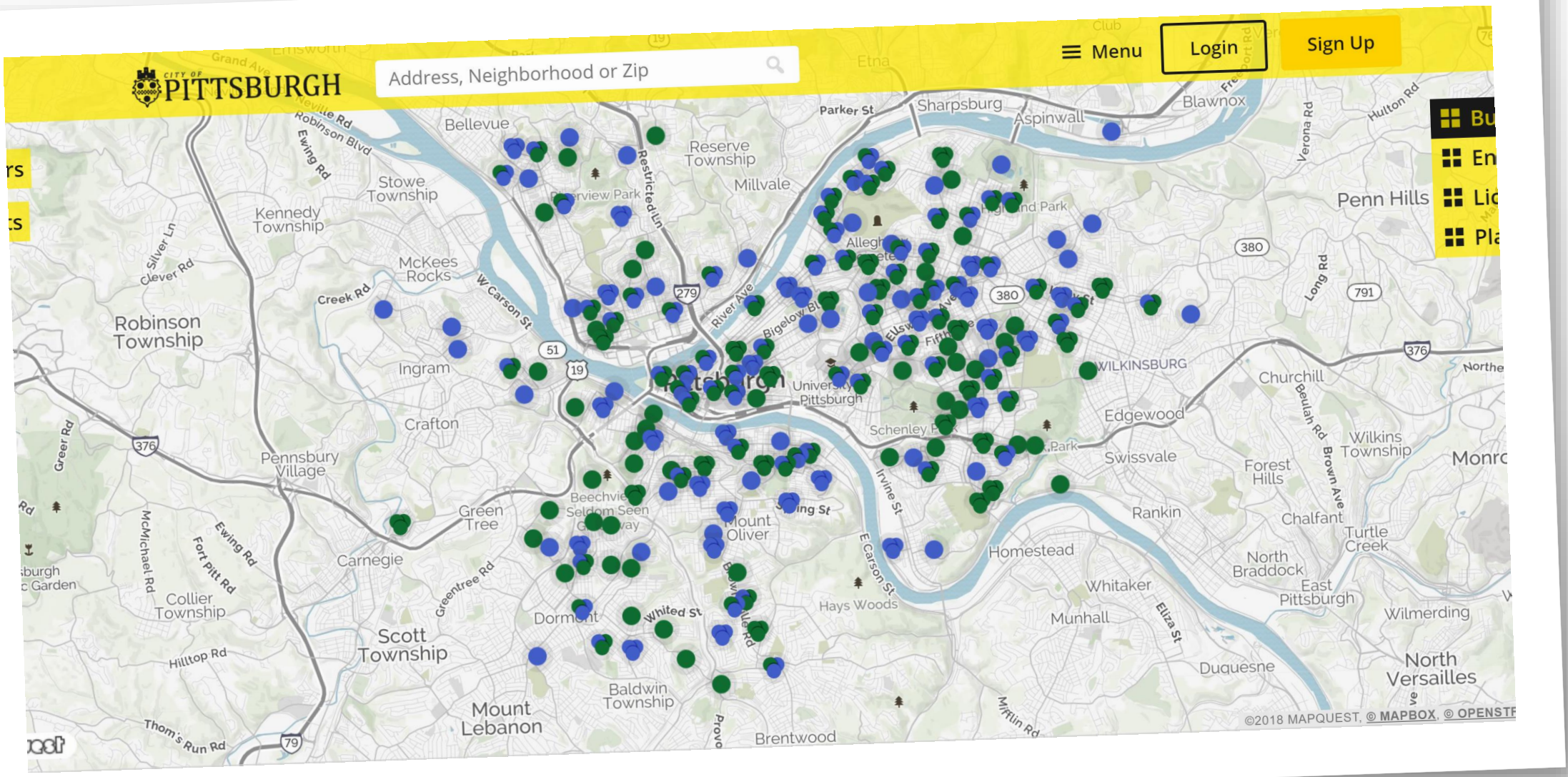
College of Public Service and Community Solutions

M.S. IN PROGRAM EVALUATION AND DATA ANALYTICS

MARKETABLE SKILLS



$66,000 license per year!

```
install.packages( "leaflet" )
library( leaflet )


### LOAD DATA ###

code.violations <- read.csv("https://raw.githubusercontent.com/subartle/orangespot/master/data/code%20violations.csv")
lat.lon <- code.violations[ c("lat","lon") ]
lat.lon <- na.omit( lat.lon )


### CREATE MAP ###

syr.map <- leaflet(data=lat.lon ) %>%
            addProviderTiles("CartoDB.Positron", tileOptions(minZoom=10, maxZoom=17))  %>%
            setView(lng=-76.13, lat=43.03, zoom=13) %>%
            setMaxBounds(lng1=-75, lat1=41, lng2=-77,  lat2=45)

syr.map


### COLOR CODE BED BUGS  ###

col.vec <- ifelse( code.violations$Complaint.Type == "Bed Bugs", "orange", NA )
addCircles( syr.map, lng = lat.lon$lon, lat = lat.lon$lat, col=col.vec )
```

(you can build a similar platform in R with 12 lines of code)

Top 50 R resources on Novel COVID-19 Coronavirus

towards data science

Rapid sharing of

- Data
- Models
- Dashboard templates
- Code

https://towardsdatascience.com/top-5-r-resources-on-covid-19-coronavirus-1d4c8df6d85f

DASHBOARD

Choose a value for R_0

1.5 | **2.25** | 3

1.5 1.75 2 2.25 2.5 2.75 3

Choose the first 'social distance period' (sdp 1)

0 | **30** | **60** | 150

0 15 30 45 60 75 90 105 120 135 150

Reduction during first period (sdp 1)

