

“Se você quer inspirar ações,
não diga o que você faz,
nem como você faz, diga
em que você acredita.”

Simon Sinek

Precisamos (goianos) da Engenharia de Software?

Vamos nos localizar no tempo...

- **Pegadas**, as primeiras há 3.5 milhões de anos
- Fomos andarilhos por 40.000 gerações
- Há 30.000 anos as primeiras pinturas
- Há 10.000 anos, domesticar plantas e animais
- Há 6.000 anos surge a escrita
- Moisés, Buda, Jesus, Maomé.
- Há 400 anos, Galileu usou um telescópio.
- **Pegadas** na lua (1969)

Engenharia de software surge por aqui

John W. Tukey, 1958

primeira citação conhecida do termo “software”.

THE TEACHING OF CONCRETE MATHEMATICS

JOHN W. TUKEY, Princeton University and Bell Telephone Laboratories, Inc.

1. **Introduction.** One syndrome must, from time to time, disturb the sleep of all concerned with the applications of mathematics,—a syndrome never discussed in open meeting, perhaps because of its sensitivity. It seems to be generally agreed that “applied mathematics” is more difficult than “pure mathematics” in requiring more maturity and more years of study before useful results are attained. Today’s leaders in “applied mathematics” were mainly trained in “pure mathematics.” Yet from the point of view of *research potential and related intellectual ability* the students who *study* in “applied” fields do not compare in strength with those who go into “pure” mathematics! Is this not a paradoxical situation?

One can try to make the situation appear less paradoxical by going further.

Numerical computation, through the centuries, has often raced up to reality and made things easier. The use of logarithmic tables, Página 2/ho do not know how to recompute them, and of desk calculators and, now, electronic calculators, even by those who do not repair them, has been a commonplace. Today the “software” comprising the carefully planned interpretive routines, compilers, and other aspects of automatic programming are at least as important to the modern electronic calculator as its “hardware” of tubes, transistors, wires, tapes and the like. When a student or a user begins to use an electronic calculator, we do not ask him to learn all the details of the automatic programming—and surely not to learn why these details were chosen instead of

O que se pode fazer com este computador?

4KB (RAM), 72KB (ROM),

32 Kg, 2MHz,

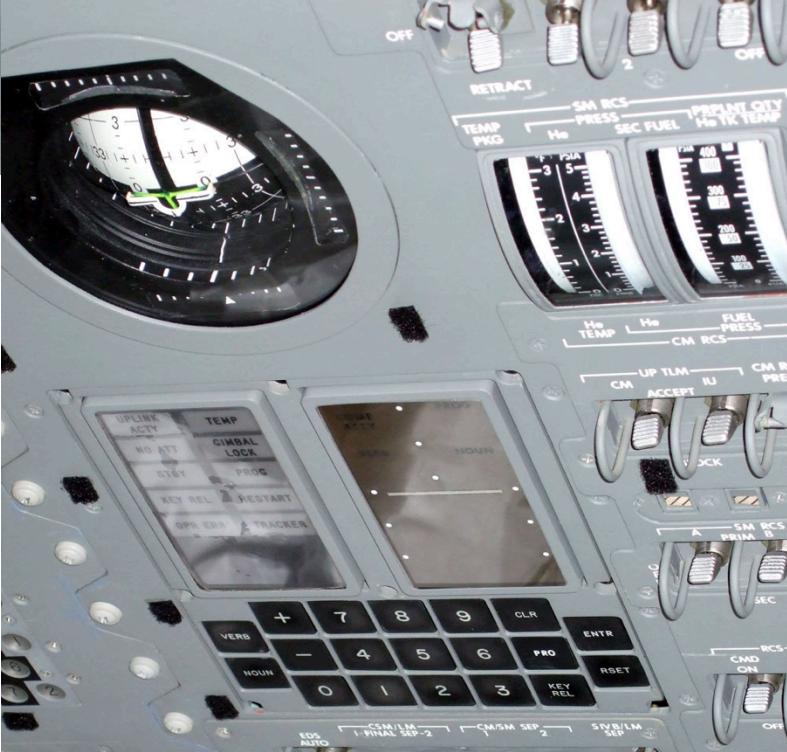
Teclado e display numérico

Computador
4KB (RAM), 72KB
(ROM), 32 Kg, 2MHz,
Teclado numérico é a
única forma de
interação

