Probabilistic ~~Forecasting~~ *Decision Making*
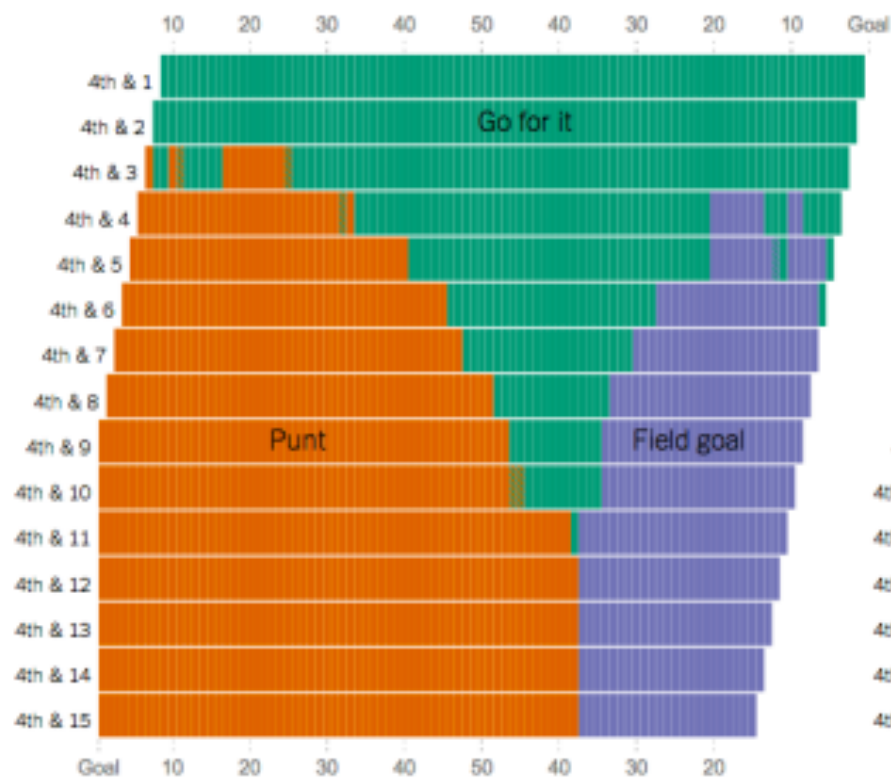
When do you want it?

Topic presented by:
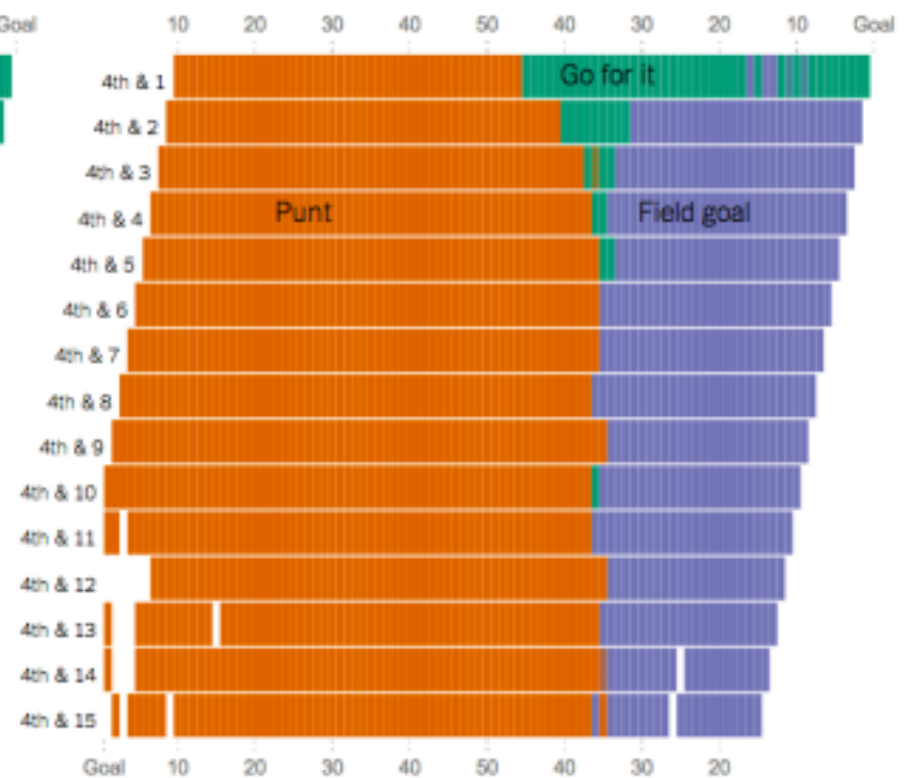**Larry Maccherone**
@LMaccherone

