

You're in the right place.
Andrew is standing in for Jessica Hodgins today!

Carnegie Mellon University

School of Computer Science



Optimizing Department/Industry Partnerships

Andrew Moore

Dean, SCS, awm@cs.cmu.edu

with many people, including Jessica Hodgins (SCS & Disney), Manuela Veloso (SCS ML & AI), Anind Dey (SCS HCII) and Martial Hebert (SCS Robotics).

CRA Snowbird, July 18th, 2016

This Talk

- What has SCS learned from local industry ties?
- What works?
 - For the companies
 - For the students and the school
- Where we misstepped
- Tips and tricks
 - My personal suggestions
 - Consensus suggestions from this group

This Talk

- What has SCS learned from loc
- What works?

The General Case

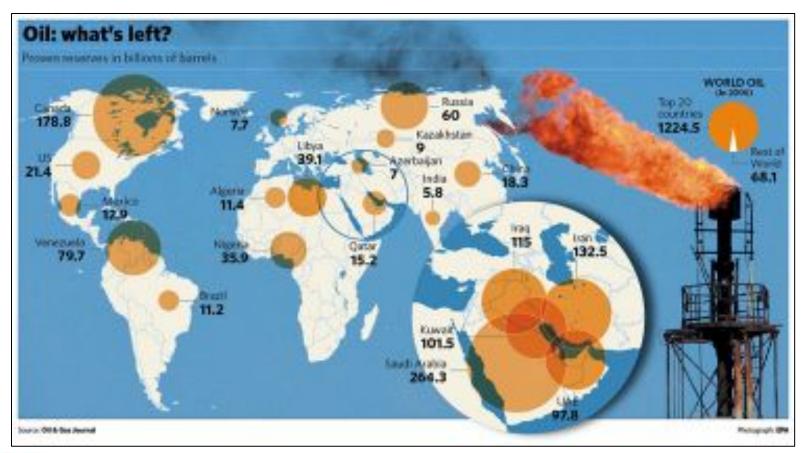
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Access to students

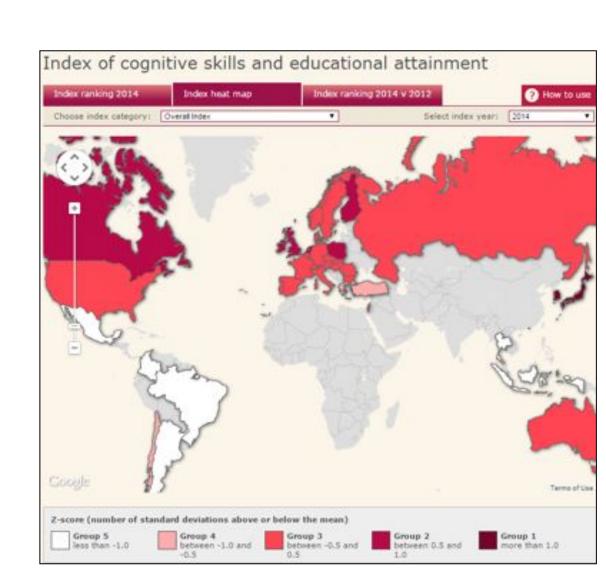
Access to students



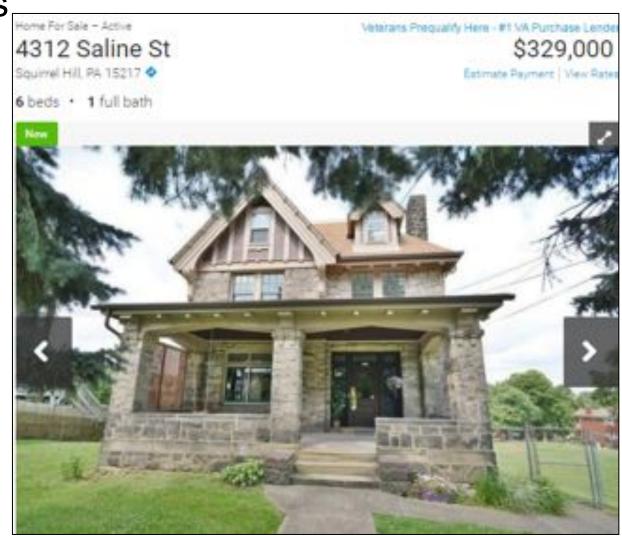
- Access to students
- Advantage in the global talent wars



- Access to students
- Advantage in the global talent wars



- Access to students
- Advantage in the global talent wars



- Access to students
- Advantage in the global talent wars
- Haves & Have-nots

Have (n): A global softwarefocussed company, or a small company with high potential upside, which has its own computer scientist talent.