0.2 | **0.6** | 1

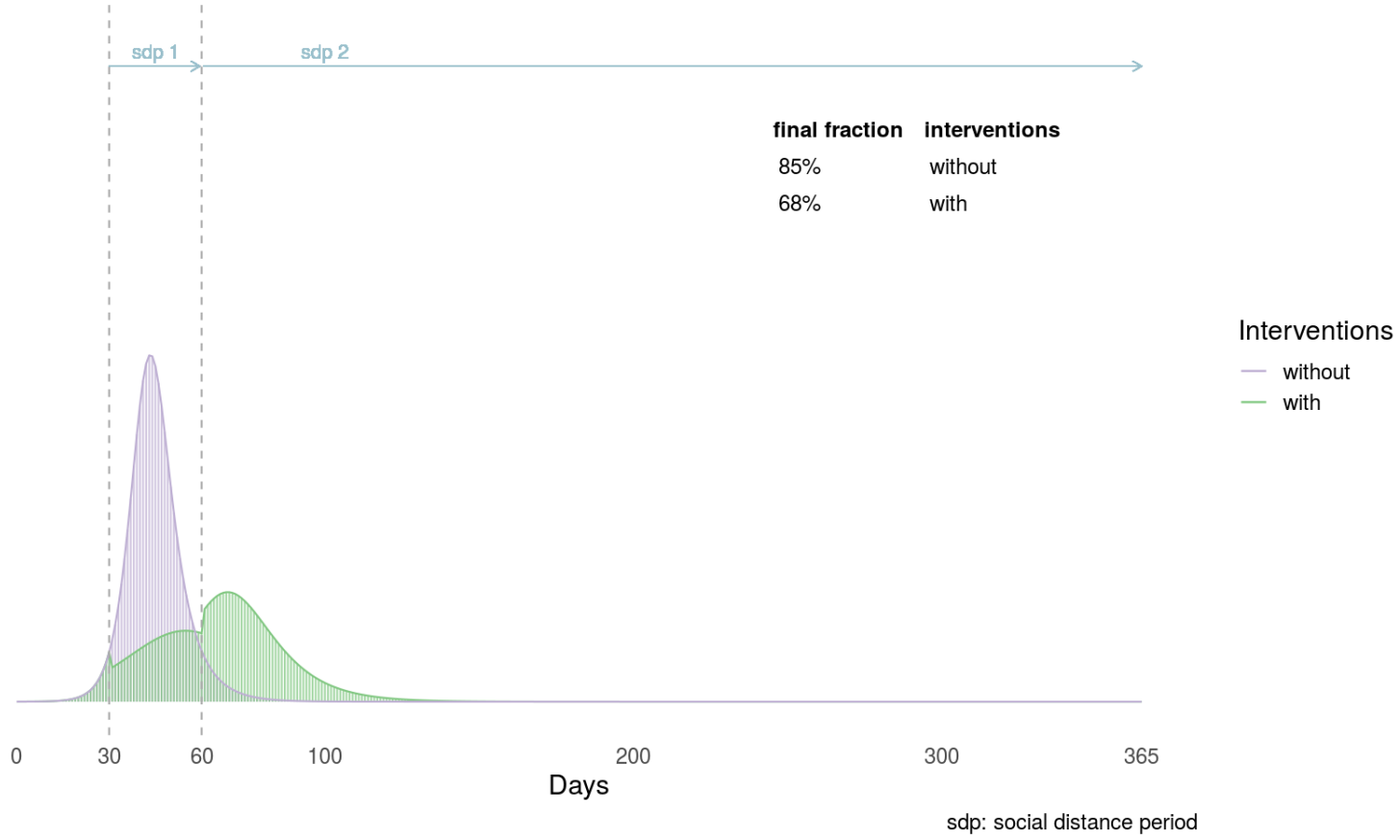
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

Reduction after first period (sdp 2)

0.2 | **0.8** | 1

0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

Daily new cases in % of the population



sdp: social distance period

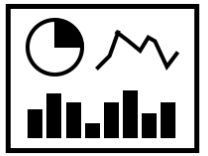
THE TOOL KIT

THE DATA SCIENCE ECOSYSTEM

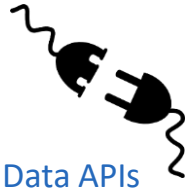
1. Data programming (R)
2. Packages (tools)
3. Open data / APIs
4. Data-driven documents
5. Collaboration platforms (GitHub)
6. Development Environments (R Studio)

R

Stack Overflow



Dynamics Web Applications (Dashboards)

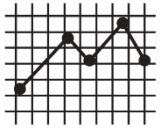


Data APIs

Statistics

(operating system)

Open Data



Graphics

GIS

GitHub

Data-Driven Documents

R

Atlas TI: $700

Stata License: $1200

SPSS: $1200 - $7800

ARCGIS: $7000

R: FREE !

OUTPUT OPTIONS

MARKDOWN

1. Reports [html] [pdf]
2. Books [link]
3. Presentations [link]
4. Tutorial [link]
5. Websites [link]
6. Dashboards [link]
7. Web Apps [link] [link] [CDC]

```
---
title: "MARKDOWN DEMO"
output: pdf_document
---


# Here is the heading

Here is some text.

## A sub-heading

Perhaps you want a list:

- Item 1
- Item 2

And here is some code:

```{r}

plot( cars, col="steel blue", cex=1.5, pch=19 )

```
```

render

MARKDOWN DEMO

Here is the heading

Here is some text.

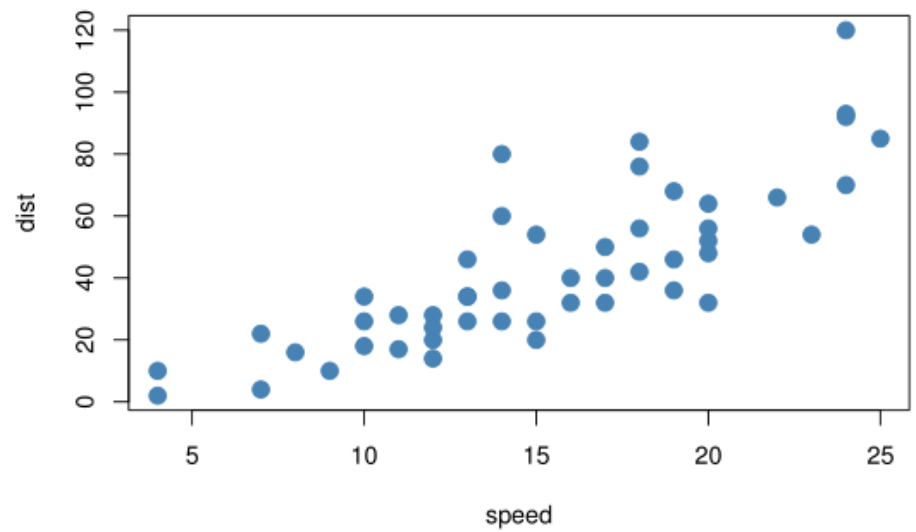
A sub-heading

Perhaps you want a list:

- Item 1
- Item 2

And here is some code:

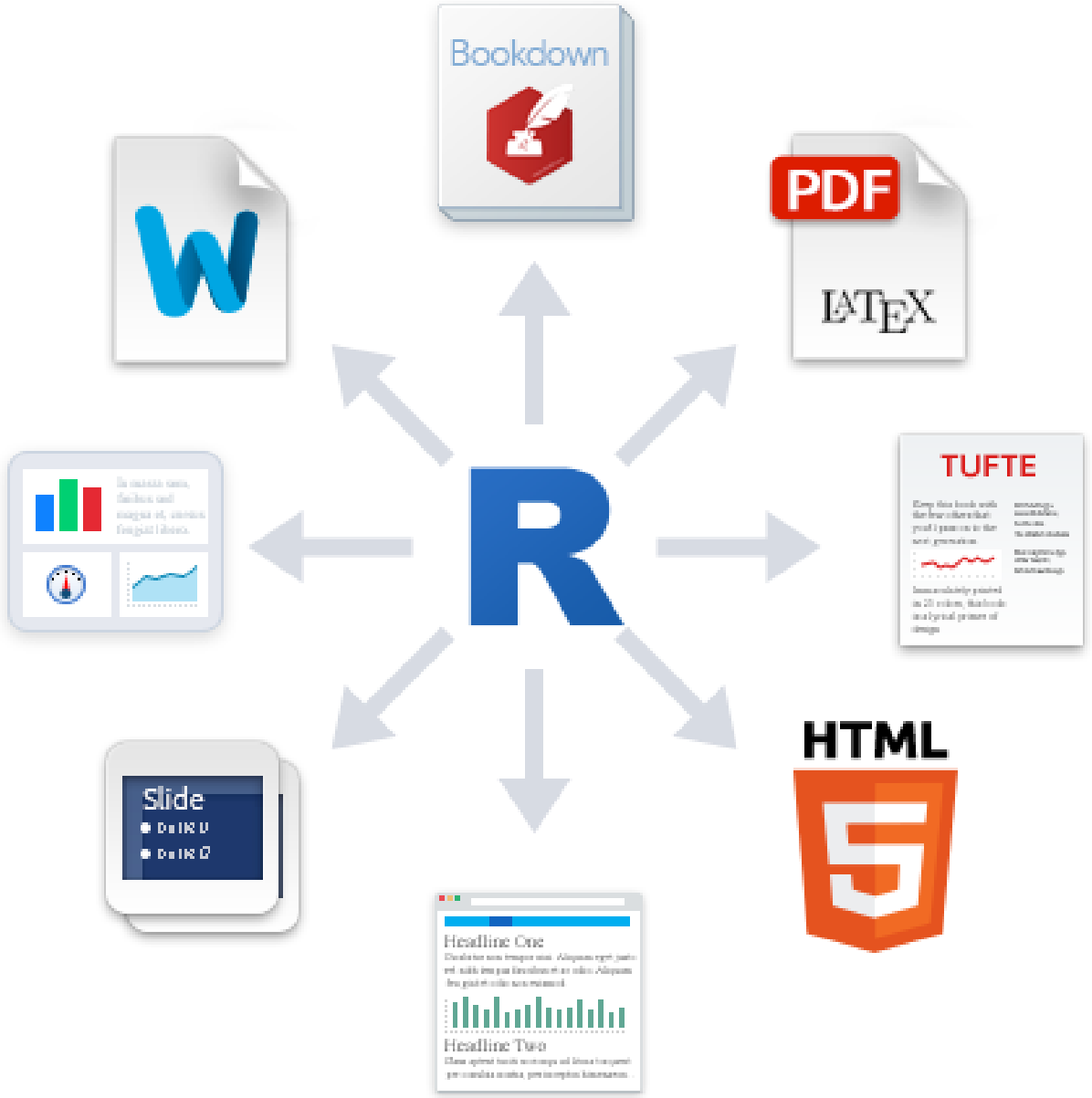
```
plot( cars, col="steel blue", cex=1.5, pch=19 )
```



```
---
title: "MARKDOWN DEMO"
output: pdf_document
---
```

```
---
output: html_document
---
```

```
---
output: flexdashboard::flex_dashboard:
---
```



THE LEARNING CURVE

EVALUATION PROFESSIONS

DATA SCIENCE PROFESSIONS

Specialist (PhD / Team Lead)

Specialist (Machine Learning)

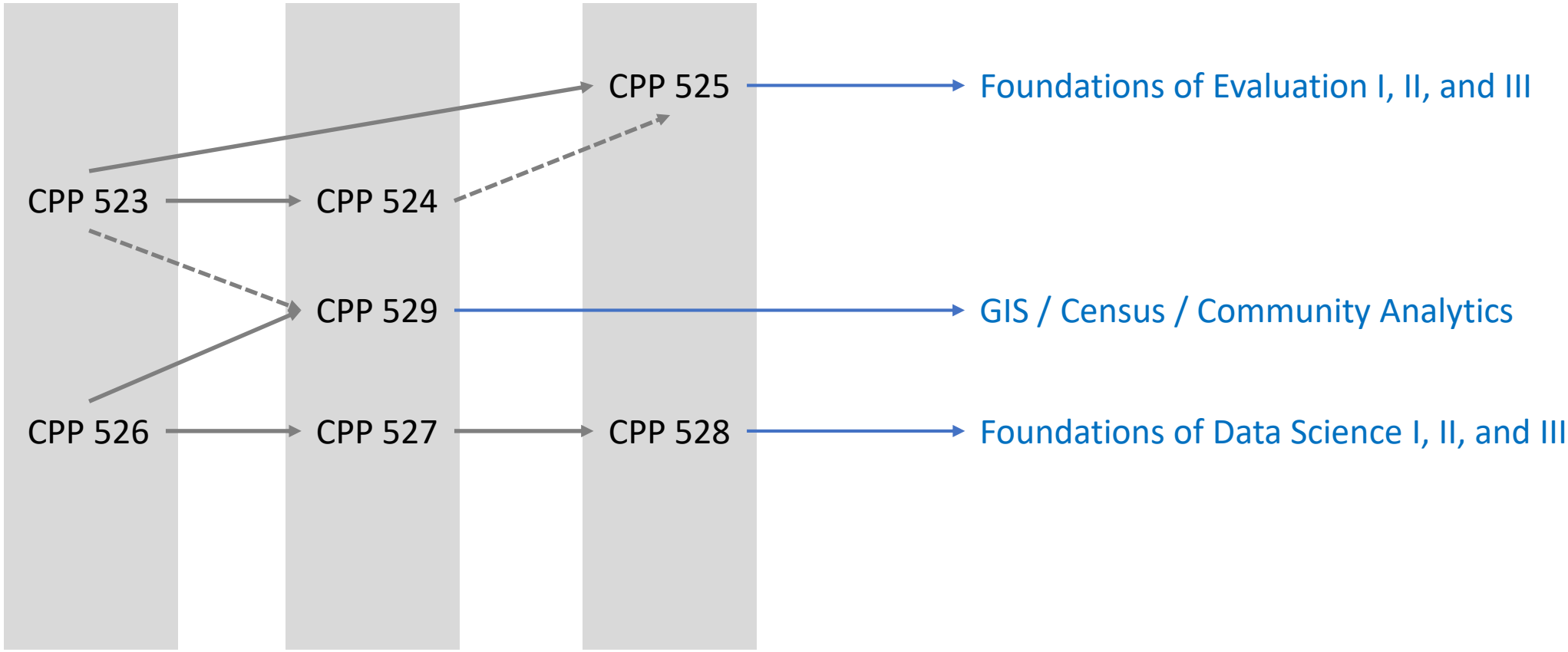
Generalist
(Design Evaluations)

