Using Big Data and the Internet of Things for Ubiquitous Insights, Social Good, Sustainability,…

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http://www.boozallen.com/datascience

Why Big Data for Societal Good?

Booz Allen's Data Science Practice	Our Passion for Data Science	Lack of a National Data Science Event

http://www.boozallen.com/datascience/

http://www.datasciencebowl.com/
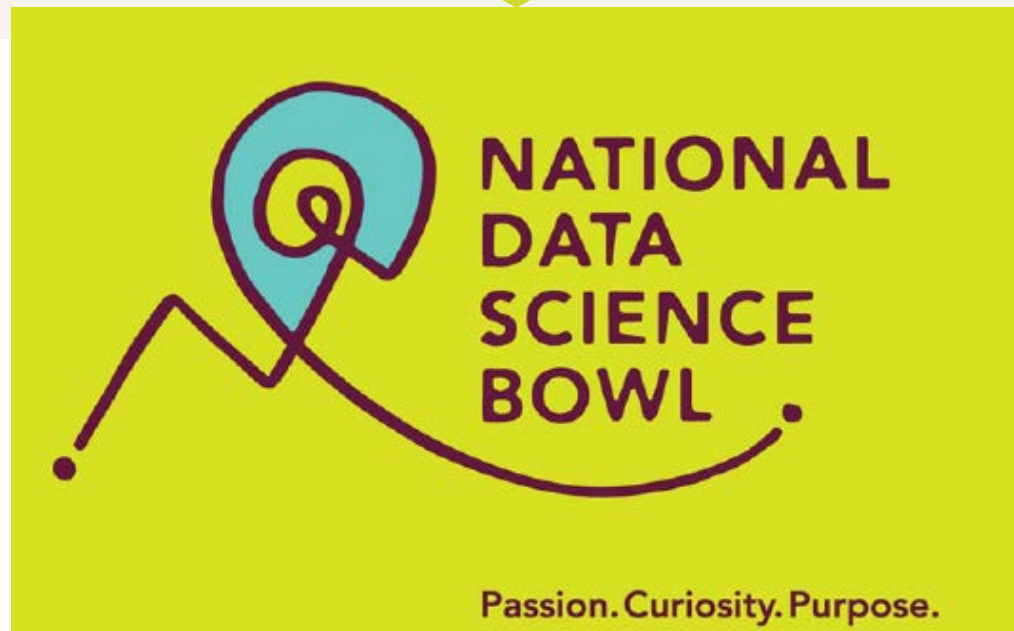
Citizen Data Science!

Booz | Allen | Hamilton & kaggle

*"We and the broader data science community
share a common passion, culture, and vision
for using data science for social good."*

About Kaggle

- World's largest online data science competition community

- Over 500,000 members across ~200 countries

- Community uses diverse backgrounds to solve some of the most complex data science problems in the world

