Survey

tinyurl.com/gened1112MarchSurvey

GenEd 1112 Survey

This survey, designed to help the teaching staff structure the remainder of our semester, will not be widely circulated, but it is "public" in that your answers are not confidential. Please see the final question if you would like to express any thoughts confidentially.

Email *

Valid email

This form is collecting emails. Change settings

Prediction: Week 8

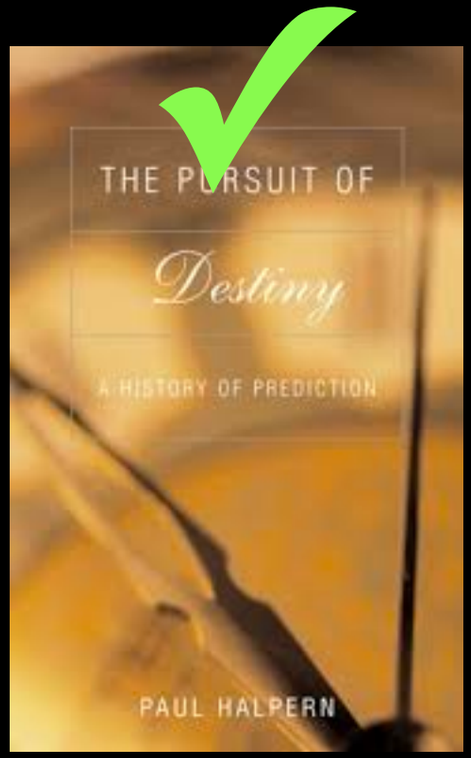
Introduction to Modern “Simulations” (Modern Predictions)

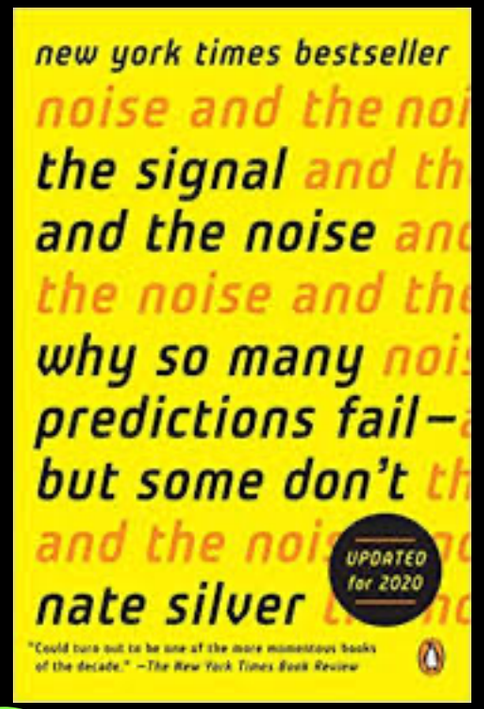
(Your final projects)

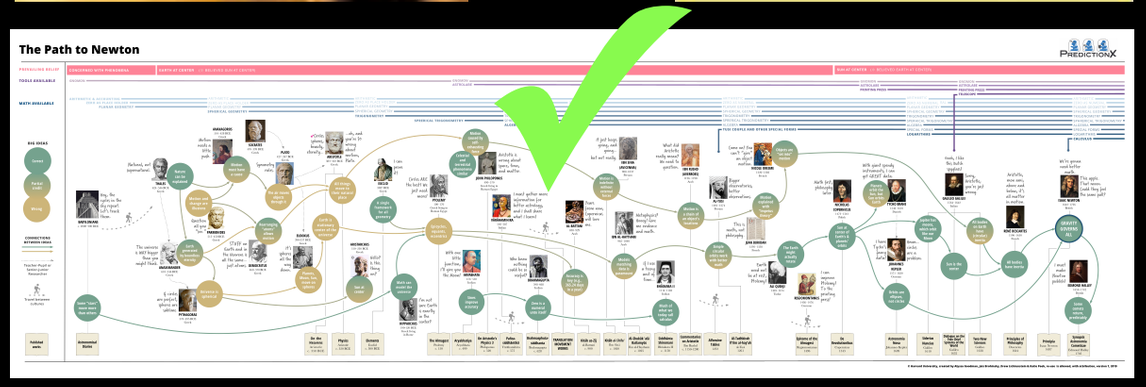
How to evaluate and appreciate **accuracy** and **uncertainty in Predictions.**

Weather & Climate Prediction

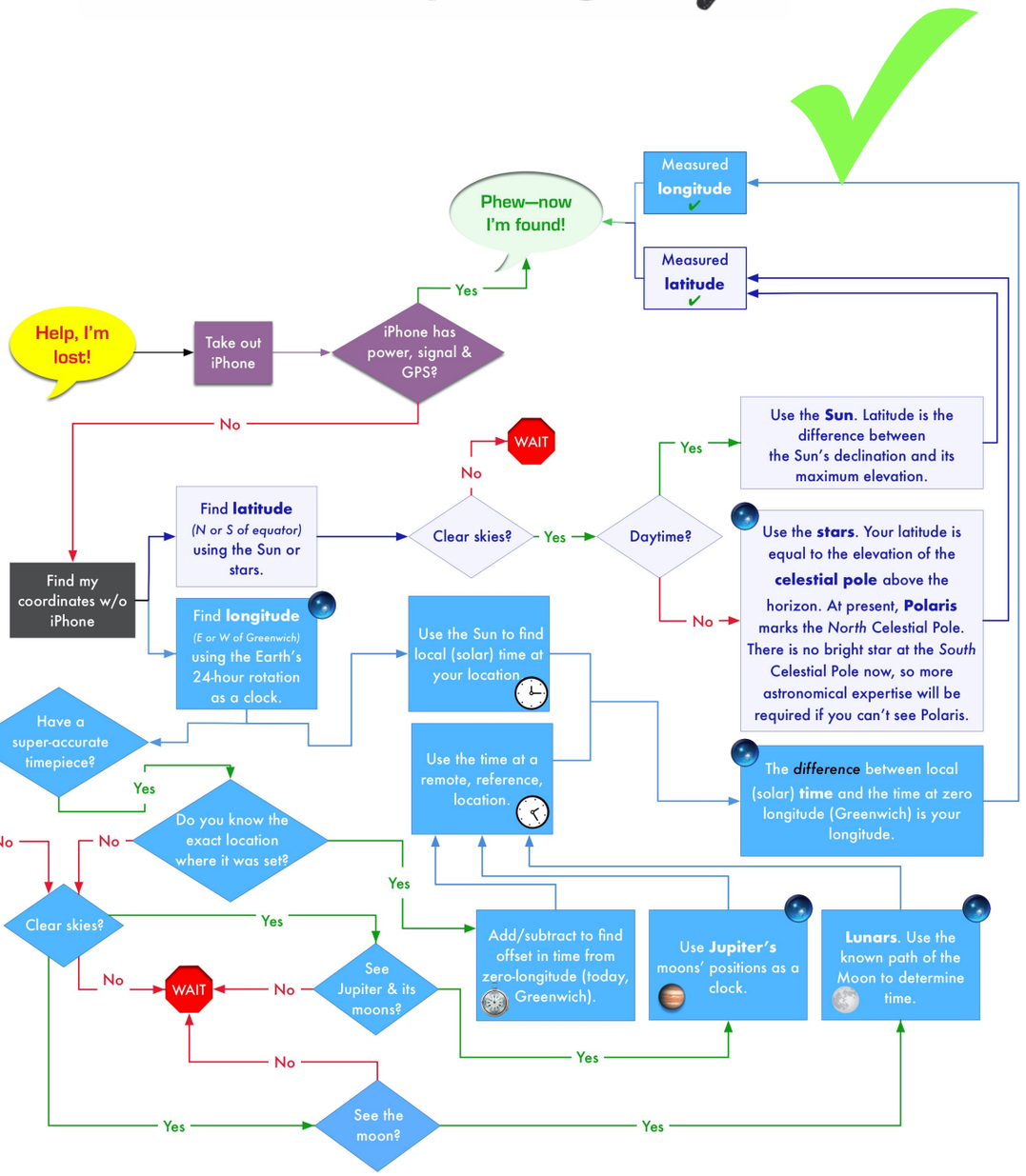
First— Where are we?







PREDICTIONX



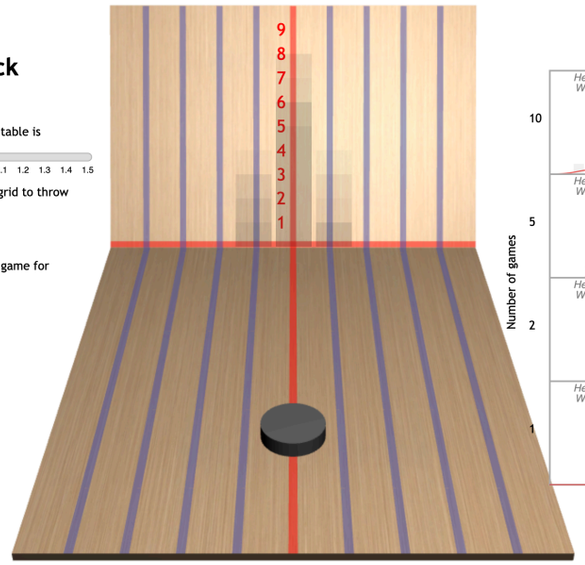
Slide-the-puck

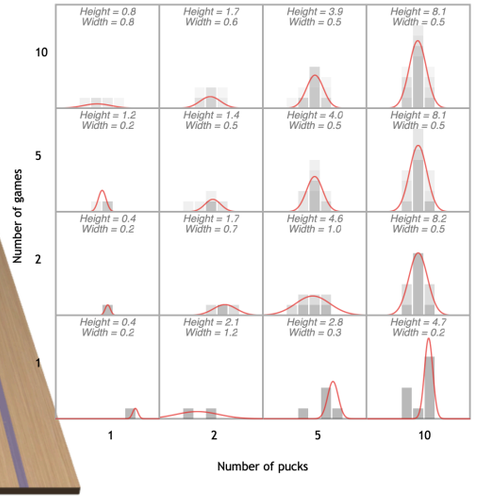
1. Decide how rough your table is

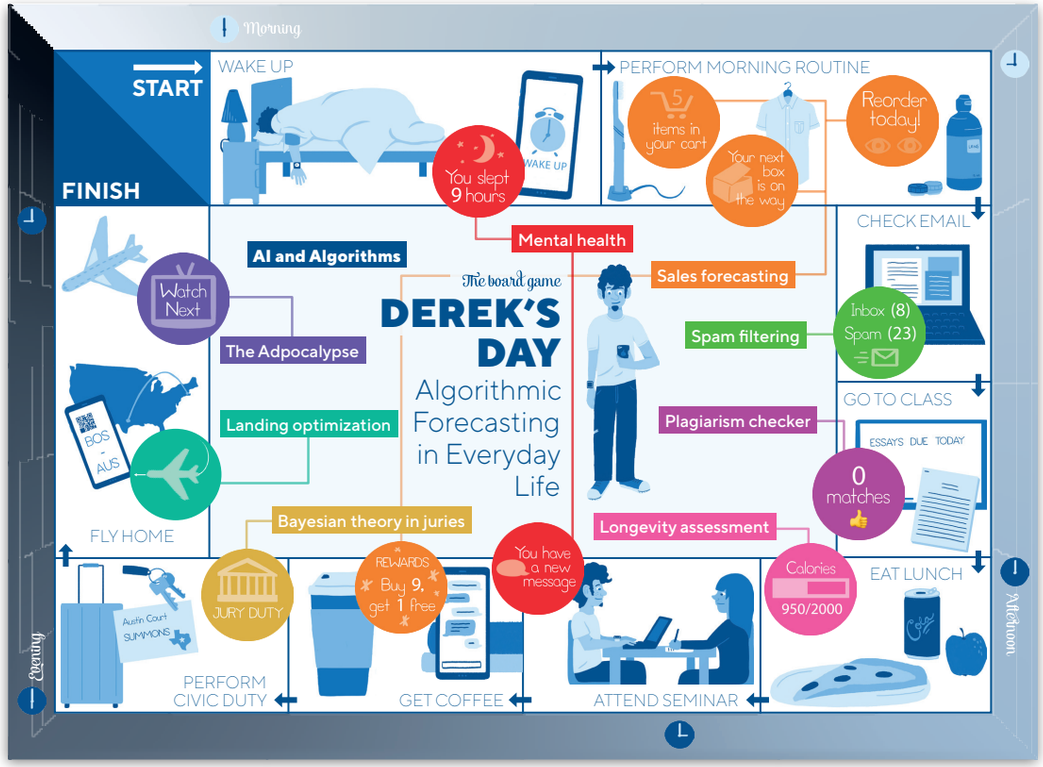
0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5

2. Click anywhere on the grid to throw the puck

3. Click here to finish the game for you







Library catalog > Cluster

Favorite Share ...

Modern Prediction

This cluster includes expert interviews with researchers across an array of disciplines with the unifying topic of modern predictive systems. Learn about prediction efforts in Earth, Space, Health, Wealth, and the Future of the Future, accompanied by annotations and links to deepen your understanding.