Generalist
(Inference w Data)

Tech
(Collect Data &
Write Reports)

Tech
(Wrangle Data &
Write Reports)

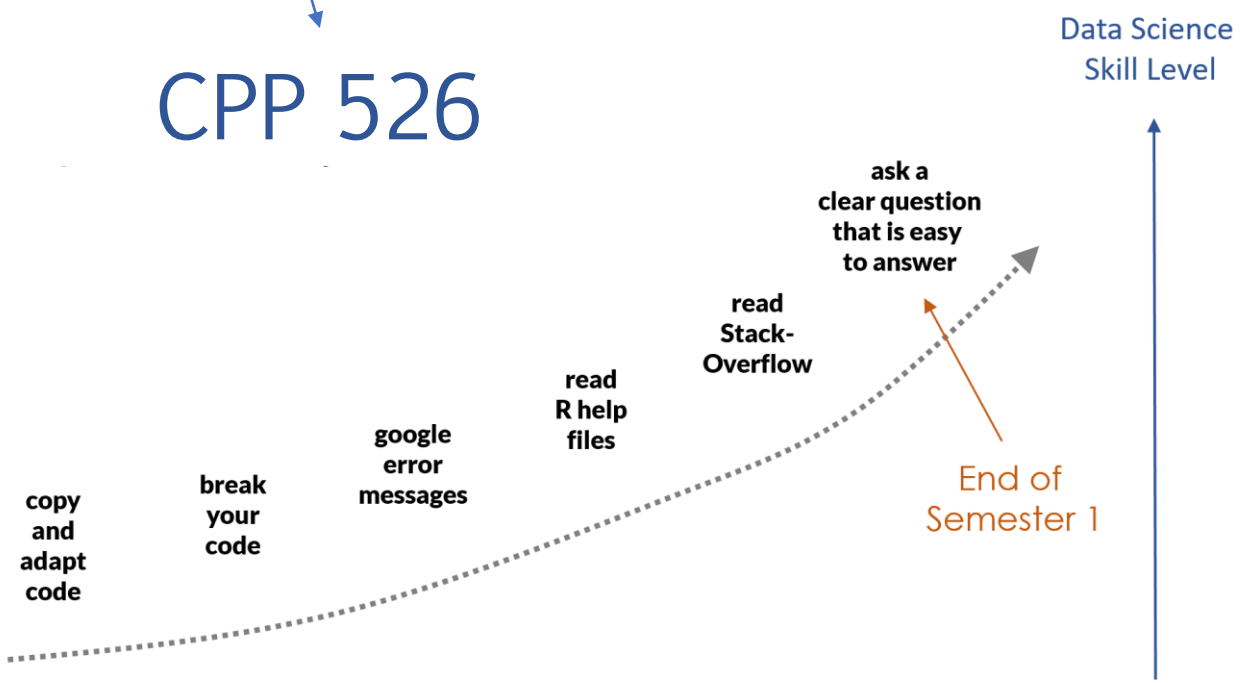
CORE COURSES



The Learning Curve

CPP 526: DS 1	CPP 529: Com Analytics	CPP 527: DS 2	CPP 528: DS 3
• **Read existing code** • **Read documentation** • **Adapt code** • **Participate in discussion boards**	• Use data APIs (census data) • Manage non-standard data types (map files) • Master object types and work-flow	• Write custom functions • Create an R package • Create custom report templates • Build a website	• Manage large projects • Utilize GitHub effectively for collaboration • Use tools to ensure work is reproducible