Have Not (n): Any company which does not have a major internal computer scientist cohort.

- Access to students
- Advantage in the global talent wars
- Haves & Have-nots
 - Haves:
 - it's the donut

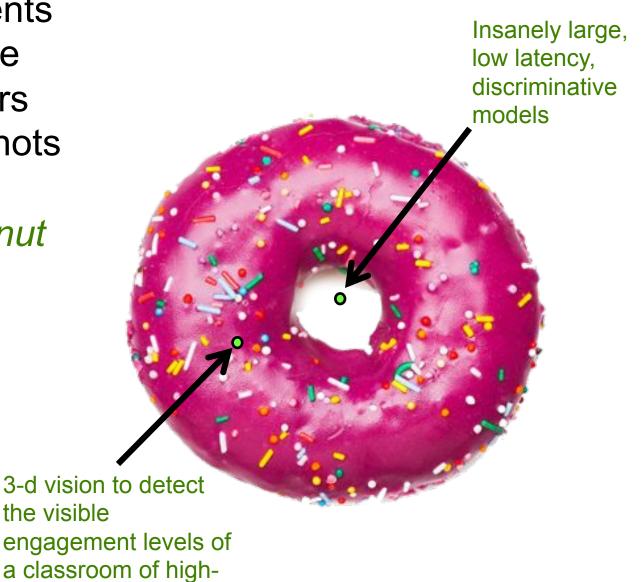


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schoolers



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low latency, discriminative models 3-d vision to detect

the visible engagement levels of a classroom of high-schoolers

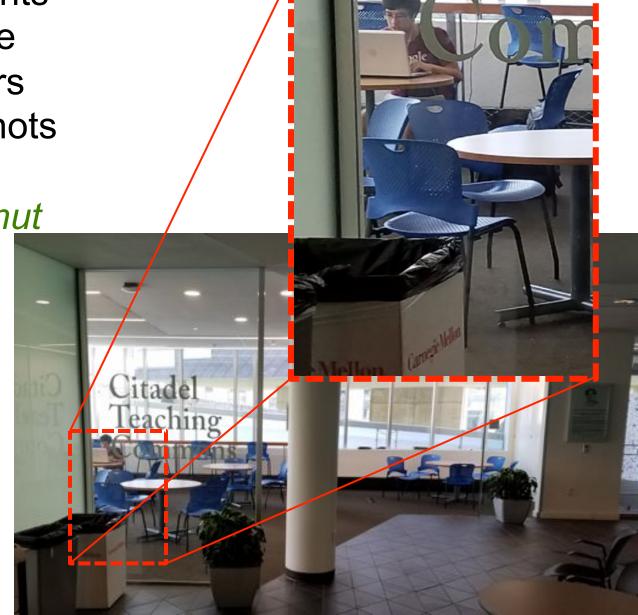
History of weasel
worship in the
middle ages

Insanely large,

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 - it's the donut
 - it's the branding



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 - Have-nots
 - it's the ideas



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 - it's the branding
 - Have-nots
 - it's the ideas
 - it's the culture changers



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 - For the students and the school

Specific Stories

- Where we misstepped
- Tips and tricks
 - My personal suggestions
 - Consensus suggestions from this group

Disney	Better products, new thinking
Google	Industry breakthroughs, talent acquisition, outreach to new groups
IBM	New technology, quick expansion when needed
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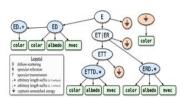
Denoising Case Study: Paper to Press

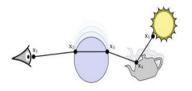
Fabrice Rousselle, David Adler (WDAS), Henning Zimmer, Oliver Wang, Peter Kaufmann, Wojciech Jarosz, Alexander Sorkine-Hornung

Originating Research

Path-Space
Decomposition for
Improved SpatioTemporal Upsampling
and Denoising of
Rendered Animations