WHAT NYT 4TH DOWN BOT RECOMMENDS ON 4TH DOWN
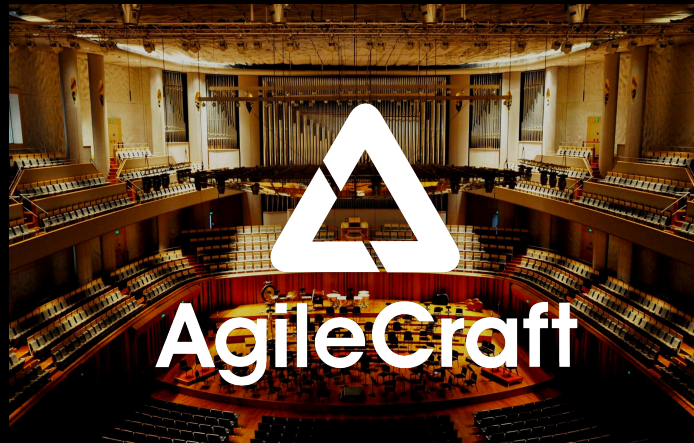
Go for it

Punt

Field goal

WHAT N.F.L. COACHES DO MOST OFTEN

Go for it

Punt

Field goal

Bias eats good decisions for breakfast

By understanding probabilistic decision making, we learn to trust and overcome bias

Larry Maccherone
@LMaccherone

Every decision is a forecast!

You are forecasting that your choice will have better outcomes than the other alternatives

So…
quality of decision depends upon:

1. alternatives considered, and

2. models used to forecast the outcome of those alternatives.

Probabilistic models are superior

Probabilistically, it's better to go for it on 4th down more often than coaches do

For a given alternative, let:

P_g = Probability of good thing happening

V_g = "Value" of good thing happening

Then:

Value of the alternative = $P_g \times V_g$

An
lean/agile product management example

Worst case (25%)   Likely case (50%)   Best case (25%)

1

$8M

$1M

$1M

$$P_W \times V_W = .25 \times \text{-}\$1.00M = \text{-}\$0.25M$$
$$P_L \times V_L = .50 \times \$1.00M = \$0.50M$$
$$P_B \times V_B = .25 \times \$8.00M = \$2.00M$$

$2.25M

2

$1M $2M $2M

$$P_W \times V_W = .25 \times \$1.00M = \$0.25M$$
$$P_L \times V_L = .50 \times \$2.00M = \$1.00M$$
$$P_B \times V_B = .25 \times \$2.00M = \$0.50M$$

