

Medicina y computación

Dos aliados excepcionales

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www.ubihpc.com





Agenda

- Introducción
- Alcance de la computación
- Medicina y computación
- Emprendimiento en Colombia
- Emprendimiento internacional
- El camino a seguir
- Extra perks

Introducción



```
#!/usr/bin/env python

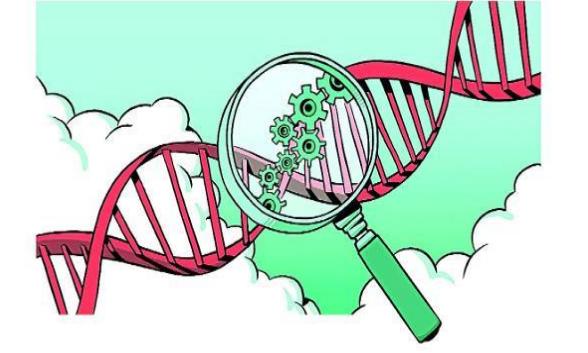
import scapy.all as scapy

def scan_ip(IP):

    """
    Scanning IP
    """

    arp_request = scapy.ARP(pdst = IP)
    arp_request.show()
    broadcast = scapy.Ether(dst ='ff:ff:ff:ff:ff:ff')
    broadcast.show()
    arp_request_broadcast = broadcast/arp_request
    print(arp_request_broadcast.summary())
    arp_request_broadcast.show()

scan_ip('192.168.1.1/24')
```



“Whether you want to uncover the secrets of the universe, or you want to pursue a career in the 21st century, basic computer programming is an essential skill to learn.”

Stephen Hawking
Theoretical Physicist, Cosmologist, and Author



Alcance de la computación

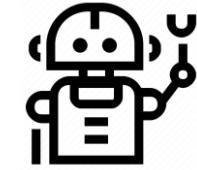


**El man que arregla el
computador**

**“Un ingeniero de sistemas no lo necesitas
todo el día, sino dos horas”: Alicia Arango
sobre una posible reforma laboral**

Sin embargo

Alcance de la computación



Robótica



Ethical hacking



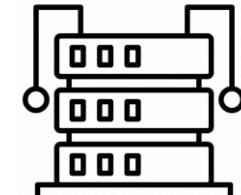
Lenguajes de
programación



IoT

1. Computer Hardware
2. Computer Networking
3. Computer Software
4. Cloud computing
5. Cyber Security and Ethical Hacking
6. Data Science and Data Analysis
7. Programming Language
8. Micro Architecture
9. Operating system
10. Web Development

11. Web Designing
12. Graphics design
13. Network Analytics and testing
14. Robotics
15. R&D
16. Artificial intelligence
17. Computer Aided Design drafter
18. Computer Operator
19. Data Entry Operator
20. Computer Administrator



Supercomputación
Linux



Inteligencia
artificial



- Redes neuronales
- Aprendizaje supervisado
- Aprendizaje no supervisado
- Aprendizaje por refuerzo
- Visión por computador
- Algoritmos genéticos