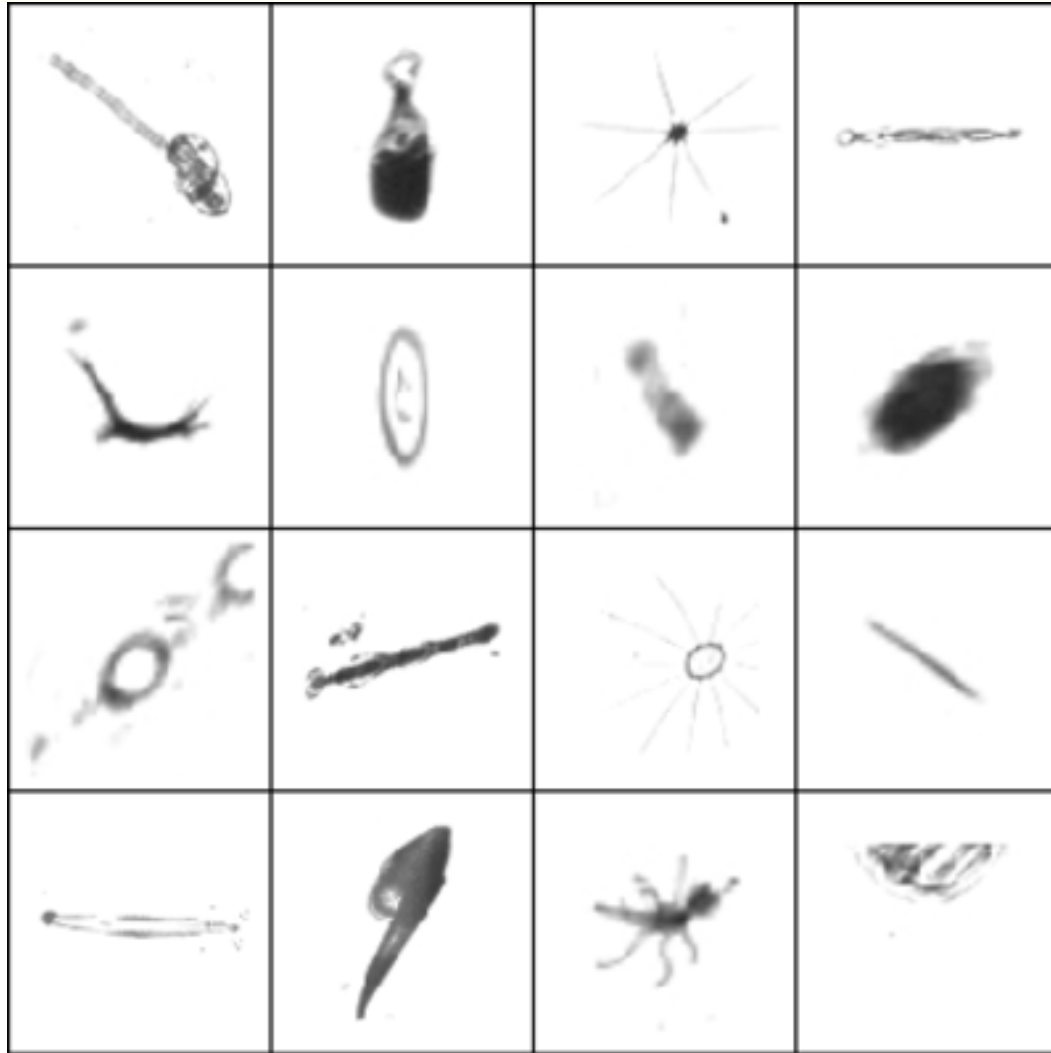- Extremely strong brand within the data science community

SERVICES PROVIDED BY PLANKTON:

1. Provide food for humans and marine animals
2. Produce oxygen (phytoplankton)
3. Remove carbon dioxide from the atmosphere
4. Contribute to global biodiversity
5. Provide biomedical products

FISHING

CO_2 O_2

PHYTOPLANKTON

(PLANTS)

ZOOPLANKTON
(ANIMALS)