Introduction to Modern “Simulations” (Modern Predictions)

0	Biological Sciences +5	English	**Knowledge** None	LabXchange Standard License

LabXchange™

“Modern Prediction” Interviews at PredictionX.org

Prediction & Philosophy	Agustin Rayo
Prediction in Astrophysics	Avi Loeb
Artificial Intelligence	Ben Shneiderman
Predicting Health, and Earthquakes	Brendan Meade and Susan Murphy
Prediction & Psychology	Dan Gilbert
The Future of Energy and the Earth	Dan Kammen
Behavioral Economics	David Laibson
Personal Genomics	George Church
Climate Change	Gina McCarthy
Population Genetics	Immaculata De Vivo and Peter Kraft
The Search for Extraterrestrial Intelligence	Jill Tarter
Epidemiology	Megan Murray
Philosophy & Prediction	Ned Hall
The Business of the Future of Energy and the Earth	Rebecca Henderson
Uncertainty in Science	Stuart Firestein

+Brand-new Podcast Episodes coming to PredictionX.org & Spotify

List of UK Interviews Conducted by Alyssa Goodman, September 2022

David Wallom
Energy Future and Climate Mitigation
Professor of Informatics within the Department for Engineering Science at University of Oxford

Laura Van Broekhoven
Ancient Mesoamerica, Appropriation of Knowledge
Professor of Museum Studies, Ethics and Material Culture at University of Oxford

Sir David Spiegelhalter
Public Understanding of Risk, Uncertainty
Chair of the Winton Centre for Risk and Evidence Communication at University of Cambridge

Lord Martin Rees
On the Future
Emeritus Professor of Cosmology and Astrophysics at the University of Cambridge

Tim Palmer
Weather and Climate Modeling, Ensemble Modeling, Uncertainty
Royal Society Research Professor in Climate Physics, Senior Fellow at Oxford Martin Institute at University of Oxford

Richard Ovenden
Transfer of Knowledge, re:Path to Newton
Professorial Fellow and Bodley's Librarian at University of Oxford

Scott Osprey
Climate Modeling Uncertainty and Carbon Recovery
Senior Research Scientist of the Department of Physics at University of Oxford

Myles Allen
Climate Modeling Uncertainty and Carbon Recovery
Professor of Geosystem Science

Jacob Dahl
Haruspicy, Astronomy, and Gods
Professor of Assyriology

Parsa Daneshmand
Haruspicy, Astronomy, and Gods
Research Fellow at University of College London

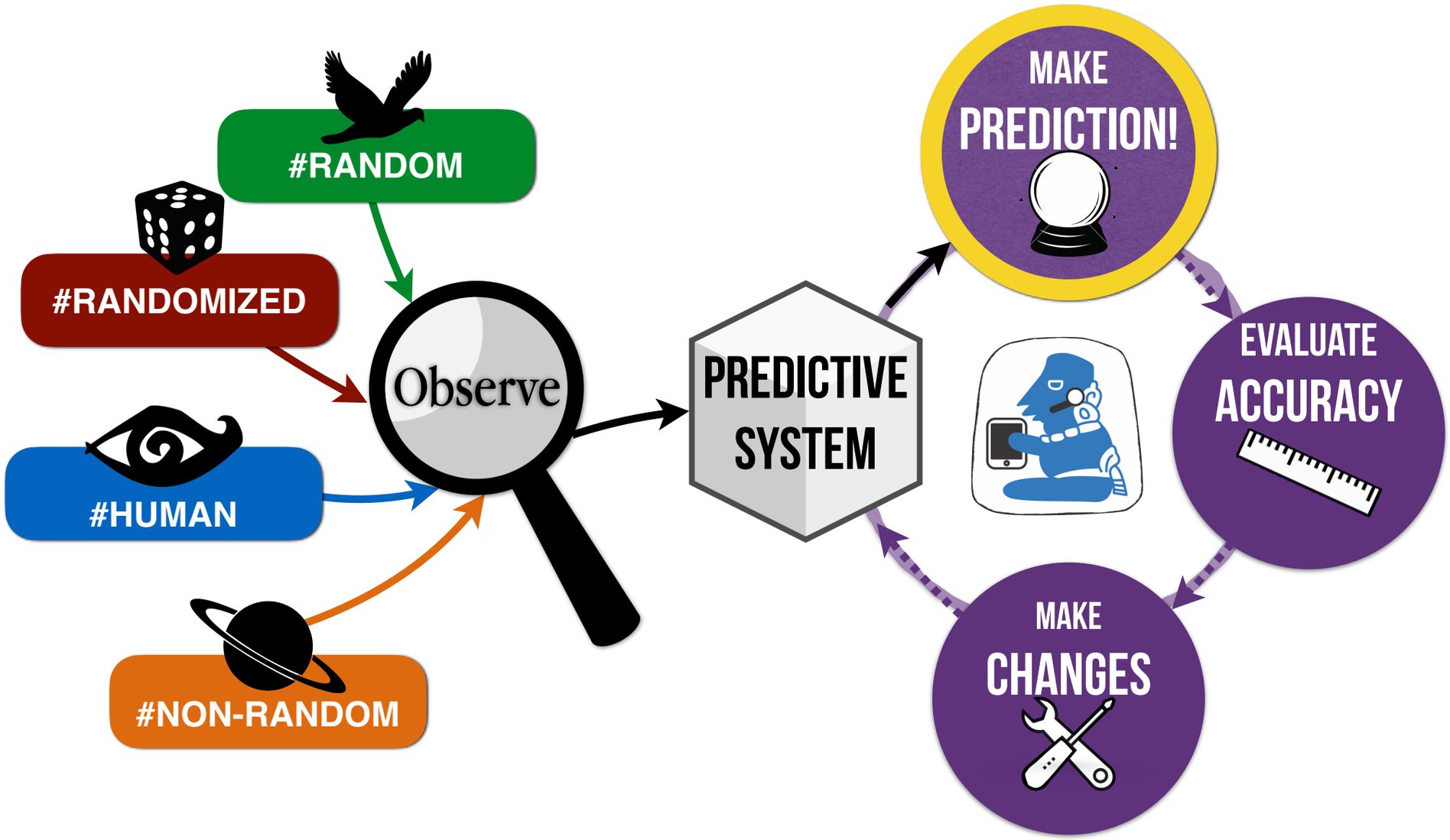
Rob Iliffe
Isaac Newton
Professor of History of Science at Oxford, Co-Director of the Oxford Centre for the History of Science, Medicine and Technology at University of Oxford

Katherine Blundell
Astrophysics and "Expectations" re:Padua Rainbow
Professor of Physics at University of Oxford

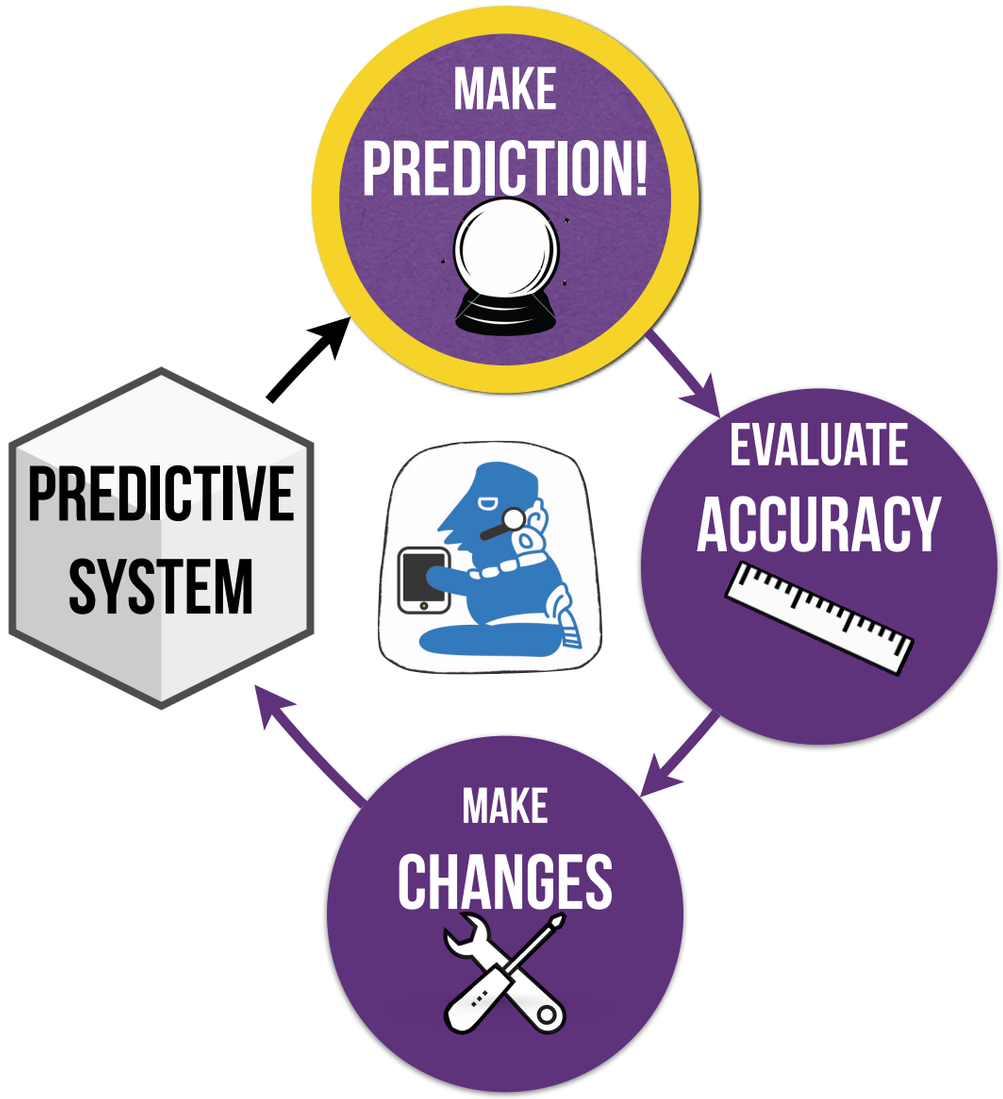
. . . stay-tuned

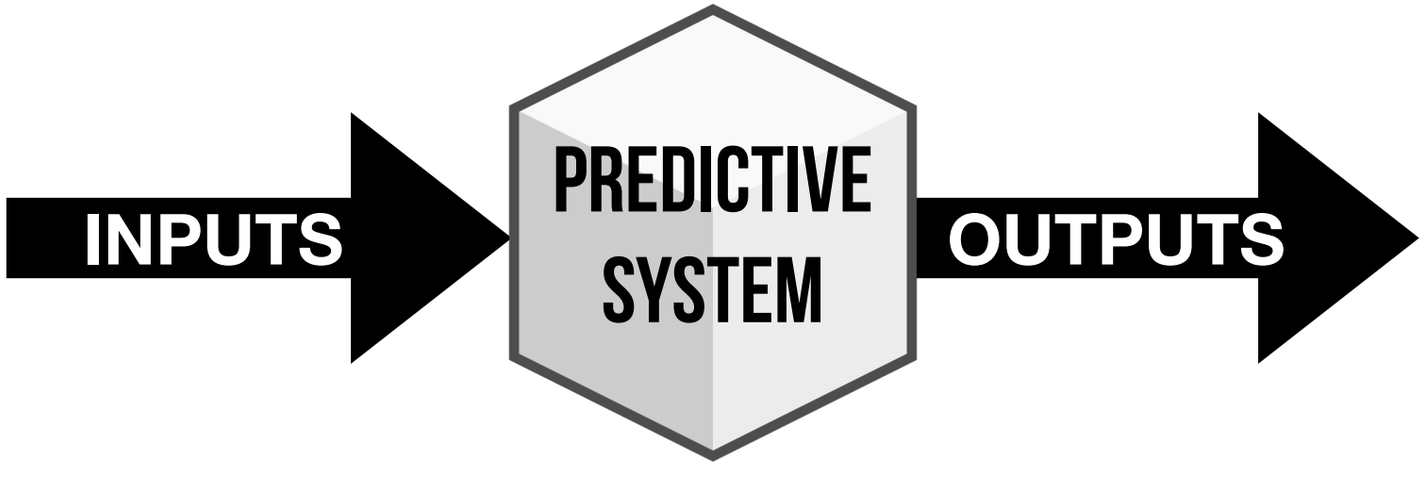
What's a "Prediction"? (V3)

"MODERN PREDICTION" & the Framework



https://openclipart.org/


MAKE
PREDICTION!
EVALUATE
ACCURACY
MAKE
CHANGES
PREDICTIVE
SYSTEM

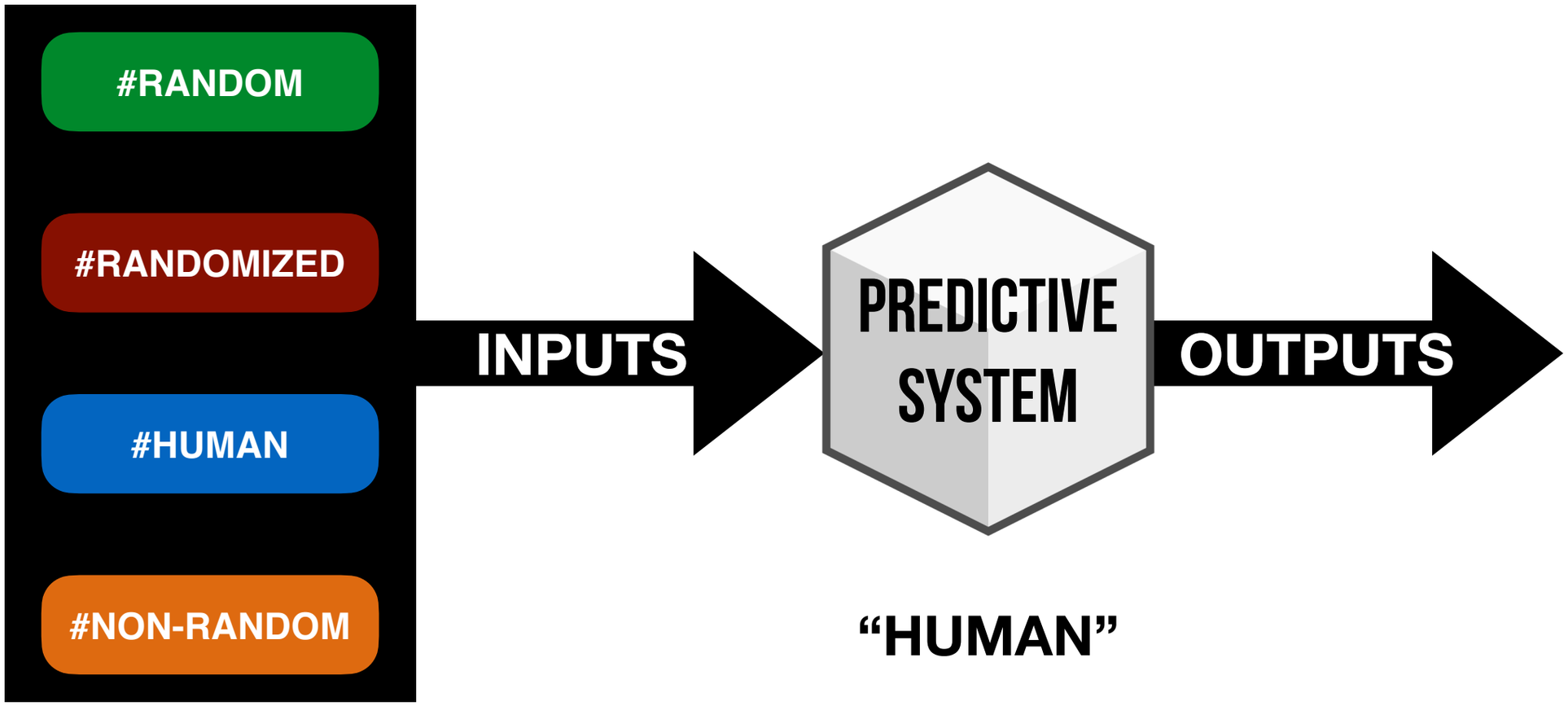


“HUMAN”