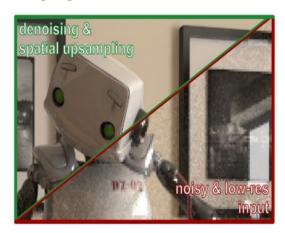
$$D(\mathbf{v}_t) = \sum_{\mathbf{f} \in \mathbf{F}} \frac{1}{n_{\mathbf{f}}} \Psi_p (\|\mathbf{f}_{t+1}(\mathbf{p} + \mathbf{v}_t(\mathbf{p})) - \mathbf{f}_t(\mathbf{p})\|^2)$$





Paper Published

Path-Space Motion
Estimation and
Decomposition for
Robust Animation
Filtering - Eurographics
2015



Patent Filed

Path-Space
Decomposition for
Improved SpatioTemporal Upsampling
and Denoising of
Rendered Animations

Online Sulv	minim (Et 5014
A Path-Space Decomposition for In	nproved Spatio-Temporal Upsampling
	Rendered Animations
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. 1 Introduction	
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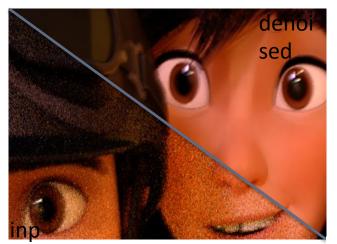
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Sorkine-Hornung

Contribution to Walt Disney Animation Studios Hyperion Team

Collaboration credited in **Big Hero 6**



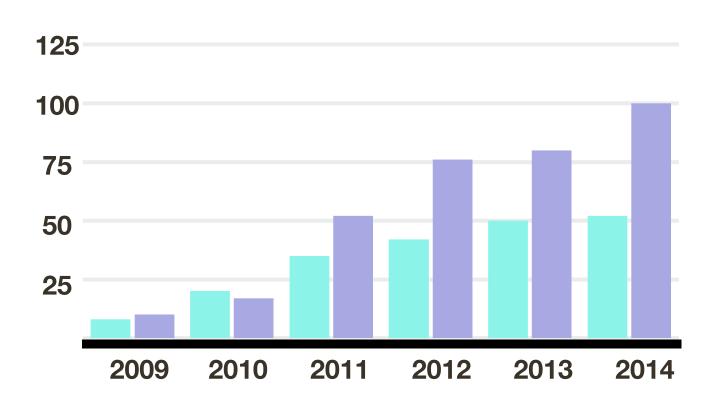






PATENT RESULTS

- Patents
- Publications





Disney	Better products, new thinking
Google	Industry breakthroughs, talent acquisition, outreach to new groups
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Disney	Better products, new thinking	ID A	Object Name MacBook Air Trackpad	EM-Sense Signal
Google	Industry breakthroughs, talent acquisition, outreach to new groups	B C D	Dremel 3000 Rotary To Black & Decker Sander Door Handle w/ MagLo	
IBM	New technology, quick expansion when needed	F	Fixed Steel Ladder Sub-Zero Refrigerator	
Caterpillar	New technology and business model	H	ArmorActive Conf. Scre Flourescent Desk Lamp DDRUM Power Adapte	h
Oculus	Collection of world experts	J	Honda CM250 Motory	Address to a con-
Uber	Combo of Machine Learning, Vision and Behavior Based Control Knowhow	K L M	T-Fal Avanté Classic Toal FitBit Aria Scale Sonicare Elec. Toothbri Kenmore Elite Refrigera	ısh
[Unnamed ML company]	Access to students, differentiation in tech	P	Samsung Gas Range Incandescent Floor Lar	np
Amazon	NLP chance to expand	Q	Printrbot 3D Printer Apple iPad 2	
[Unnamed consumer company]	New thinking, access to students	s T	Microsoft PPI Display DeWalt Power Drill	- Amadana
Bosch	New thinking, practical researchers	v	MacBook Pro Trackpac	1
Carnegie Mellon Unit School of Compu		X Hor	Samsung 70° TV Mac '14 Structures Worksh	op Transport Office

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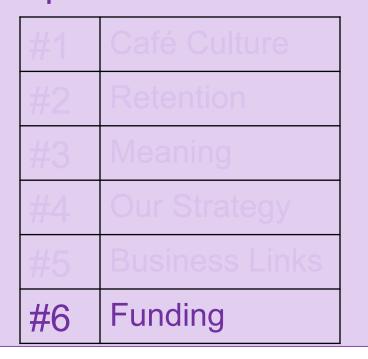
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- For Students
 - They have friends in the biz
 - Startups have a much better shot
 - We can close the loop on education relevance much more quickly
 - Much more informed about their possible futures