COPEPOD   FISH LARVAE

CRAB ZOEA

JELLYFISH

SALPS

URCHIN LARVAE   SHRIMP / KRILL

BACTERIA
& OTHER
MICROBES

SINKING PARTICLES

POOP PELLETS

CARBON REMOVAL

PLANKTON

FORAGE FISH

TOP PREDATORS
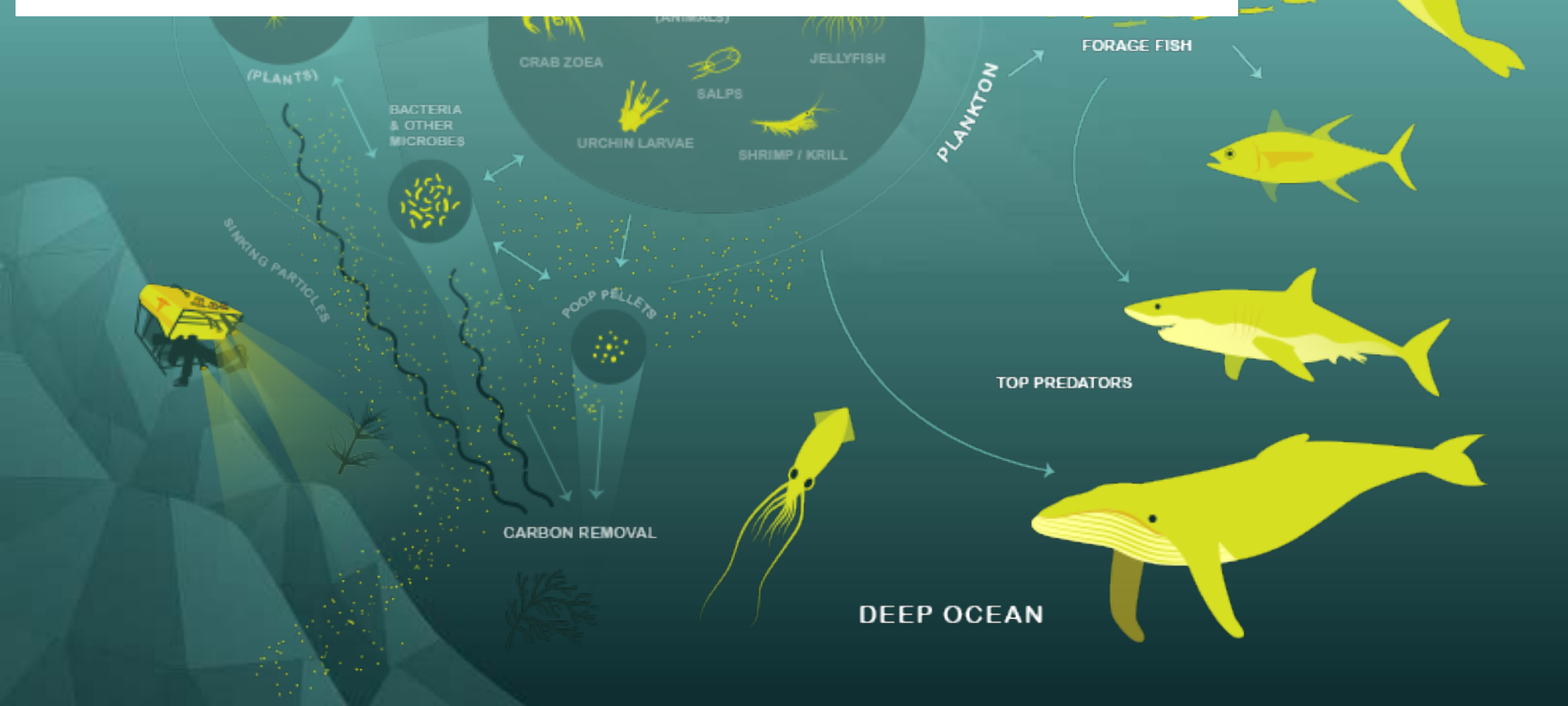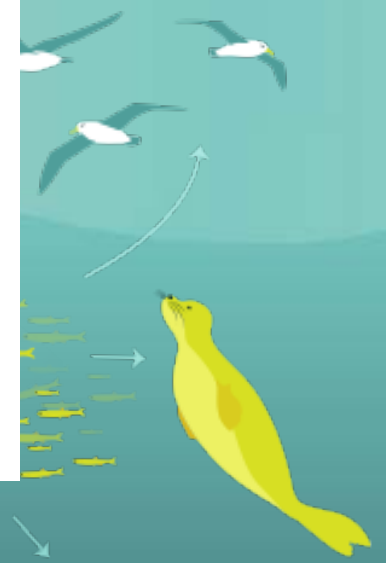
DEEP OCEAN
