

# **Giving Yourself Options with Interdisciplinary STEM**

January 7, 2014

Guha Jayachandran  
Web: <http://guha.me/>  
Twitter: @guha

# Outline

---

- Interdisciplinary Examples
- Other Thoughts

***Feel free to interrupt!***

# Part I: Interdisciplinary Examples

# Takeaways from These Examples

- Some of the most exciting opportunities in STEM are for those that can work across traditional discipline boundaries
  - Either between different STEM categories (for example, biocomputation) or between STEM and other areas like business
- STEM can be applied to anything
- Everything is interdisciplinary
- Key is to get good fundamentals and stay flexible

# Biocomputation

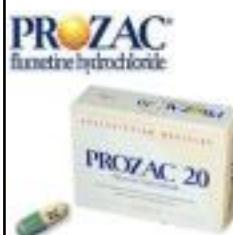
---

- Application of computer science to biological problems
- In reality, a vague term
  - It is used to describe everything from medical image processing to genetic sequence alignment algorithms
- The intersection of 2 massive revolutions

# Revolutions



Computational

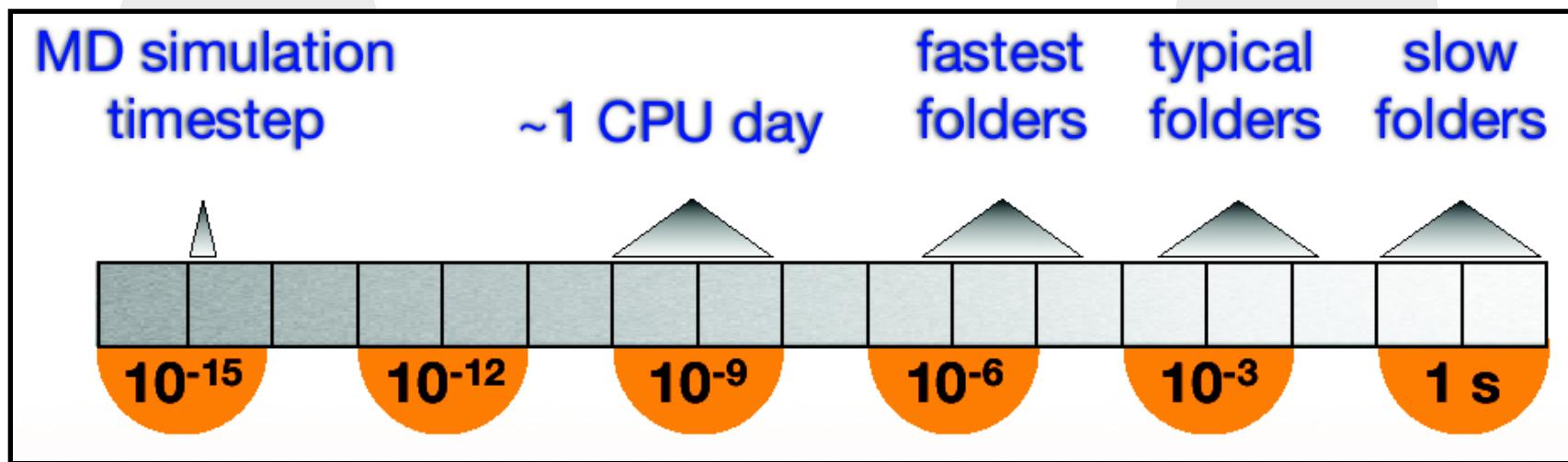


Biomedical



<http://guha.me/>

# Difficulties in Simulation



# Difficulties in Simulation

Need:

More computational  
power and better  
computational  
techniques

slow  
folders

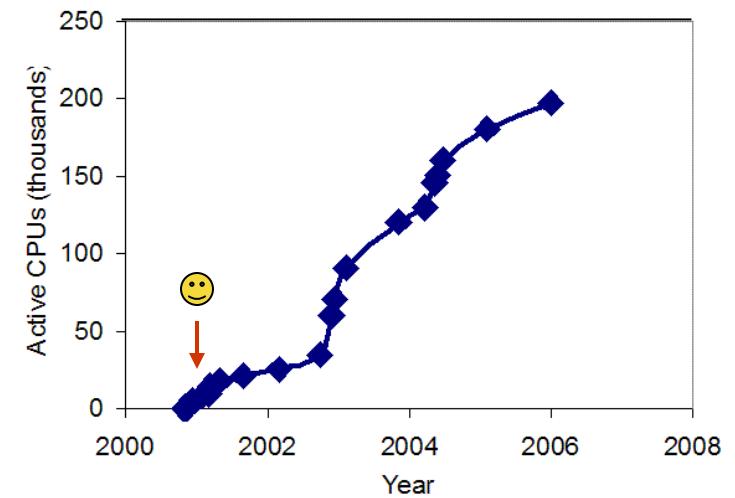
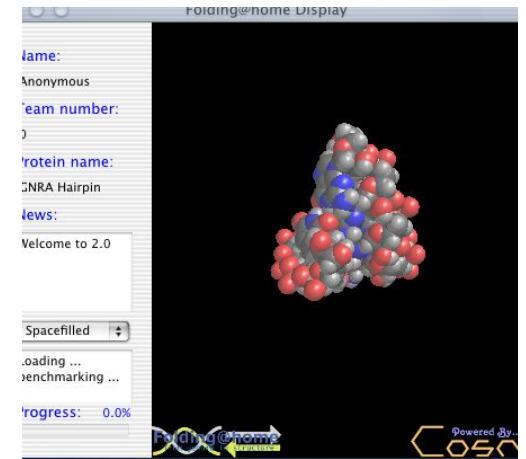
MD simu  
times

$10^{-15}$

1 s

# Folding@Home

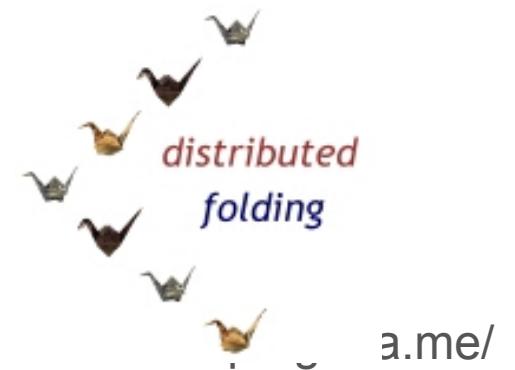
- Distributed computing project (  
<http://folding.stanford.edu>): anyone  
can run the software (Linux/Windows/  
Macintosh/PS3)
- Clients run assigned simulations with  
unused processor cycles
- Steady growth in install base
- Listed in Guinness Records for its  
power



# Other Distributed Projects



CycleTraders



# yeti@home

BIG EAT HAIRY DEAL

“ there's a small, but  
captivating possibility  
that your computer  
will detect the  
faint footsteps of a  
hairy monster... ”

# SIC@HOME

“The SIC project searches for just such  
incredible coincidences. If we can find such a  
coincidence, we can prove that the universe is  
truly infinite!”

