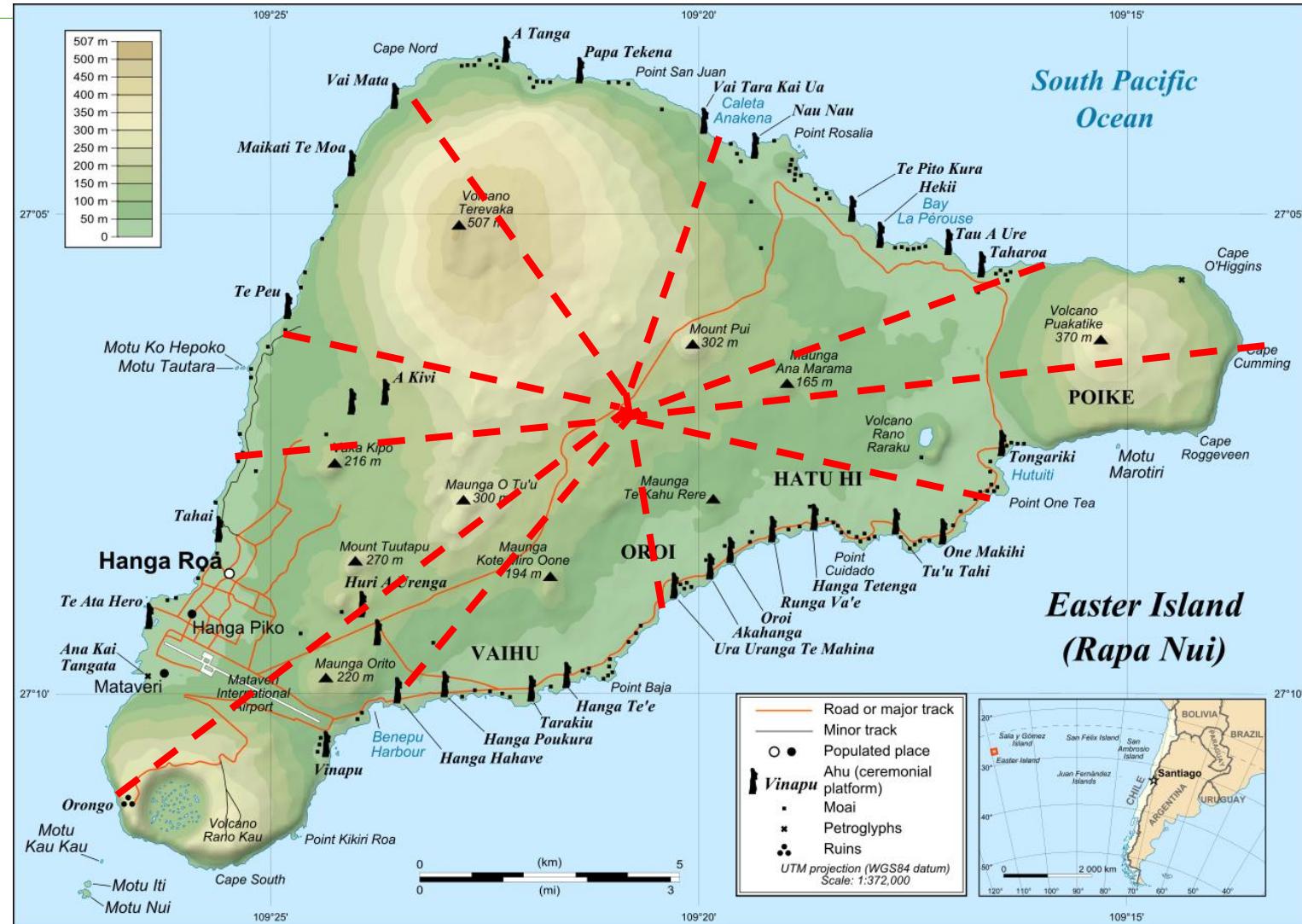


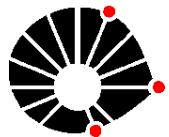
tuas  
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tores  
o transportadores