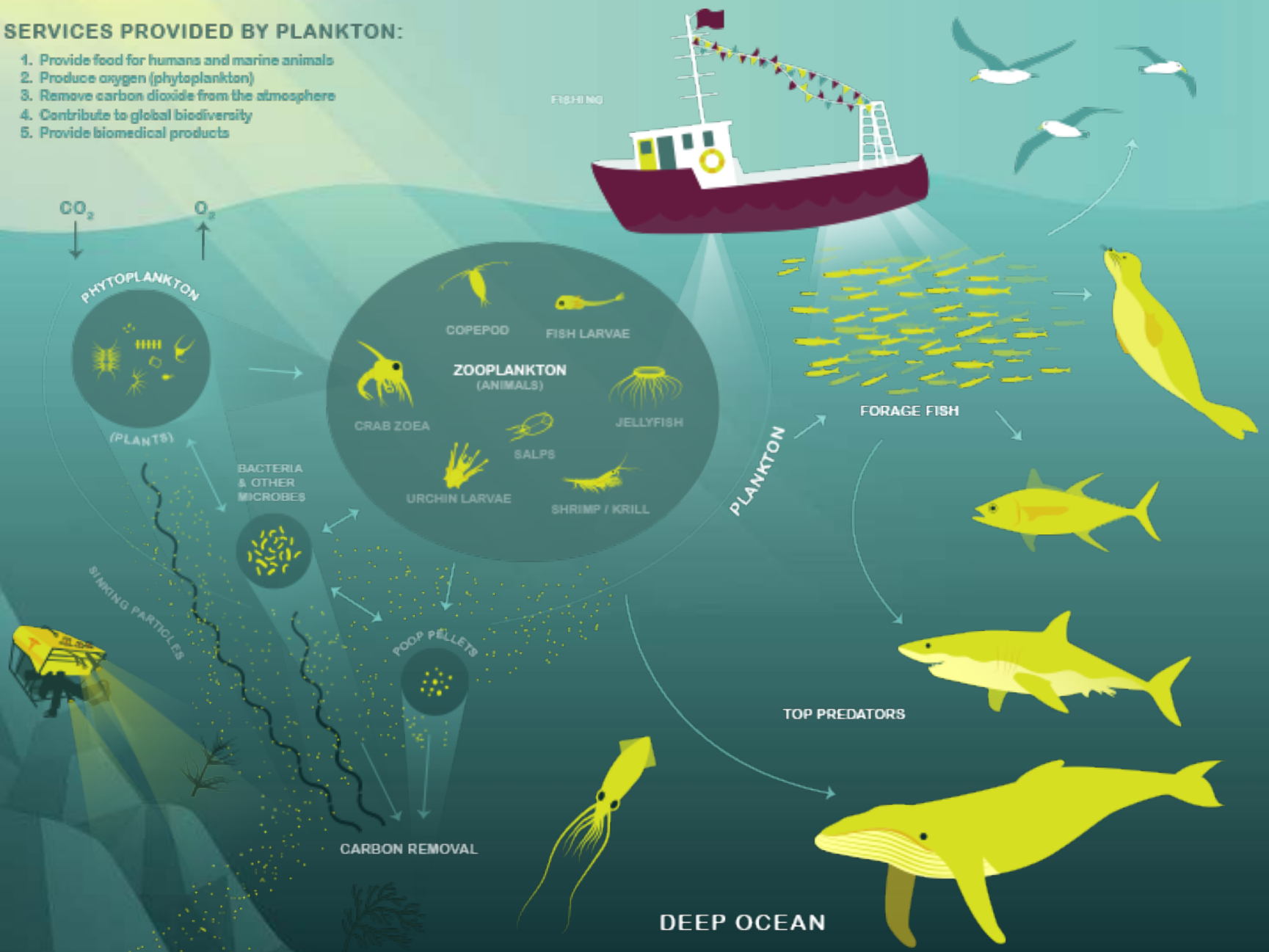
Services provided by Plankton:
- Provide food for humans and marine animals
- Produce oxygen (phytoplankton)
- Remove CO2 from the atmosphere
- Contribute to global biodiversity
- Provide biomedical products
- Major source of nutrients for indigenous populations