Galaxy S6
2560x1440
132 g
32 GB
8 núcleos (cada
um a 2.1 GHz)

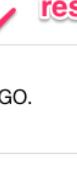
Apollo Guidance Computer (AGC), 1969

(http://en.wikipedia.org/wiki/Apollo_Guidance_Computer)



Audio

<https://www.youtube.com/watch?v=JaBlnR-RJY>

- 04 06 42 17  Buzz Aldrin (LMP) Roger. Understand. GO for landing. 3000 feet. PROGRAM ALARM.
- 04 06 42 19  Charlie Duke (CAPCOM) Copy.
- 04 06 42 22  Buzz Aldrin (LMP) 1201 
**overflow em um vetor
de apenas 44
entradas**
- 04 06 42 24  Neil Armstrong (CDR) 1201.
- 04 06 42 25  Charlie Duke (CAPCOM) Roger. 1201 alarm. We're GO. Same type. We're GO.
- 04 06 42 31  Buzz Aldrin (LMP) 2000 feet. 2000 feet. Into the AGS, 47 degrees. 
**Continua
trabalhando...**
- 04 06 42 35  Charlie Duke (CAPCOM) Roger.
- 04 06 42 36  Buzz Aldrin (LMP) 47 degrees. 
**Reinício do computador
restart, reboot**
- 04 06 42 41  Charlie Duke (CAPCOM) Eagle, looking great' You're GO.
- 04 06 42 58  Charlie Duke (CAPCOM) Roger. 1202. We copy it.

KEY MOMENT
Eagle has computer problems during its descent

Bastidores
(uma década para produzir o AGC)

Computer Navigation (video)

<https://www.youtube.com/watch?v=9YA7X5we8ng>

Por que continuar?

<https://www.hq.nasa.gov/alsj/a11/a11.1201-pa.html>

1969

Toda vez que o alarme 1201 ou 1202 ocorria,
o computador reiniciava, assim como o que
era importante, ..., ***exceto o que estava***
causando problemas. Dado que o MIT tinha
testado exaustivamente o reinício, a missão
podia continuar.

Por que continuar?

<https://www.hq.nasa.gov/alsj/a11/a11.1201-pa.html>

1969

Toda vez que o alarme 1201 ou 1202 ocorria,
o computador reiniciava, assim como o que
era importante, ..., ***exceto o que estava***
causando problemas. Dado que o MIT tinha
testado exaustivamente o reinício, a missão
podia continuar.

Relações com “termos recentes”

computador reiniciava

Exige automatizar a implantação
Immutable Infrastructure.

exceto o que causa problema

Circuit-Breaker Pattern

Release It!

2007

testado exaustivamente

Qual método não inclui teste?