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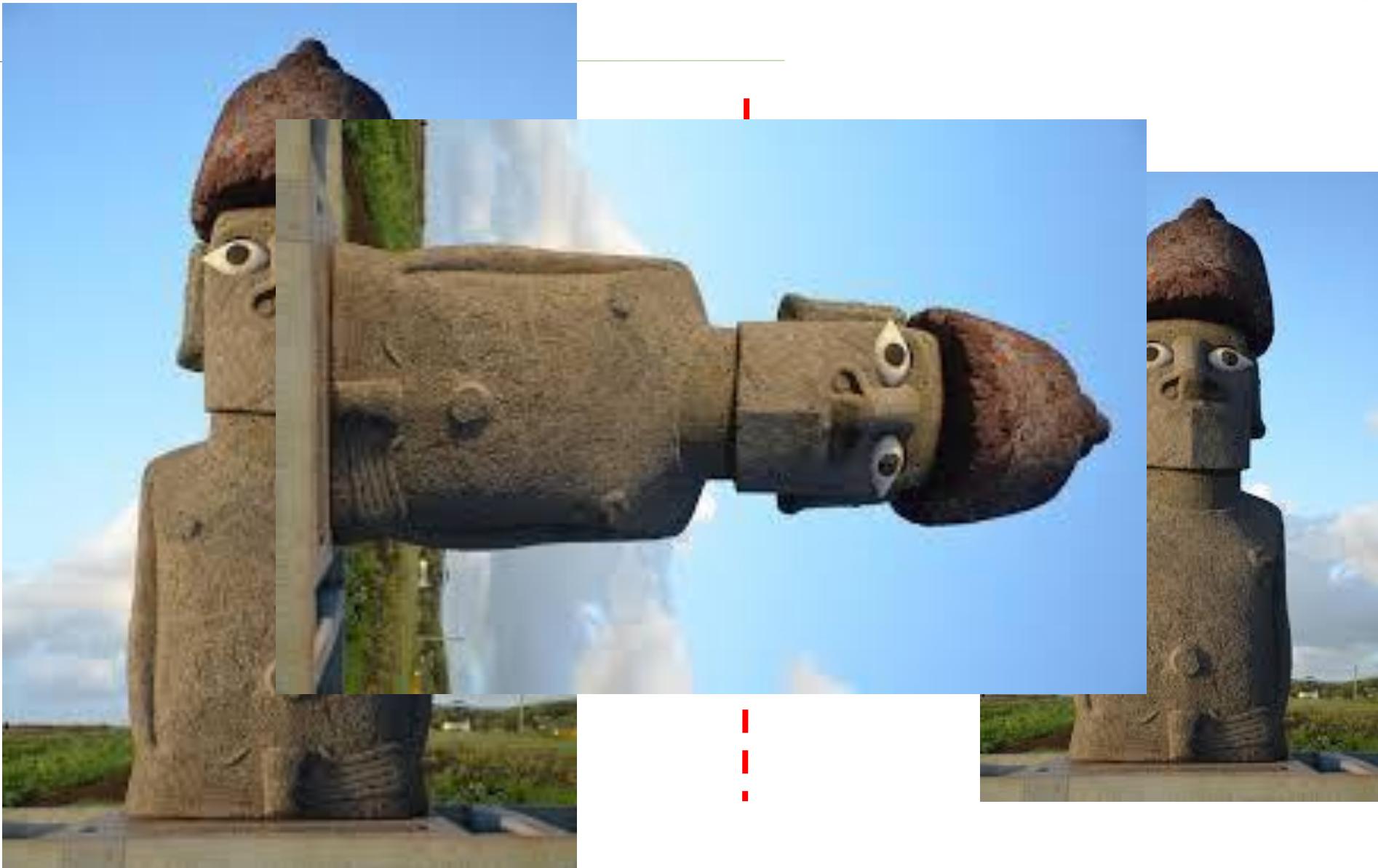
# Ilha de Páscoa



