Big Data

Imagine Future Infrastructure: Technology, Research and People

Security & Resiliency

Society of American Military Engineers

December 14, 2018
Big Data
..is Dead, Long Live Cloud Computing!

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INTRODUCING GOALS

Goal 1
Advance equity in City government.

Goal 2
Ensure Dallas is a Welcoming City to immigrants and all residents.

Goal 3
Increase economic mobility for Dallas’ vulnerable and marginalized residents.

Goal 4
Ensure Dallas provides residents with reasonable, reliable, and equitable access.

Goal 5
Leverage partnerships to promote healthy communities.

Goal 6
Invest in neighborhood infrastructure to revitalize historically underserved neighborhoods.

Goal 7
Promote environmental sustainability to improve public health and alleviate adverse environmental conditions.
Big Data
A Retrospective
1950’s Military Program Origins

Los Alamos 1960’s Average
Software Compute Time ~7min

Los Alamos 1990’s Average
Software Compute Time ~7min
“The Most Dangerous Phrase in the English Language is, ‘We’ve Always Done It This Way’

Rear Admiral Grace Hopper
Origins of GIS and Early Big Data

Quantitative and Qualitative Measures of the Environment
Design with Nature - Ecological Principles
“Generating Living Structures”

1977 A Pattern Language - Christopher Alexander, Architect
A Pattern Language

#40. Old People Everywhere

#90. Beer Hall

#114. Hierarchy of Open Space

#51. Green Streets

#52. Network of Paths and Cars

#64. Pools and Streams

#45. Necklace of Community Projects

#8. Mosaic of Subcultures

#253. Things from your Life
Discovery of “A Pattern Language” by Programmers

Object Oriented Programming
Software Development - Form Follows Function
Emergence of Digital Environments

Simulating & Modeling abstractions gives way to increased frequency and resolution delivering reliable versions of reality.
‘We have a problem, there is $10^{15}$ SqFt of construction in the world and we have no system that assures us we will have a sustainable future’

OOPSLA 1996 San Francisco
‘I suspect that there is a connection with the work I do and the work you do. The world is becoming all-digital and you have the power to shape the decisions that will change the future’
2002 “Digital Age”
Today’s Big Data Sources and Types
Satellite Imagery

https://earthengine.google.com/timelapse/#v=3.14,-96.85506,10.004,LatLng&t=0.68
Drones
Each GE Engine produces over 10Tb of data each day from 5,000 Sensors feeding AI processes that predict conditions resulting in 40% efficiency gains.
Keys to Success: Cloud Computing
Big Data Applications - Need Cloud Computing
Keys to Success
Open Data Portal

Connecting Communities through Data and Technology...

Browse the Town of Cary's Catalog of Datasets:

- Culture & Heritage
- Economy & Business
- Education
- Environment
- Geographic Info
- Government
- Police & Crime
- Town Planning & Permits
- Sports & Leisure
- Transportation
- Under Construction

Featured Data Stories & Videos:
Business Analyst

Eden, the Business Analyst, approaches data from different angles and applies analytics models to confidently support or dispel assumptions.

App Developer

Kai, the Application Developer, builds applications that interact with data and implements data models.

Data Scientist

Chris, the Data Scientist gets deep into the data to draw hidden insights and influence business decisions.

Data Engineer

Harley, the Data Engineer, builds and maintains a scalable data infrastructure to make relevant data available to teams.
Design Thinking
Big Data Example Applications
Big Data Applications - Machine Learning
Cloud Vision

Derive insight from your images with our powerful pretrained API models or easily train custom vision models with AutoML Vision BETA.

View documentation for this product.

Powerful image analysis

Cloud Vision offers both pretrained models via an API and the ability to build custom models using AutoML Vision to provide flexibility depending on your use case.

Cloud Vision API enables developers to understand the content of an image by encapsulating powerful machine learning models in an easy-to-use REST API. It quickly classifies images into thousands of categories (such as, "sailboat"), detects individual objects and faces within images, and reads printed words contained within images. You can build metadata on your image catalog, moderate offensive content, or enable new marketing scenarios through image sentiment analysis.

AutoML Vision Beta makes it possible for developers with limited machine learning expertise to train high quality custom models. After uploading and labeling images, AutoML Vision will train a model that can scale as needed to adapt to demands. AutoML Vision offers higher model accuracy and faster time to create a production-ready model.
Big Data applications
Synthetic Reality
For training data, we were given some driving sequences of different cities.
Data Models and Reality Are Converging
Resilient Design pursues Buildings + Communities that are shock resistant, healthy, adaptable and regenerative through a combination of diversity, foresight and the capacity for self-organization and learning.

A Resilient Society can withstand shocks and rebuild itself when necessary. It requires humans to embrace their capacity to anticipate, plan and adapt for the future.

– RELi Action List + Credit Catalog Author Doug Pierce
Resiliency and Innovative Technology Can Thrive If We Commit to:

- Open Data
- Cloud Computing
- Data Sciences + Design
- Open Source
- Commitment to Innovation
- Our People