CPP 526

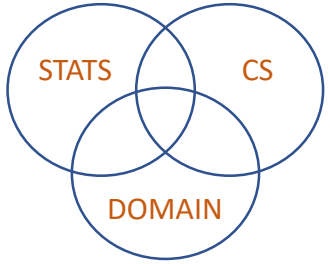


It takes 5-10 years for your personal development to plateau

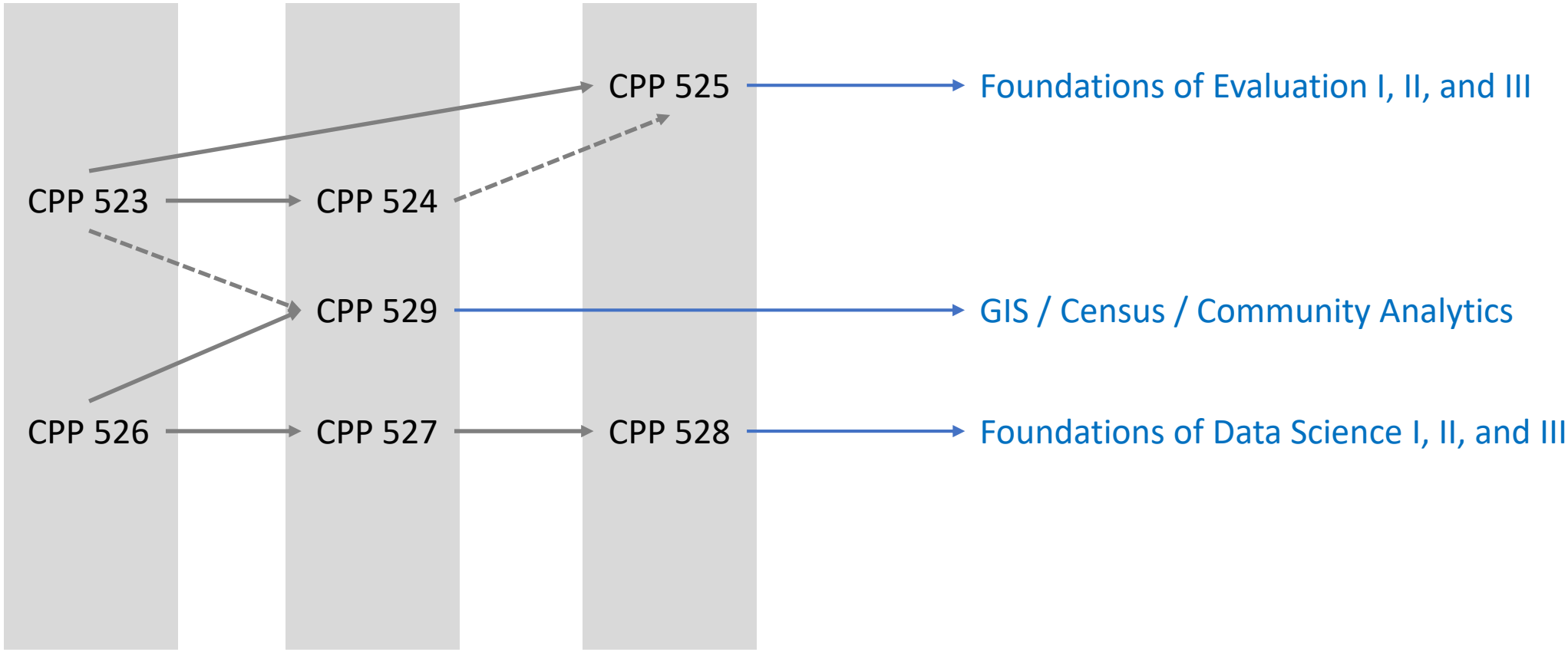
ELECTIVES AND CAPSTONE

2 Electives
1 Capstone with client

→ Opportunities for specialization



CORE COURSES



HOW TO SUCCEED

GETTING HELP (20 MINUTE RULE)

- Work in groups
- Google errors – read StackOverflow → question about functions
- Post questions to GitHub → question about labs

  https://ds4ps.org/cpp-526-spr-2020/help/

- Attend review sessions
- Schedule office hours

GRADES – EXAMPLE COURSE BREAK-DOWN

- 50% Labs (weekly - pass/fail)
- 10% Discussion (YellowDig)
- 10% Code-Through

- 30% Final Projects / Exams

ACADEMIC INTEGRITY

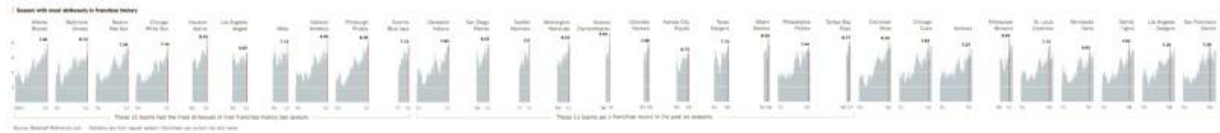
"Plagiarism, or the use of another's words, ideas, materials, or work from the Internet or any other source without properly acknowledging and documenting the source. Students are responsible for knowing the rules governing the use of another's work or materials and for acknowledging and documenting the source appropriately."

(from the Student Policy handbook at Academic Integrity Office)

- What is plagiarism in an open-source world?
- What does it mean to plagiarize code?
- When in doubt, reach out!

ASU
R

EXAMPLE LABS



In Majors, a Swing and a Mystery

Last season, 111 hitters struck out at least 100 times. In 1978, 23 hitters reached that figure.

The acceptance of strikeouts as a necessary byproduct of production is now ingrained.

From First Sports Page

during a game we'd put crooked numbers up there," Town said, referring to multiple-run innings. "But it's hard to contain any type of rally."

True enough, although the American League record-holding six strikeouts in a season, the 2012 Oakland Athletics, are not complaining. Despite all of the swinging and missing last season, the A's were 16-6 and captured the A.L. West title.

To Clint Davis, who is entering his second season as Oakland's hitting coach, the important thing was not how much his hitters struck out, but when. The team grounded into only 97 double plays (23 fewer than the average team) and hit 180 home runs (31 more than the average team). Those numbers matter more to the A's, who will not ask their hitters to change.

"I don't want to throw negatives at them," Davis said. "No, we struck out, and you don't want to strike out. But I don't want my guys to just go up there and pepper the ball. They have the potential to drive the ball."

The A's finally met their match in the postseason, striking out 39 times in a five-game division series loss to the Detroit Tigers and their power pitching staff. Oakland managed only 30 hits and 1 home run in the series.

Home runs rose by 8 percent from 2011 to 2012, but generally power is down. After nine consecutive seasons of more than 5,000 homers — starting in 2000, when the majors expanded to 30 teams — history have reached that mark once in the last six years. That suggests that power is harder to find, so teams want anyone with power potential to swing big.

"There's still guys that are tough to strike out, but their game has to be like that to order to be in the big leagues," Tigers catcher Alex Avila said. "Guys who can hit home runs and have any sort of power, teams are going to want them to hit home runs."

Tigers General Manager Dave Dombrowski said there was far less stigma to striking out than there was when he started in baseball in 1974. That season, 31 players hayood at least 100 times. Last year, 115 did. The acceptance of strikeouts as a necessary byproduct of production is now ingrained.

Consider the Cleveland Indians, rivals of the Tigers in the American League Central. The Indians added four players this offseason who struck out at least 140 times in 2012: Drew Stubbs, Mark Reynolds, Michael Brantley and Nick Swisher. (Their also-subtracted one, Shin-Soo Choo.) The Indians' new manager, Terry Francona, said his team would have speed, as well as power, to go with the strikeouts. He dismissed concerns of an older generation.

"I laugh when I hear guys say dad's age: 'You guys got to shorten up and go to right,'" said Francona, whose father, Tito, played from 1956 to 1975. "Well, O.K., but you guys used to score 400 runs a year. We're scoring 680. So somebody's doing something different."

Francona continued: "Base on balloon guys are stronger. There's a lot more swing and miss, but there's also more runs. The idea's to score runs regardless of how you do it."

One of Francona's players, Jason Giambi, is the oldest outfielder in the majors and a former league leader in strikeouts. Giambi, 42, said the rising strikeout rate was caused by better pitching.

Gone, Giambi said, are the days when hitters knew they could beat off single-throwing middle infielders and fifth starters. In Giambi, the worst pitchers on a staff are now simply solid, their stuff can still be overpowering.

"There's this influx of unbelievable arms," said Giambi, who spent most of the last four seasons with Colorado. "I was telling guys in here, like N.L. West in a joke. Every guy on the mound is filthy. Every guy out of the bullpen throws 98."

That is an exaggeration, but hitters seem to believe it, and often panic in the ever-increasing specialization of bullpen roles as a means for all the strikeouts. Seattle Mariner Manager Jack Zduriencik said teams were not new to turn a struggling starter into a reliever to see if his velocity would spike; he cited Joe Blanton, Glenn Perez and Baltimore's Tommy Hunter as successful examples.