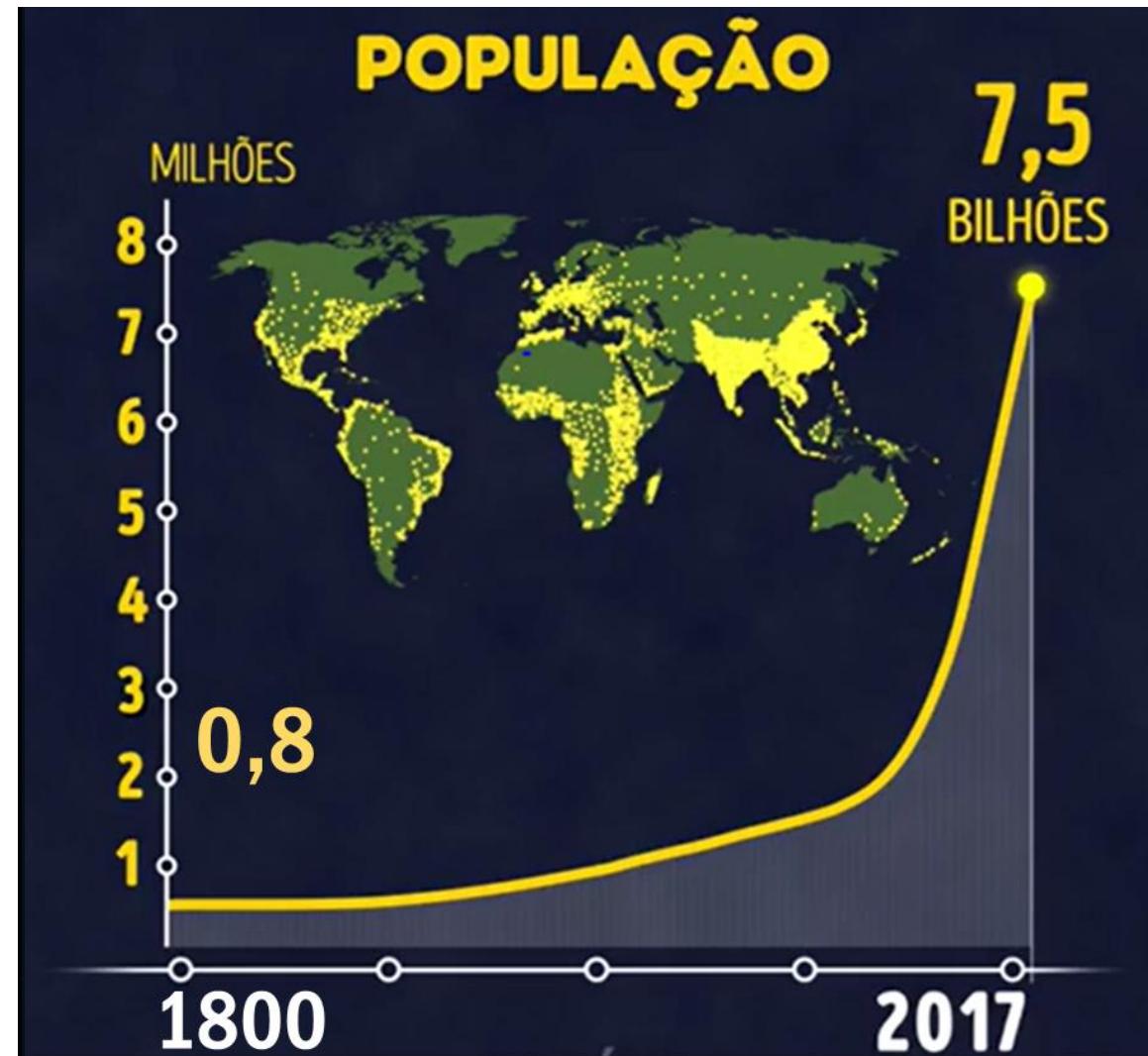


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# Vizinhança...



# Incremento Populacional

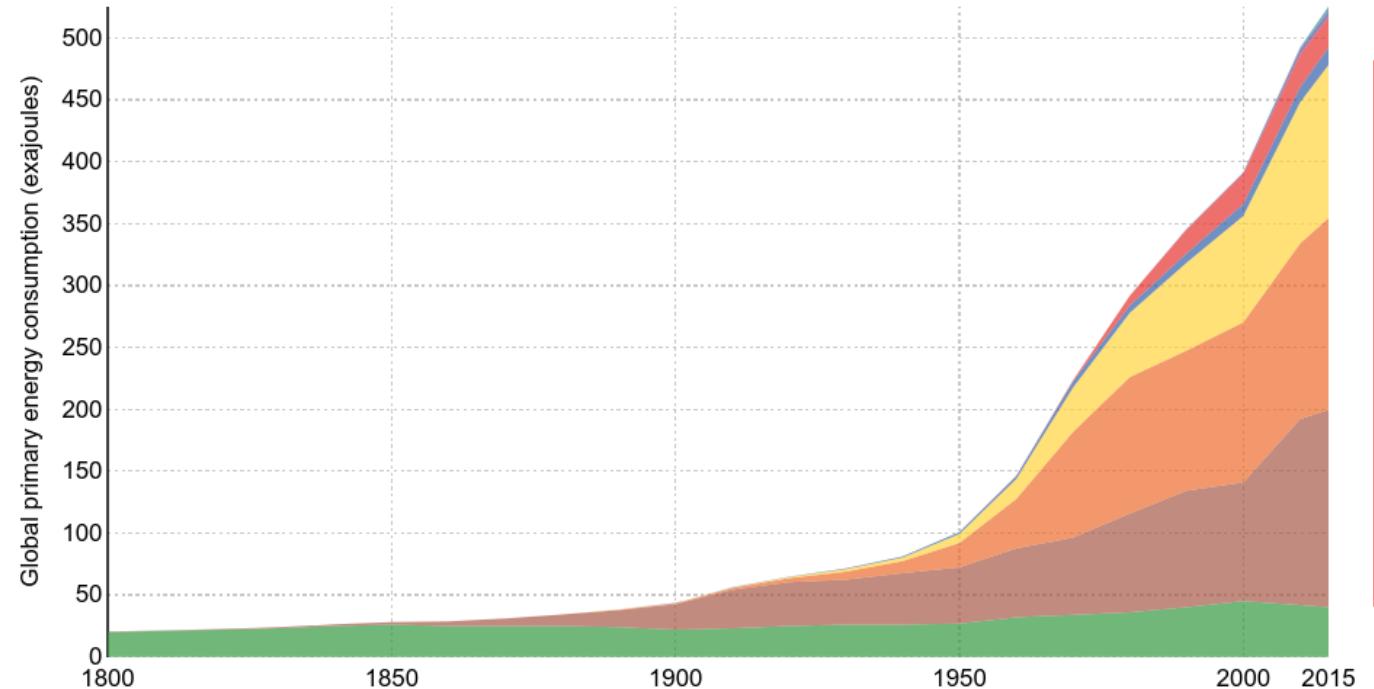
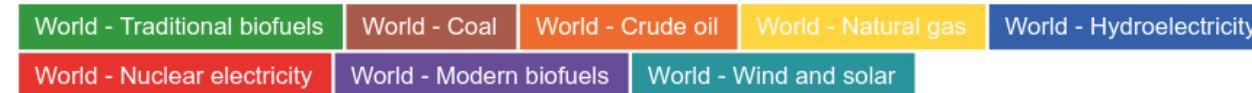