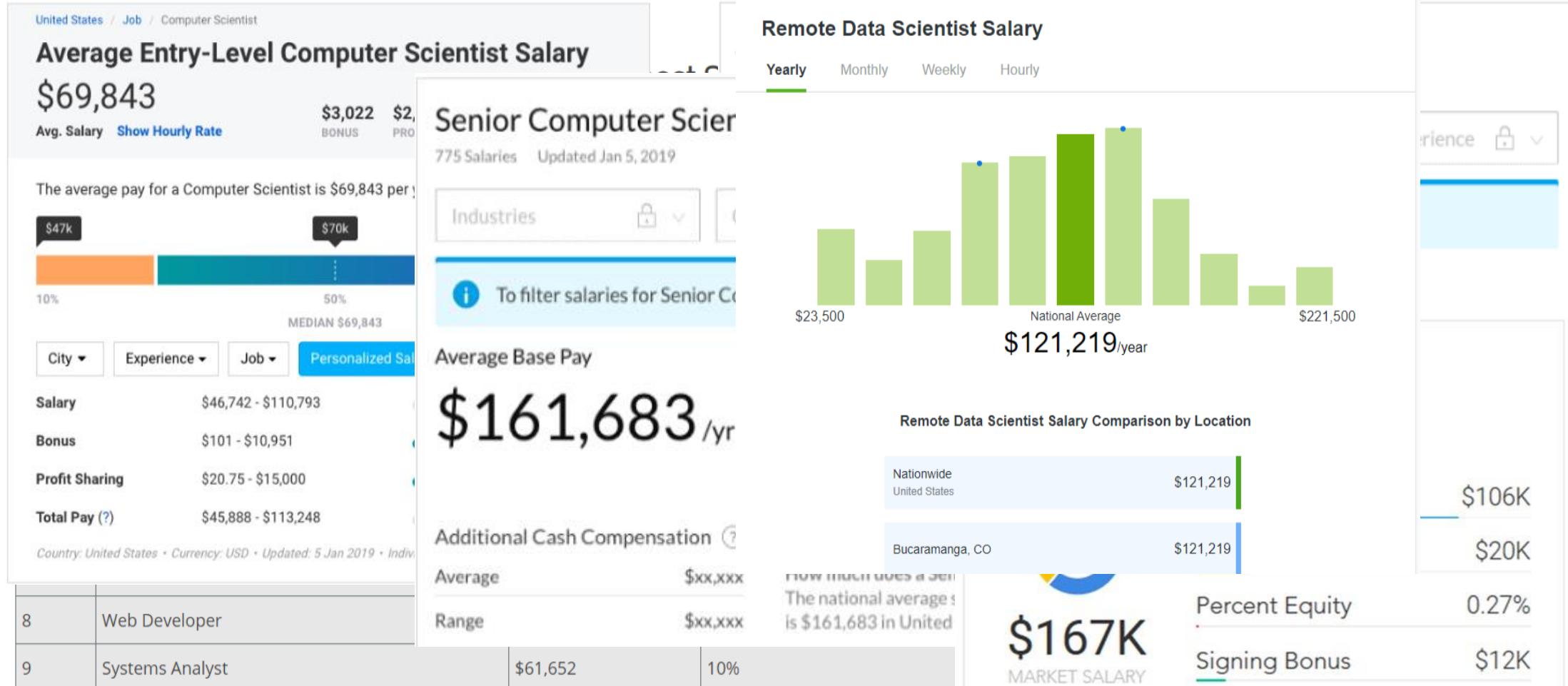
Automatización



Realidad virtual y
Realidad aumentada

21. DBMS (DataBase management system)
22. IT Help Desk Technician
23. Video Game Designer
24. Computer Architecture and Engineering
25. UI designer
26. Computer Animation and 3D design
27. Computer vfx
28. Motion graphics and Visual Effects
29. Computer Biosystem
30. Numeric analysis
31. Cryptography
32. Education field
33. Research and development
34. Traffic control system
35. Mobile Application Development
36. Computer Accounting
37. User Experience design
38. Content Writer
39. SEO
40. Digital Marketing
41. Business Management
42. Stenographer and typist
43. Health diagnosis
44. Clinical image processing
45. Hospital administrator
46. Medical Record Technology
47. Video editing and compositing
48. Online marketing
49. Computer service and maintenance
50. Computer Assembling

Alcance de la computación



Es un buen momento para saber de computación, o aprender

Es muy bacano todo lo que se puede hacer

Medicina y computación



If somebody is working in computer science he does things. We have a whole Seattle called the Internet Modelling that is a mix of people who are science and math-type people that we're making in polio or whatever we're really driven by the need to do something.

— Bill Gates

AZ QUOTE

Table 1

Increase of Data Volume and Complexity relative to Computational Power.

Neuroimaging (annually)		Genomics (BP/Yr)		Moore's Law (transistor counts)	Bandwidth (Edholm's Law)	Years
Size	Complexity	Size	Complexity			
200 GB	1	10 MB	1	1×10^5	10^5	1985-1989
1 TB	2	100 MB	2	1×10^6	10^6	1990-1994
50 TB	5	10 GB	3	5×10^6	10^8	1995-1999
250 TB	6	1TB	4	1×10^7	10^9	2000-2004
1 PB	7	30TB	5	8×10^6	10^{10}	2005-2009
5 PB	8	1 PB	7	1×10^9	10^{11}	2010-2014
10+ PB	9	20+ PB	8	1×10^{11}	10^{13}	2015-2019 (estimated)

MB (megabyte) = 10^6 , GB (gigabyte) = 10^9 , TB (terabyte) = 10^{12} , PB (petabyte) = 10^{15} , BP=base pairs

Complexity = measure of data heterogeneity (e.g., new imaging data acquisition modalities or sequence coverage depth; complexity of 5 indicates a 5-fold increase of the data diversity over 1985)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4795481/>

Datos masivos

- Útiles?
- Mantenimiento? Actualización?
- Organizados?