But specialization often starts well before the majors. Prospects are often groomed as relievers. Zduriencik said, adding that scouts rarely see amateurs throw seven innings twice a week anymore. The emphasis on strict pitch counts as early as Little League may well be responsible for modern pitchers' lack of durability, but it also might make them more likely to maintain high velocity.

The Atlanta Braves' closer, Craig Kimbrel, who fanned more than half the batters he faced last season, said he wanted to be a starter when he entered professional baseball. The Braves saw him as a future closer, and soon enough, Kimbrel knew why: His stuff was enhanced with the smaller workload, and his body felt better.

"I like going out there pitching and not have my arm be killing the next day," Kimbrel said. "I thought, I can get used to this."

Andrew Friedman, the Tampa Bay Rays' general manager, has found plenty of victims, bargain relievers with high strikeout rates, while developing a power rotation through the farm system. (Late year's Tampa Bay staff recorded the fourth-most strikeouts in history.) But Friedman brushed off the idea that pitchers were throwing harder today.

The arch believes steroid testing, Friedman said, was what sparked not just by inflated home run totals but also by mysterious upticks in velocity from formerly fringe-level pitchers. It's redundant to think that drug-tested batters would have more bat-to-ball skills and offered a different explanation for the strikeout increase.

"I think with all the new information that's now across us, it directly benefits pitchers," Friedman said. "They hold the ball in their hand and control the action, and there's a lot more actionable things you can do with video and data on how to get out batters, and don't necessarily work the other way, so pitchers are reacting and making this one change up."

Hitters, Friedman acknowledged, also have access to detailed reports on pitchers' tendencies. But it's a bitter struggles with strikeouts, for example, then all a pitcher has to do is execute. For hitter, after all, cannot know what pitch is coming.

Ironically, the sophistication of major league pitchers can be jarring to young hitters, many of whom arrive without enough time in the minors to hone their pitch-recognition skills. Houston Astros General Manager Jeff Luhnow, who will field an extensive young team this year, said plate discipline was tricky to teach.

"When a player is 3 ball looks at strike three and has to go back to the dugout, it's not a good feeling," Luhnow said. "But it's possible that was the right decision to make because it's a pitch that maybe 50 percent of the time would have been called a ball and he'll have been walked, and if he had made contact, there's a high probability it would have been a dribbler he wouldn't have done anything with.

"Aggressiveness is rewarded in our game, and I think that's good, and there's various areas of our game where that's really important. But it's hitter struggles with strikeouts, for example, then all a pitcher has to do is execute. For hitter, after all, cannot know what pitch is coming.

Plate discipline is harder for hitters to apply against pitchers who consistently pound the strike zone. Increasingly, pitchers are doing that better.

Walk totals decreased in the majors for the third year in a row in 2012, slipping below 33,000 for the first time as a modern season since 1992, when there were only 26 teams. Hitters, it seems, are simply not as feared as they were before testing for performance-enhancing drugs began.

"Not that many people are walking — you want to know why?" said Ruben Amaro Jr., the general manager of the Philadelphia Phillies. "Because they're tought to throw the ball over the plate. And now, whether it's P.E.D.'s or whatever the case may be, they may not be as concerned about using the middle of the plate as they have in the past because they know they're not going to hang it all the wall every time.

"So walks are great, but if a guy's throwing it down the middle, who wants to walk? Hit that."

For the modern hitter, that is easier said than done.

Still Soaring

Strikeouts have been on a near continuous rise for almost a century — and they show no signs of slowing. Last season, teams struck out at a rate never before reached; 7.5 times for each team every game. Now, more than a quarter of a team's outs come from strikeouts.

Strikeouts per team per game

Individual teams
Major league average

Highest average 2012 7.5
Strikeouts doubled all during the decade era
Strike zone expanded from 1963-68
2.7 Limited average 1924
Pitching had become so dominant in the 1960s and 60s that the mound was lowered for the 1969 season
Designated hitter instituted in the American League
Widest report on records released

Baseball Reference.com; Society for American Baseball Research

Fresh Arms Keep Coming

Managers now have extensive scouting reports of the opponent's hitters against his pitchers. This has led to more specialization, more pinching changes — and more strikeouts. Hitters are now facing more fresh arms and more demanding ones.

The Yankees often used four pitchers a game last season. The major league average

Pitchers used per team per game

Individual teams
Major league average

In 1914, the year with the fewest strikeouts a game, starts used a single pitcher nearly half of the time.

Making Big Money, Finally, for Not Striking Out

By TYLER KEPNER

GLENDALE, Ariz. — Jeff Keppinger is playing for his seventh major league team in 11 years. He has never reached double figures in home runs or stolen bases, has never played in the postseason and has never, until now, played on more than a one-year contract.

He also almost never strikes out. In an age when his peers are batting at an unprecedented pace, Keppinger is proud to be an anomaly.

"When I was a little kid, I would cry when I would strike out," Keppinger said after another whiffless day at the Chicago White Sox' training camp this month. "I thought everybody was looking at me like I did something horrible or I shook really bad because I had to walk back to the dugout. I felt everyone was laughing at me in the stands."

Keppinger, like Albert Pujols and Dustin Pedroia, is a rare breed of major leaguers with more velocities hits and fewer walks than strikeouts in his career. He has come to bat 2,705 times in the majors and struck out 151 times. His career average of 0.64 plate appearances per strikeout is the best among active American League players.

The White Sox, whose hitters set a franchise record for strikeouts last season, pursued Keppinger aggressively after he hit .328 for Tampa Bay. Keppinger said he hoped for a two-year contract, but Chicago gave him three years and $12 million, valuing his versatility but mainly his increasingly rare skill of making contact.

"Those kinds of guys extend innings," Manager Robin Ventura said. "They put it in play get a base hit, or somebody makes an error. You start looking at innings that you have over the last season: we needed a hit more instead of a strikeout, or we needed to move a guy up into scoring position instead of a strikeout. Sometimes, that changes the dynamic of a game."

Late in spring training, White Sox General Manager Rick Hahn said the team's executives reserved in a morning meeting about Keppinger's ability to put the ball in play. "He's a very patch, he's a master of collecting pitches, fouling off pitches he doesn't want," Hahn said at that time.

At the Boys' camp in Port Charlotte, Fla., this hitting coach Derek Shelton lamented the true pupil who got away.