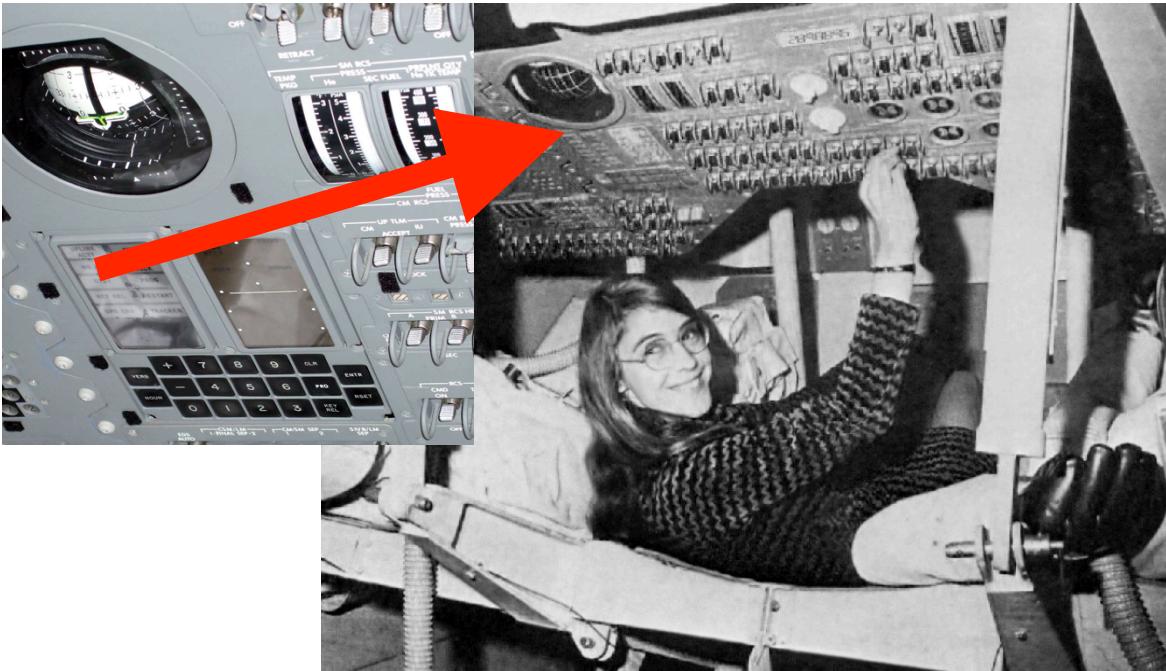
Código fonte (programa utilizado pela Apollo 11)
<http://www.ibiblio.org/apollo/Colossus.html>

GAP: ASSEMBLE REVISION 055 OF AGC PROGRAM COMANCHE BY NASA 2021113-051										10:28 APR. 1.1969	COMAID .029	PAGE 399	
L	ANGLEFIND									USER'S PAGE NO.	1	EO S3	
0500				15,2000					BANK	15			
050001	REF	1		22,2000					SETLOC	KALCMONI			
050002				22,2000					BANK				
0501	REF	5	LAST	394	E6,1561				EBANK=	BCDU			
05015	REF	1							COUNT	22/KALC			
0502	REF	11	LAST	390	22,2000	0 6005 1	KALCMAN3	TC	INTPRET				
0503				22,2001	77634 0			RTB					
0504	REF	2	LAST	394	22,2002	44376 0			READCDUK		PICK UP CURRENT CDU ANGLES		
0505	REF	6	LAST	399	22,2003	03262 1			STORE	BCDU	STORE THE INITIAL S/C ANGLES		
0515				22,2004	72364 0			AXC,2	TLOAD	COMPUTE THE TRANSFORMATION FROM			
0517	REF	11	LAST	396	22,2005	03320 0			MIS		INITIAL S/C AXES TO STABLE MEMBER AXES		
0518	REF	7	LAST	399	22,2006	03262 1			BCDU		(MIS)		
0519				22,2007	77624 1			CALL					
0520	REF	2	LAST	394	22,2010	44405 0			CDUTODCM				
0521				22,2011	72364 0			AXC,2	TLOAD	COMPUTE THE TRANSFORMATION FROM			
0522	REF	4	LAST	121	22,2012	03425 1			MFS		FINAL S/C AXES TO STABLE MEMBER AXES		
0523	REF	5	LAST	398	22,2013	01156 1			CPHI		(MFS)		
0524				22,2014	77624 1			CALL					
0525	REF	3	LAST	399	22,2015	44405 0			CDUTODCM				
0526				22,2016	45160 1	SECAD	AXC,1	CALL		MIS AND MFS ARRAYS CALCULATED	\$2		
0527	REF	12	LAST	399	22,2017	03320 0			MIS				
0528	REF	1		22,2020	44334 0				TRANSPOS				
0529				22,2021	77775 1			VLOAD					
0530				22,2022	77626 0			STADR					
0531	REF	12	LAST	114	22,2023	50474 0			STOVL	TMIS *120			
0532				22,2024	77626 0			STADR					
0533	REF	13	LAST	399	22,2025	50502 0			STOVL	TMIS *6			
0534				22,2026	77625 0			STADR					
0535	REF	14	LAST	399	22,2027	74510 0			STOVL	TMIS	TMIS = TRANSPOSE(MIS) SCALED BY 2		
0536				22,2030	75160 1			AXC,1	AXC,2				
0537	REF	15	LAST	399	22,2031	03266 0			TMIS				
0538	REF	5	LAST	399	22,2032	03425 1			MFS				
0539				22,2033	77624 1			CALL					
0540	REF	3	LAST	395	22,2034	44304 0			MXM3				
0541				22,2035	45575 1			VLOAD	STADR				
0542	REF	1		22,2036	50335 1			STOVL	MFI *120				
0543				22,2037	77626 0			STADR					
0544	REF	2	LAST	399	22,2040	50343 0			STOVL	MFI *6			
0545				22,2041	77626 0			STADR					
0546	REF	3	LAST	399	22,2042	74351 0			STORE	MFI	MFI = TMIS MFS (SCALED BY 4)		
0547				22,2043	45001 1			SETPD	CALL	TRANSPPOSE MFI IN PD LIST			
0548				22,2044	00023 0				1BD				
0549	REF	1		22,2045	44343 0				TRNSPSPD				
0550				22,2046	45575 1			VLOAD	STADR				
0551	REF	1		22,2047	50974 0			STOVL	TMFI *120				
0552				22,2050	77626 0			STADR					
0553	REF	2	LAST	399	22,2051	50502 0			STOVL	TMFI *6			