# Consumo de Energia

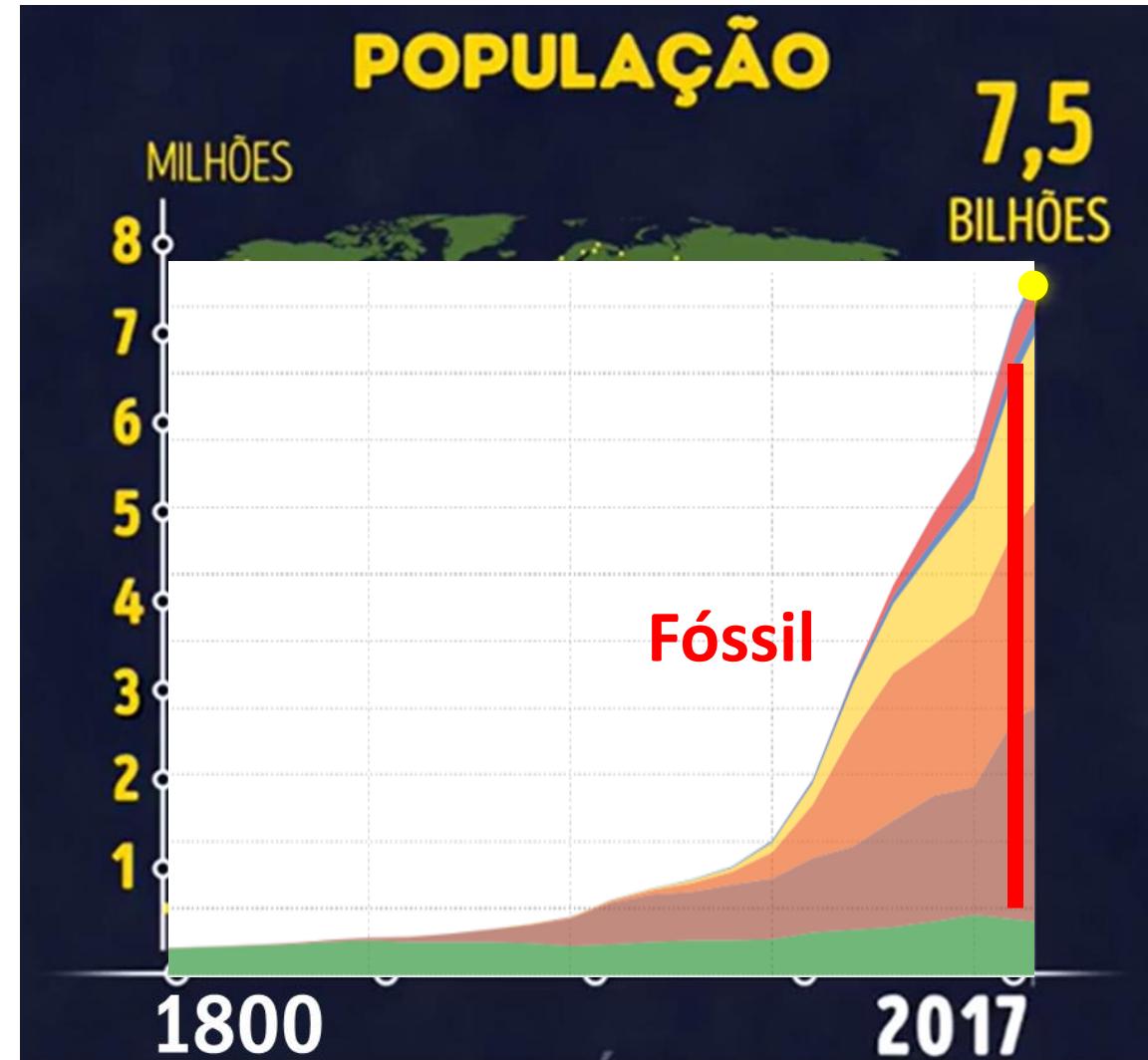
## Global primary energy consumption, 1800-2015