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Genoma humano \approx 3 billones de bases \rightarrow 700 MB \rightarrow \approx 200 GB

AGCCCCTCAGGAGTCCGGCACATGGAAACTCCTCATTCCGGAGGTAGTC
AGATTACCCCTGGCTCACCTGGCGTGCCTCGCGGGCAAACATAAGAAC
CGTCGTCTAAATGACTCTTAAAGTAGAATAGCGTGTCTCCTTCCAGCC
TCCGAAAAACTCGGACCAAGATCAGGCTTGTCCGTTCTCGCTAGTGATG
AGACTGCGCCTCTGTCGTACAACCAATTAGGTGAGTTCAAACCTCAGGG
TCCAGAGGCTGATAATCTACTTACCCAAACATAG

@SEQ_ID
GATTGGGGTTCAAAGCAGTATCGATCAAATAGTAAATCCATTGTTCAACT
CACAGTTT
+
!/*(((***+))%%%++)
(%%%%.1***-+*)**55CCF>>>>CCCCCCC65

Genoma limpio

- Procesarlo
- Usarlo \rightarrow supercomputación
- Aprender \rightarrow Inteligencia Artificial

HERV-K – Leucemia Mieloide Aguda
25 casos y 25 controles
 \approx 10 TB

Genoma al salir del secuenciador (recién cocinado)

- Almacenarlo
- Pre-procesarlo
- Almacenarlo

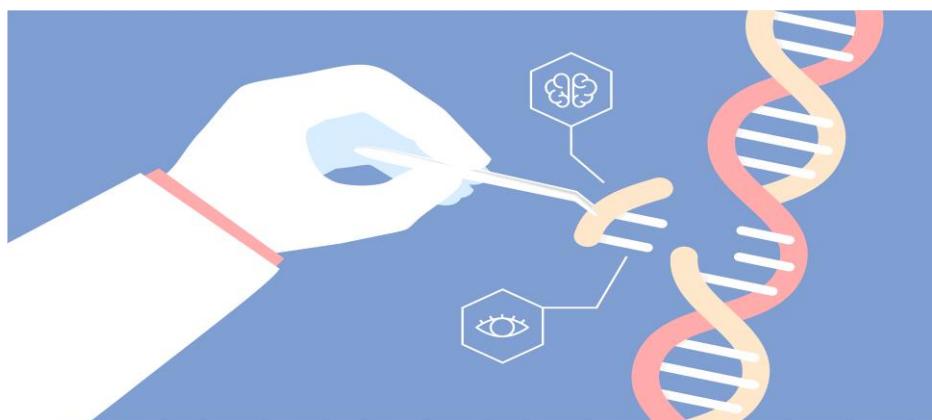
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Enfermedades

Como crear nuevos fármacos efectivos para el tratamiento o prevención de enfermedades y con mínimos efectos secundarios?

Quimioterapia



CRISPR/Cas9

Edición génica

Como realizar modificaciones en un solo gen que no afecten a largo plazo el genoma completo?

Simulación

Programación
Paralelización
IA



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- Prevención
- Preparación
- Promoción
- Políticas públicas



Salud pública

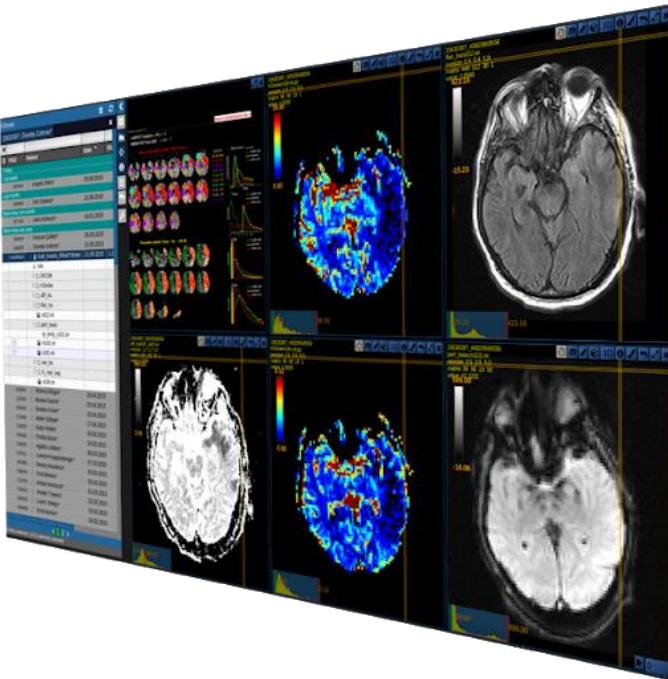


Datos de los pacientes

- Accesibilidad del personal médico
- Accesibilidad del personal médico
- Aplicaciones móviles
- Eficiencia
- Medio ambiente



Imágenes médicas



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 babylon

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We want to put an accessible and affordable health service in the hands of every person on earth

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Doctors are available 24 hours a day, 7 days a week. For pricing and times in Ireland please [click here](#).