STATISTICAL

SIMULATION

COMBINATIONS



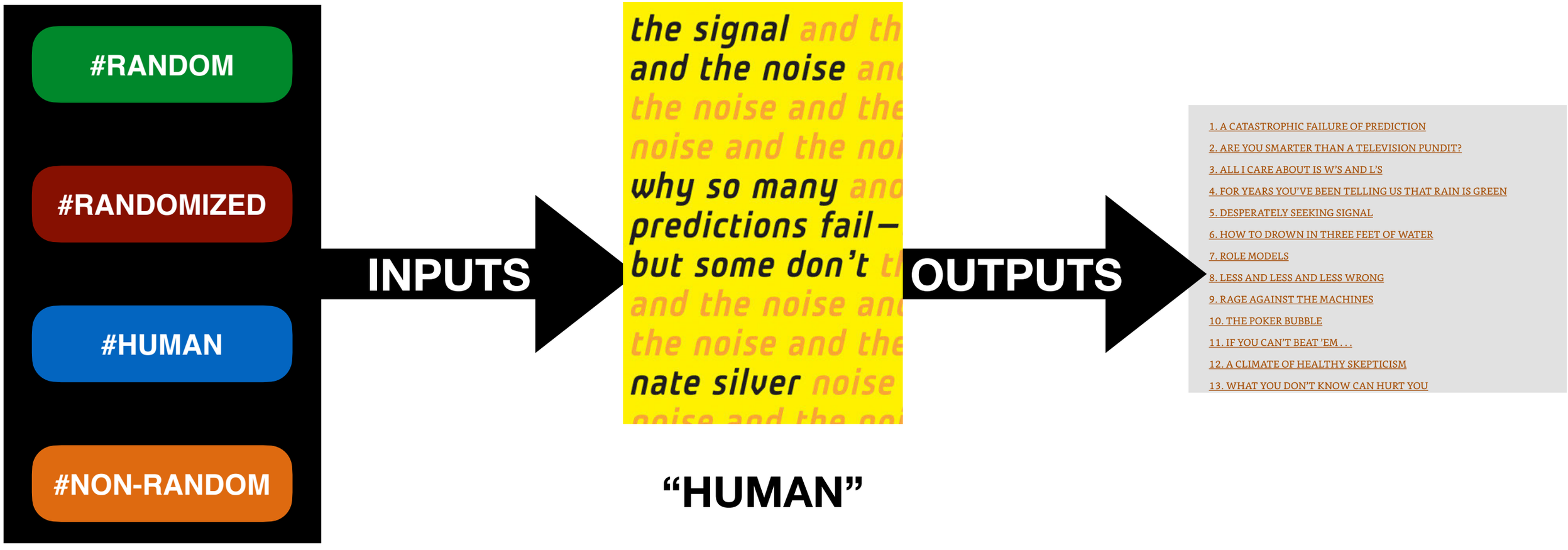
“HUMAN”

STATISTICAL

SIMULATION

COMBINATIONS

A variety of such examples are presented in *The Signal and the Noise*, by Nate Silver



"HUMAN"

STATISTICAL

SIMULATION

COMBINATIONS

"MODERN PREDICTION"

Kinds of

PREDICTIVE SYSTEM

"HUMAN"

STATISTICAL

SIMULATION

COMBINATIONS

To make predictions about

EARTH

HEALTH

SPACE

WEALTH

AND MORE…

*With outcomes that are either "**deterministic**" or "**probabilistic**."*

[where we are heading, later]

March 22, 2023

Table Slides

"MODERN PREDICTION"

Kinds of

PREDICTIVE SYSTEM

"HUMAN"

STATISTICAL

SIMULATION

COMBINATIONS

To make predictions about

EARTH

HEALTH

SPACE

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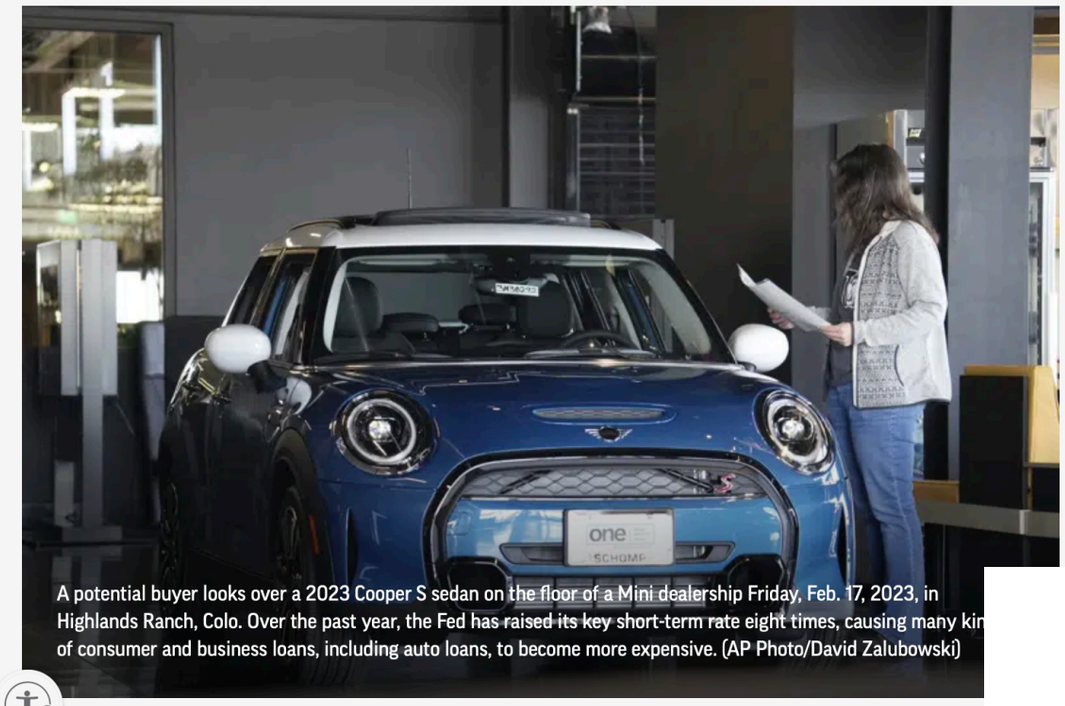
AND MORE…

*With outcomes that are either "**deterministic**" or "**probabilistic**."*

AP U.S. News World News Politics Sports Entertainment Business Technology Health Science Oddities Listen

2023 US recession now expected to start later than predicted

By CHRISTOPHER RUGABER February 27, 2023



A potential buyer looks over a 2023 Cooper S sedan on the floor of a Mini dealership Friday, Feb. 17, 2023, in Highlands Ranch, Colo. Over the past year, the Fed has raised its key short-term rate eight times, causing many kir of consumer and business loans, including auto loans, to become more expensive. (AP Photo/David Zalubowski)

Click to copy

WASHINGTON (AP) — A majority of the nation's business economists expect a U.S. recession to begin later this year than they had previously forecast, after a series of reports

submitted by Gary Zhan

Advisor › Mortgages Advertiser Disclosure

Housing Market Predictions For 2023: Are Home Prices Finally Becoming Affordable?

By Robin Rothstein
Forbes Advisor Staff

Rachel Witkowski
Editor

Updated: Mar 16, 2023, 5:00pm

New Member

submitted by Ilija Wan-Simm

Low Rates Were Meant to Last. Without Them, Finance Is In for a Rough Ride.

Economists expected inflation and rates to stay low for years. With Silicon Valley Bank's implosion, Wall Street is starting to reckon with how wrong that prediction has proved.

submitted by Victoria Ono

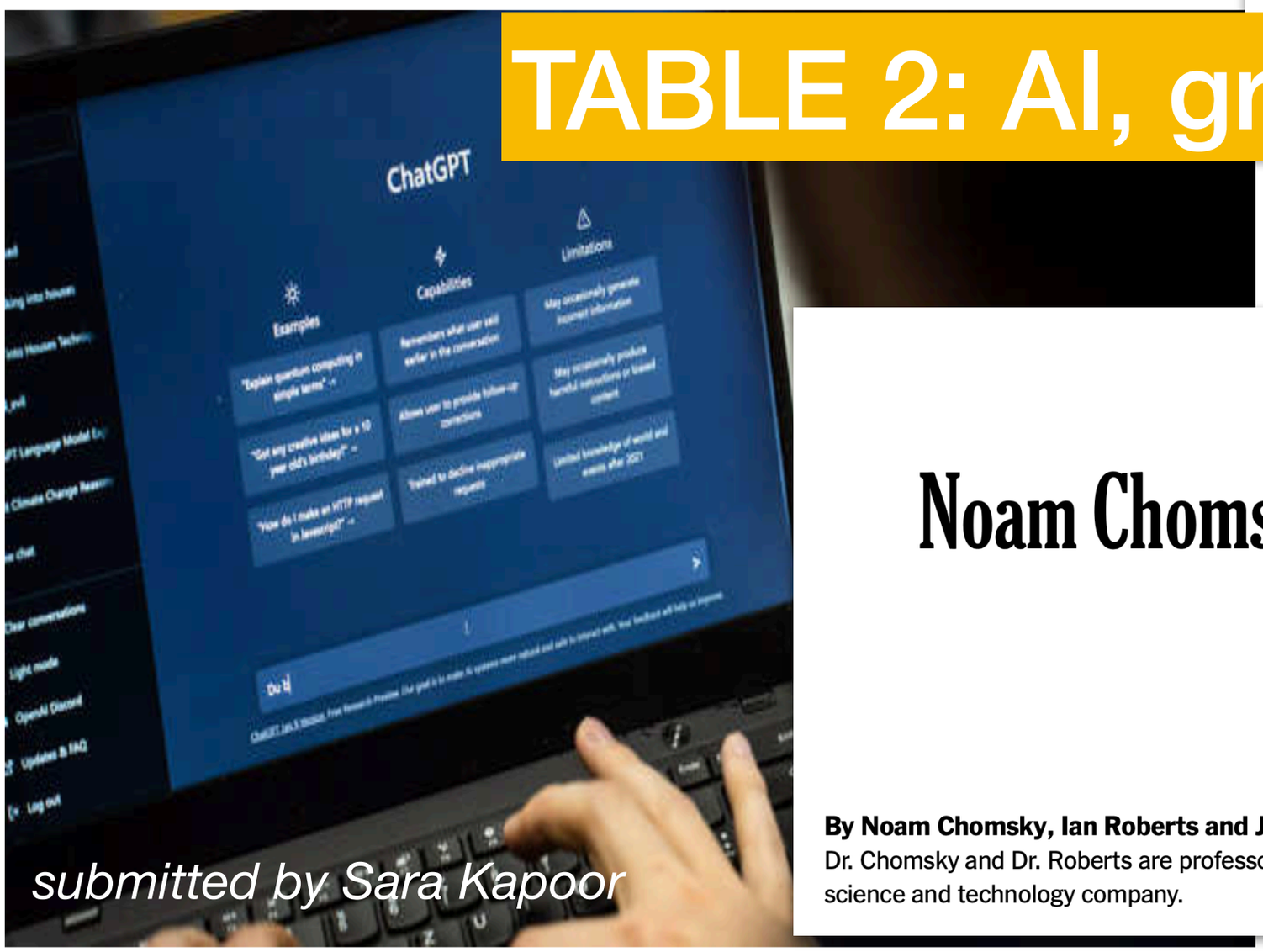
TABLE 1: WEALTH

BUSINESS INSIDER
INDIA

Home › Stock Market › News » A Rogue Version Of ChatGPT Is Predicting The Stock Market Will C
Wrong.

A rogue version of ChatGPT is predicting the stock market will crash this week. Here's why the AI chatbot is dead wrong.

MATTHEW FOX | MAR 15, 2023, 20:08 IST



submitted by Sara Kapoor

Getty Images

TABLE 2: AI, group 1

MEDICINE

125 Comments

AI develops cancer treatment in 30 days, predicts survival rate

By Brooke Steinberg

March 20, 2023 | 9:32am | Updated

submitted by Anh-Tu Le

GUEST ESSAY

Noam Chomsky: The False Promise of ChatGPT

March 8, 2023 7 MIN READ

By Noam Chomsky, Ian Roberts and Jeffrey Watumull
Dr. Chomsky and Dr. Roberts are professors of linguistics. Dr. Watumull is a director of artificial intelligence at a science and technology company.

Massachusetts Institute of Technology

Education Research Innovation Admissions + Aid Campus Life **News** Alumni About MIT

MIT News

ON CAMPUS AND AROUND THE WORLD

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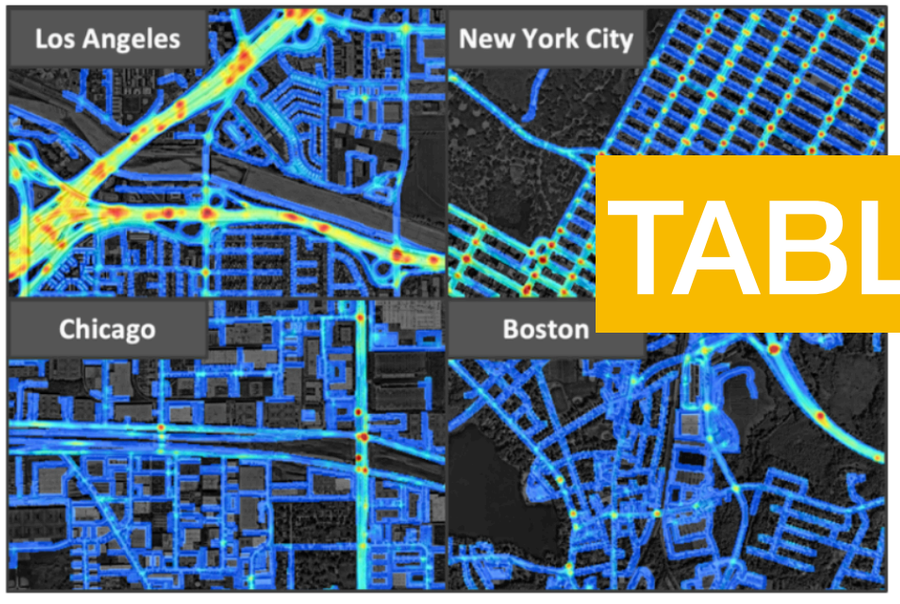
Deep learning helps predict traffic crashes before they happen

A deep model was trained on historical crash data, road maps, satellite imagery, and GPS to enable high-resolution crash maps that could lead to safer roads.

Rachel Gordon | MIT CSAIL
October 12, 2021



A dataset that wa
maps covered 7,5
Los Angeles, New
Boston. Among th

submitted by Harry Moore

WORLD ECONOMIC FORUM

Join us Sign in / Sign up

This AI can predict your personality just by looking at your eyes

Aug 7, 2018

TABLE 3: AI, group 2

submitted by Devagana Rana

Tinder may not get you a date. It will get your data.

Valentines come and go, but what you put online could be forever.