<http://guha.me/>

# Virtual Airplanes

**Why compute?** To make possible the otherwise impossible.

**Where does that power come from?** Using understanding instead of physical trial and error.

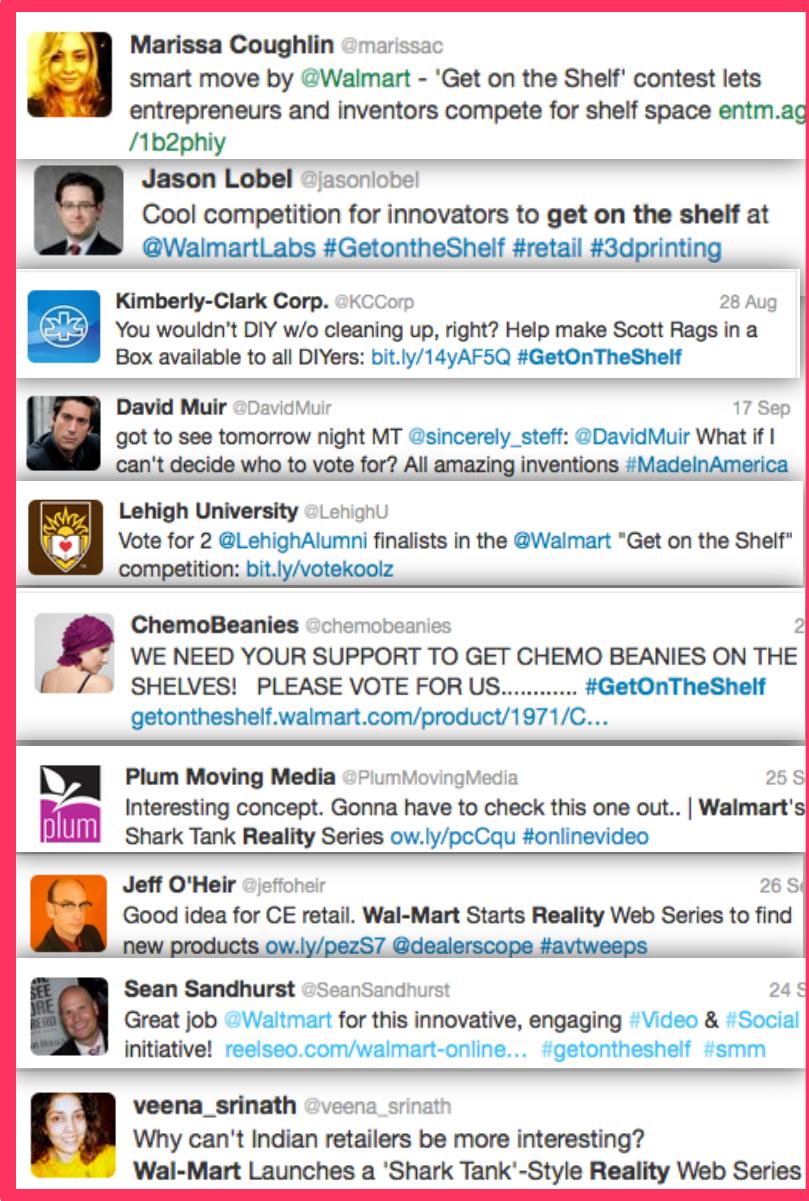


# STEM + Non-STEM

---

- Understand business
  - Best learned by watching and doing
- Engineering principles can be applied to many areas
- Example of “social marketing:” Get On The Shelf

# Get On The Shelf



Marissa Coughlin @marissac smart move by @Walmart - 'Get on the Shelf' contest lets entrepreneurs and inventors compete for shelf space [entm.ag/1b2phiy](http://entm.ag/1b2phiy)

Jason Lobel @jasonlobel Cool competition for innovators to **get on the shelf** at @WalmartLabs #GetontheShelf #retail #3dprinting

Kimberly-Clark Corp. @KCCorp 28 Aug You wouldn't DIY w/o cleaning up, right? Help make Scott Rags in a Box available to all DIYers: [bit.ly/14yAF5Q](http://bit.ly/14yAF5Q) #GetOnTheShelf

David Muir @DavidMuir 17 Sep got to see tomorrow night MT @sincerely\_steff: @DavidMuir What if I can't decide who to vote for? All amazing inventions #MadeInAmerica

Lehigh University @LehighU 20 Sep Vote for 2 @LehighAlumni finalists in the @Walmart "Get on the Shelf" competition: [bit.ly/votekoolz](http://bit.ly/votekoolz)

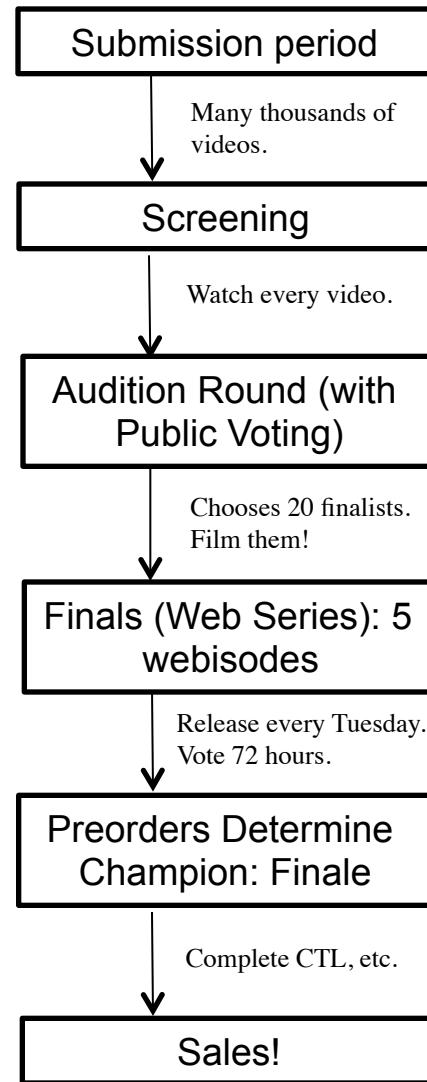
ChemoBeanies @chemobeanies 21 Sep WE NEED YOUR SUPPORT TO GET CHEMO BEANIES ON THE SHELVES! PLEASE VOTE FOR US..... #GetOnTheShelf [getontheshelf.walmart.com/product/1971/C...](http://getontheshelf.walmart.com/product/1971/C...)