Margaret Hamilton

[http://en.wikipedia.org/wiki/Margaret_Hamilton_\(scientist\)](http://en.wikipedia.org/wiki/Margaret_Hamilton_(scientist))

Criou o termo “software engineering”, asynchronous software, priority scheduling, end-to-end testing, ...



Primeiro uso “formal” de “engenharia de software”, 1968

<http://homepages.cs.ncl.ac.uk/brian.randell/NATO/nato1968.PDF>

SOFTWARE ENGINEERING

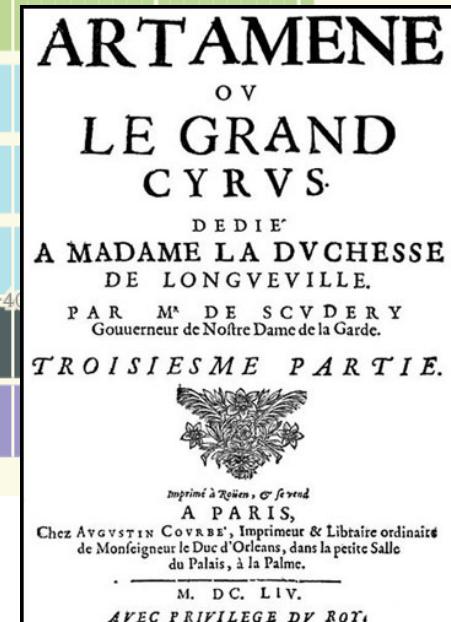
*Report on a conference sponsored by the
NATO SCIENCE COMMITTEE
Garmisch, Germany, 7th to 11th October 1968*

*Chairman: Professor Dr. F. L. Bauer
Co-chairmen: Professor L. Bolliet, Dr. H. J. Helms*

Editors: Peter Naur and Brian Randell

Resoluções
CONTRAN 311 e 312
(abril de 2009)

