

Microsoft Research

# Faculty Summit



FUTURE WORLD

2011 ← → 2031

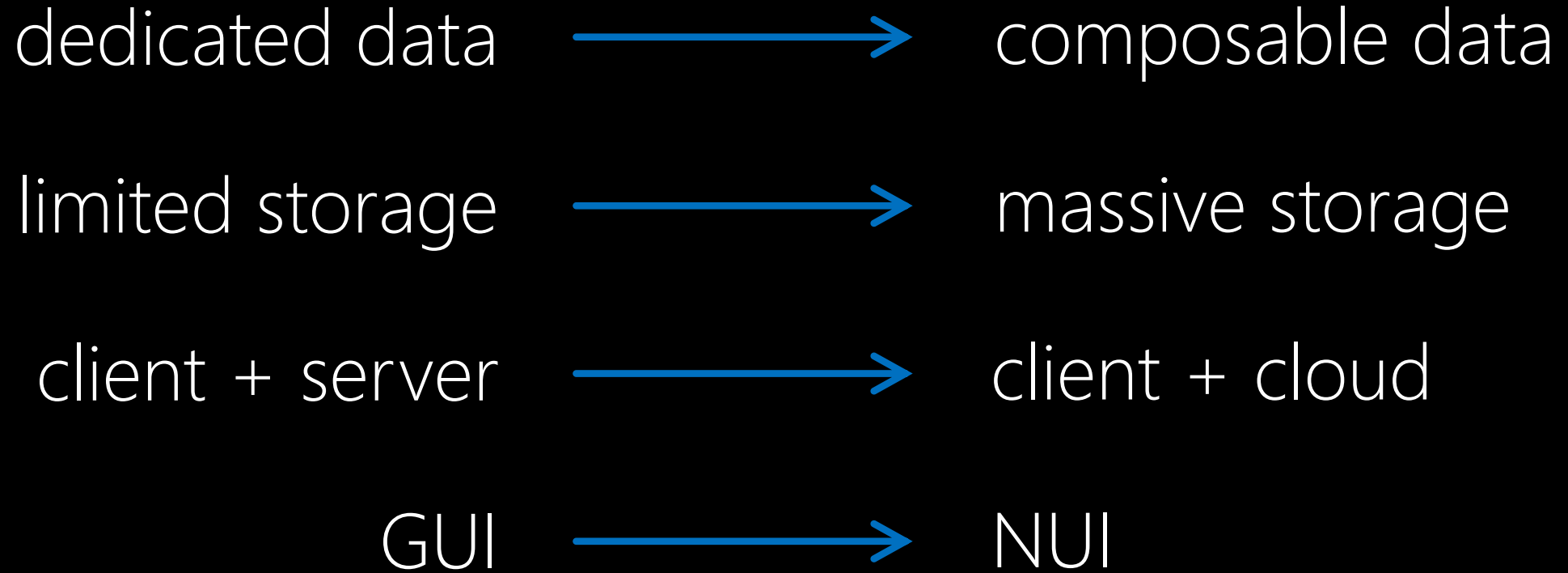


Microsoft Research  
**FacultySummit**

# Beyond the Interface: Computing Transformed

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Microsoft Corporation

FUTURE WORLD 2031  
2011



composable data

massive storage

client + cloud

NUI

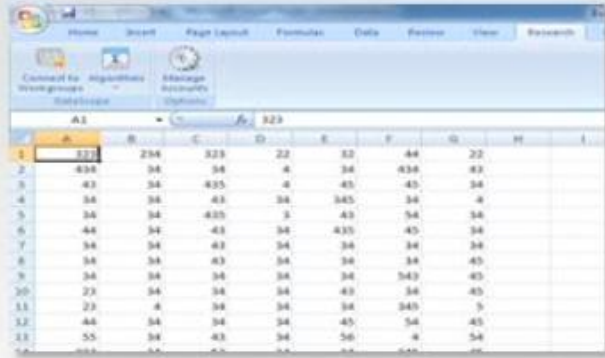


learning from big data



# excel datascope

## Client



## Excel Features

- User Authentication
- Data Import/Export
- Data Sampling
- Analysis Scheduling
- Job Monitoring