By Rebecca Heilweil | Feb 14, 2020, 1:50pm EST

SHARE

submitted by Chaelon Simpson

submitted by Tara Mooney

INNOVATIONS

The hunt for a better weather forecast

Tech start-ups are aiming for more precise predictions with new techniques, but progress is slow

By Pranshu Verma

Updated January 20, 2023 at 10:29 a.m. EST | Published January 20, 2023 at 6:00 a.m. EST

submitted by Michael Hume

TIME

DAILY SPOTLIGHT MACRON'S UNCERTAIN FU

The cone of uncertainty has narrowed in recent decac

FORBES > INNOVATION > SCIENCE

EDITORS' PICK

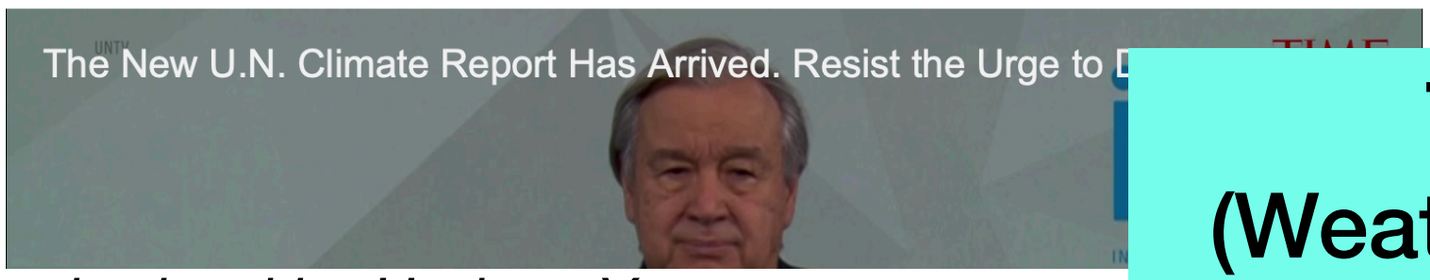
Was The Forecast For Hurricane Ian Bad? Depends On Your Perspective

Marshall Shepherd Senior Contributor

Follow

CLIMATE • EXTREME WEATHER

The Scariest Part of the New U.N. Climate Report? What Scientists Can't Predict



submitted by Hudson Yang

TABLE 4: Earth (Weather + a little climate)

The New York Times https://www.nytimes.com/2023/03/20/climate/global-warming-ipcc-earth.html

World Has Less Than a Decade to Stop Catastrophic Warming, U.N. Panel Says

A new report says it is still possible to hold global warming to relatively safe levels, but doing so will require global cooperation, billions of dollars and big changes.

TABLE 5: Climate

By Brad Plumer

March 20, 2023 Updated 6:05 p.m. ET

7 MIN READ

Earth is likely to cross a critical threshold for global warming within the next decade, and nations will need to make an immediate and drastic shift away from fossil fuels to prevent the planet from overheating dangerously beyond that level, according to a major new report released on Monday.

The report, by the Intergovernmental Panel on Climate Change, comprehensive understanding to date of ways in which the plan rise 1.5 degrees Celsius (2.7 degrees Fahrenheit) above preindus continue to burn coal, oil and natural gas.

That number holds a special significance in global climate politi to "pursue efforts" to hold global warming to 1.5 degrees Celsius flooding, drought, crop failures and species extinction become si

But Earth has already warmed an average of 1.1 degrees Celsius records last year, that goal is quickly slipping out of reach.

There is still one last chance to shift course, the new report says slash greenhouse gases roughly in half by 2030 and then stop ad those two steps were taken, the world would have about a 50 percent chance of limiting warming to 1.5 degrees Celsius.

Delays of even a few years would most likely make that goal unattainable, guaranteeing a hotter, more perilous future.

"The pace and scale of what has been done so far and current plans are insufficient to tackle climate change," said Hoesung Lee, the chair of the climate panel. "We are walking when we should be sprinting."

The report comes as the world's two biggest polluters, China and the United States, continue to approve new fossil fuel projects. Last year, China issued permits for 168 coal-fired power plants of various sizes, according to the Centre for Research on Energy and Clean Air in Finland. Last week, the Biden administration approved an enormous oil drilling project known as Willow that will take place on pristine federal land in Alaska.

submitted by Emma Greaves+

FOX NEWS 9:41 AM

U.S. Politics World Opinion Media Entertainment Sports Lifestyle Video More Login Watch TV

TRENDING PUTIN-XI MEETING | TRUMP | SVB COLLAPSE | BUSTER MURDAUGH

MEDIA · **Published** March 20, 2023 7:00pm EDT

UN report predicting climate catastrophe in 2030 met with mockery: 'Every single prediction' has been 'wrong'

Twitter users blasted a climate change report for continuing to warn about 'catastrophic' effects

submitted by Sarah Mann

TABLE 6: Politics

The needle is back. Here's how it works.

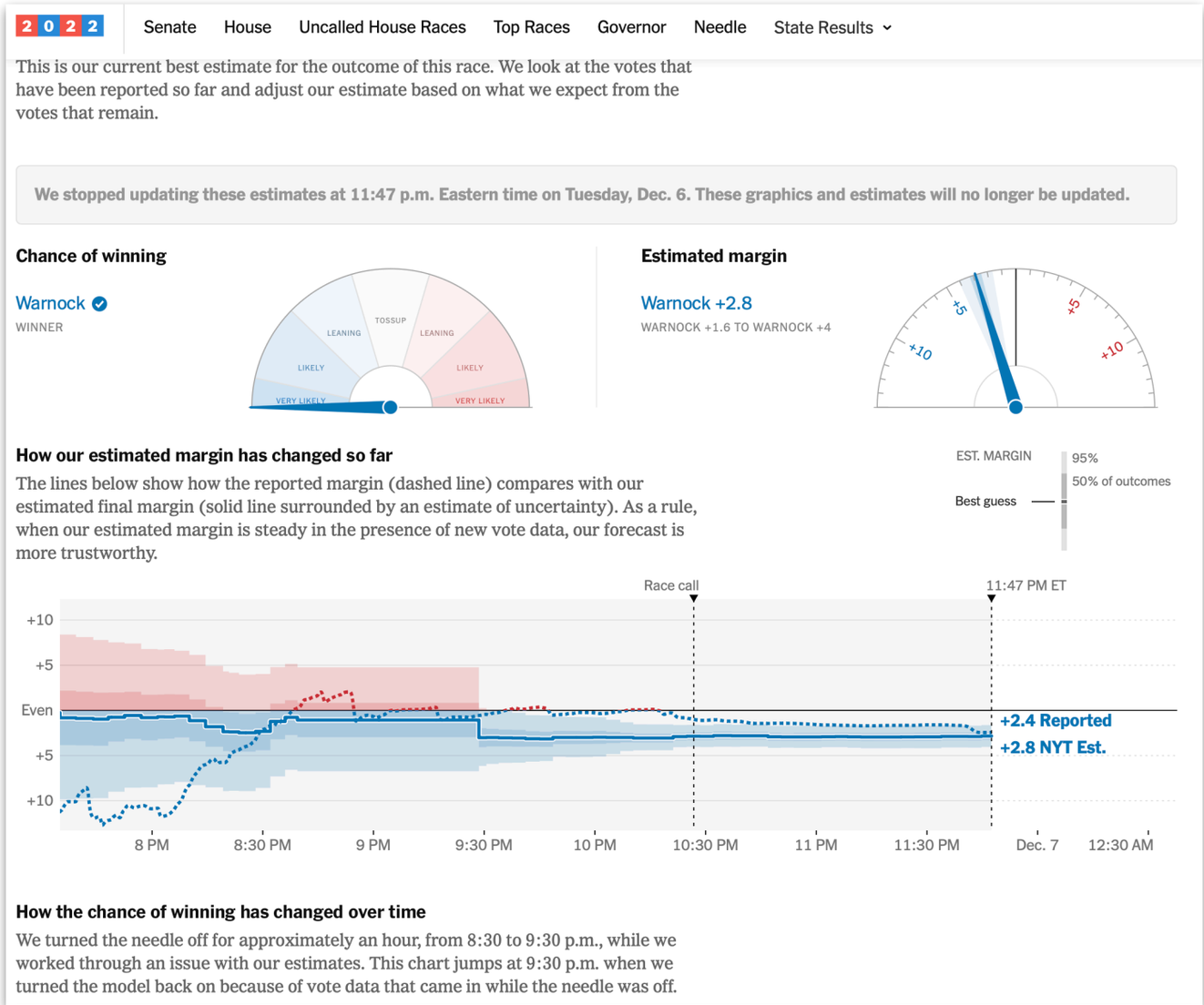
Our forecasting tool can help you understand which candidate or party is on track for victory.

Give this article

By The New York Times

Published Nov. 8, 2022 Updated Dec. 6, 2022

The needle is an innovative forecasting tool that was created by The New York Times and debuted in 2016. It is intended to help you understand what the votes tallied so far suggest about the most likely winner in key contests.



submitted by Christina Xiao

TABLE 7: March Madness

submitted by many students

Prediction X: Modern Simulations--THEMES/TAGS

These "tags," used on LabXchange will all make sense to you by the end of our course… (video assignments to come + read Nate Silver's book, please!)

#simulation_or_model (c.f. list)
#theoretical_empirical (c.f. Rainbow diagram)
#framework_model_inputs (c.f. document)
#framework_testing (c.f. document)
#biases (c.f. document)
#uncertainty (c.f. document, puck simulation (link), Take a Sweater)
#approximation (c.f. Ten questions) #Heuristic
#public_reaction (c.f. document)
#predictability
(essay about predictability, determinism, randomness and uncertainty--use Clint's sand on shuffleboard analogy, includes #convergence, #divergence, #feedback #chaos)
#unkown_unknowns
#bayes_theorem
#deterministic_vs_probabilistic (probabilistic vs. deterministic prediction...when is uncertainty small enough to call it "deterministic"?)
#machine_learning (c.f. list)
#artificial_intelligence(c.f. list, Derek's Day)
#prediction_vs_decision
#explanation_vs_prediction (c.f. rainbow diagram)
#technology_theoretical_computation_and_math (c.f. list)
#technology_observational_experimental_devices_and_sensors (c.f. PtN)
#future_of_the_future
#personal_or_societal
#samplesize
#resolution
#rainbow_diagram

"MODERN PREDICTION"

Kinds of

PREDICTIVE SYSTEM

"HUMAN"

STATISTICAL

SIMULATION

COMBINATIONS

To make predictions about

EARTH

HEALTH

SPACE

WEALTH

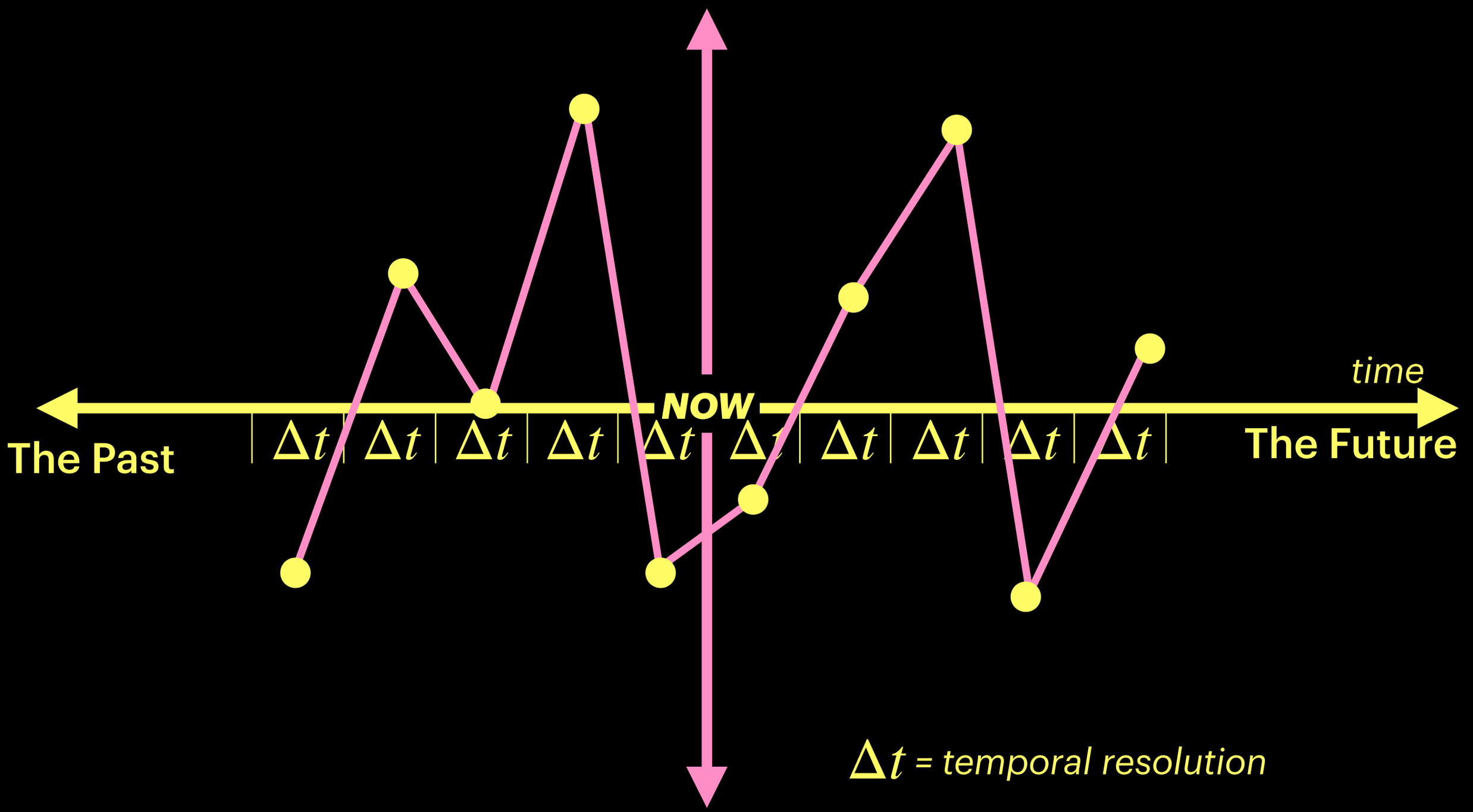
AND MORE…

*With outcomes that are either "**deterministic**" or "**probabilistic**."*

SIMULATION

some quantity

(e.g. could be a spatial position, happiness, CO_2, or the value of a stock)



Δt = *temporal resolution*

EARTH

HEALTH

SPACE

WEALTH

time

NOW

The Past

The Future

Δt Δt Δt Δt Δt Δt Δt Δt Δt Δt

Δt = *temporal resolution*

The IllustrisTNG Project

"The next generation of cosmological hydrodynamical simulations."