$1.75M
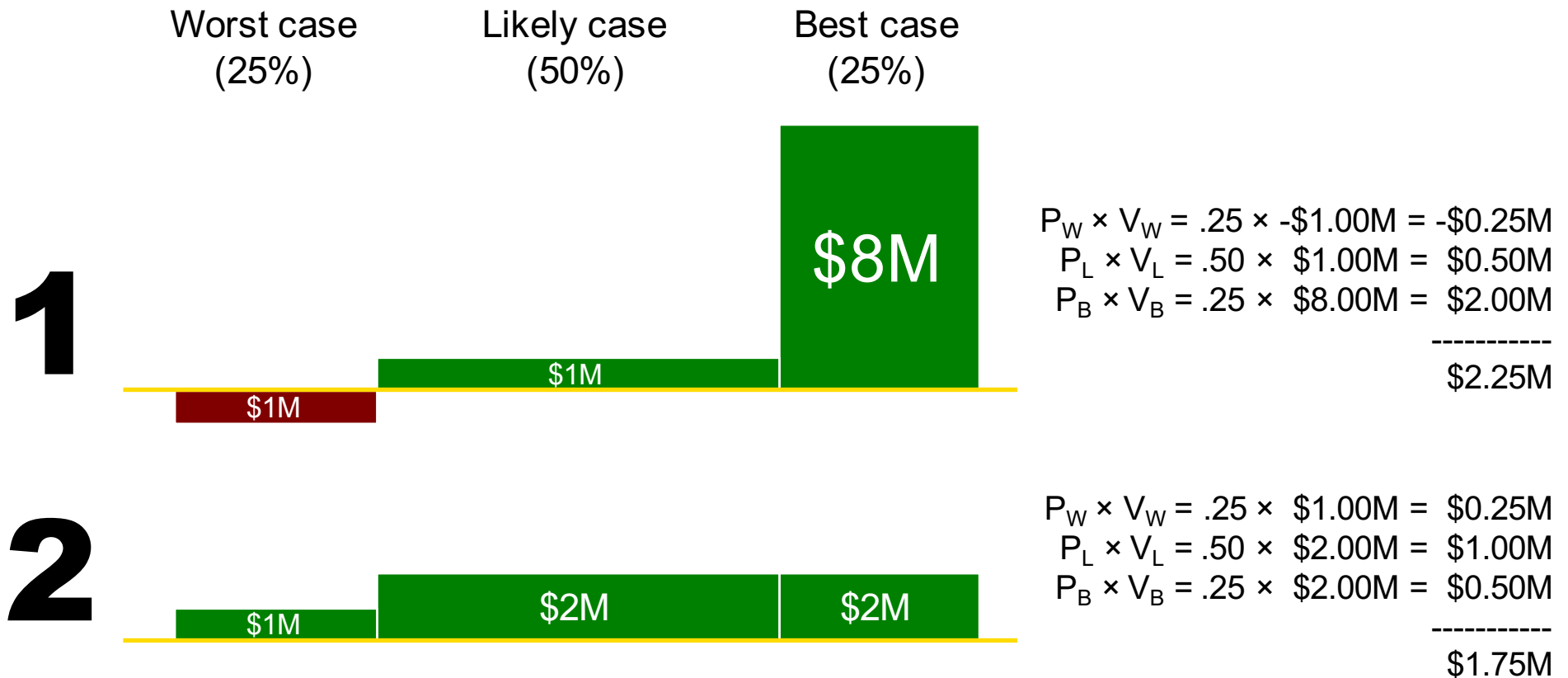
Which strategy is best…
…for your company?
…for your career?

If you get only 1 project then strategy 2 is better 75% of the time

If you get ∞ projects then strategy 1 is better 100% of the time

How many projects do you need for strategy 1 to be better more often than not?

Nate Silver

Using Monte Carlo simulation to predict elections ... and sports outcomes

```
 1  iterations = 10000
 2
 3  lumenize = require('./lumenize')
 4  {RandomPicker, utils, table} = lumenize
 5  xForm = lumenize.csvStyleArray_To_ArrayOfMaps
 6
 7  config1 = {distribution: [{p: 0.25, value: -1}, {p: 0.50, value: 1}, {p: 0.25, value: 8}]}
 8  picker1 = new RandomPicker(config1)
 9
10  config2 = {distribution: [{p: 0.25, value: 1}, {p: 0.50, value: 2}, {p: 0.25, value: 2}]}
11  picker2 = new RandomPicker(config2)
12
13  strategy1Better = (numberOfProjects) ->
14    winsForStrategy1 = 0
15    for i in [1..iterations]
16      strategy1Profit = strategy2Profit = 0
17      for j in [1..numberOfProjects]
18        strategy1Profit += picker1.get()
19        strategy2Profit += picker2.get()
20      if strategy1Profit > strategy2Profit
21        winsForStrategy1++
22    return '' + Math.floor(100 * winsForStrategy1 / iterations) + '%'
23
24  results = [['Number of Projects', '% Strategy 1 Wins']]
25
26  for numberOfProjects in [1..4]
27    results.push([numberOfProjects, strategy1Better(numberOfProjects)])
28
29  while numberOfProjects < 100
30    numberOfProjects *= 2
31    results.push([numberOfProjects, strategy1Better(numberOfProjects)])
32
33  utils.log(table.toString(xForm(results)))
```