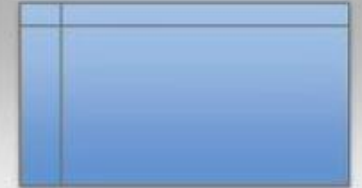
## Cloud



Data Products



Data Analysis Libraries



Metadata Tables



Web Service



Workers

Powered by  
**Windows Azure**

# excel datascope

The screenshot shows the Microsoft Excel DataScope interface. The ribbon is set to 'XDA' and includes the following groups and options:

- Accounts:** Manage Accounts, View Status
- Workgroup:** Connect Workgroup
- Dataset:** Import, Export
- Algorithm:** Outlier Detection, Machine Learning, Collocation, Clustering, Bayesian, Manage Algorithms

The active dataset is 'OceanData\_Dataset...' and the selected cell contains the formula '=Latitude'. The data table is as follows:

	A	B	C	D	E	F	G	H	I	J	K
1	Latitude	Longitude	Depth	Salinity	Temperat	Current					
2	125.1754	65.39015	2000	15.00068	0.00344	3.579928					
3	115.4601	45.4303	1000	3.178595	0.00311	6.646316					
4	110.1455	55.11229	2500	9.596857	0.001692	7.147596					
5	115.001	45.42193	1000	2.486194	0.001184	7.508713					
6	115.4186	45.35599	1000	2.921007	0.003764	4.139709					
7	120.2891	60.31296	1500	11.72448	0.002753	1.051162					
8	115.3924	45.48249	1000	3.959335	0.004483	2.057954					
9	120.38	60.21606	1500	10.4222	0.004082	1.528704					
10	110.2448	55.22488	2500	9.786277	0.004826	4.288581					

# excel datascope: powered by "daytona"

Technologies:

Azure data analysis services

MapReduce optimized for iterative processing

Challenges:

Exponential data growth

Latency

Cost and time tradeoff

Continuous analytics on  
streamed data



The screenshot shows the Excel Data Scope interface. The ribbon includes 'File', 'Home', 'Insert', 'Page Layout', and 'Formulas'. The 'Data Analytics' group contains 'Manage Accounts', 'View Status', 'Connect Workgroup', and 'Import Data'. The 'Accounts' group contains 'Accounts'. The 'Workgroup' group contains 'Workgroup'. The 'Formulas' group contains 'fx'. The data table is titled 'OceanData\_Dataset\_...' and has columns A, B, C, and D. The data is as follows:

	A	B	C	D
1	Latitude	Longitude	Depth	Salinity
2	125.1754	65.39015	2000	15.00068
3	115.4601	45.4303	1000	3.178595
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# predicting readmission of hospital patients