tng-project.org

10 kpc

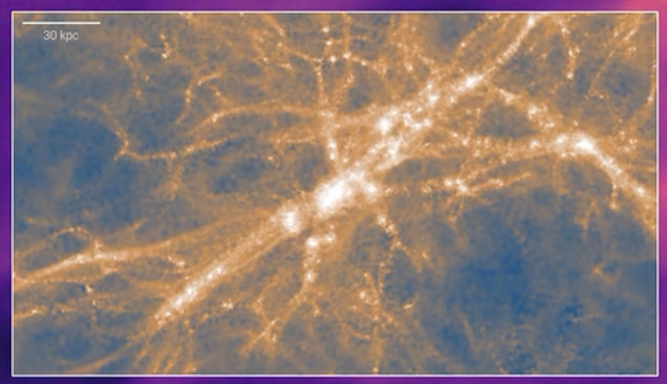
z = 8.3

$\Delta x, \Delta t$

log $M_\star$ = 7.94

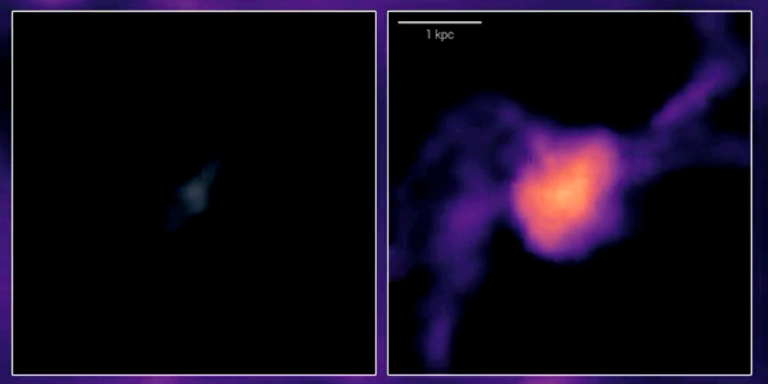
SFR = 0.2 $M_\odot$ yr^{-1}

TNG50



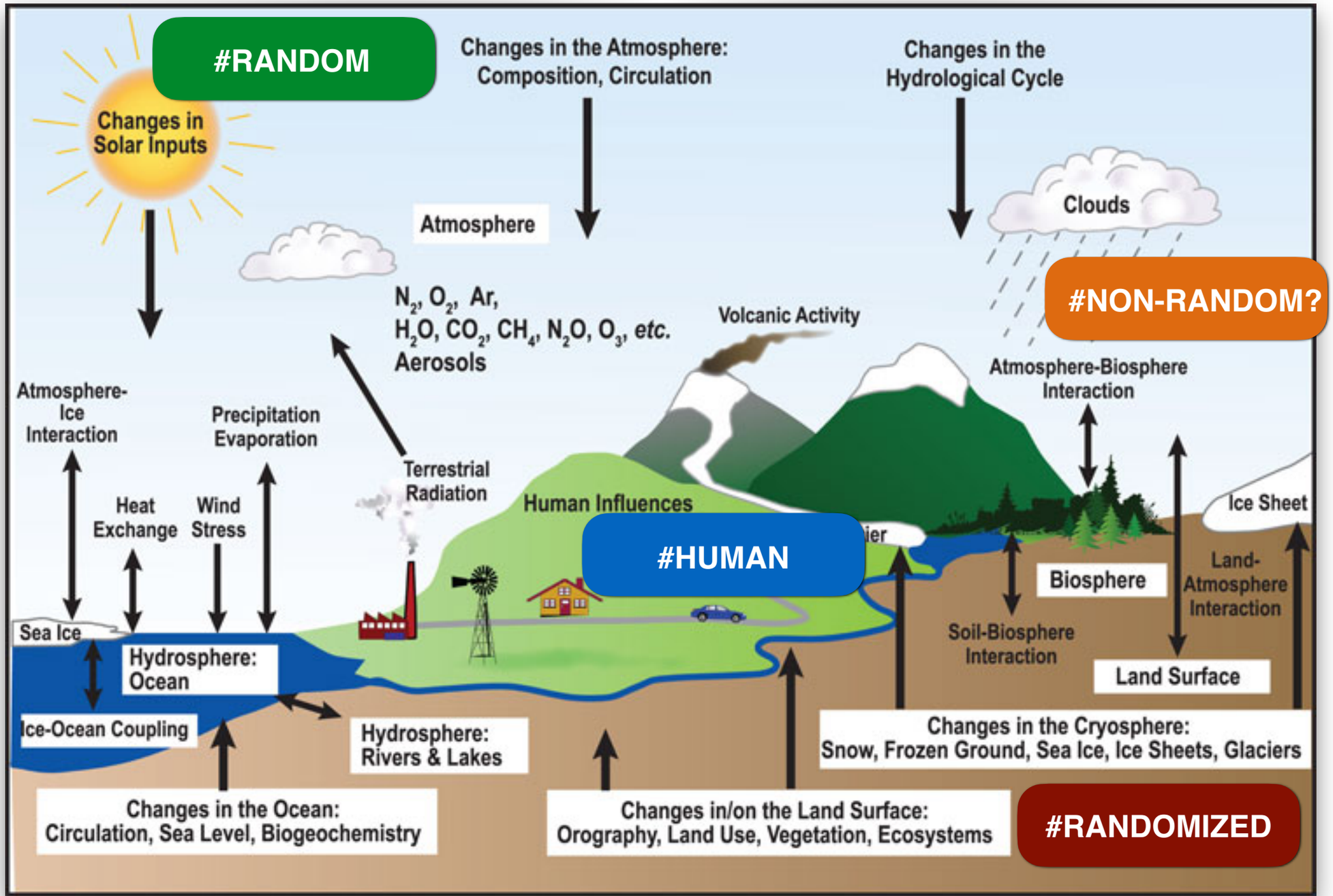
large-scale dark matter, then gas

gas density, transitioning to gas metallicity during the brief pause and rotation



small-scale stellar & gaseous distributions

Climate Simulation Needs all inputs, all approaches, careful uncertainty evaluation



EVALUATE ACCURACY

blogs.scientificamerican.com/the-curious-wavefunction/are-more-accurate-climate-change-models-worse

Simulation, Resolution, Uncertainty

SLIDE-THE- PUCK KNOW-HOW

1. Use full screen

2. How to Play:

1. Decide how rough your table is

The lower the number, the more rough your table will be and the more the puck will veer off course.

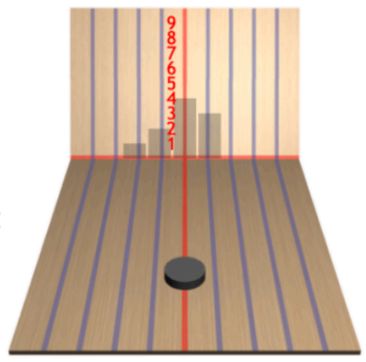
2. Choose the number of games and pucks by clicking anywhere on the grid

3. Click the blue link to finish the game and have all the boxes automatically filled in.

3. Understanding Your Results

THE BOARD

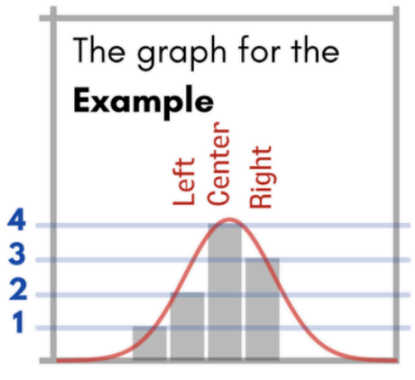
Example: The puck hit the board 4 times at the center, 3 times to the right of the center, and 2 times to the left of the center

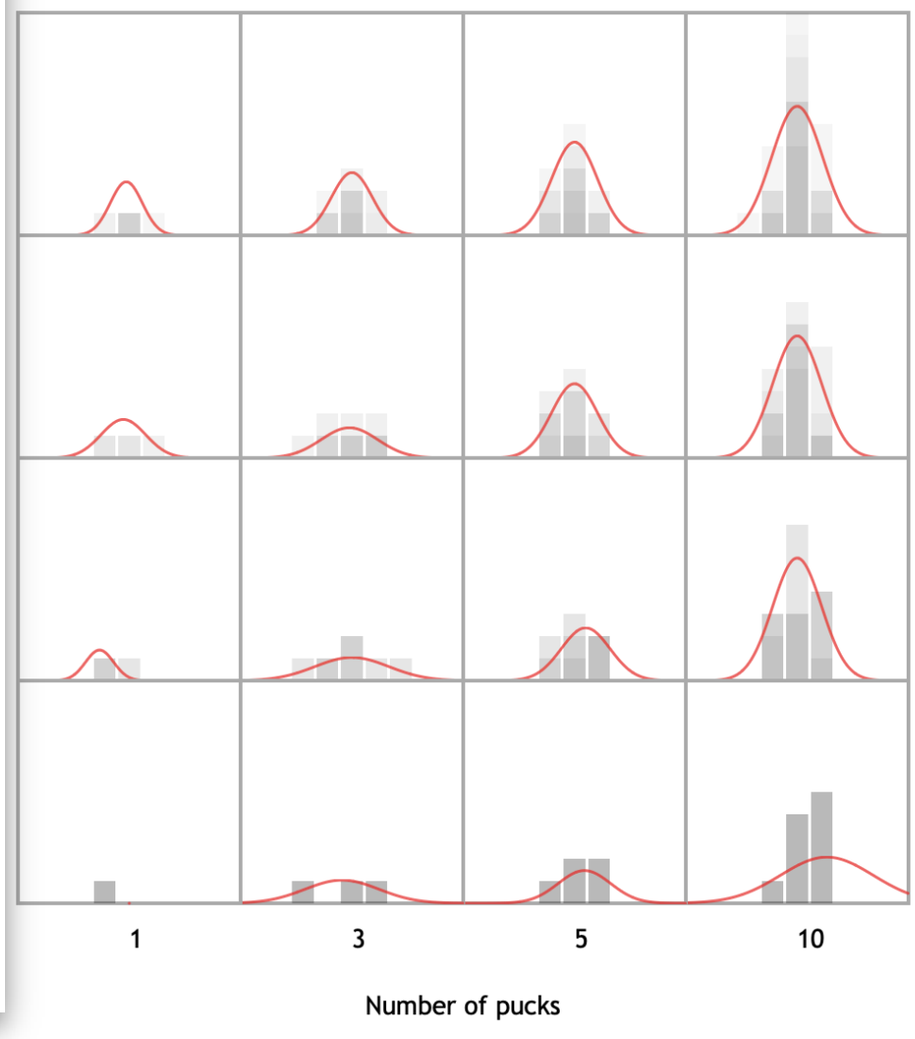


THE GRAPH

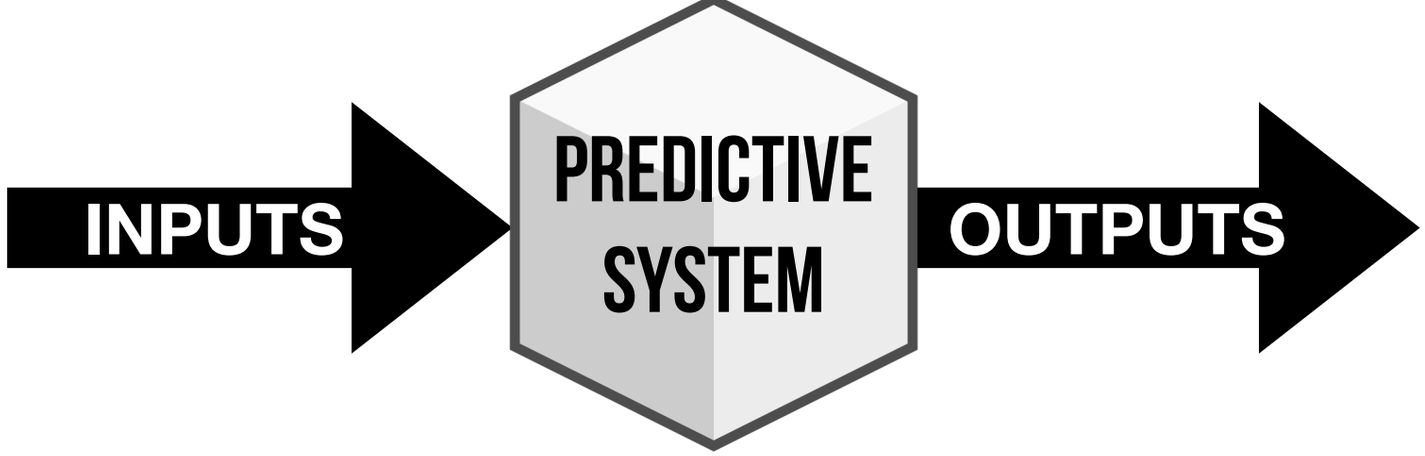
The y-axis is the number of times a puck hit that position and the x-axis is the position of the puck.

Example: The puck hit the board 4 times at the center, 3 times to the right of the center, and 2 times to the left of the center

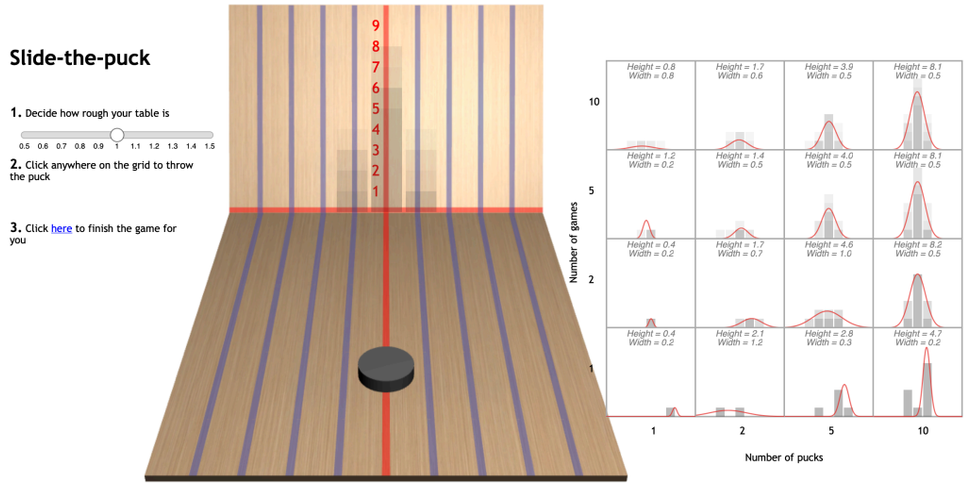




predictionx.org/introduction-to-uncertainty



SIMULATION



What comes into play in this SIMULATION?

The model in this “predictive system” is **#NON-RANDOM** Newtonian physics, with friction.