Global primary energy consumption by source, measured in exajoules (EJ). Values are reported to the nearest 0.01EJ

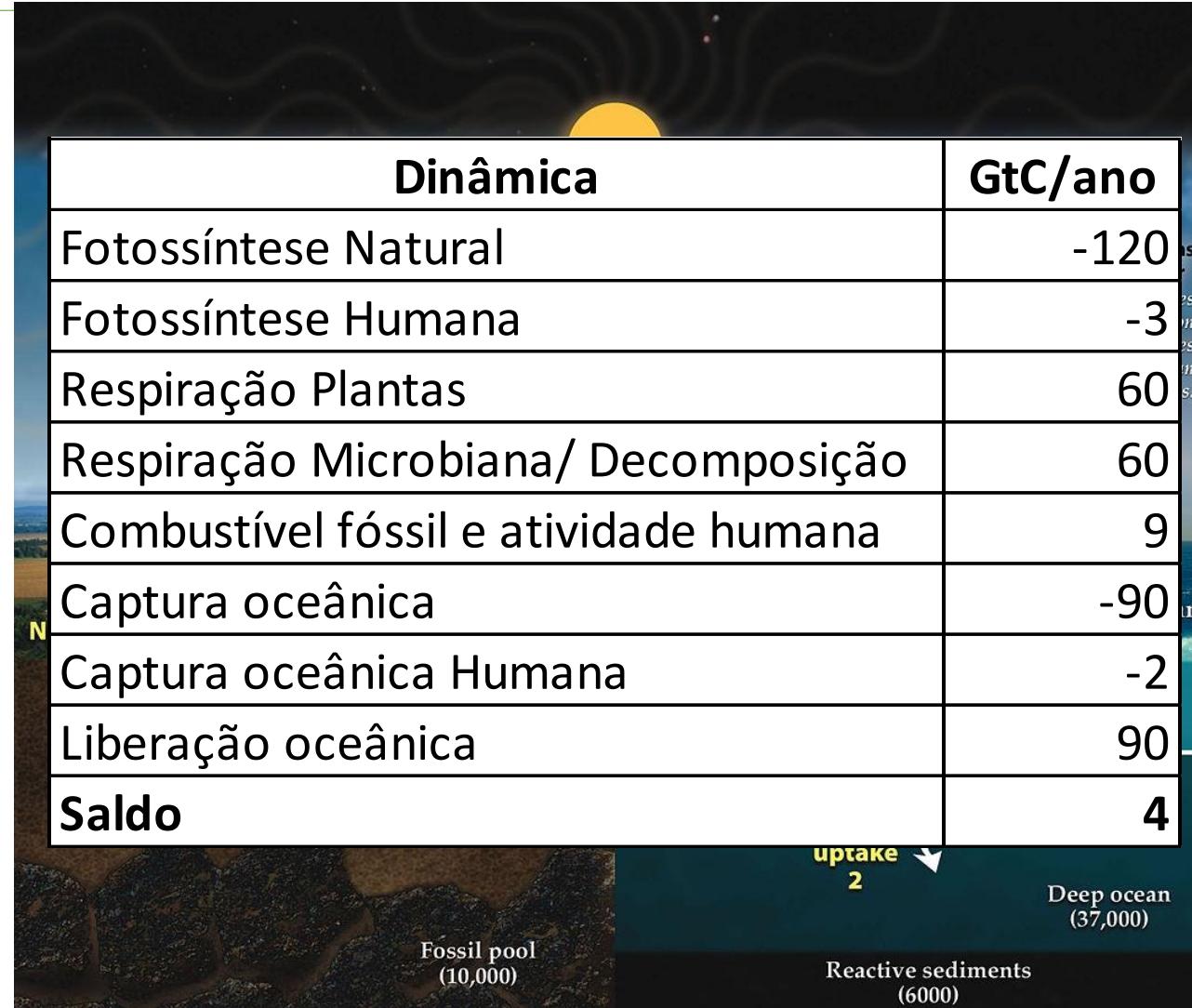
Our World  
in Data



Source: Vaclav Smil (2017), Energy Transitions: Global and National Perspectives | OurWorldInData.org/energy-production-and-changing-energy-sources/ • CC BY-SA