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#1	Café Culture
#2	Retention
#3	Meaning
#1	Our Strategy
77-1	odi odiatogy
#5	Business Links

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#4 #5	Our Strategy Business Links

Al technology stack

Autonomy Augmented Humans

Al infrastructure

Decision Support

Modeling

ML Components

Data Science Kernel Layer

Device Layer

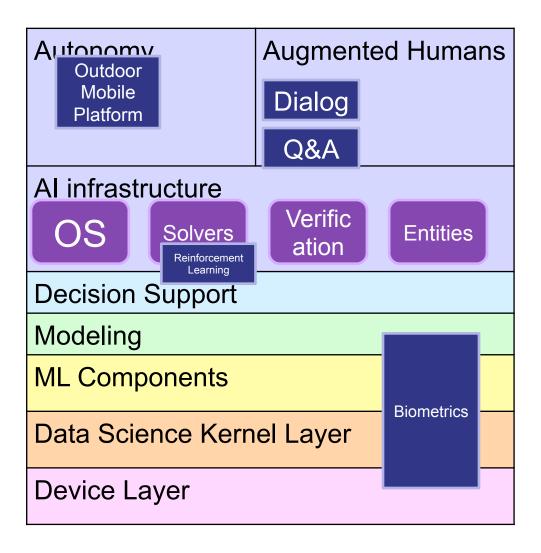
Al technology stack

Autonomy Augmented Humans Al infrastructure Verific OS Solvers Entities ation **Decision Support** Modeling **ML** Components Data Science Kernel Layer **Device Layer**

Industry focus areas

AI infrastructure component

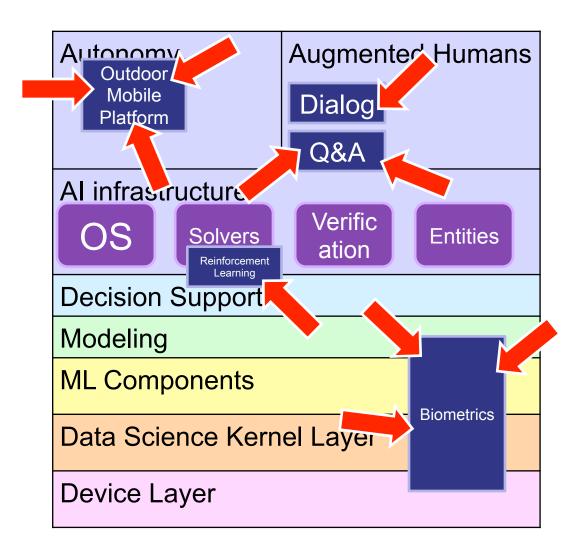
Industry Hotspot 2016



Industry DANGER!!!