Play with it yourself at:
http://jsfiddle.net/lmaccherone/j3wh61r7/

Number of Projects	% Strategy 1 Wins
1	25%
2	43%
3	55%
4	59%
10	64%
20	72%
40	80%
80	90%
160	96%

Emotion and bias plays a part

Scary?

1 $1M $8M

Did any of you get emotional about the $1M loss?

Did any of you want to question the $8M number?

Do you believe the $8M?

1 $1M $8M
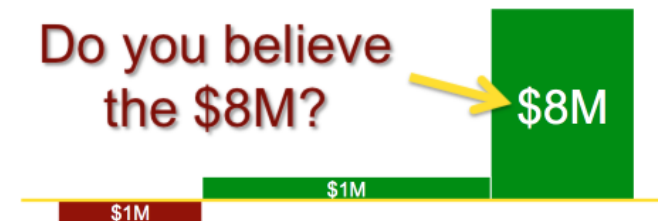
We've totally…

…eliminated fear from the equation

…changed the nature of the conversation

Argument is about *who* is right.
Decision making is about *what* is right.

Getting probability input you can trust

We are inaccurate when assessing probabilities

But, training can "calibrate" people so that of all the times they say they are X% confident, they will be right X% of the time
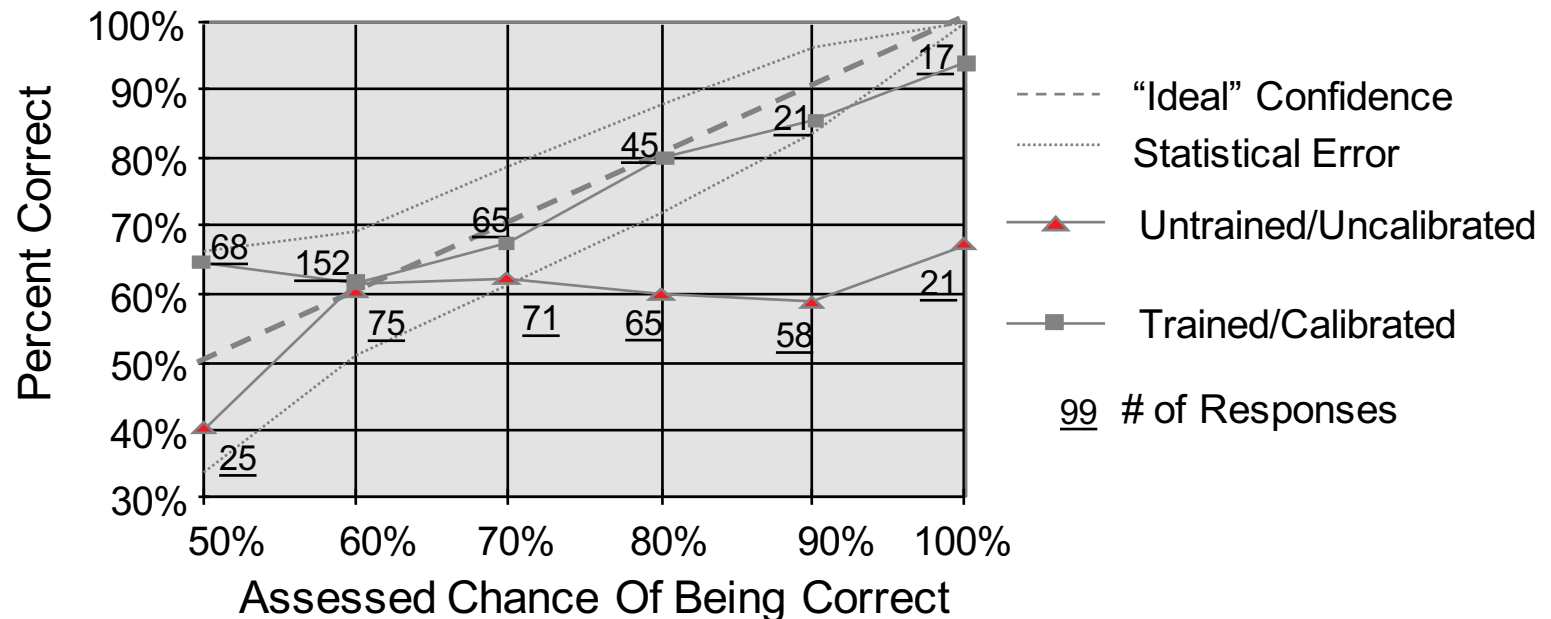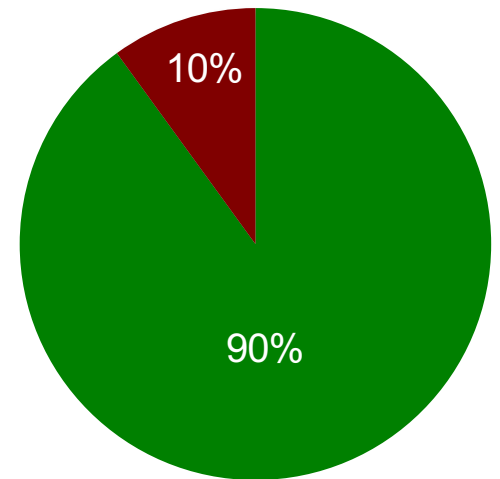
Equivalent Bet calibration