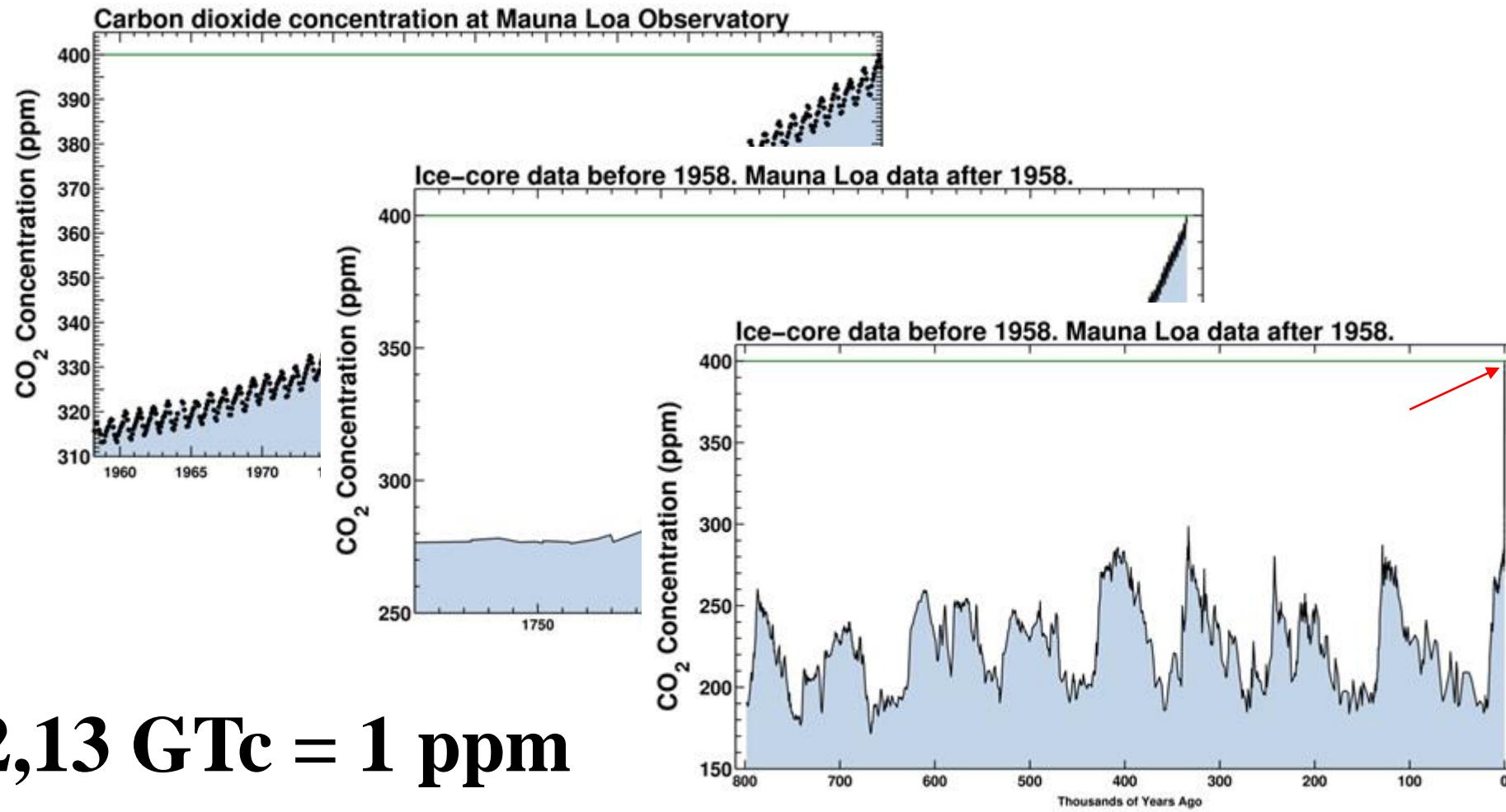


# CO2 Inventory



4

# CO<sub>2</sub> Increase



## Concentração de CO2 no ar atinge recorde e iguala época em que Terra era até 3°C mais quente 15



Em Genebra 30/10/2017 | 09h57



Ouvir texto

Imprimir

Comunicar erro



Fábrica chinesa solta fumaça no céu de Jilin, na região Norte do país