Plum Moving Media @PlumMovingMedia 25 Sep Interesting concept. Gonna have to check this one out.. | Walmart's Shark Tank Reality Series [ow.ly/pcCqu](http://ow.ly/pcCqu) #onlinevideo

Jeff O'Heir @jeffoheir 26 Sep Good idea for CE retail. Wal-Mart Starts Reality Web Series to find new products [ow.ly/pezS7](http://ow.ly/pezS7) @dealerscope #avtweeps

Sean Sandhurst @SeanSandhurst 24 Sep Great job @Walmart for this innovative, engaging #Video & #Social initiative! [reelseo.com/walmart-online...](http://reelseo.com/walmart-online...) #getontheshelf #smm

veena\_srinath @veena\_srinath 23 Sep Why can't Indian retailers be more interesting? Wal-Mart Launches a 'Shark Tank'-Style Reality Web Series



<http://guha.me/>

“Just wanted to let you know how much I appreciated your contest. **It was great fun - and to top it off, my business has tripled since I entered...** Once again, thank you for all of the publicity (and the extra business)!”

“...I thank you, not just for me, but for **the opportunity you gave so many.**”

“Your professionalism from the beginning and throughout the first round has been **top notch** and it was a pleasure being included in the Mix. **I have gained numerous connections from being involved in the contest.**”

“Thank you the experience was a blast.”

**“Thank you for the opportunity! It has been exhilarating!”**

“Thanks again for the exposure. We have received several orders and calls since we did the youtube.”

“Thank you for the opportunity and for the encouragement, it's been a lot of fun!”

“Hats off to you, if you continue this policy, you will see that **America will always will remain first...**”

“We had article written on Fast Company magazine and were interviewed on TV by ‘The Morning Show’ in Jacksonville, Florida.

**The ‘Get On The Shelf’ contest program helped us propel to even more exposure. Without it, we would not have been on the map.”**

“Thanks again for the opportunity. **This was a awesome contest.**”

“May God continue to bless Walmart and the Walmart family.”

“It was a great opportunity all the way around, and we look forward to maybe having the opportunity again down the road.”

“I wanted to thank you guys for the opportunity to be apart of this contest... **I’m just so appreciative that an opportunity like this came my way.... Again you guys gave me so much fun for one short month.**”

**“Opportunities like your Get On The Shelf promotion level the playing field and allow small business owners the opportunity to flourish!** Thanks again for providing this exciting promotion. I am more determined than ever to grow my business because one day... will be in the position to offer similar opportunities to small businesses!”

“Thank you so much for allowing us to participate! We had a great time and made tons of connections! **We are well on our way** with a purchase of over 500,000... **Great exposure for us!** Thanks for the great time!”

Walmart!! YOU ROCK!! how impressive to get back to me with this response.

Thank you for having this contest! It definitely helps to get the word out about our product. Just want to let you know that we have interest in the UK for our product now, not just the US.

I wanted to take a moment to thank you so much for all you are doing for small businesses, entrepreneurs and inventors across American by allowing us to gain so much publicity thru your contest... This contest has been an amazing marketing experience... Our FB insights have increase over 1200%! We ran out of stock for all of our inventory here at my home office and have orders on hold to ship out when they come in this week! We have been contacted by a global distributor here in Tennessee, a distributor in Europe and we picked up another school Fundraising account thru our custom department! Wow, the exposure is amazing and [we're] so grateful!

I simply wanted to take this opportunity to thank you and tell you that your contest has made a huge difference in the growth of our product and we greatly appreciate the opportunity you have provided not only for us, but for all the well deserving products in the contest! You are making a difference!

I do have to say that being in this contest has increased traffic on my website and I've received an increase in online orders! Amazing! Thank you for putting together such a great contest.

I don't have a question. I have a comment. I think your "Get on the shelf" contest is outstanding. Whoever came up with the idea deserves an "atta boy". Why? Because we don't have enough companies in our country that appreciate new and innovative ideas anymore. That's why we're losing our competitive edge to other countries. The new ideas Wal-Mart is promoting is creating jobs for small business and America. Kudos to Wal-Mart !

Dear Walmart, I am really thrilled...! I have been getting some great press in my area of Philadelphia. I wanted to share with you a link to a great article featuring me, my product & the GOTS contest...

Just wanted to say thanks . The publicity from get on the shelf help us land 170 store chain.

# Other Interdisciplinary Examples

- Medical image processing
  - Computer aided detection: Is there cancer in this mammogram or CT?
  - Management of images
- Biomechanical devices
- Finance
  - Examples: “Financial engineering,” high-frequency trading, venture capital
- Product design
  - Mechanical engineering plus art
- Computer animation
- Computational music
- Any early-stage technology startup
  - You have to wear many hats
- Many more...

# Preparation

---

- Get fundamentals
  - Statistics and probability
  - Programming
  - Basic physics, chemistry, biology, in that order
- Get a variety of experiences
- If you have fundamentals and practice, you can apply skills in variety of ways and often learn enough of new application areas as needed