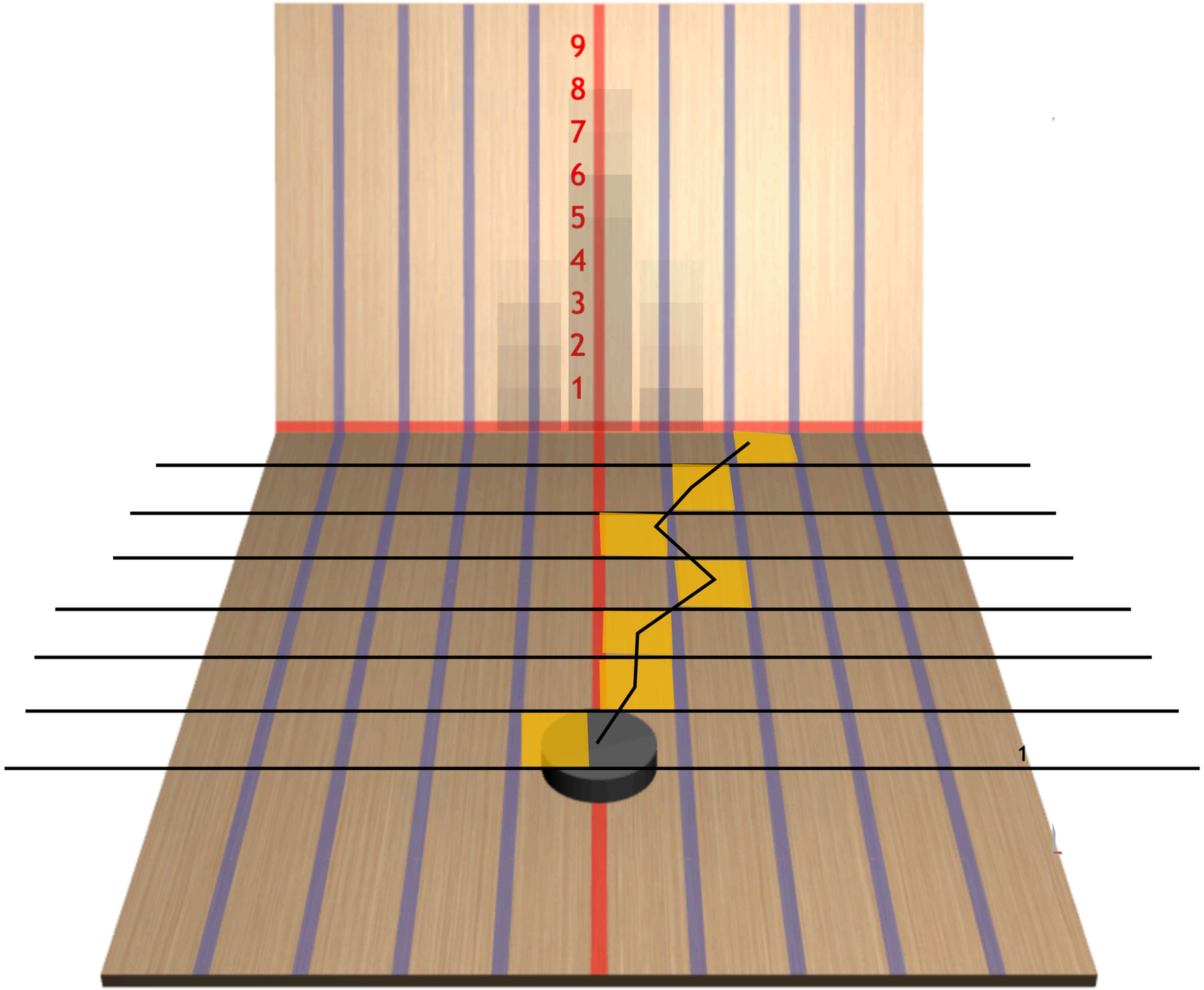
The puck is launched with in a **#RANDOMIZED** direction (**input**) whose **mean** is straight ahead (along the red line).

At each **“time-step,”** the puck’s direction is given a **#RANDOMIZED** directional offset, within a small range centered on “straight ahead.” The range is determined by the “roughness” of the table. Perfectly smooth=exactly straight ahead.

The path of the puck looks jerky when you play because the **time** and/or **spatial resolution** of the situation is low (not very good).

The **distribution** of final positions (**outputs**) shows a range of positions (“**uncertainty**” around prediction of exactly straight ahead) effected by **inputs** (in this case table roughness), and settles to reliable values with more and more **trials**.

The path of the puck looks jerky when you play because the **time** and/or **spatial resolution** of the situation is low (not very good).



Some jargon that matters

“Out of Sample” Events

"ensemble model with stochastic representations of uncertainty"

Prediction: Week 8

Introduction to Modern “Simulations” (Modern Predictions)

(Your final projects)

How to evaluate and appreciate **accuracy** and **uncertainty in Predictions.**

Weather & Climate Prediction

Your final projects:
How to evaluate and appreciate **accuracy** and **uncertainty in Predictions.**

The plan for final projects (link)

"Carry out a study a particular type of predictive system, with special attention to how **accurate** it *should* be, how **uncertainty** is measured, and how uncertainty about it is **communicated**. In particular, find a way to **study** its **accuracy** on your own, either with new analysis, or from the literature. In the end, you will create an **online video summary** (5 minutes long) of your findings, with accompanying text and graphics."

On **Canvas** you will find a link to a Google Doc that provides:

1. Detailed **instructions**, with a step-by-step "rubric" for what we'd like you to include (history of the field, documentation of your research, controversies, future prospects, etc.), and point values.
2. Request to finalize your topic, in consultation with your TF.
3. Possible **themed**-sections or TF office hours, depending on your schedules.

Shall AG remove Option B?

Your final projects:
How to evaluate and appreciate **accuracy** and **uncertainty in Predictions.**

Where does *uncertainty* in Prediction come from?

Human Behavior

Models'

Resolution, Appropriateness, Inputs

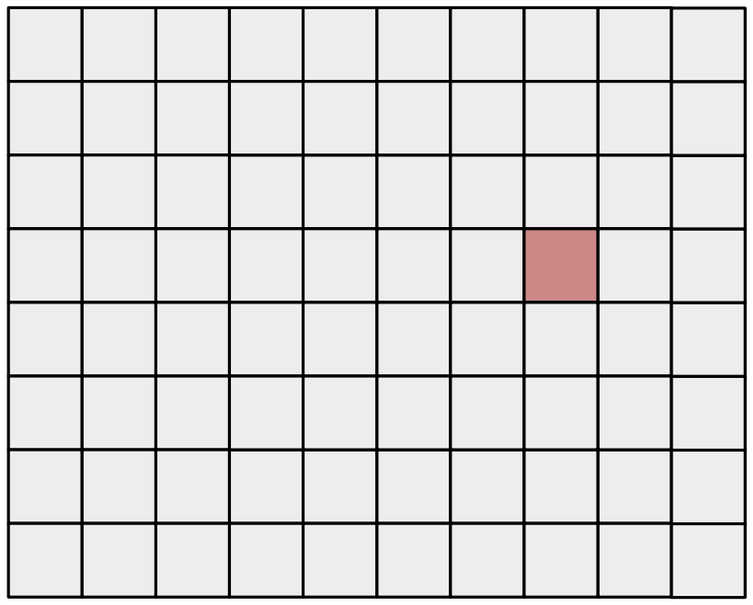


TABLE TALK

Consider & discuss
methods of
prediction &
sources of
uncertainty for your
table's system
(Slides on Canvas
under "Discussions"

Prediction: Week 8

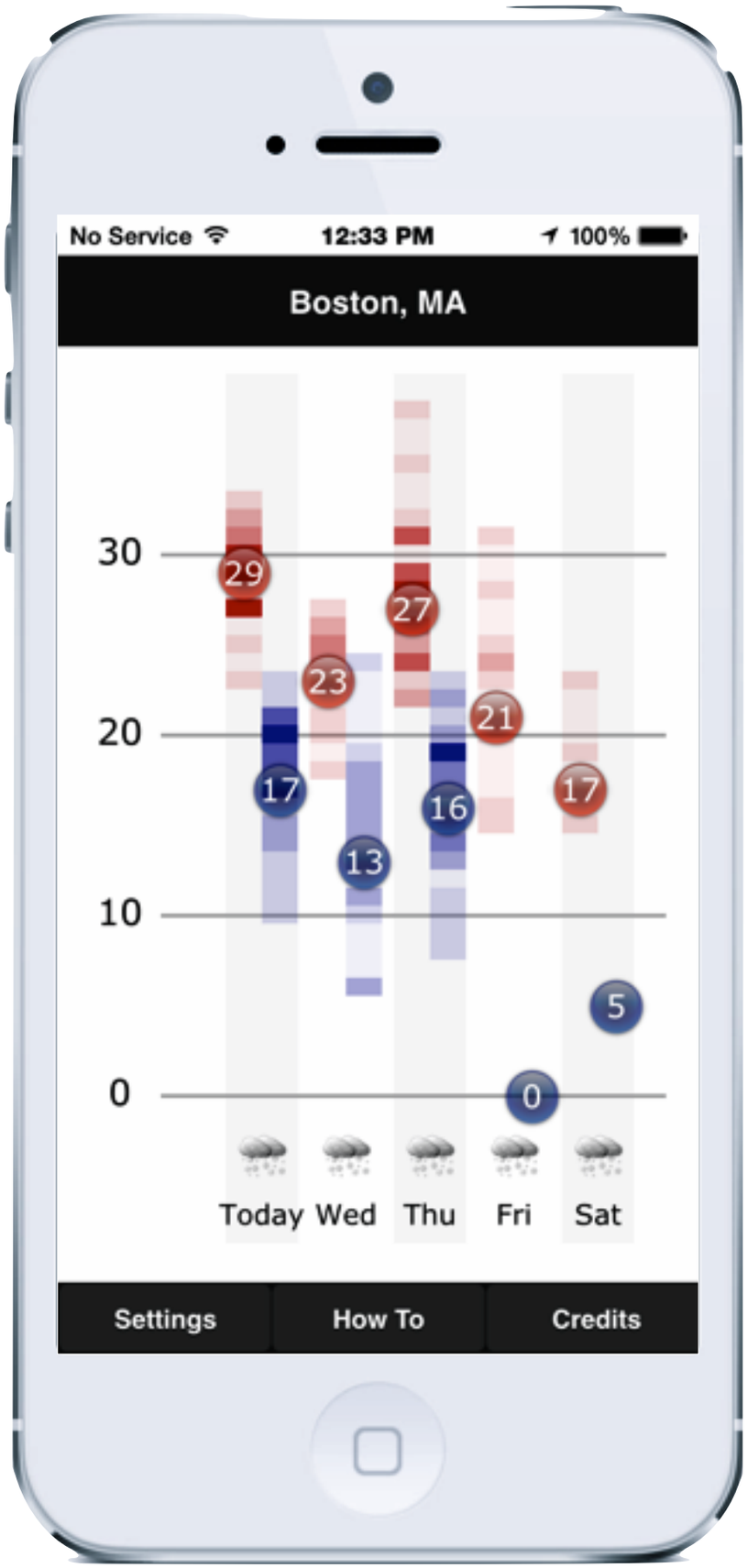
Introduction to Modern “Simulations” (Modern Predictions)

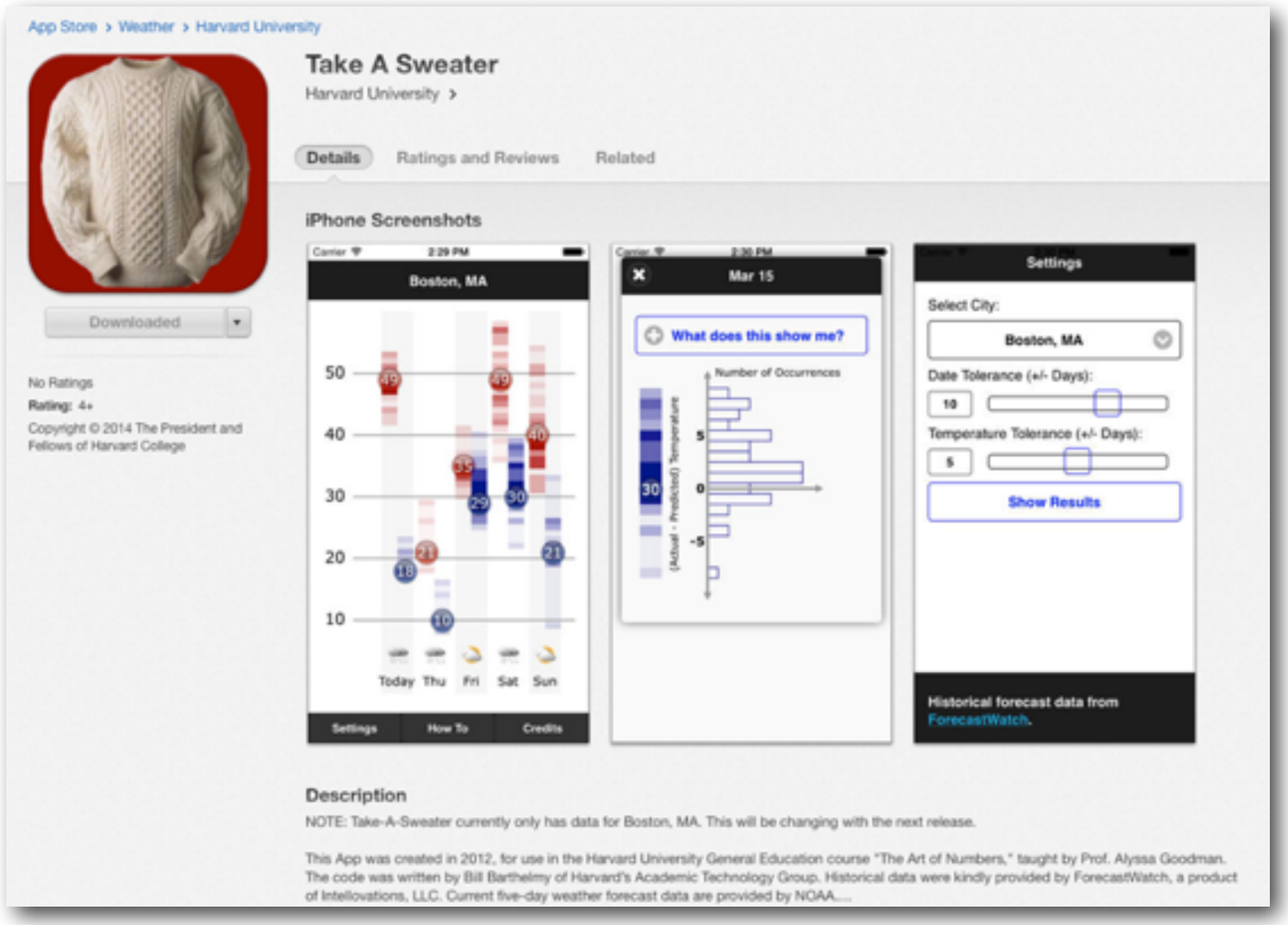
(Your final projects)