# predicting readmission of hospital patients

ADMITDTM	DISCHARGEDTTM	AGE	SEX	Odds ratio	Evidential Finding	FACTORS_ANTI_READMISSION
12/03/2010 14:57	12/08/2010 18:03	62	F	0.29207	Num past 1yr visits = more than 10	in the hospital / Number of heart conditions is 0 / Pat
12/08/2010 18:45	12/08/2010 18:45	74	M	0.27172	In a previous visit Sodium = L	sits = 2 / Number of heart conditions is 0 / Admission
11/16/2010 16:14	12/08/2010 18:50	48	M	0.23211	In a previous visit ABG Arterial O2 Hb = C	F = inf
12/02/2010 13:49	12/08/2010 18:14	68	M	0.21646	Patient had dx = Health services for specific procedures, not carried out	sits = 2
12/01/2010 05:26	12/08/2010 18:55	44	M	0.21139	Patient was given "Famotidine" during a previous 1yr visit.	F = inf
12/01/2010 19:08	12/08/2010 18:13	61	M	0.20785	Hour of visit = 10	sits = 2 / Num past 1yr visits = 2 / Marital Status is equ
11/30/2010 21:50	12/08/2010 18:52	70	M	0.19002	Patient had dx = Symptoms involving skin and other integumentary tissue	ted during last year / Num past 3m visits = 1 / Num pa
12/08/2010 08:51	12/08/2010 18:45	68	M	0.18684	Patient had dx = Functional digestive disorders, not elsewhere classified	ted during last year / Num past 3m visits = 1 / Num pa
12/03/2010 20:32	12/08/2010 17:50	80	M	0.18167	Patient had dx = Gastrointestinal hemorrhage	sits = 1 / stayed 3-6 days in the hospital / Ave gap of p
12/01/2010 01:13	12/08/2010 18:06	79	M	0.17978	Patient was given "Nitroglycerin" during a previous 1yr visit.	sits = 1 / Ave gap of past yr visits = between 61 and 3
12/08/2010			F	0.17697	Gaps since using warfarin family is less than 2 days	ted during last year / Num past 3m visits = 2 / Gap sin
12/08/2010			F	0.16159	Monocyte Absolute Count = H	ted during last year / Num past 3m visits = 1 / Num pa
			F	0.15941	Patient was given "Carvedilol" during a previous 1yr visit.	ted during last year / Num past 3m visits = 1 / Num pa
			F	0.15610	Patient was given "Cyclobenzaprine Hcl" during a previous 1yr visit.	ted during last year / Num past 3m visits = 1 / Num pa
			F	0.15590	Patient had dx = Depressive disorder, not elsewhere classified	ted during last year / Num past 3m visits = 1 / Num pa
			M	0.15260	In a previous visit Pulmonary Po2 = L	ted during last year / Num past 3m visits = 2 / Ave gap
			M	0.15209	Fungus Culture = normal	ted during last year / Num past 3m visits = 1 / Num pa
			F	0.14204	Patient was given "MORPHINE SULFATE" during a previous 1yr visit.	ted during last year / Num past 3m visits = 1 / Num pa
			F	0.14141	Num past 3m visits = between 5 and 11	ted during last year / Num past 3m visits = 1 / Num pa
			F	0.14015	Patient was given "Levalbuterol Hcl" during a previous 1yr visit.	ted during last year / Num past 3m visits = 1 / Ave gap
			M	0.13644	Gap since last visit = between 2 and 7 days	ted during last year / Num past 3m visits = 1 / Num pa
			F	0.12955	Free T4 = H	ted during last year / Num past 3m visits = 1 / Ave gap
			M	0.12542	Patient had dx = Gastric ulcer	ted during last year / Num past 3m visits = 1 / Num pa
			M	0.11285	In a previous visit Prothrombin Time = H	ted during last year / Num past 3m visits = 1 / Num pa
			M	0.10869	Number of heart conditions is 3	ted during last year / Num past 3m visits = 1 / Num pa
12/07/2010 22:23	12/08/2010 19:13	56	M	10.95 %	stayed <1 day in the hospital / 44 < Age < 60	Was NOT admitted during last year / Num past 3m visits = 1 / Num pa

depression

gastric ulcer  
or GI drugs

# predicting readmission of hospital patients

	FACTORS_ANTI_READMISSION
ers of fluid, electrolyte, an	stayed 3-6 days in the hospital / Number of heart conditions is 0 / Pa
rs of fluid, electrolyte, and	Num past 3m visits = 2 / Number of heart conditions is 0 / Admission
	Gap since first HF = infinite / Admission reason is empty / Marital Stat
-base balance / Patient ha	Num past 3m visits = 2 / Ave gap of past yr visits = between 61 and 3
	Gap since first HF = infinite / Number of heart conditions is 0 / Marital
Chronic renal failure	Num past 3m visits = 2 / Num past 1yr visits = 2 / Marital Status is equ
ards to health / Patient ha	Was NOT admitted during last year / Num past 3m visits = 1 / Num pi
	Was NOT admitted during last year / Num past 3m visits = 1 / Num pi
-base balance / Patient ha	Num past 3m visits = 1 / stayed 3-6 days in the hospital / Ave gap of
	Num past 3m visits = 1 / Ave gap of past yr visits = between 61 and 3
- between 15 and 30 days	Was NOT admitted during last year / Num past 3m visits = 2 / Gap sin
personal history presenting	Was NOT admitted during last year / Num past 3m visits = 1 / Num pi
	Was NOT admitted during last year / Num past 3m visits = 2 / Ave gap
	Was NOT admitted during last year / Num past 3m visits = 1 / Num pi
	Was NOT admitted during last year / Num past 3m visits = 1 / Num pi
	Was NOT admitted during last year / Num past 3m visits = 1 / Num pi
	Was NOT admitted during last year / Num past 3m visits = 1 / Ave gap
	Was NOT admitted during last year / Num past 3m visits = 1 / Num pi
	Was NOT admitted during last year / Num past 3m visits = 1 / Num pi
	Was NOT admitted during last year / Num past 3m visits = 1 / Num pi

