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CRA CCC 2017: Computing Research: Addressing National Priorities and Societal Needs

SmartFarm: Turning Data Analytics into Farm Implements

Oct. 23, 2017
Data Analytics: Making Sense of It All
Cloud + Data Analytics: Revolutionizing Commerce

- What will you buy?
- When will you buy it?
- What will you pay?

Internet Activity

Inference and Prediction
Cloud + Data Analytics: Revolutionizing Commerce

What will you buy?
When will you buy it?
What will you pay?

Internet Activity

Inference and Prediction

Math and Statistics

CODE!
The world needs more food for a growing population.

Source: UN FAO
Our Research: What Else Can We Revolutionize With It?

THE WORLD NEEDS MORE FOOD FOR A GROWING POPULATION

BUT WE ALREADY USE 80% OF OUR FRESH WATER FOR AGRICULTURE

Source: UN FAO
Our Research: What Else Can We Revolutionize With It?

**THE WORLD NEEDS MORE FOOD FOR A GROWING POPULATION**

Source: UN FAO

**BUT WE ALREADY USE 80% OF OUR FRESH WATER FOR AGRICULTURE**

Source: UN FAO

**30% OF GLOBAL ENERGY USED TO PRODUCE FOOD**

**22% OF GREENHOUSE GASSES FROM AGRICULTURE**

Source: USDA
Our Research: What Else Can We Revolutionize With It?

The world needs more food for a growing population.

But we already use 80% of our fresh water for agriculture.

We lose almost half the food we produce to spoilage.

30% of global energy used to produce food.

22% of greenhouse gases from agriculture.

Source: UN FAO, USDA.
The Opportunity
Data-Driven Decision Support & Automation

What should I grow?
When should I water?
What will my yields be?

Inference and Prediction
Digital Infrastructure → Sustainable Agriculture Productivity
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Public Clouds

- Amazon Web Services
- Microsoft Azure
- Google Cloud Platform
Public Clouds

- Amazon Web Services
- Microsoft Azure
- Google Cloud Platform
Digital Infrastructure (Compute/Analytics, Storage, Communications)

Service Distribution Network For Data Analytics

Edge Tier

Public Cloud Tier

Devices

Edge Clouds

Public Clouds

UCSB SmartFarm

amazon web services

Microsoft Azure

Google Cloud Platform
Defining the Next-generation Infrastructure for Things (I4T)
Defining the Next-generation Infrastructure for Things (I4T)

Digital Infrastructure (Compute/Analytics, Storage, Communications)
A New Kind of Computer Science Research

- Problem driven and empirical
  - Food-Energy-Water nexus
- Societal and regional impact
- Multidisciplinary collaboration
- Leverages entrepreneurial activity
- Engages the community
Thanks!

UCSB RACELab
The Lab for Research on Adaptive Computing Environments
Computer Science Department, Harold Frank Hall (E-5), Santa Barbara, CA

- **Collaborators:** UCSB, CalPoly, UCDavis, Fresno State, Powwow Energy, Sedgwick Reserve, UC Extension, Private Growers

- **Support:** Google, Huawei, IBM Research, Microsoft Research, NSF, NIH, California Energy Commission

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