3 MONTHLY	ANNUAL	PAY AS YOU GO
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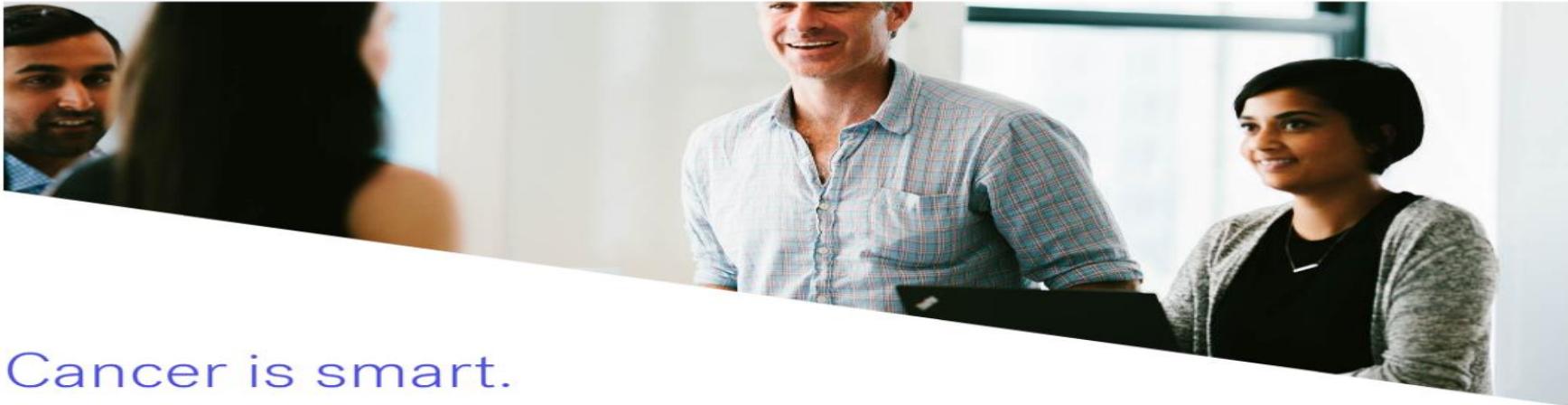
<https://www.babylonhealth.com/>

Herramienta diagnóstica (IA)

Comunicación 24/7 con personal médico



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\$ 313M

Cancer is smart.
Together, we can
be smarter.

Accelerating cancer research and improving the quality of care requires the entire industry to work together. Our products connect community oncologists, academics, hospitals, life science researchers and regulators on a shared technology platform.

Together, we can learn from the experience of every patient.