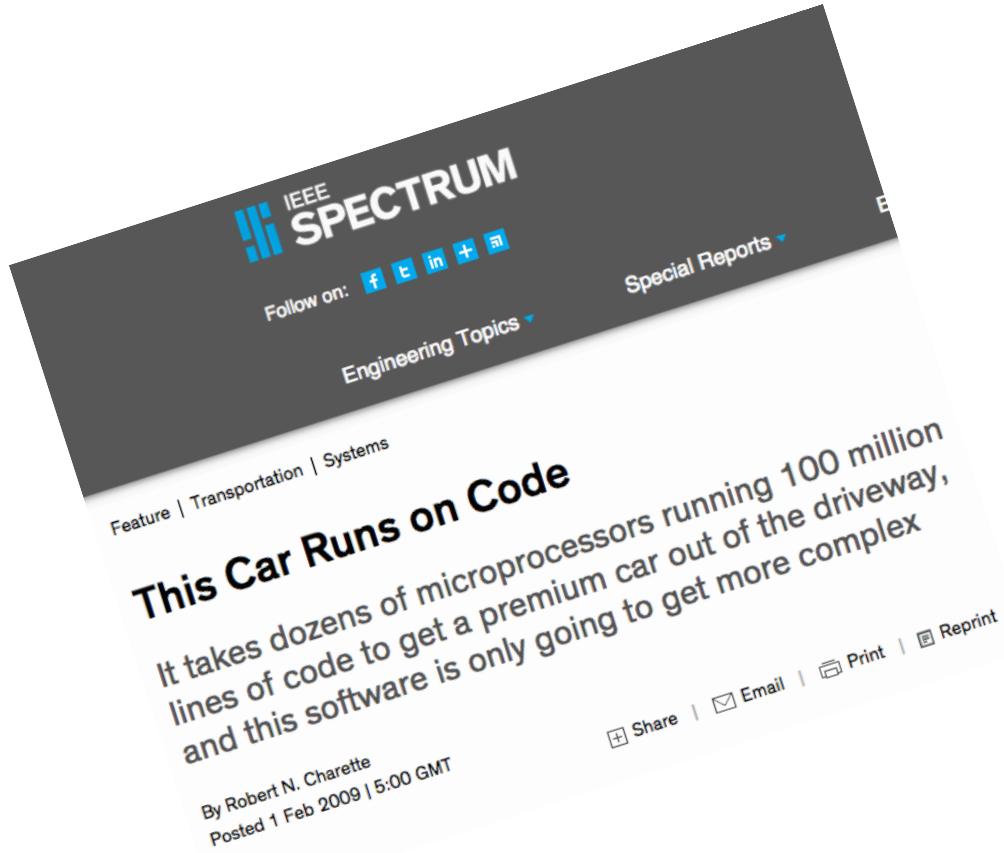
Software pode ser “grande”?



Fonte: informationisbeautiful.net (2015)

<http://www.artamene.org/>

Carro de Troia?



Código de Defesa do Consumidor
Lei 8078, 1990
Redação abaixo de 2012

Art. 6o.

III - o direito à informação adequada e clara sobre os diferentes produtos e serviços, com especificação correta de quantidade, características, composição, qualidade e preço, bem como sobre riscos que apresentem.

DIRETORIA DE ADMINISTRAÇÃO

EXTRATO DE DISPENSA DE LICITAÇÃO Nº 116/2011

Nº Processo: 25380002625201171 . Objeto: Transferência de tecnologia pela ALERT PORTUGAL para a FIOCRUZ de solução ALERT e desenvolvimento conjunto de plataformas e sistemas automatizados. Total de Itens Licitados: 00002 . Fundamento Legal: Artigo 24, inciso XXV, da Lei 8.666/93 . Justificativa: Para atender as demandas do Sistema Único de Saúde SUS. Declaração de Dispensa em 05/08/2011 . PEDRO RIBEIRO BARBOSA . Vice - Presidente de Gestão e Desenvolvimento Institucional. . Ratificação em 05/08/2011. PAULO ERNANI GADELHA VIEIRA . Presidente . Valor: R\$ 364.997.809,00 . Contratada :ALERT SERVICOS DE LICENCIAMENTO DSISTEMAS DE INFORMAT . Valor: R\$ 220.000.000,00 . Contratada :ALERT LIFE SCIENCES COMPUTING, S... . Valor: R\$ 155.000.000,00