Last year's winning team :
Team Deep Sea

A group of postdocs and graduate students from the University of Ghent in Belgium.

- Average accuracy of 81% across all 121 plankton classes
- More than 1000 competing teams
- More than 15,000 submissions
- Recap: http://www.datasciencebowl.com/recap-first-annual-data-science-bowl/

We did it again this year with a $200K heart health challenge!

Data providers and partners: Drs. Michael Hansen and Andrew Arai, of the NIH National Heart, Lung, and Blood Institute (NHLBI); and the Children's National Medical Center.

Other partners include: NVIDIA; American College of Cardiology; The Children's Inn at NIH; FNIH (Foundation for the NIH); MedStar Institute for Innovation; and more.

The Challenge: improve diagnosis of heart disease through faster, more accurate measurement of ejection fraction (end-systolic and end-diastolic volumes) in cardiac MRI data.

The Data: time-series of MRI scans from over 1000 patients.

"The only unit of time that matters is heartbeats." —Paul Ford

2.5 BILLION BEATS.
ONE LIFETIME.
HOW WILL YOU USE YOURS?

Systole (contracts)   One Heartbeat (a cardiac cycle)   Diastole (expands)

Hyperdynamic > 75%
Normal EF 55 – 65%
Mildly Abnormal 45 – 55%
Moderately Abnormal 35 – 45%
Severely Abnormal < 35%

$$\frac{\text{Volume of blood pumped out of ventricle per beat}}{\text{Total volume of blood in ventricle at end diastole}} = \text{ejection fraction (\%)}$$

ejection fraction (%)
The measurement of how much blood the left ventricle pumps out on a beat-by-beat basis

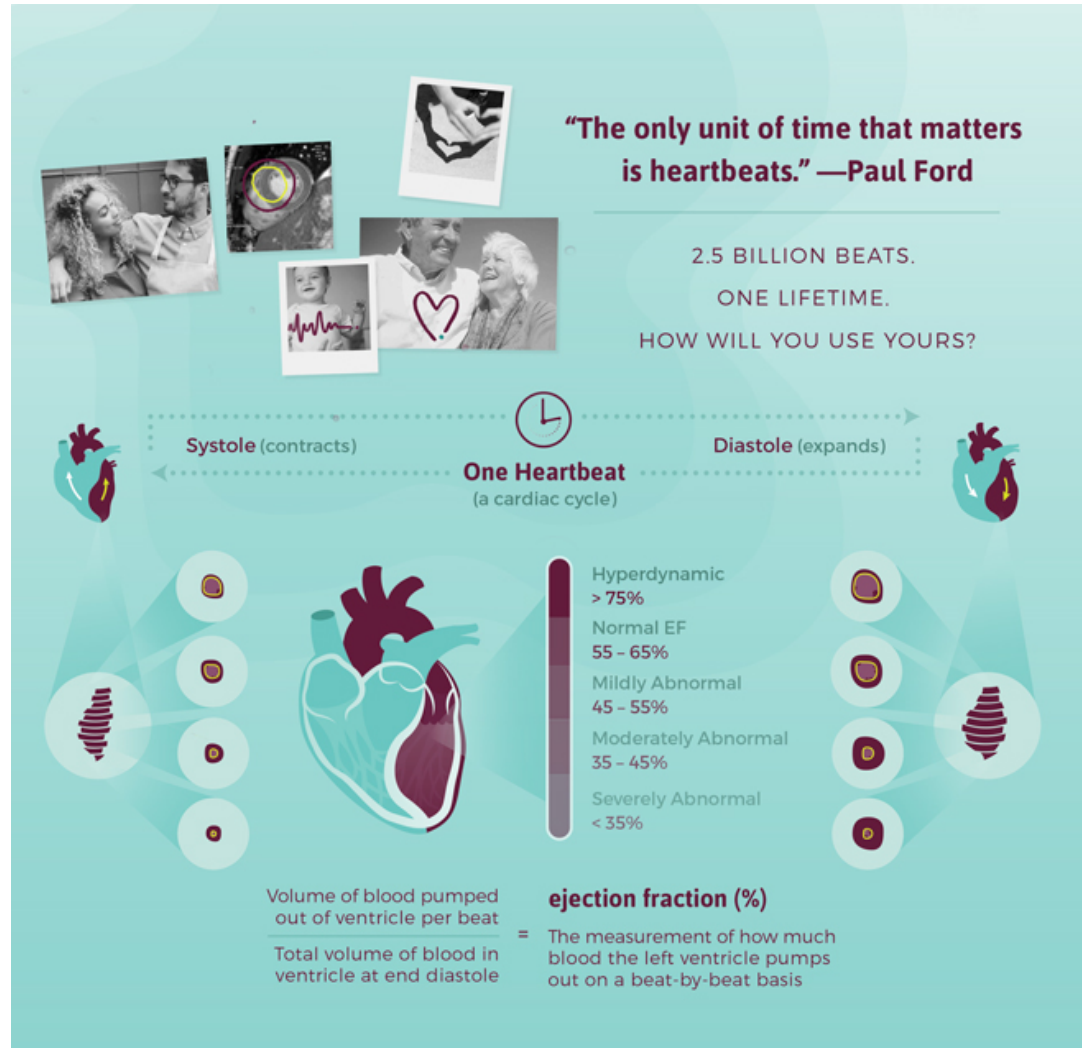# We did it again this year with a $200K heart health challenge!