## Technologies:

Connected systems, devices, sensors

Machine learning & cost/benefit analysis

Predictive models

Decision-theoretic inference

## Challenges:

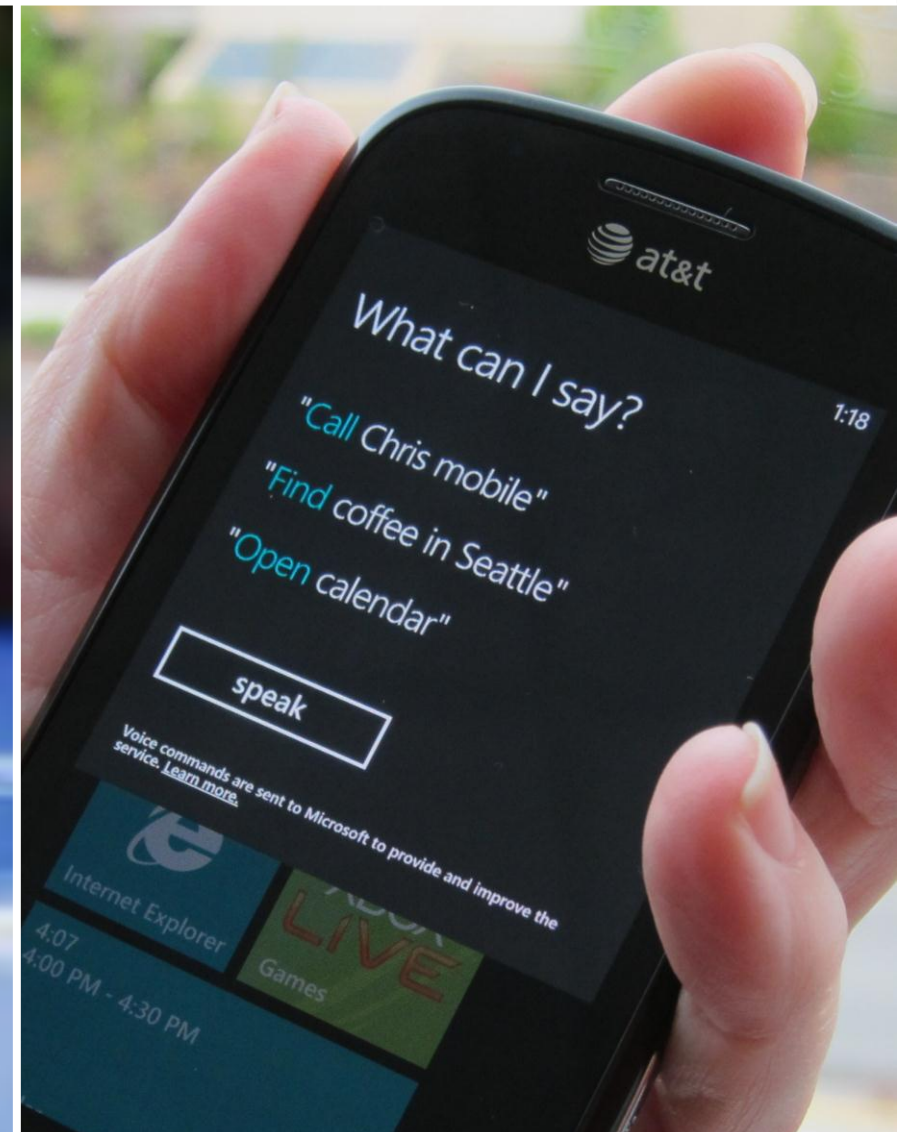
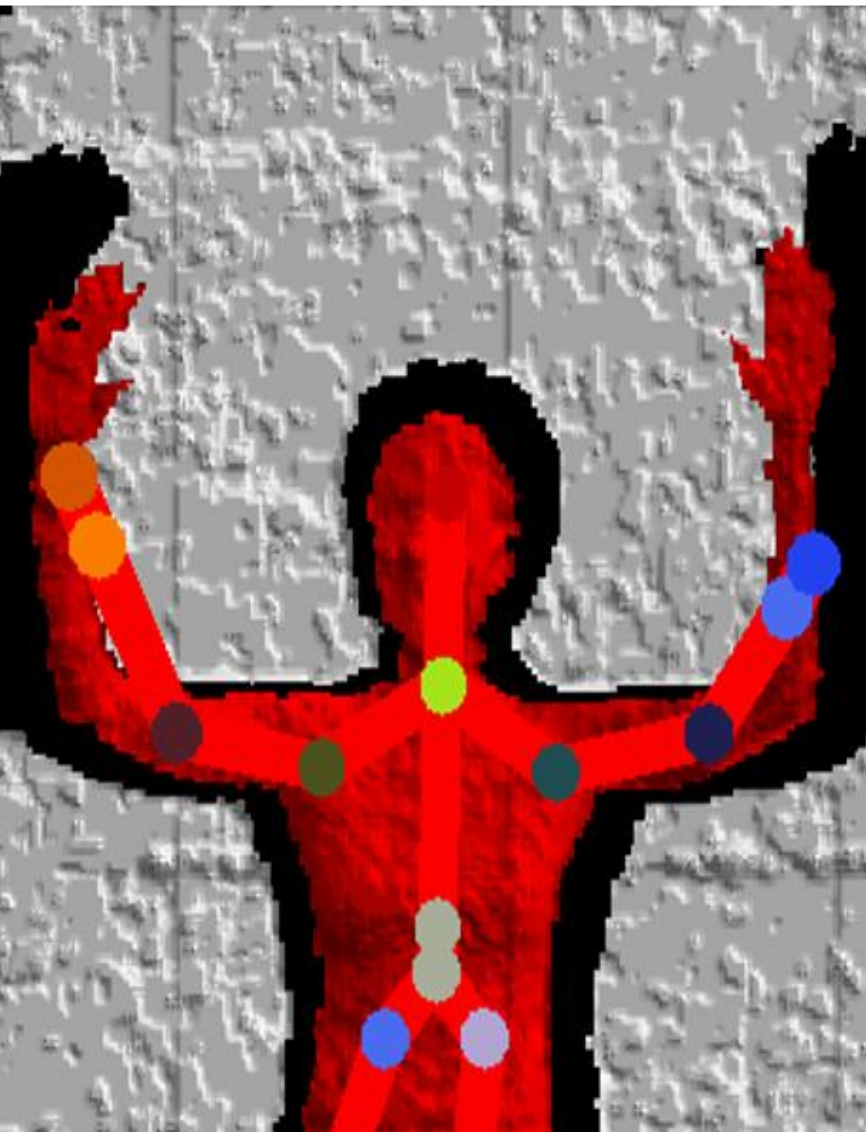
Inducing causality