How to evaluate and appreciate **accuracy** and **uncertainty in Predictions.**

Weather & Climate Prediction

"Take A Sweater"

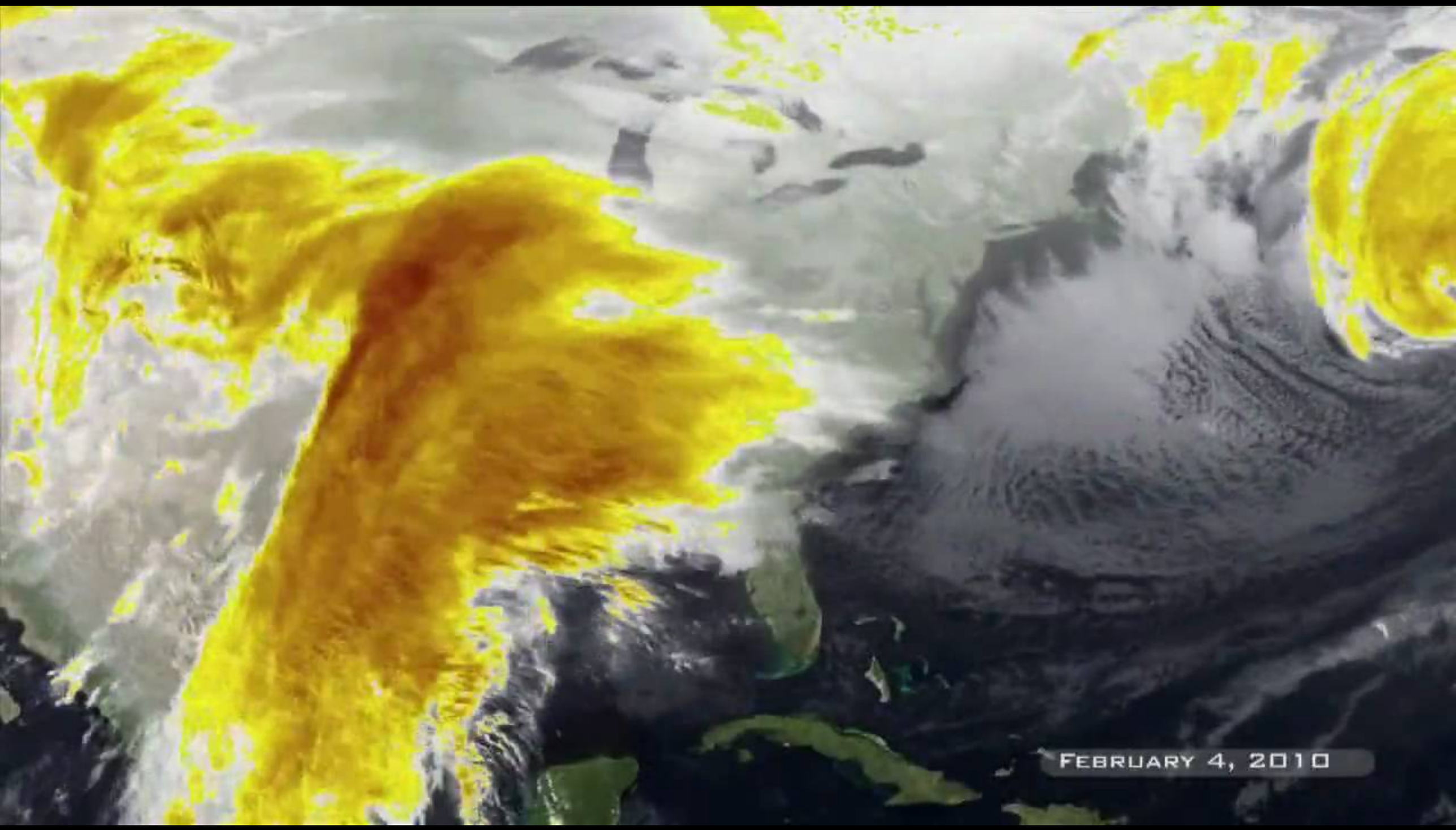




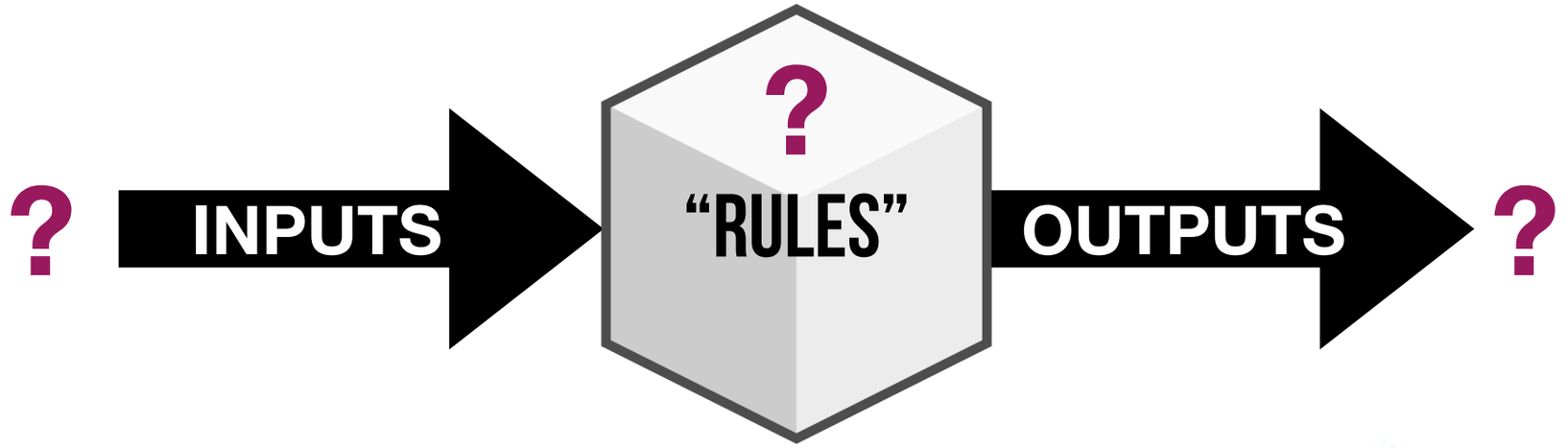
takeasweater.com, and "TakeASweater" in the Apple App Store

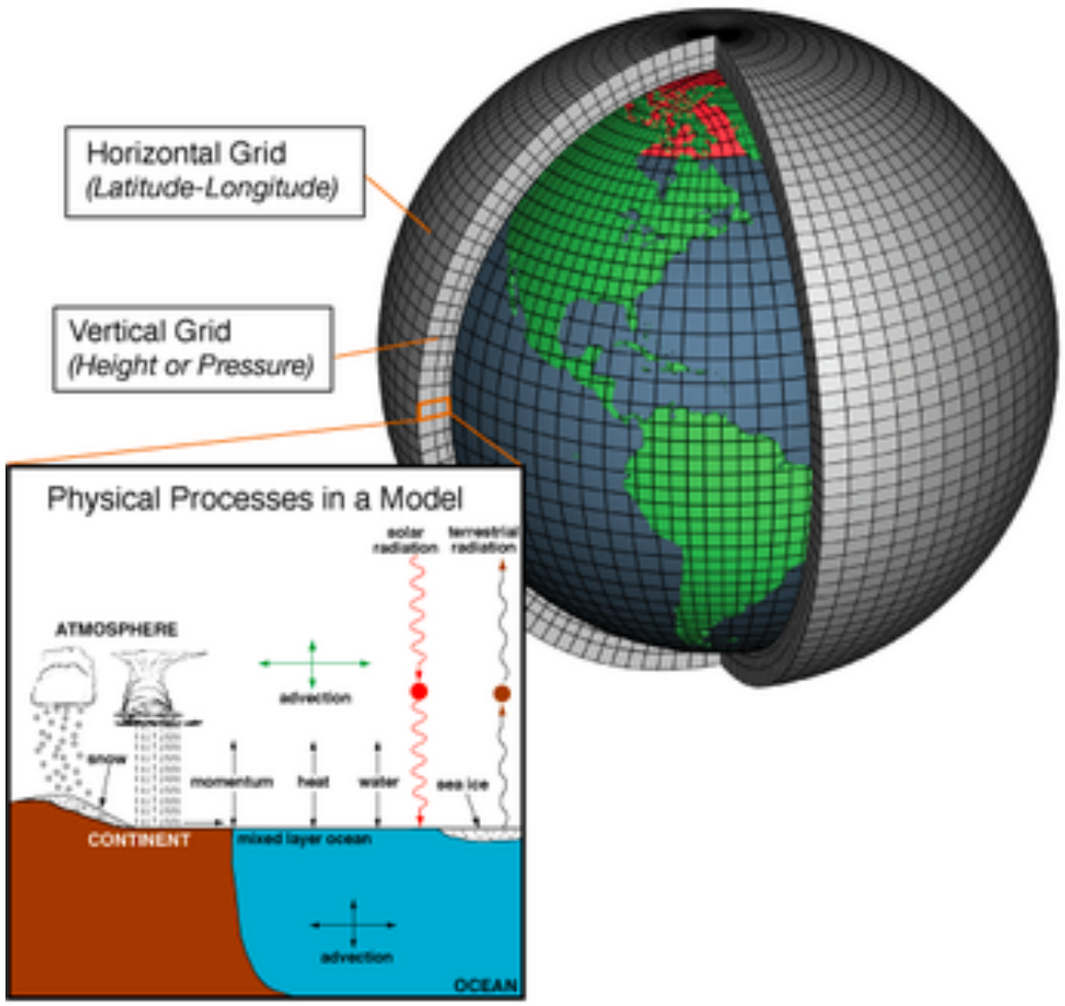
with thanks to Eric **Floehr** of Forecast Watch and Bill **Barthelmy** of HUIT Academic Technology at FAS

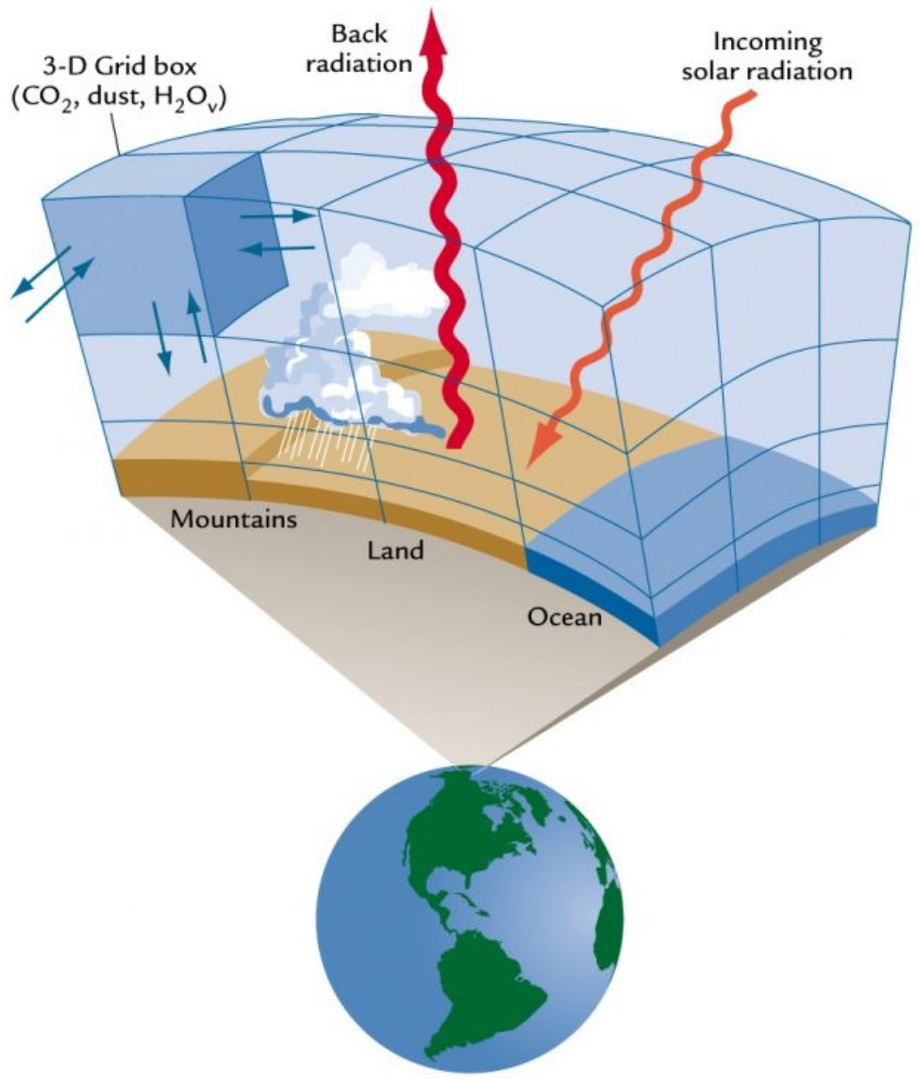
“Supercomputing the Climate”



https://www.youtube.com/watch?v=jj0WsQYtT7M







Credit: www.viaenglish.com/blog/en/how-weather-models-predict-the-future/

What measured inputs are important to numerical simulations of weather?

Top

What "rules" (e.g. physical and/or chemical principles) are used in numerical simulations of weather?

Top

What are the key outputs of weather prediction?

Top

“The Primacy of Doubt”

Weather forecasting

Weather forecasting is the application of current technology and science to predict the state of the atmosphere for a future time and a given location.

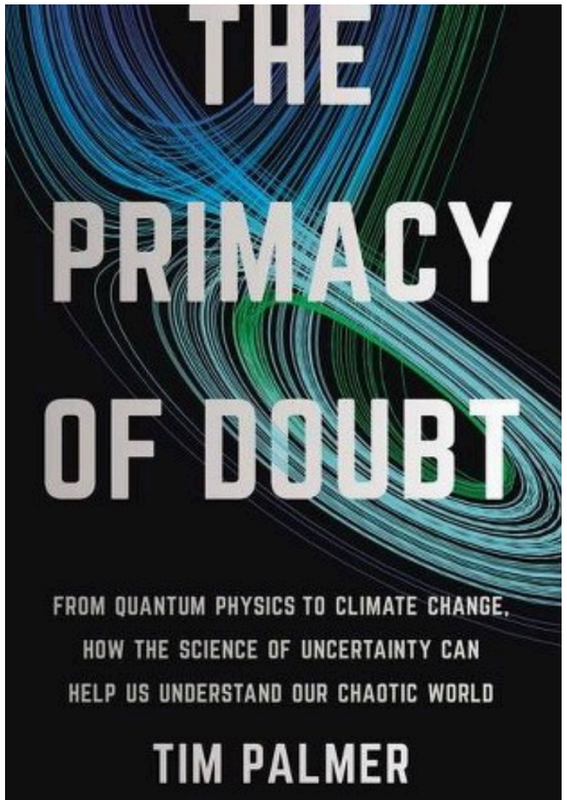
Weather forecasts are made by collecting as much data as possible about the current state of the atmosphere (particularly the temperature, humidity and wind) and using understanding of atmospheric processes (through meteorology) to determine how the atmosphere evolves in the future.