<https://flatiron.com/>

Investigación de Cancer – Cloud computing, IA

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CLIENTS TECHNOLOGY PUBLICATIONS NEWS CONTACT

\$ 77.3M

GNS Healthcare: discover the true drivers
of patient therapeutic response

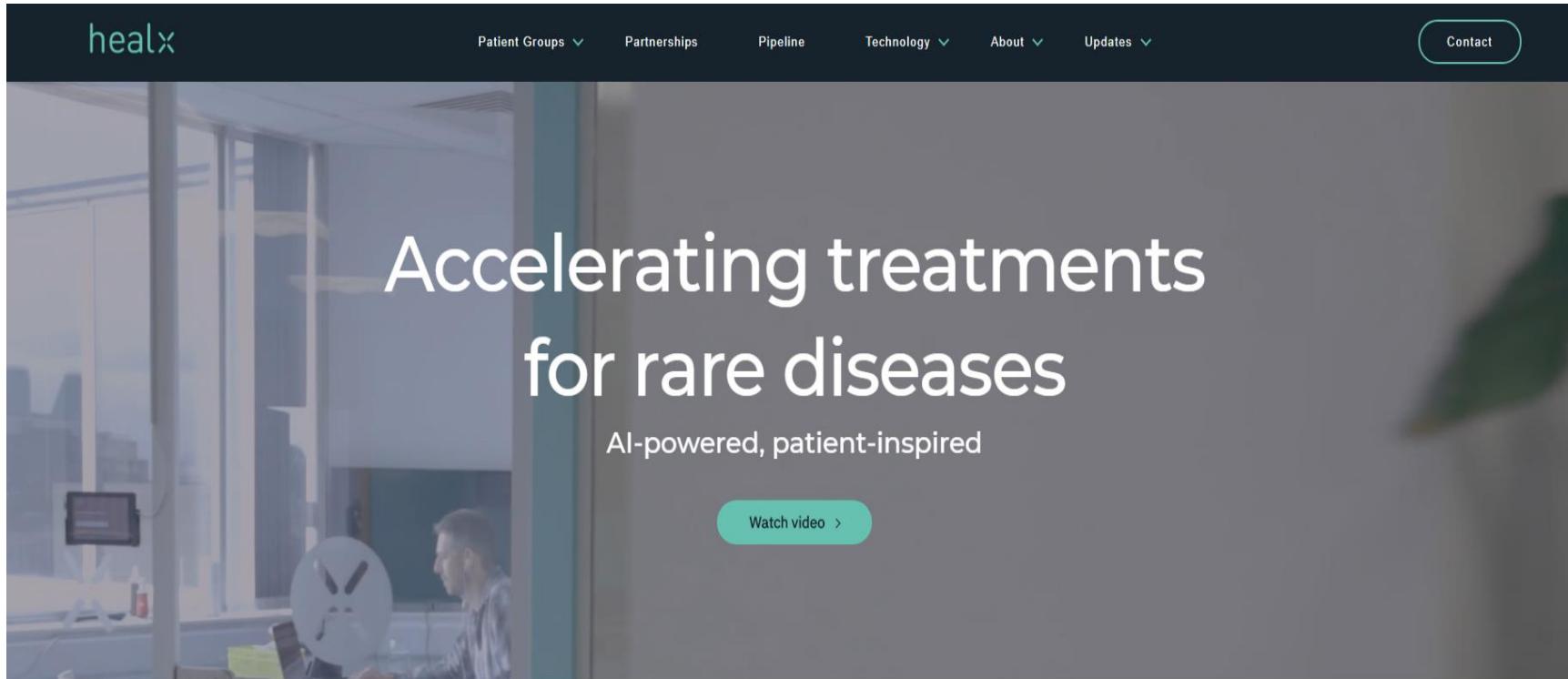
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GNS Healthcare is the leading causal AI company enabling the discovery of *which* patients respond to drugs and *why*. The world's largest biopharma companies trust us to help them better understand disease progression, quickly pinpoint patient subpopulations, and generate stronger evidence of clinical value. Access to next generation patient data, combined with our causal AI and simulation technology, enables rapid knowledge generation driving clinical trial design and market access positioning.

<https://www.gnshcalthcare.com/>

Cuáles pacientes responden a las medicinas y porqué?

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\$ 67.9M

We've created the world's most efficient AI platform for rare diseases. It makes drug discovery faster, smarter and safer, and supports our team and partners in discovering and translating new treatments towards the clinic.

