Medical Informatics: Introduction

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• **Moore’s law** - The number of transistors (basic computational units) that can be put on a computer chip doubles every 2 years.

![Cost per genome graph](chart.png)

Source: National Human Genome Research Institute

• **Beyond Moore’s law** - We are now beating Moore’s law in genomics. Now, significantly more than double the number of bases (basic elements of genetics) can be sequenced every 2 years at a fixed cost.
Big data

Figure 1: Approximate Growth of Different Data Populations

CHARACTERISTICS OF BIG DATA

**Volume:**
The sheer amount of data generated or data intensity that must be ingested, analyzed, and managed to make decisions based on complete data analysis.

**Velocity:**
How fast data is being produced and changed and the speed with which data must be received, understood and processed.

**Variety:**
Both structured and unstructured data generated by a wide range of sources.

**Veracity:**
The quality and provenance of received data.

Source: TechAmerica Foundation
Yishen (Tom) Chen  
*SMART Genomics API*

Xi (Steve) Chen  
*Genomics development library*

**Design**

**Implementation**

**Predictive Medicine**

Andrew Li & Arul Prasad  
*Exploration of disordered proteins related to drug resistance*

**Translational Medicine**

John Zhang  
*Integrating genomic, clinical, and patient questionnaire information for breast cancer diagnosis and treatment*
Design: An interface for communicating genomic information

**Presenter:** Yishen (Tom) Chen

**Title:** The SMART Genomic API

- Getting genomic and clinical components to talk to each other.
- Paved way for clinical genomic apps.

**Result:** Work being integrated into International standards by international standard organization (Fast Healthcare Interoperability Resources HL7).
From Design to Implementation

**Presenter:** Xi (Steve) Chen  
**Title:** Genomics development library  
**Result:** Created API software development kit for Android. Created sample app released on Android Market.
Translational Medicine

**Presenter:** John Zhang

**Title:** Integrating genomic, clinical, and patient questionnaire information for breast cancer diagnosis and treatment

**Result:** First app to integrate clinical-grade genomics, clinical records, and family history for cancer risk prediction
Predictive Medicine

**Presenter:** Andrew Li and Arul Prasad

**Title:** Exploration of disordered proteins related to drug resistance in Hepatitis B virus and lung cancer

**Result:** Discovered gene-based drug resistance significantly associated with two classes of protein disorder.
R&D Cycle

Yishen (Tom) Chen  
*SMART*  
Genomics API

Xi (Steve) Chen  
Genomics development library

Design

Implementation

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