However, the chaotic nature of the atmosphere and incomplete understanding of the processes mean that forecasts become less accurate as the range of the forecast increases.

Traditional observations made at the surface of atmospheric pressure, temperature, wind speed, wind direction, humidity, precipitation are collected routinely from trained observers, automatic weather stations or buoys.

During the data assimilation process, information gained from the observations is used in conjunction with a numerical model's most recent forecast for the time that observations were made to produce the meteorological analysis.

More is to come…



Weather & Climate Prediction

computers to solve them.

The output from the model provides the basis of the weather forecast.

Note: The above text is excerpted from the Wikipedia article "Weather forecasting", which has been released under the GNU Free Documentation License.

sciencedaily.com/terms/weather_forecasting.htm

Factors Determining Uncertainty

Very clever modern simulation "meshes" *move* and *adjust* with what's happening in the simulation.

(e.g. Arepo "moving mesh" code, using Voronoi tessellation)

#resolution

#approximation

FYI—same "Vornoi … ives the curved line on the "original … now map.

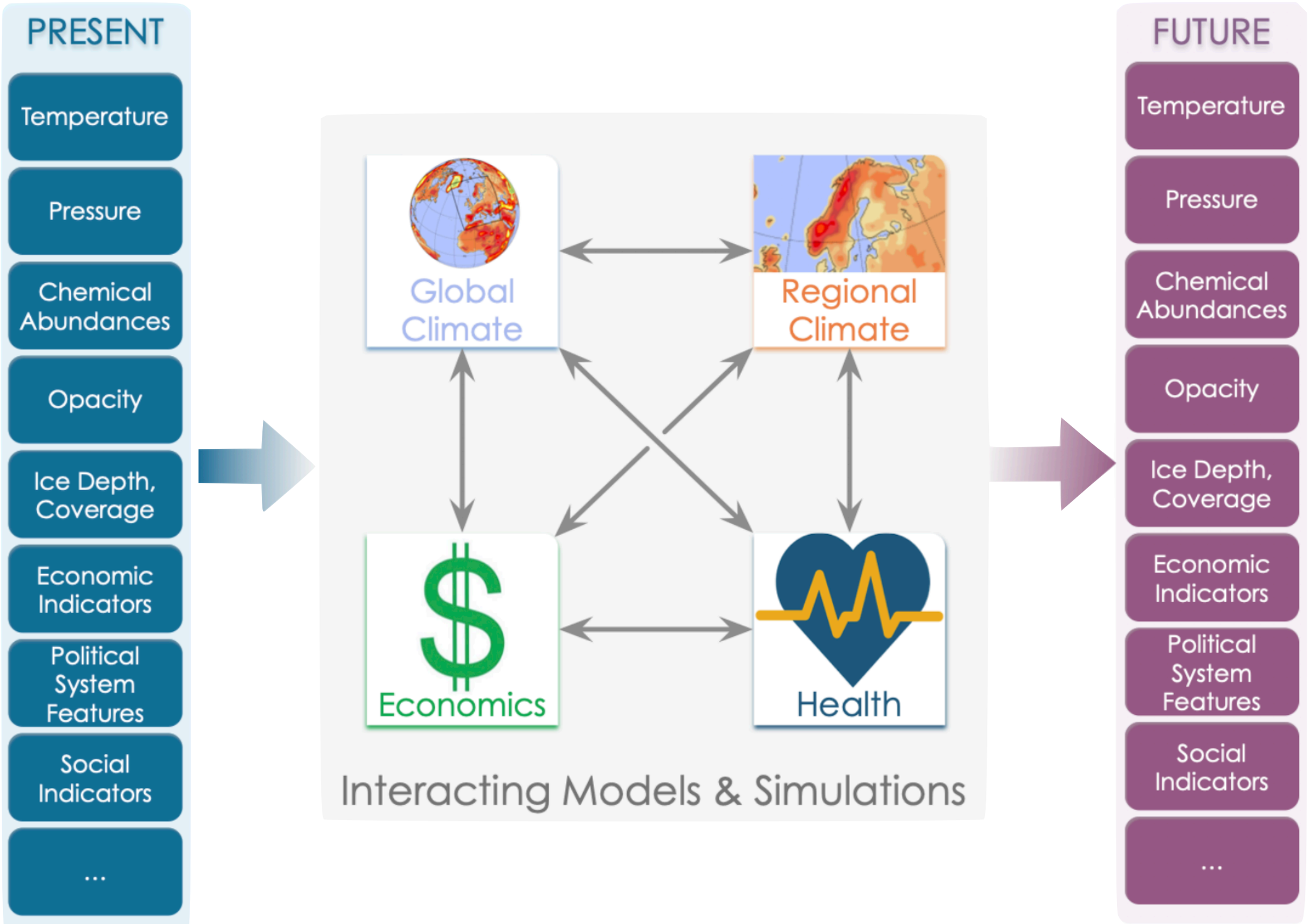
Image credit: Volker Springel, wwwmpa.mpa-garching.mpg.de/~volker/arepo/

Next time… Silver vs. Palmer views re:Weather/Climate (after you hear Palmer interview)

Does human visualization help? Silver says yes , Palmer says no... Silver says National Weather Service keeps 2 sets of records, w/ & w/o humans, and w/humans is better, refutes Silver's claim of no study?

Palmer: Weather—fractal models? Chaos? (Lorenz)
“microphysics of ice is not in the simulations”

Where we will be in 5 weeks…



Fine points & questions for future discussions

"Simulation" vs. "Numerical Experiment"
  Simulation: goal is reality
  Numerical Experiment: A "what if" question, about one parameter or idea.

What to do about critical inputs you can't have
(e.g. underground activity in earthquake forecasting, true # of COVID-19 infections, aspects of human behavior)?

Is a more complicated system always better?
  SimCity 2000 vs. The Sims…

DOS Zone Maintance mode

Search game...

DOWNLOAD PC VERSION

Play Sim City 2000 | DOS game online in browser

Sim City 2000 Browser Version

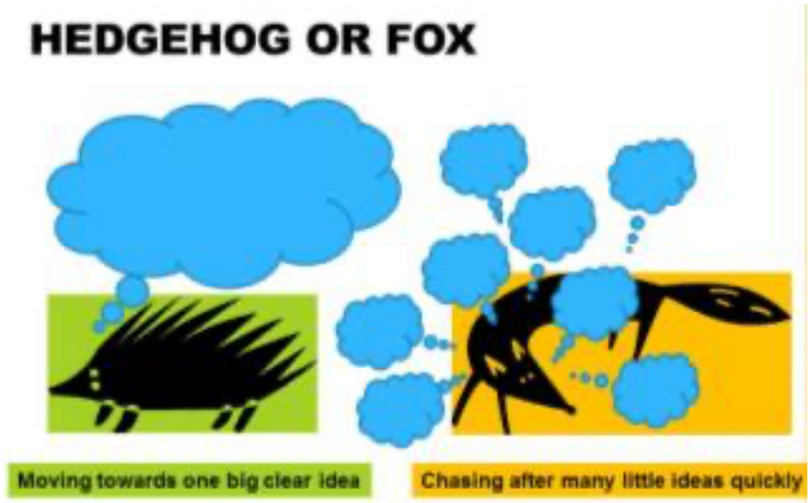
Play online ENG Mobile </>

Sim City 2000: Video and Screenshots

dos.zone/sim-city-2000-1993/

Words or phrases you heard in class recently that were MOST unfamiliar or confusing to you...

extra materials…



hedgehogsvsfoxes.com/take-a-test/

you are a HEDGEHOG

The greek poet Archilochus wrote: “The fox knows many things, but the hedgehog knows one big thing.”

As a hedgehog, you structure your mind around a single, defining idea. You probe deeply and narrowly, and you know where you’re going. You’re determined and have a straightforward way of thinking.

Famous Hedgehogs

but... Does Nate Silver have it backwards? slate.com/culture/2014/03/foxes-vs-hedgehogs-a-history-from-nate-silver-fivethirtyeight-and-isaiah-berlin-back-to-archilochus-of-paros.html

To use the Forum...

Spaces by Wix

Join “PredictionX” on Spaces by Wix

Download the app and join “PredictionX” to check out their site on the go and stay updated with the latest news, offers and more.

Enter your phone number to get a download link

US +1

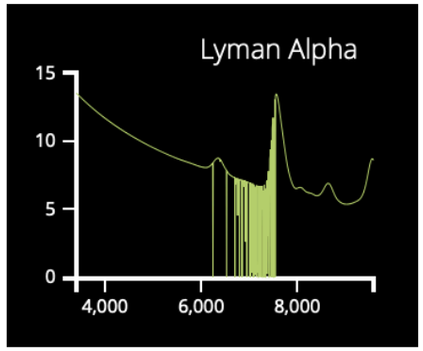
Phone number

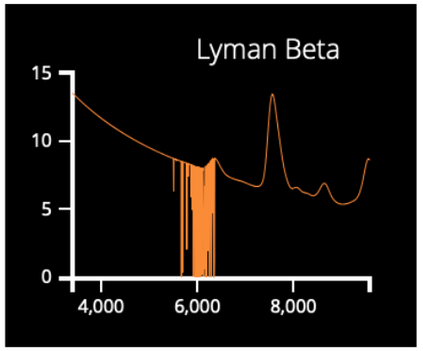
Send

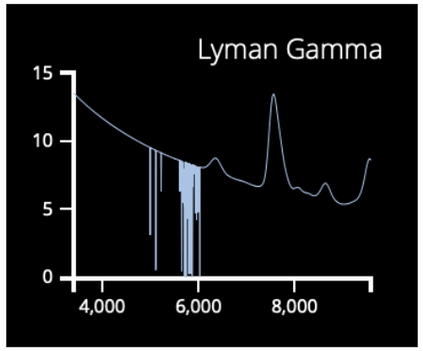
Or scan to download

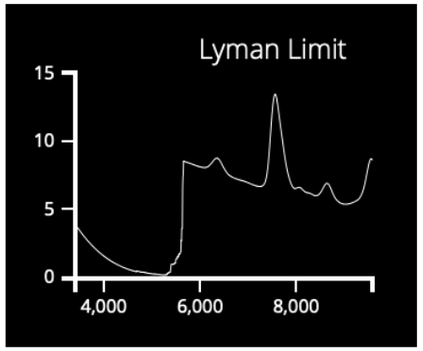
Lyman alpha forest interactive module

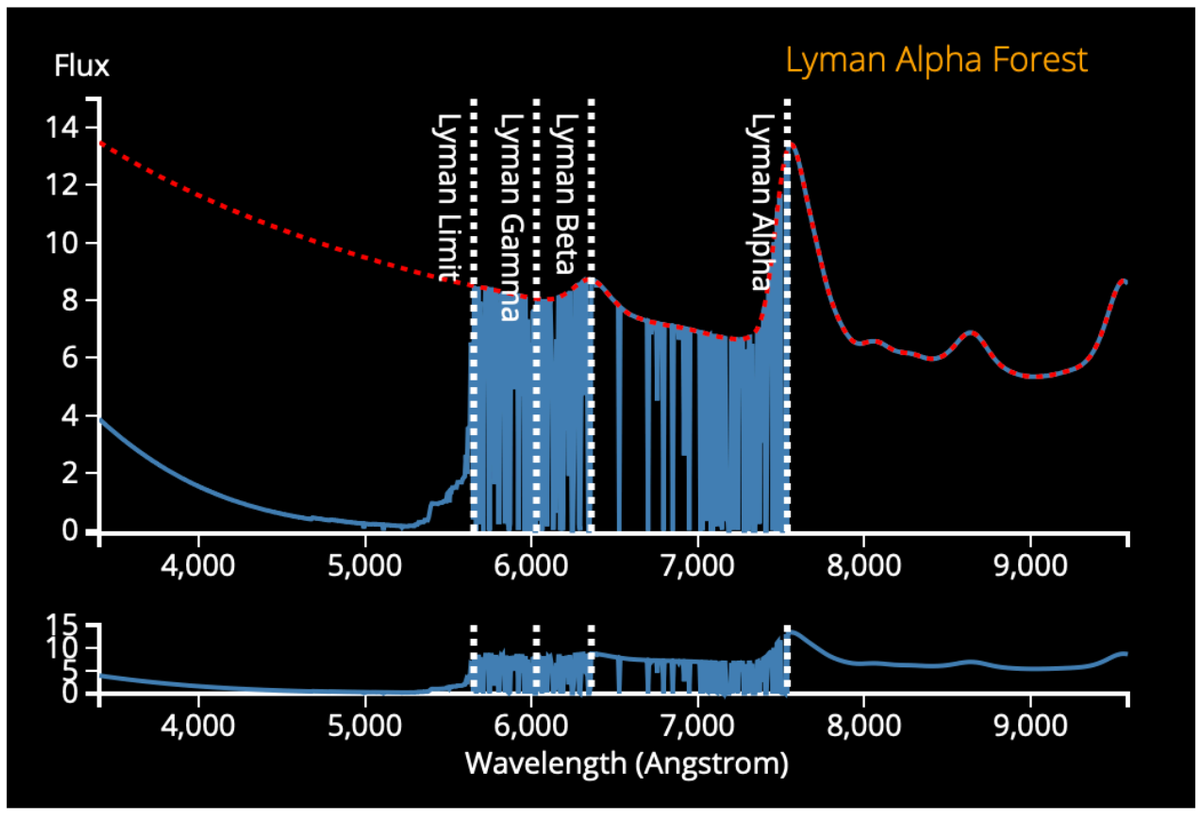
created by Yuan-Sen Ting











Remove plot labels

- [x] Lyman-alpha
- [x] Lyman-beta
- [x] Lyman-gamma
- [x] Lyman-limit

- ( ) Continuum subtracted
- (•) Quasar mode
  - [x] Quasar Spectrum

Animate

Total column density

7.9e17 atoms/cm²

Redshift index, β

20.1

Column density index, α

1.3

Quasar redshift

5.2

edge.edx.org/courses/HarvardX/SCI999/2014/courseware/68a892803b9044698728e3aeac6371ae/2252043c58dc456ba731e470dcf11094/

What *is* a numerical "simulation" or a "model"?