Spatial and Big Data Services for Lower Cost, Better Quality Healthcare Systems

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January 24, 2017
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Rural areas have higher death rates from the five leading causes of death.

Some causes:
- Fewer healthcare providers, less preventive care
- Long travel distances for specialty and emergency care
Improve Emergency Services Planning, Bavaria
Oracle Spatial and Graph Routing Solution

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Technology Trends
Rapid Impact on Digital Health
Three Major Trends

• Big Data

• Advanced analytics

• Cloud computing
1. Big Data
1. Big Data

Old and New Data Sources
• Electronic health records
• Genomic sequencing
• Mobile sensors
• Insurance claims
• Social media
• Track food purchases
Sensors and Wearable Devices

• Fitness activity trackers
  – Watches and trackers reach 110 million in sales in 2016
  – Smart phone penetration will surpass 6 billion by 2020
  – Low cost way to track and improve population health

• Biosensors
  – Physiological measurements: Heart rate, skin temperature, blood oxygen levels

• Smartphone apps to transmit data: weight, BP, heart rate
Published January 12, 2017

- Track heart rate, skin temperature and blood oxygen levels continuously

Results

- Identify onset of Lyme disease and inflammation before external symptoms
- Detect risk for type 2 diabetes
Large Scale Data Processing with Cluster Computing

In memory cluster computing
Big Data Platform

Process sensor data and identify interesting events

Store an interesting event
2. Advanced Analytics

http://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.2001402
Spatial Analysis

• What is an optimal way to identify the nearest trauma facility? Which water source could have caused the diarrhea outbreak measured at this clinic?

• Link disparate sources of Big Data by location
  Example: Tweet + location of sensor + insurance claim address

• Mapping and Visualization of analysis results

• Categorization, clustering and filtering based on location and proximity
3. Cloud Computing

- Cost Reduction
- Reduce Overhead
- Develop and deploy quickly
- Flexibility
Oracle Cloud Services

Examples

Oracle Big Data Cloud Service
Oracle Big Data Spatial and Graph
Oracle Advanced Analytics
and more

Oracle Database Cloud Services
Oracle Spatial and Graph
Oracle Advanced Analytics
and more

Oracle Storage Cloud Service
Tracking Disease at the World’s Largest Religious Festival: Kumbh Mela

- 30 million people visit to bathe in holy waters

**Water and Sanitation**
- 46 tubewells
- 600+ km pipes
- 92 million liters/day clean water
- 35,000 temporary toilets
- 7,000+ night soil sweepers

A Harvard South Asia Institute Initiative

Courtesy: Dr. Satchit Balsari and the Jana Swasthya team
Track Disease in Real-Time

EMCounter Disease Surveillance System

- Real-time upload in 35 medical clinics through mobile devices
- View patient trends in real-time throughout the festival
- Cloud technology enabled easy access and sharing by doctors, policy makers, data analysts, and others

Actionable Data in Real-Time

- Identify festival locations that need additional doctors, nurses, medical supplies
- When a surge in diarrhea was observed at a clinic, track water source to shut it down
- Identify unusual illness patterns
Spatial and Graph Technologies at Oracle

Oracle Database Spatial and Graph

Spatial and Graph Cloud Offerings

Oracle Big Data Spatial and Graph

NoSQL
Integrated Cloud
Applications & Platform Services