<https://healx.io/>

David Brown – co-inventor del Viagra

7000 enfermedades raras → 5% con tratamiento aprobado

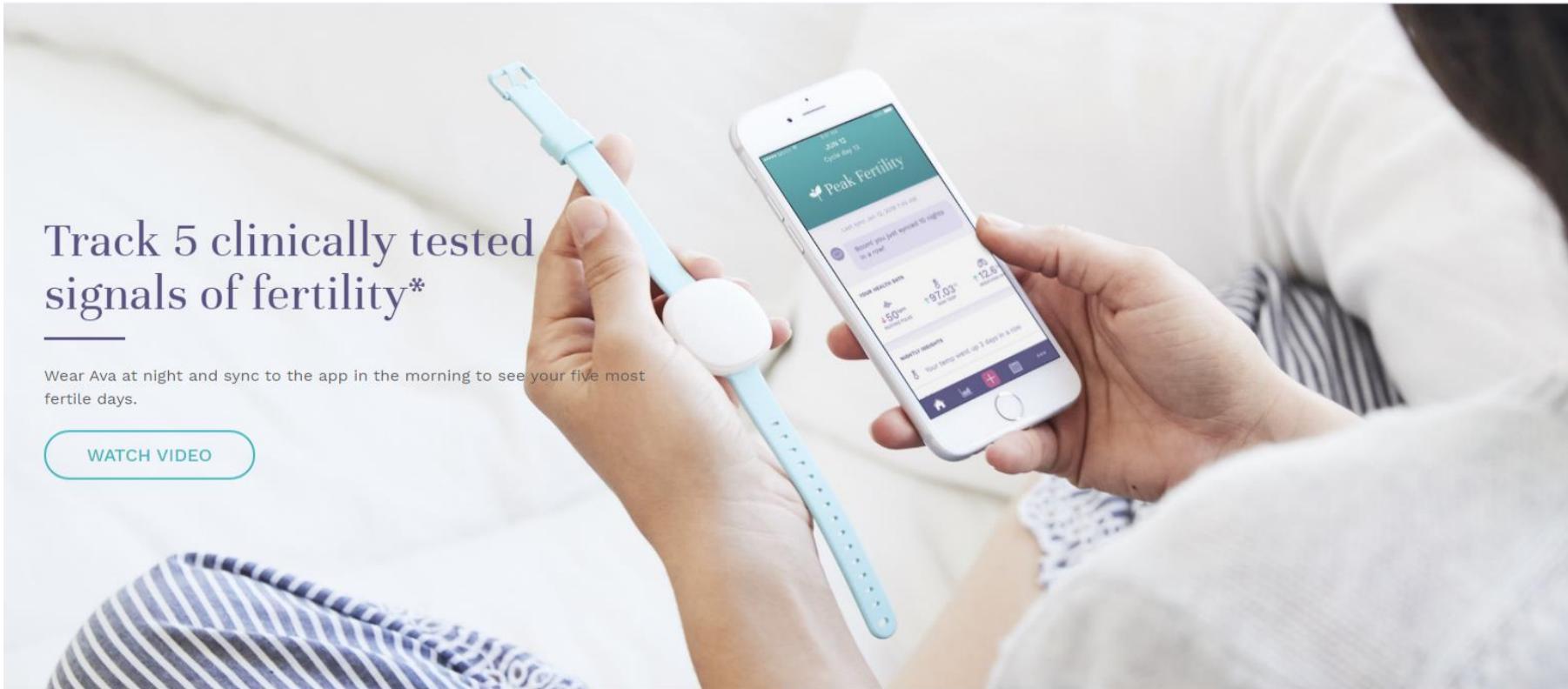
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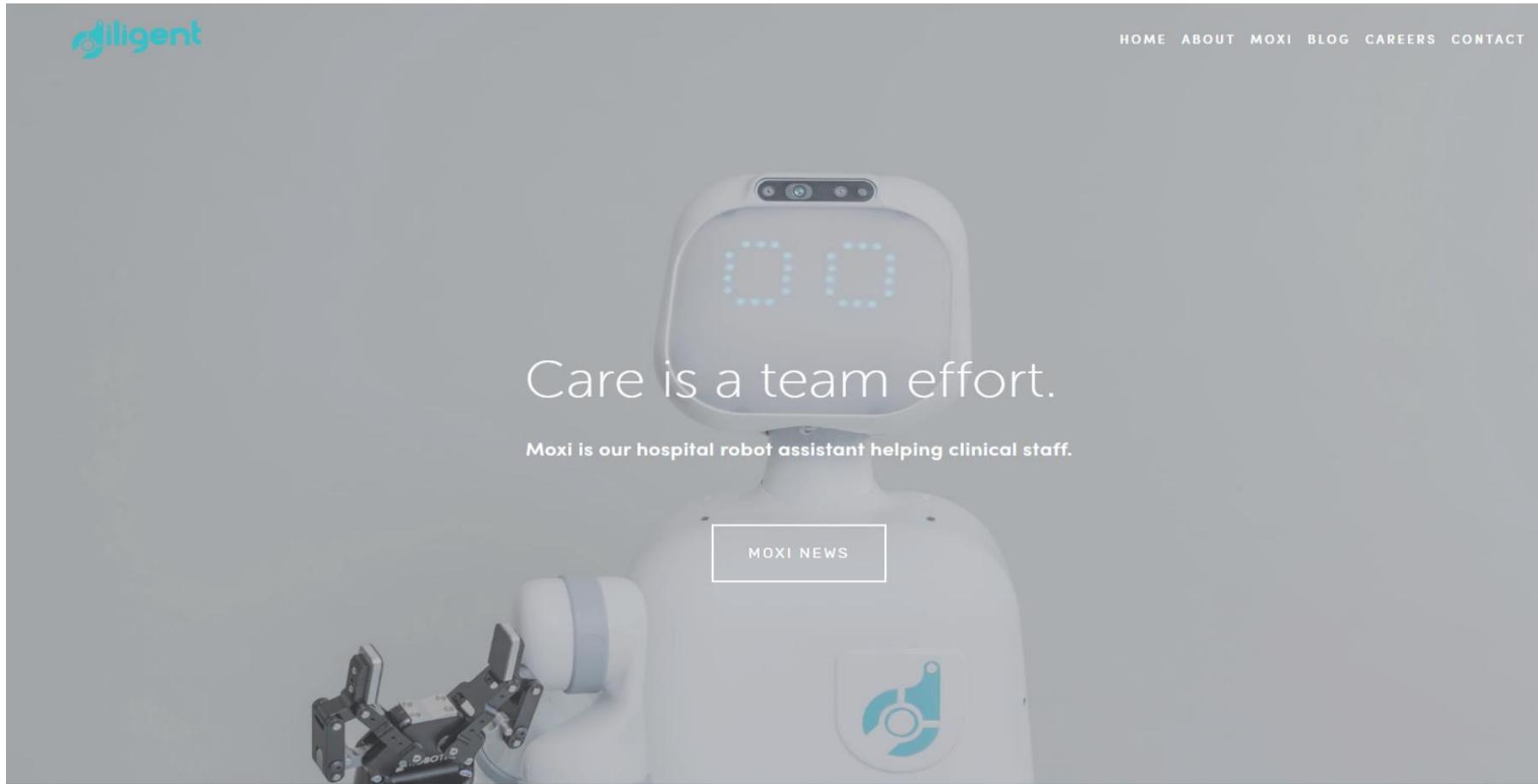