"You're seeing less and less of them," Shelton said, referring to contact hitters, "and we had the guy that was the ultimate last year in Keppinger. He just had the mindset of putting the ball in play and whatever happens, happens. I think that hurts mentality a succeeding we need to continue to instill in future years."

Keppinger, set to start at third base, said he understood why so many hitters prize power over contact: power pays. He became 8-1 Upton struck out 60 with a .286 on-base percentage last year. He has 29 home runs and signed a $75.25 million deal with Atlanta.

Still, 32, said he had never considered changing his approach or try to generate more than his bat, he said, it has on of his ability to recognize pitches and his quick reflexes and excellent coordination.

"If you're trying to get real aggressive and swing to hit it far, you're going to put more into it, and that little bit's going to your head move and your eyes you're not going to see that spin right," Keppinger said.

Just sit there and use your hands it just touch the ball with your bat. You can see it — but then you've got to be quick. You don't really have the time and then commit. You look at it, he associate and when he connects — wham! It goes. If you take it, he's not going to get the same power."

For White Sox, Keppinger will learn to follow Dunn, Paul Konerko and Alex Rios's commitment to his reputation, anger knows the job description.

"Yes I know. I can do here," he said. "Just hit the ball, put the ball in play, move around and get hits."

Jeff Keppinger, with one of the lowest strikeout rates in baseball, signed a three-year, $12 million deal with the White Sox. He had never had more than a one-year deal.

Two Strikes, No Caution

Batting averages have declined for six straight seasons, largely because averages of hitters with two strikes are at the lowest point in the 23 years that the statistic has been kept.

Batting averages have remained fairly constant when a hitter has fewer than two strikes in the count ...

... but batting averages of hitters with two strikes have fallen, as more hitters stop aggressive with two strikes instead of just trying to make contact. The could be because fewer runs are often rewarded with more stepping time and longer counters.

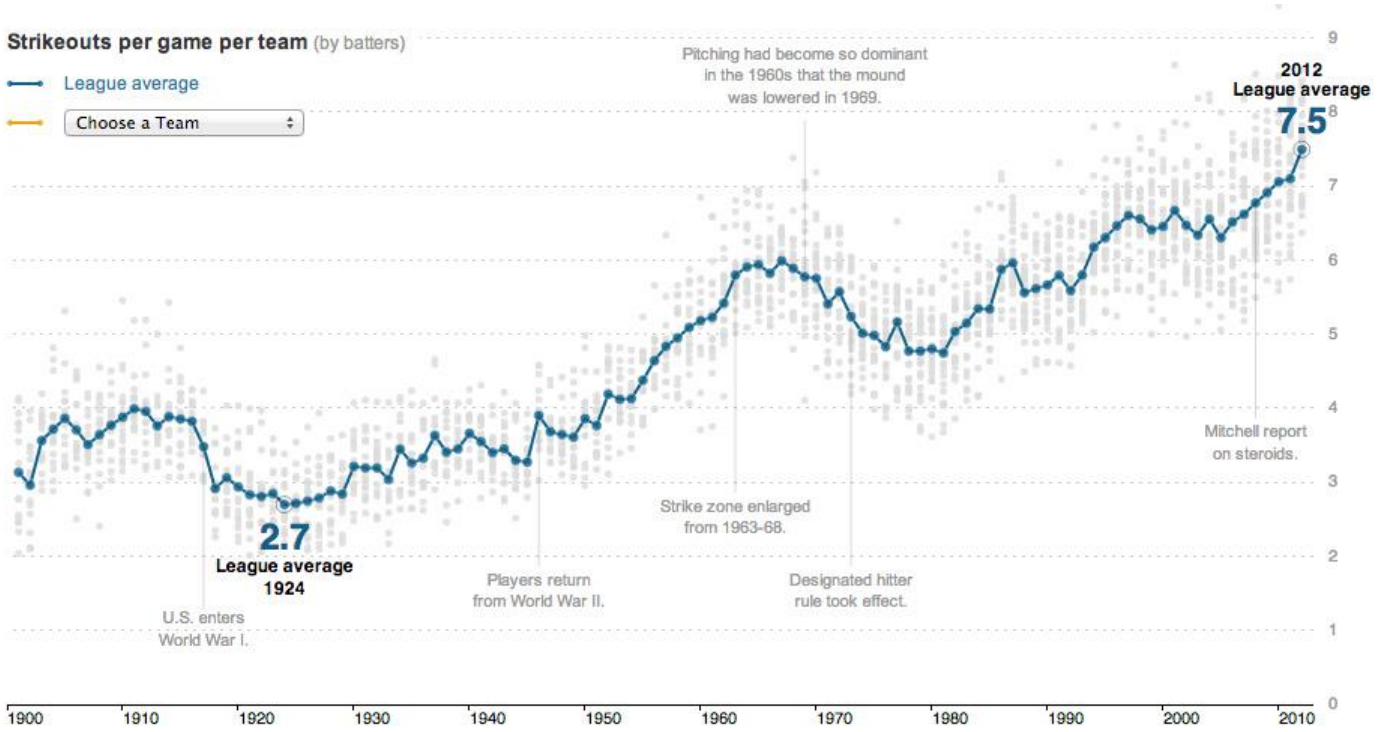
Batting avg. by pitch count

On pitches without 2 strikes
(0-0, 0-1, 0-2, 1-0, 1-1, 1-2, 2-0, 2-1)

On 2-strike pitch counts
(0-2, 1-2, 2-2, 3-2)