What year did Newton published the Universal Laws of Gravitation?

Pick year range that you are **90% certain** it would fall within.

Win $1,000:

1. It is within your range; or
2. You spin this wheel and it lands green
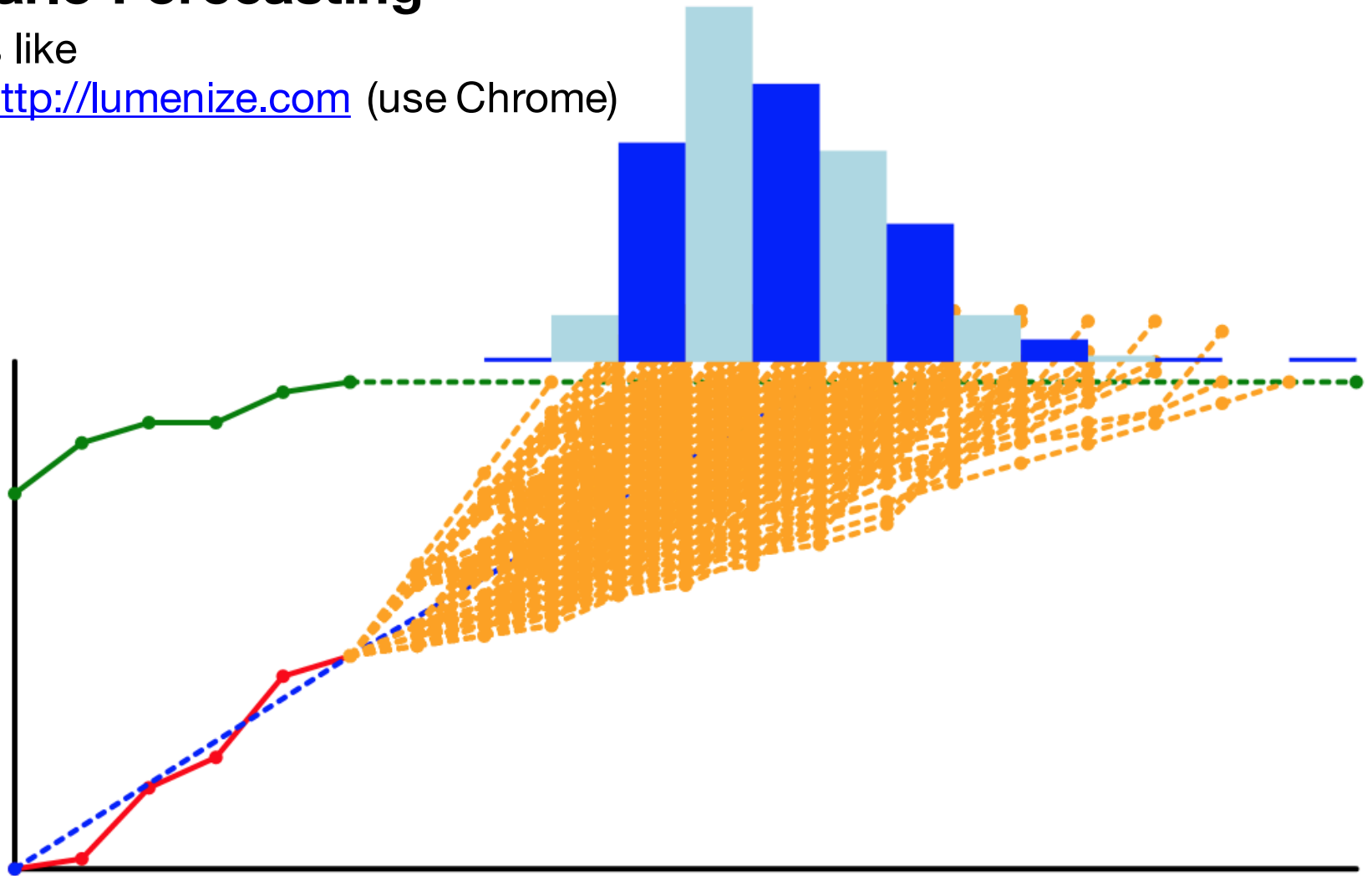
Adjust your range until 1 and 2 seem equal.