(SIDEC - 05/08/2011) 254425-25201-2011NE800091

msdn subscriptions

Compre uma assinatura online do Visual Studio with MSDN da Microsoft para obter acesso mais rápido aos serviços de software, além dos benefícios fornecidos pela sua assinatura. Selecione seu local para obter os preços mais atualizados disponíveis pela Microsoft na sua região, que pode não refletir todas as taxas aplicáveis.

Brasil:

0800-761-7454

+55 (11) 4706-0900

De segunda a sexta-feira | das 9h00 às 18h00 (horário de Brasília)

Visual Studio Premium with MSDN - R\$ 18.237,07



Visual Studio Ultimate with MSDN - R\$ 18.237,07



Visual Studio Test Professional with MSDN - R\$ 6.464,49



Visual Studio Professional with MSDN - R\$ 3.573,50



MSDN Operating Systems - R\$ 2.083,30



Renovar ou atualizar uma assinatura existente



As assinaturas adquiridas neste site duram 12 meses. Os preços não incluem os impostos aplicáveis.



Ano de referência 2009

- MSFT (Microsoft)
\$58 bilhões (quase 6 vezes o PIB do Paraguai)
- Oracle
Receita anual equivale ao PIB do Uruguai
- IBM
\$100 bilhões (38% do PIB da Argentina)
- PIB de Goiás (2006)
R\$57 bilhões (metade do faturamento da MSFT)

The study also considers pay, which was determined income and growth potential. Mathematicians' annual but Ms. Courier, 38, says her salary exceeds that am

WSJ 2009 -

The Best and Worst Jobs

Of 200 Jobs studied, these came out on top -- and at the bot

The Best

1. Mathematician
2. Actuary
3. Statistician
4. Biologist
5. Software Engineer
6. Computer Systems Analyst
7. Historian
8. Socioloast

The Worst

200. Lumberjack
199. Dairy Farmer
198. Taxi Driver
197. Seaman
196. EMT



8. Software Engineer
\$93,100

THE WALL STREET JOURNAL

Today's Paper • Columns • Blogs • Topics • Journal Community

Home World U.S. New York Business Ma

JANUARY 5, 2011

The Best and Worst Jobs

CareerCast rated 200 jobs based on income, working environment, stress, physical demands and job outlook, using data from the Labor Dept. and U.S. Census and researchers' own expertise. See which jobs were ranked highest and lowest, and their midlevel income. The highest-ranked jobs are highlighted in yellow. Click on column headers to sort.

See full rankings on CareerCast.com. (More: The Best and Worst Jobs.)

Rank	Title	Midlevel Income
1	software engineer	\$87,000
2	mathematician	\$94,000
3	actuary	\$87,000
4	statistician	\$73,000
5	computer systems analyst	\$77,000
6	meteorologist	\$85,000
7	biologist	\$74,000
8	historian	\$65,000

THE WALL STREET JOURNAL

Today's Paper • Columns • Blogs • Topics • Journal Community

Home World U.S. New York Business Markets Tech Personal Finance Life & Style Opinion Careers Real Estate Small Business

QUICK LINKS: SEC v. Goldman | Oil Spill | Metropolis | Financial Regulation | Property Report | Apple iPad | Heard on the Street | Sports | Speakeasy

JANUARY 5, 2010

Best and Worst Jobs 2010

The 200 best and worst jobs in the U.S. in 2009 based on five criteria -- environment, income, employment outlook, physical demands and stress -- according to a newly released study from job site CareerCast.com. Read about the methodology.