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It is not just about improving Cardio Imaging Analytics.

It's about Reed's story:

One in 100 children are born with congenital heart defects!

Data Science Use Case examples

- ❑ Smart Apps (Find best price; real-time travel adjustments; type-ahead texting)
- ❑ Predictive Retail (Dynamic Pricing, Smart Supply Chain, Precision Demand Forecasting)
- ❑ Precision Marketing (SegOne, Personalized Real-time Ad Campaigns for Next Best Offer)
- ❑ Smart Highways (Real-time intelligence among vehicles, weather, roads, repairs)
- ❑ Precision Traffic (Self-driving & Self-parking Connected Cars)
- ❑ Smart Cities (Growth, Dynamic Street-lighting, Smart Energy Usage)
- ❑ Predictive Law Enforcement (Predictive, Prescriptive personnel & resource placements)
- ❑ Smart Healthcare (Wearables, Personalized Medicine, Patient/Provider Monitoring)
- ❑ Invisibles (under-the-skin smart sensors that measure, learn, respond) = The Internet of Emotions!
- ❑ Personalized Online Education (Dynamic learning, Gamification, Real-time interventions)
- ❑ Precision Forests, Farms, Vineyards,… (Data-driven Planning, Nurturing, Harvesting)
- ❑ Fintech / Banks / Insurance (Fast Risk analysis, Fraud detection, Personalized services)
- ❑ Smart Organizations (Workspaces, Process Mining for Efficiencies, Workflow recommender engines)
- ❑ Predictive Machines (Early Warning, Prescriptive Maintenance & Obsolescence, IoT, Industrial IoT)

The XYZ of Data Science in our lives & business:
(intelligence at the edge of the network… at the point of data collection)

Smart X :

- Smart Cities
- Smart Highways
- Smart Supply Chain

Precision Y :

- Precision Medicine
- Precision Farming
- Precision Pricing

Personalized Z :

- Personalized Health
- Personalized Learning
- Personalized Shopping Experience

http://blog.autoserviceintelligence.com/a-smart-crm-in-action-building-consumer-trust-part-2

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Big Data + the IoT + Citizen Data Scientists =
= Partners in Sustainability

The Internet of Things (IoT):

- Knowing the knowable via deep, wide, and fast data from ubiquitous sensors!

Big Data:

- In the Big Data era, Everything is Quantified and Tracked!

- Examples:
  - Social Networks
  - Population & Personal Health
  - Smart Cities
  - Smart Highways
  - Retail Analytics
  - Cybersecurity
  - IoT = Internet of Things
  - IoE = Internet of Everything!

SDGs are KPIs for the World!

1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE AND JUSTICE STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

THE GLOBAL GOALS
For Sustainable Development

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