Even *pretending* to bet money works.

10%

90%

An
agile delivery date forecast example

Monte Carlo Forecasting

What it looks like
Live demo: http://lumenize.com (use Chrome)

Seek to change the nature of the conversation

Getting even more sophisticated

1. Only use slopes after it stabilizes. Discard the first N.
   (Lumenize has v-optimal algorithm for finding this inflection point)

2. Weight later slopes more heavily.

3. Markov chain pattern reproduction. Accomplishes 1 and 2 above automatically.

4. Simulate the movement of each individual work item through the system. Can find bottlenecks and help optimize your role balance.
   Troy Magennis has the expertise and tools for this.

… but for those brave enough to journey
into the dangerous world of
agile measurement
there are great riches to be had.

The trick is to slay the dragons.

The Dragons of Agile Measurement
If you do metrics wrong, you will harm your agile transformation

1. **Dragon**: Measurement as a lever
   Slayer: Measurement as feedback

2. **Dragon**: Unbalanced metrics
   Slayer: 1 each for Do it fast/right/on-time, and Keep doing it

3. **Dragon**: Metrics can replace thinking
   Slayer: Metrics compliment thinking

4. **Dragon**: Expensive metrics
   Slayer: 1st work with the data you are already passively gathering

5. **Dragon**: Using a convenient metric
   Slayer: Outcomes ← Decisions ← Insight ← Metric (ODIM)