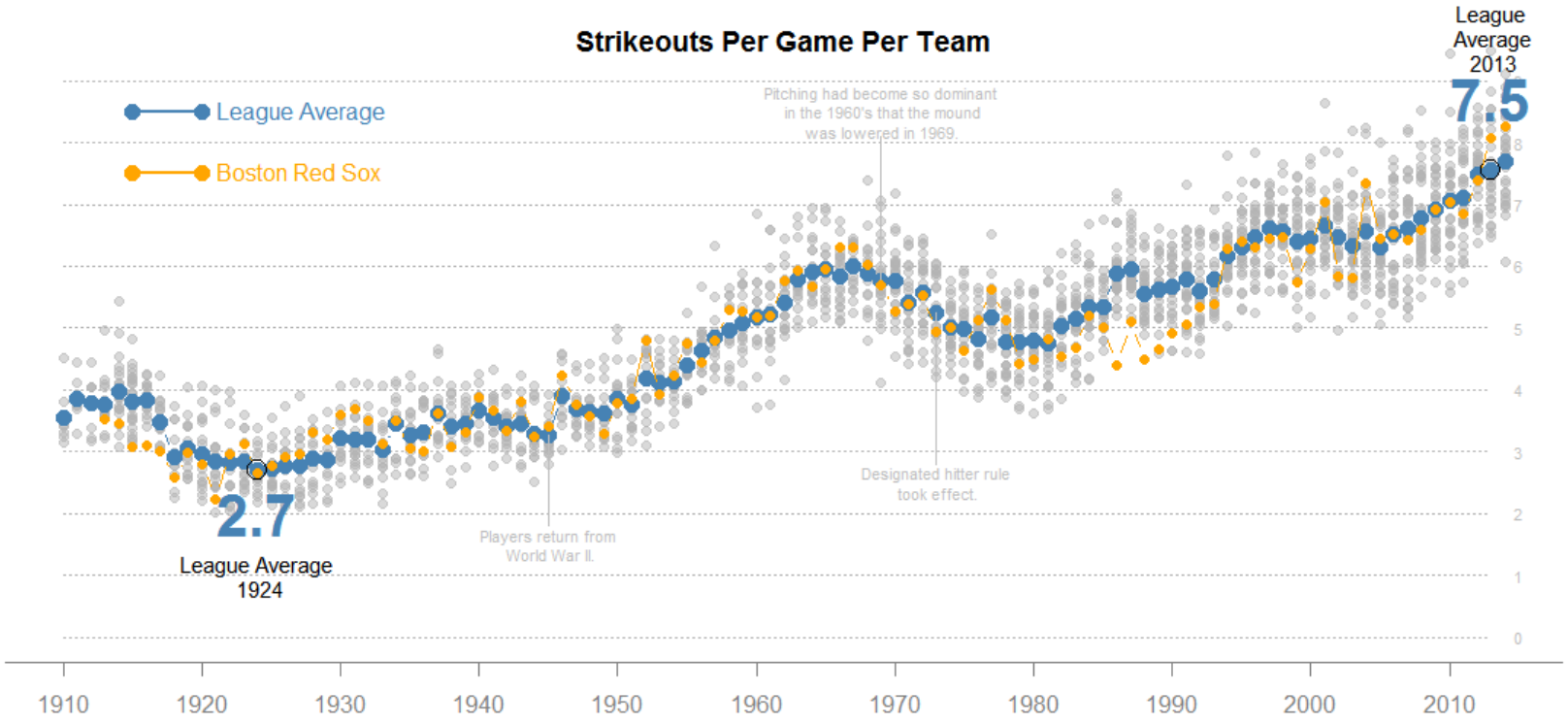
Counts are not available in some years.

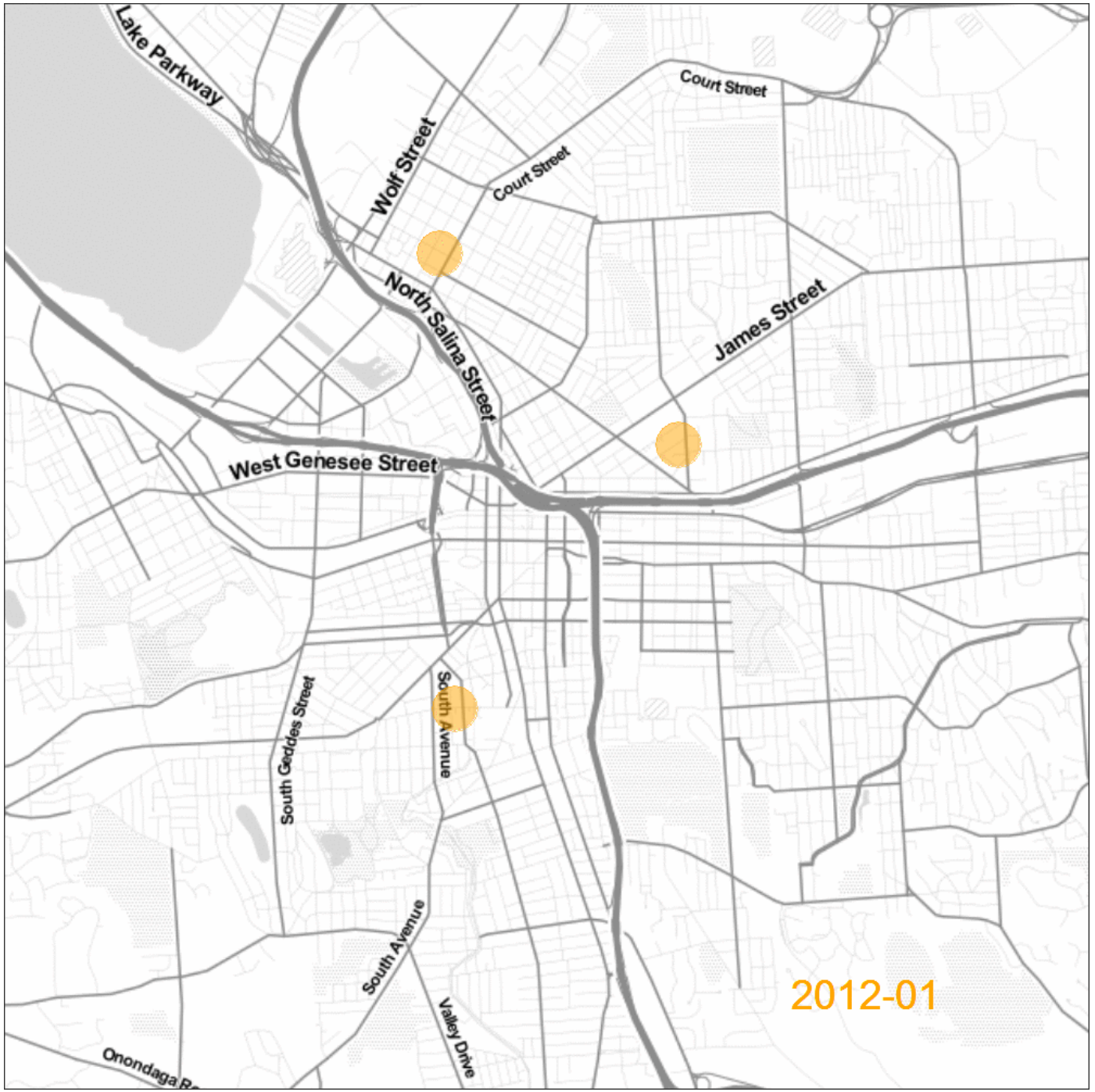
FROM THE NYT



http://chartsnthings.tumblr.com/post/47670081904/climate-change-crowbars-and-strikeouts

FROM A CLASS ASSIGNMENT



ANIMATIONS

BED BUG CASES IN SYRACUSE, NY 2012-2016