\$ 45.3M

<https://www.avawomen.com/>

Brazalete → predicción de días fértiles (IA)

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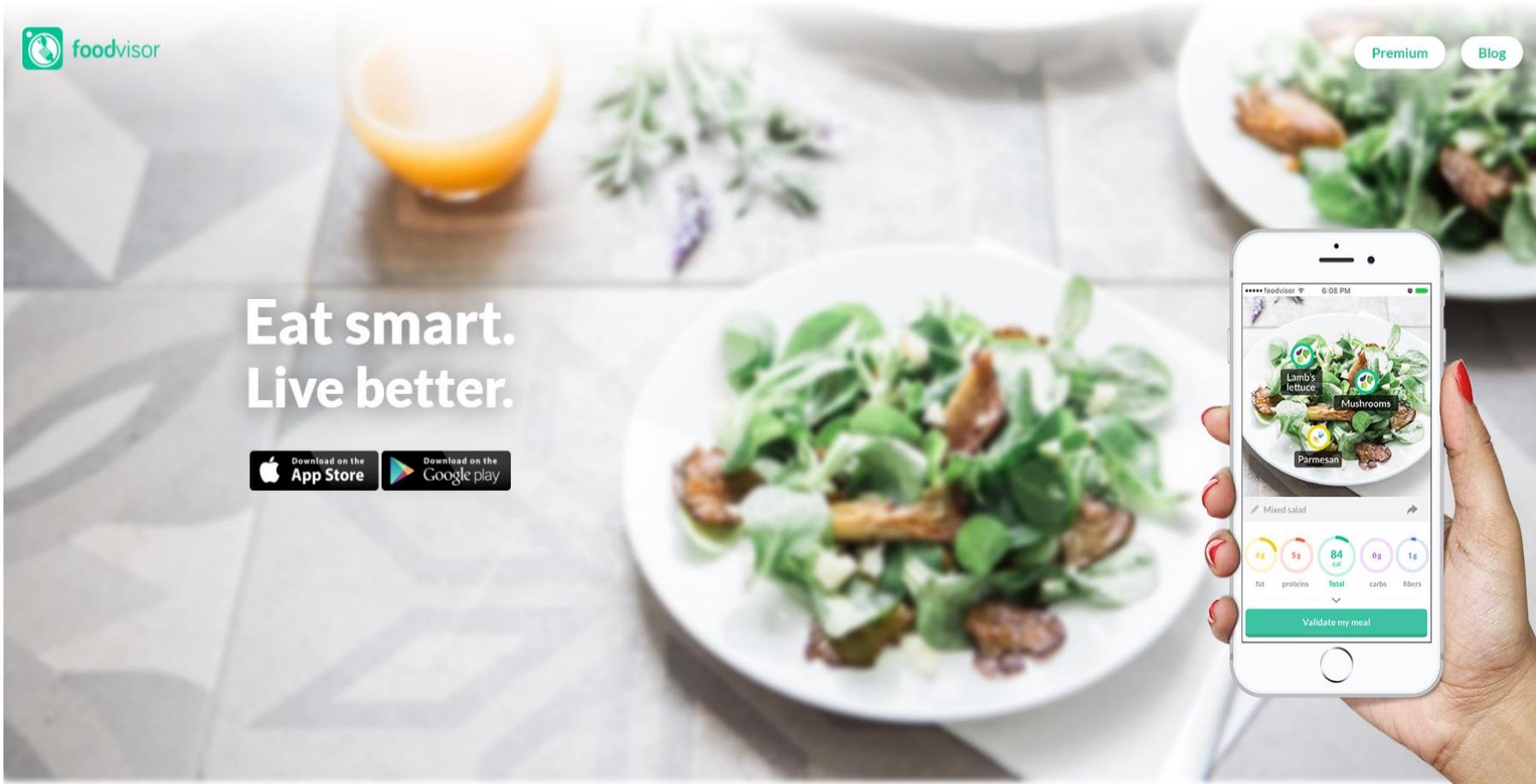