AI infrastructure component

Industry Hotspot 2016

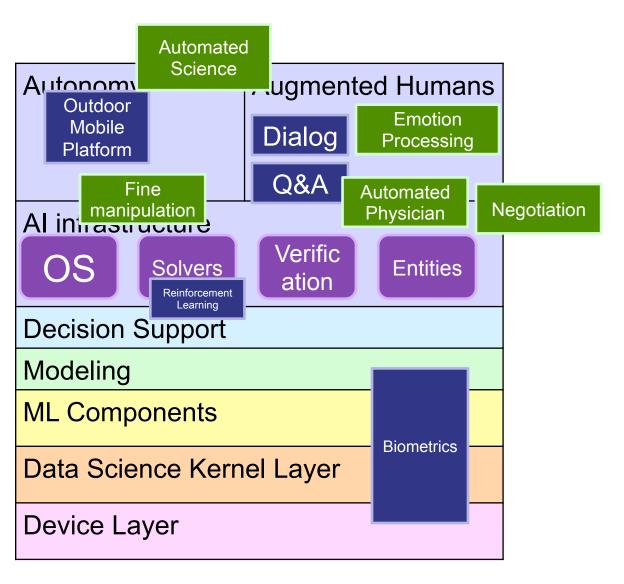


CMU focus areas

AI infrastructure component

> Industry Hotspot 2016

CMU/SCS investment

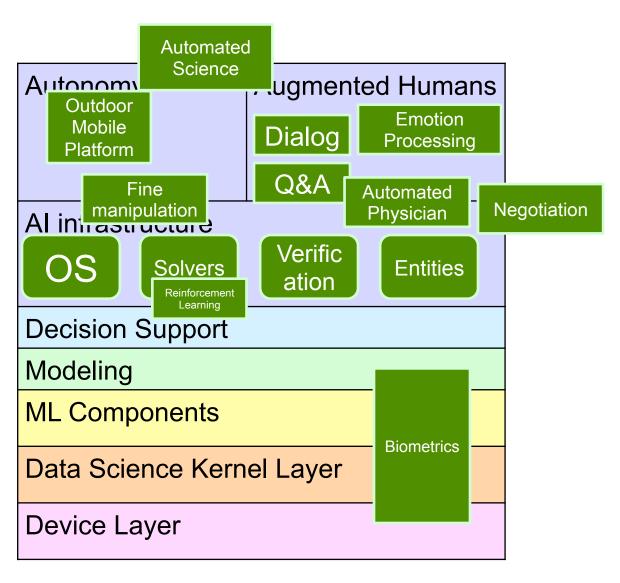


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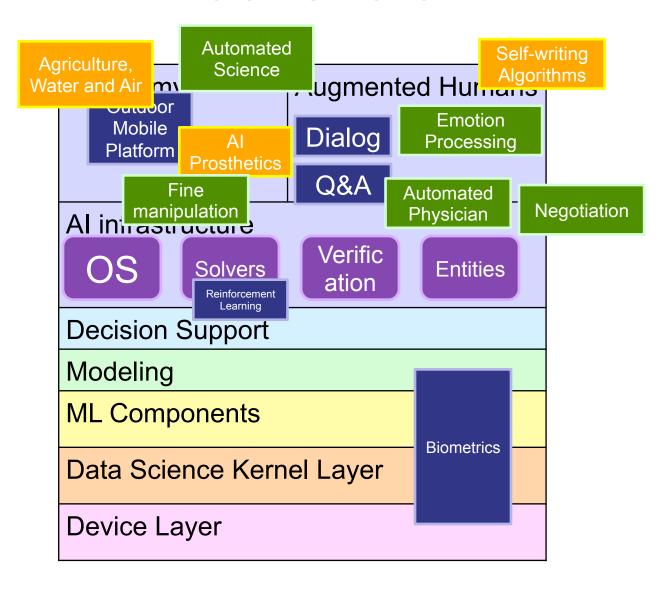
Moonshots

AI infrastructure component

> Industry Hotspot 2016

CMU/SCS investment

CMU/SCS moonshot



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#6	Funding

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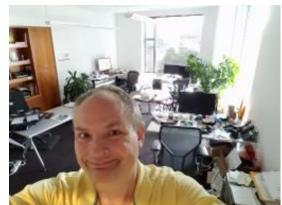
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Rookie Mistakes

- Rookie Mistakes
 - Not enough Product Managers and Bizdev people
 - Excessive internships? (There <u>are</u> other things to do with summers)
 - Brand Snatching
 - University under-delivery (the pie problem)

























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- Rookie Mistakes
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 - Excessive internships? (There <u>are</u> other things to do with summers)
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- Issues which will always be hard
 - Joint IP issues
 - Grad Student + Faculty + Company triangle
 - Distracted Faculty

- Rookie Mistakes
 - Not enough Product Managers and Bizdev people
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 - Brand Snatching
 - University under-delivery (the pie problem)
- Issues which will always be hard
 - Joint IP issues
 - Grad Student + Faculty + Company triangle
 - Distracted Faculty
- Requires careful attention but a good problem to have:
 - So-called faculty "poaching" by industry

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Tips and Tricks for a loving University/ Company relationship

Dos	Don'ts
Back Channel friendships	Don't do it solely for funding
Central part of curriculum discussion	Deal with IP issues head- on, and ramp up your legal and contracts teams
Student exposure	Remember the donut: don't aim for the center for the "Haves"
Find out the mission of the local lab, and help nurture it.	Don't be a work-for-hire shop for the "have nots".

My personal suggestions

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My personal suggestions

I would be grateful for changes and additions to this tip/trick set.