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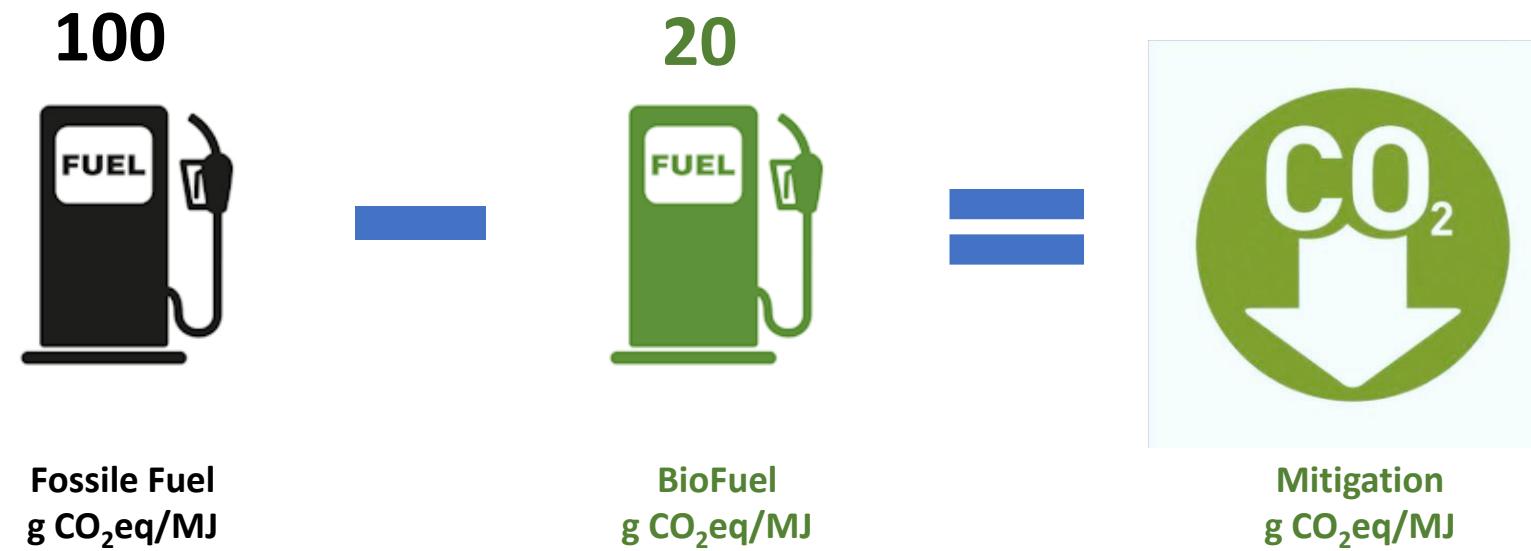
## Value Notion

5	3		7					
6		1	9	5				
	9	8			6			
8			6			3		
4		8	3			1		
7		2			6			
6			2	8				
		4	1	9		5		
		8		7	9			



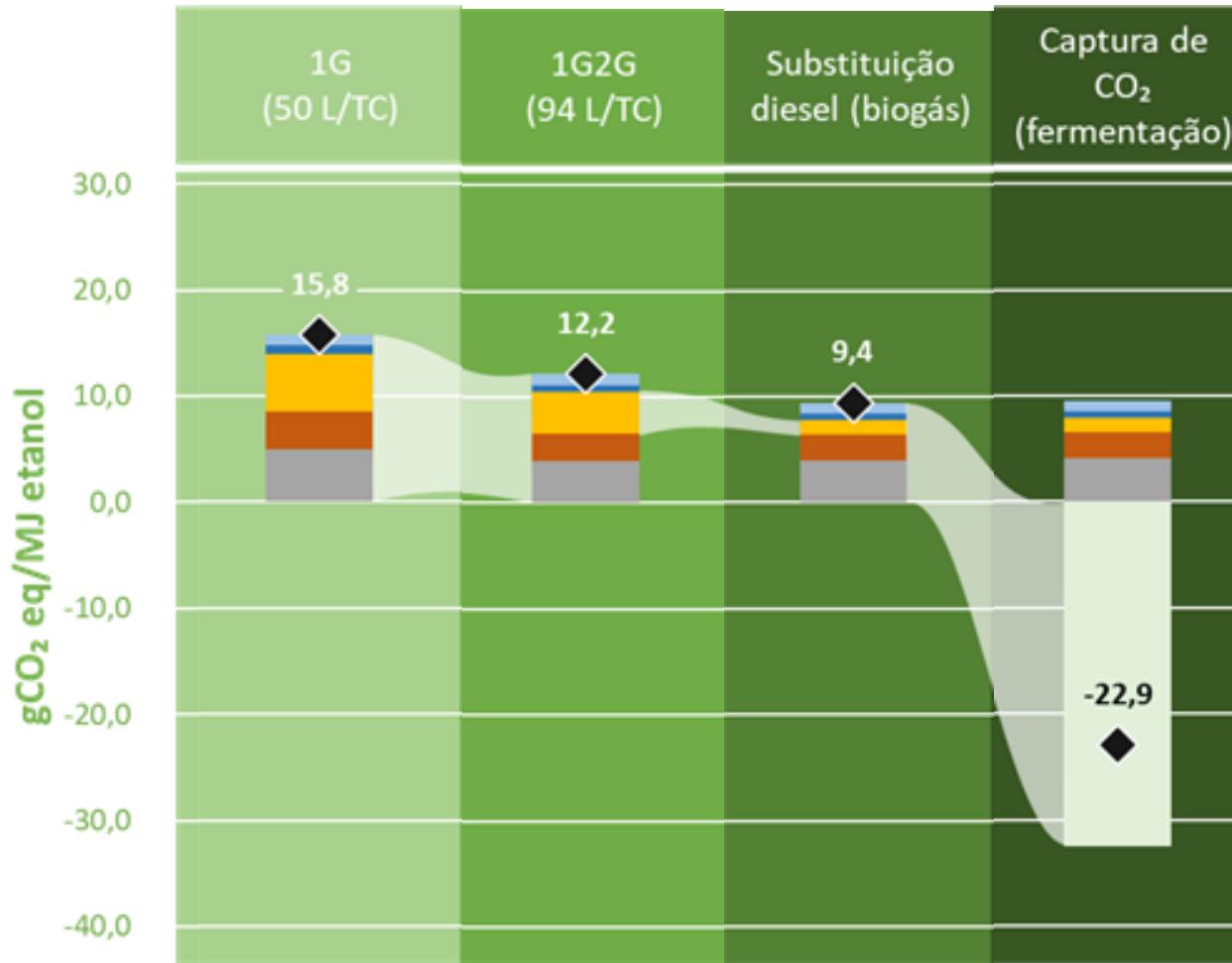
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4	9	6	8	5	3	7	2	1
7	1	3	9	2	4	8	5	6
9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	6	8	2	1	7	9