Transfer learning

Temporal reasoning

Privacy and security

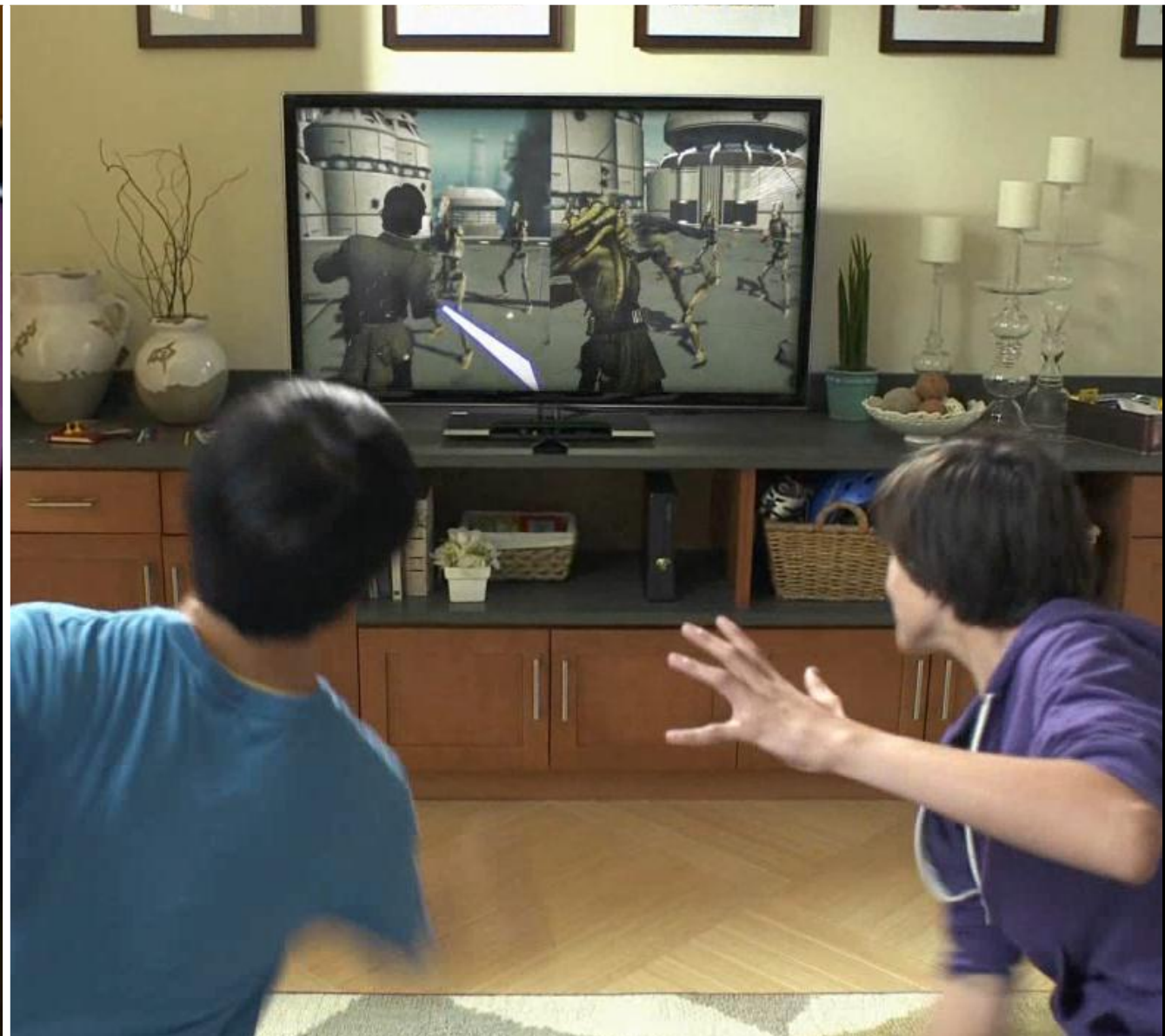




natural user interfaces



kinect: from impossible to possible



# kinect: under the hood



## Technologies:

Machine learning

Depth sensing

Speech recognition

Gestural interface

Parallel computing

Computer vision

Sound processing

Identity recognition

## Challenges:

Ambient noise, variable light

Annoying little-brother problem







# avatar kinect: a new way to be social





# avatar kinect: facial mesh



# avatar kinect: under the hood



## Technologies:

Low-cost VGA sensor

Multi-person audio

Expression capture

Handling sensor data with low latency

## Challenges:

Accurate head/body geometry capture

Low light/IR sensing

Hand/finger tracking

Eye gaze detection



Projects 7:44 PM

**Review**  
Group Treatment Sessions  
8 More Patients Eligible for This Group  
Latest Treatment Session Ready for Review

**Evaluate**  
New Bionic Contact Lenses  
3 of Your Patients are Eligible  
Colleague Dr. Pothich Reviewed This Device in Cardiac Journal

**Prepare for**  
Regional Diabetes Symposium  
Updated Conference Agenda Available  
2 More of Your Colleagues Have Registered  
12 New Panels and Keynotes Added

<b>Poland</b> Carole <small>Recent Blood Analysis (Backlog)</small>	<b>Kastner</b> Steve <small>Treatment Review</small>	<b>Chisholm</b> Martin <small>Treatment Review</small>
<b>Penor</b> Lori <small>Treatment Review</small>	<b>Jean</b> Virginia <small>Treatment Review</small>	<b>Singh</b> Guninder <small>Stomach Pain</small>
<b>Hao</b> Chen <small>Size Throat</small>	<b>Herman</b> Anne <small>Follow</small>	<b>Andersen</b> Thomas <small>Annual Physical</small>

Next Patients





computing transformed