\$ 5.8M

<https://diligentrobots.com/moxi>

Enfermera robot

Medicina y computación



\$ 5.1 M

<https://www.foodvisor.io/>

Visión por computador para detectar cantidades y tipos de comida
y estimar valor nutricional

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The image shows the CorPath GRX robotic vascular intervention system. It consists of a robotic arm mounted on a mobile cart. The cart features a monitor displaying a live video feed from the catheter tip, control panels, and a keyboard. A robotic arm with a catheter is positioned over a simulated patient bed. The Corindus logo is visible at the top left, and the CorPath GRX brand name with the subtitle "Precision Vascular Robotics" is prominently displayed on the right.

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CorPath GRX
Precision Vascular Robotics

The only FDA Cleared and CE Marked Robotic System for Coronary and Peripheral Vascular Interventions

\$
133.6M

<https://www.corindus.com/>

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- Brain Research (2,474)
- Social Science & Medicine (2,007)

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Medical Joyworks LLC	MyTherapy LLC	Przemyslaw Słota	Medical Joyworks LLC	Netmeds Marketplace L	OpenEM Foundation	Medisafe	Bhaee Technologies	Hall Date
★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
AccessMedicine Ap	HARRISON'S	MedSchool	Arabic Medicine Di	American Journal o	Full Code - Emerge	Heart's Medicine H	MedPlus Mart - Onl	Online Pharmacy N
Unbound Medicine, Inc	MANUAL OF MEDICINE	The Medical Company	Muhammad Riaz	Elsevier Inc	Minerva Medical Simula	GameHouse	MedPlus Health Service	Online Pharmacy & He
★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
jCU	t	life care	Medicine Dictionary	life care	QMDT	Medicine Dictionary	Quick Medical Dx & Rx	Medicine Dictionary
		HEALTH	HEALTH	HEALTH	McGraw-Hill Education	McGraw-Hill Education	McGraw-Hill Education	McGraw-Hill Education

Emprendimiento en Colombia



<https://minciencias.gov.co/convocatorias/todas>



<https://innpulsacolombia.com/es/ofertas>



<http://www.fondoemprender.com/>

Apps.co

<https://apps.co/>



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Reto lab



Emprendimiento internacional



Emprendimiento internacional



Combinator



Emprendimiento nacional e internacional



Tracción

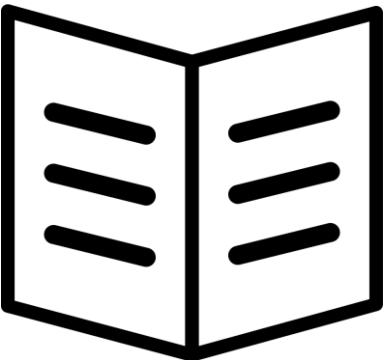
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UbiHPC

- Programación
- Ciencia de datos
- Inteligencia Artificial
- Visión por computador
- Aplicaciones móviles
- Robótica

Club 4.0

club40ubihpc@gmail.com

Extra perks



Lecturas interesantes:

<https://elmistrana.github.io/jekyll/update/2017/10/21/From-medical-to-computer-sceince-career.html>

<https://www.quora.com/What-is-the-relationship-between-computer-science-and-medicine>

<https://medium.com/precision-medicine/how-big-is-the-human-genome-e90caa3409b0>

Datos:

<https://github.com/beamandrew/medical-data>

Gracias

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