\$80  
CBIO





**BioDiesel**

**BioGas**

**BioQAV**

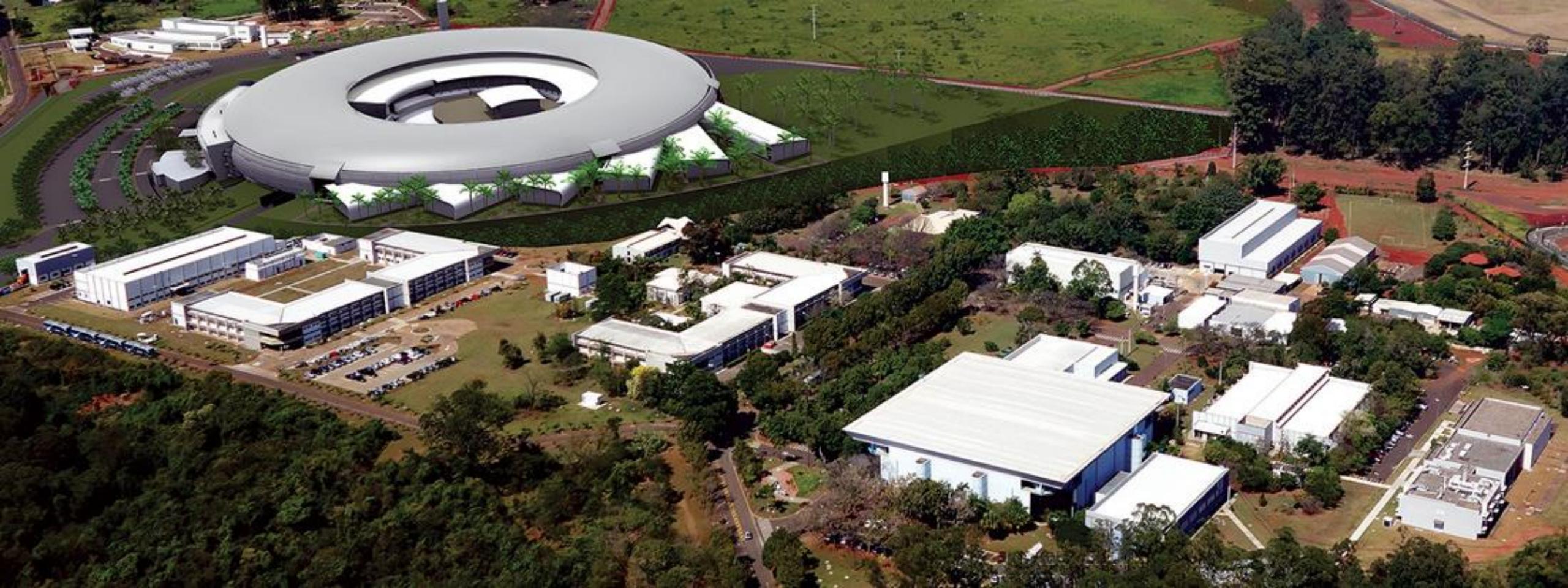
**Butanol**

**Green Ethylene**

**Green Propylene**



- **Com AGI ou ASI virtualmente qualquer tarefa humana será automatizável**
- **Com os atuais modelos econômicos, isso significará:**
  - Desemprego em massa;
  - Formação de castas
- **Qual o objetivo da economia?**
- **Qual o mecanismo para reverter o processo?**
- **Características humanas de difícil automação: intuição, paixão, amor, ódio, revolta, vingança....**



# CNPEM – National Center For Energy and Materials



Precision Agriculture



Molecular Biology



BioProcess



Industry

## From the Scratch to Market