6. **Dragon**: Bad analysis
   Slayer: Simple stats and simulation

7. **Dragon**: Single outcome forecasts
   Slayer: Forecasts w/ probability
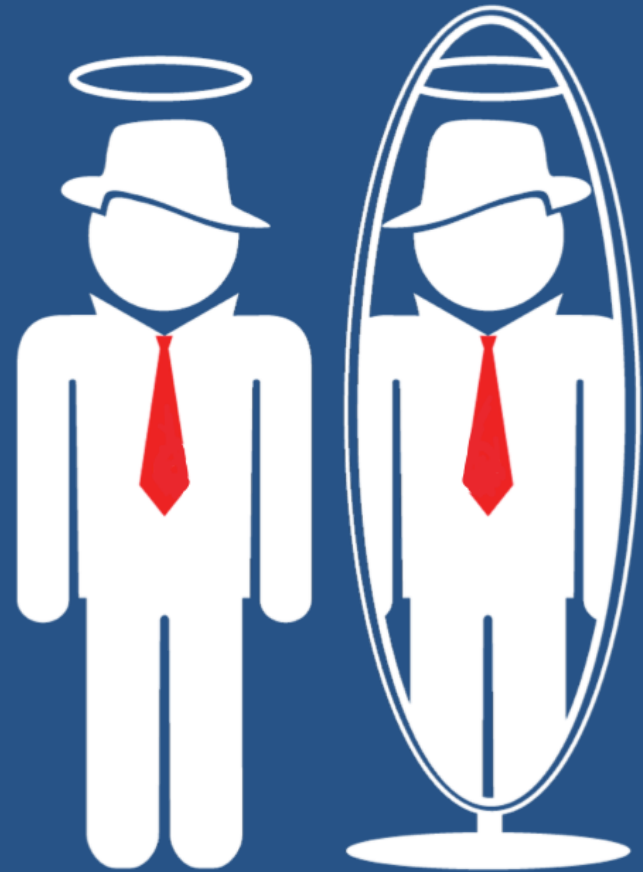
Dragon #1

Manipulating Others

Using metrics as a lever to drive someone else's behavior

Dragon slayer #1

Self Improvement

Using metrics to reflect on your own performance

Good players?

Monta Ellis
9th highest scorer
(8th last season)

Carmelo Anthony (Melo)
8th highest scorer
(3rd last season)

Dragon slayer #5
ODIM

like Vic Basili's
Goal-Question-Metric (GQM)
but without
ISO/IEC 15939 baggage

M E A S U R E

I N S I G H T   EFFECT

THINK   **D** E C I S I O N

O U T C O M E

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What?
So what?
NOW WHAT?

My 2nd talk
3:45 Wednesday
National Harbor 6/7

Top 10 criteria for great visualization

1. Answers the question, "Compared with what?" **(SO What?)**

2. Shows causality, or is at least informed by it. **(NOW WHAT?)**

3. Tells a story with whatever it takes.

4. Is credible.

5. Has business value or impact in its social context.

6. Shows differences easily.

7. Allows you to see the forest AND the trees.

8. Informs along multiple dimensions.

9. Leaves in the numbers where possible.

10. Leaves out glitter.

Now what?

Enter feedback in Sched App

Come to the AgileCraft booth:

- Questions answered

- Demo of how AgileCraft surfaces probabilistic visualizations and is the best way to scale agile

Come to my talk on Wednesday at 3:45:

- Using data to influence

- Top 10 criteria for great visualization

"They" say…

Nobody knows what's gonna happen next: not on a freeway, not in an airplane, not inside our own bodies and certainly not on a racetrack with 40 other infantile egomaniacs.
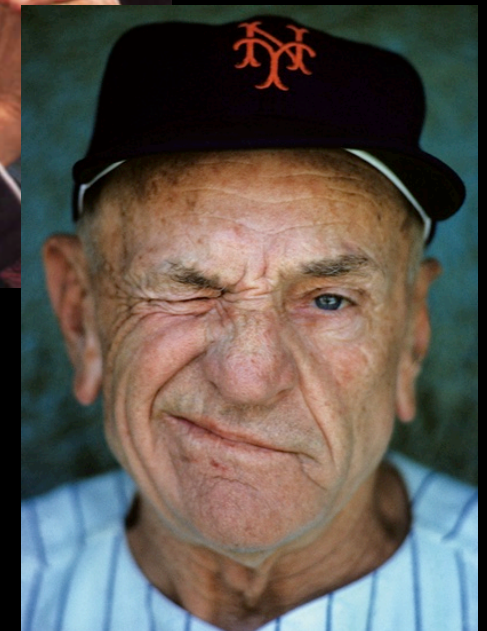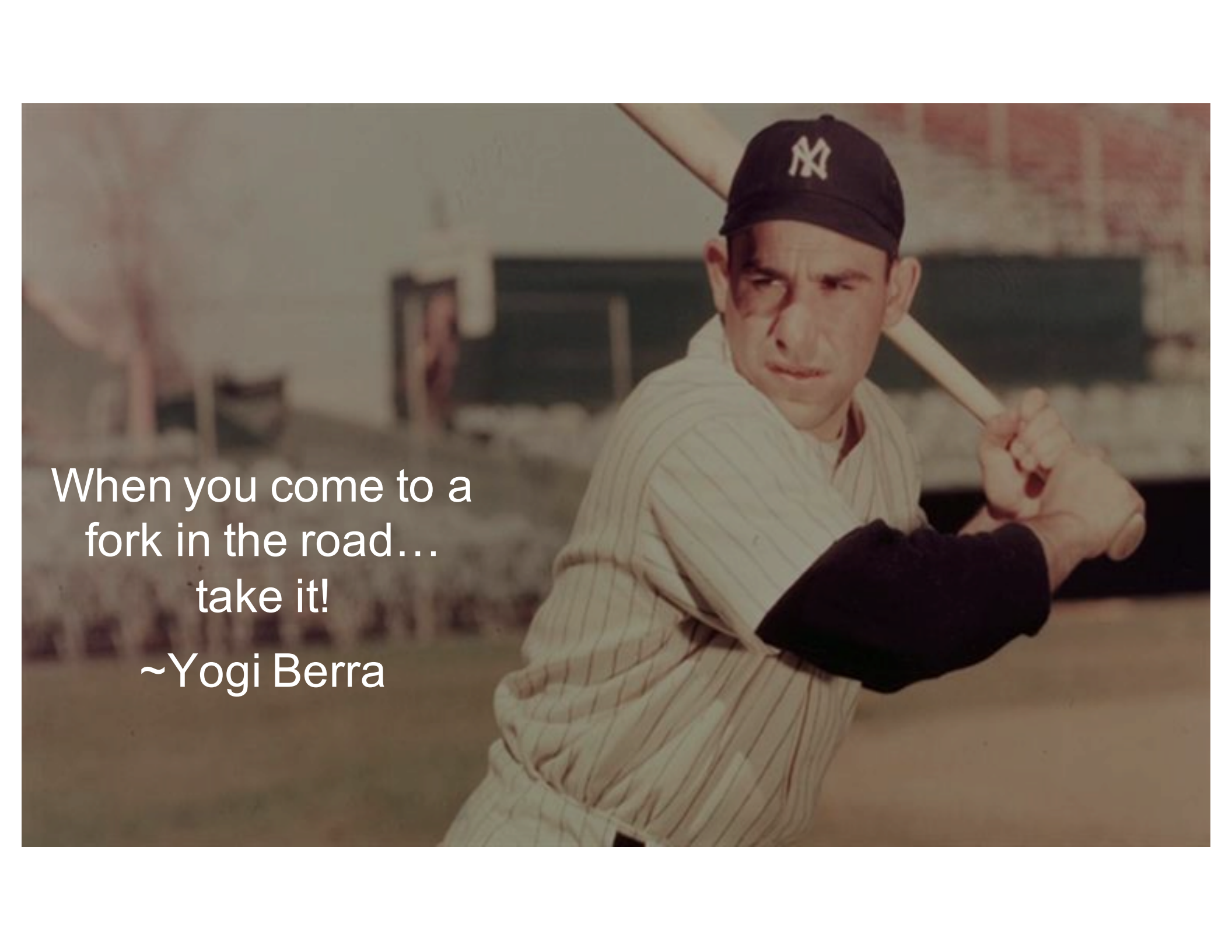– Days of Thunder

Trying to predict the future is like trying to drive down a country road at night with no lights while looking out the back window.
– Peter Drucker

Never make predictions, especially about the future.
– Casey Stengel

When you come to a
fork in the road…
take it!
~Yogi Berra

Now what?

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