<< first < prev 1 2 3 4 next > last >>

Rank	Job
1	ACTUARY
2	SOFTWARE ENGINEER
3	COMPUTER SYSTEMS ANALYST
4	BIOLOGIST
5	HISTORIAN
6	MATHEMATICIAN
7	PARALEGAL ASSISTANT
8	STATISTICIAN

THE WALL STREET JOURNAL ■ MANAGEMENT

ONLY \$1A WEEK FOR 12 WEEKS
SUBSCRIBE NOW >>
For a limited time.



Best and Worst Jobs of 2013

CareerCast.com, a career website, ranked 200 jobs from best to worst based on five criteria: physical demands, work environment, income, stress, and hiring outlook. To compile its list, the firm primarily used data from the Bureau of Labor Statistics and other government agencies. From actuary to newspaper reporter, see the complete list, and search for your job. (Related article: Not All Jobs Are Created Equal)

First Previous 1 2 3 4 Net Last

▼ Job Ranking	Job Title
1	Actuary
2	Biomedical Engineer
3	Software Engineer
4	Audiologist
5	Financial Planner

Search:

heifer.org An Investment That Makes A Difference

GET 8 WEEKS FREE
SUBSCRIBE NOW!

Opinion Careers



Primeiro, 2012

Best and Worst Jobs of 2012

CareerCast.com ranked 200 jobs from best to worst based on five criteria: physical demands, work environment, income, stress and list, the firm primarily used data from the Bureau of Labor Statistics and other government agencies. From a software engineer to a li and search for your job. (Related article: Not All Jobs Are Created Equal)

First Previous 1 2 3 4 5 Next Last

▼ Job Ranking

▼ Job Ranking	Job Title
1	Software Engineer
2	Actuary
3	Human Resources Manager
4	Dental Hygienist
5	Financial Planner

Search:

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

Carl Benedikt Frey[†] and Michael A. Osborne[‡]

September 17, 2013

Empregos ameaçados?

- 702 profissões consideradas
- 47% das profissões estão em risco nos EUA

Abstract

We examine how susceptible jobs are to computerisation. To assess this, we begin by implementing a novel methodology to estimate the probability of computerisation for 702 detailed occupations, using a Gaussian process classifier. Based on these estimates, we examine expected impacts of future computerisation on US labour market outcomes, with the primary objective of analysing the number of jobs at risk and the relationship between an occupation's probability of computerisation, wages and educational attainment. According to our estimates, about 47 percent of total US employment is at risk. We further provide evidence that wages and educational attainment exhibit a strong negative relationship with an occupation's probability of computerisation.

Keywords: Occupational Choice, Technological Change, Wage Inequality, Employment, Skill Demand

JEL Classification: E24, J24, J31, J62, O33.

*We thank the Oxford University Engineering Sciences Department and the Oxford Martin Programme on the Impacts of Future Technology for hosting the "Machines and Employment" Workshop. We are indebted to Stuart Armstrong, Nick Bostrom, Eris Chinellato, Mark Cummins, Daniel Dewey, David Dorn, Alex Flint, Claudia Goldin, John Muellbauer, Vincent Mueller, Paul Newman, Seán Ó hÉigearthaigh, Anders Sandberg, Murray Shanahan, and Keith Woolcock for their excellent suggestions.

Você pode ser substituído por uma máquina?

(Exame, 04/02/2015, pág. 22)

- Extremo menos ameaçado:
engenheiros de software, professores e publicitários
- Extremo mais ameaçado:
linhas de montagem, contadores, auditores, ...
- Análise do mercado americano, desde 1960 até 2010
 - Demanda em queda para
 - tarefas manuais rotineiras e não rotineiras
 - tarefas cognitivas rotineiras
 - Demanda em alta para
 - trabalho com novas informações
 - solução de problemas não estruturados

C
O
D
E

LEARN

TEACH

STATS

code.org

**“I challenge girls in every single country
to learn one Hour of Code”**

Malala, Nobel Peace Prize winner

“A chave para a autonomia humana é o conhecimento.”
Sandra Bozza

15º. Congresso Pensar
11/10/2014
Goiânia