

# Embracing Constraints

@AnjanaVakil | Codemotion Berlin | 13 October 2017

# Hallo!

I'm

@AnjanaVakil



The Recurse Center



# Speaking of Twitter...



jack

@jack

Follow



This is a small change, but a big move for us. 140 was an arbitrary choice based on the 160 character SMS limit. Proud of how thoughtful the team has been in solving a real problem people have when trying to tweet. And at the same time maintaining our brevity, speed, and essence!

Twitter @Twitter

Can't fit your Tweet into 140 characters? 🤔

We're trying something new with a small group, and increasing the character limit to 280! Excited about the possibilities? Read our blog to find out how it all adds up....

2:00 PM - 26 Sep 2017

18,878 Retweets 28,815 Likes



7.7K



19K



29K



# Speaking of Twitter...



Caitlin Kelly

@caitlin\_\_kelly

Follow

139 characters



jack

@jack

Follow

~~This is a small change, but a big move for us.~~  
~~140 was an arbitrary choice based on the~~  
~~160 character SMS limit.~~ Proud of ~~how~~  
~~thoughtful the team has been in solving a real~~  
~~problem people have when trying to tweet.~~  
~~And at the same time maintaining our brevity,~~  
~~speed, and essence!~~

2:48 PM - 26 Sep 2017

65,033 Retweets 145,440 Likes



902



65K



145K



# Constraints:

How do they affect our work?  
Are they all created equal?  
Which help, which hinder?



# **Constraints for Concentration**

# ***All**y*

Tech for  
everyone



# A11y

Challenge  
for devs

“ Accessibility is  
hard :(

The A11y Project

[a11yproject.com/about.html](http://a11yproject.com/about.html)

# Ally

Challenge  
for devs

# Web Content Accessibility Guidelines (WCAG) 2.0

W3C Recommendation



## Web Content Accessibility Guidelines (WCAG) 2.0

W3C Recommendation 11 December 2008

**This version:**

<http://www.w3.org/TR/2008/REC-WCAG20-20081211/>

**Latest version:**

<http://www.w3.org/TR/WCAG20/>

**Previous version:**

<http://www.w3.org/TR/2008/PR-WCAG20-20081103/>

**Editors:**

Ben Caldwell, Trace R&D Center, University of Wisconsin-Madison  
Michael Cooper, W3C  
Loretta Guarino Reid, Google, Inc.  
Gregg Vanderheiden, Trace R&D Center, University of Wisconsin-Madison

**Previous Editors:**

Wendy Chisholm (until July 2006 while at W3C)  
John Slatin (until June 2006 while at Accessibility Institute, University of Texas at Austin)  
Jason White (until June 2005 while at University of Melbourne)

Please refer to the [errata](#) for this document, which may include normative corrections.

See also [translations](#).

This document is also available in non-normative formats, available from [Alternate Versions of Web Content Accessibility Guidelines 2.0](#).

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## Abstract

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# Ally

## Challenge for devs

# Web Content Accessibility Guidelines (WCAG) 2.0

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## Abstract

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100	Conformance Checklist

w3.org/TR/2008/REC-WCAG20-20081211

# A11y

Clarity for  
products

W3C Recommendation

## Web Content Accessibility Guidelines

Guideline 1.3 Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.

[Understanding Guideline 1.3](#)

**1.3.1 Info and Relationships:** Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text. (Level A)

[How to Meet 1.3.1](#)  
[Understanding 1.3.1](#)

**1.3.2 Meaningful Sequence:** When the sequence in which content is presented affects its meaning, a correct reading sequence can be programmatically determined. (Level A)

[How to Meet 1.3.2](#)  
[Understanding 1.3.2](#)

**1.3.3 Sensory Characteristics:** Instructions provided for understanding and operating content do not rely solely on sensory characteristics of components such as shape, size, visual location, orientation, or sound. (Level A)

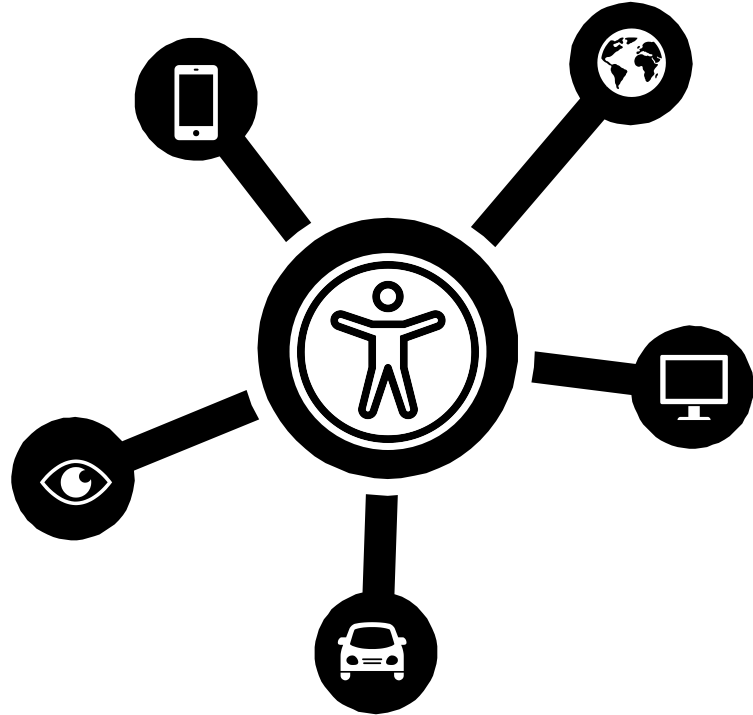
[How to Meet 1.3.3](#)  
[Understanding 1.3.3](#)

*Note:* For requirements related to color, refer to [Guideline 1.4](#).

# *All*y

Clarity for  
products

## Content vs. Presentation



# Elm

[elm-lang.org](http://elm-lang.org)



# Elm

The joy of  
constraints

“

Elm **restricts the way you program**,  
resulting in maintainable code no matter  
what.

There are **no runtime exceptions** so  
debugging is way less of an issue.

Ossi Hanhinen, Futurice

“How Elm made our work better”

[futurice.com/blog/elm-in-the-real-world](https://futurice.com/blog/elm-in-the-real-world)

# Elm

Types vs.  
Typos

```
1 type alias Person =  
2   {  
3     firstName : String,  
4     lastName : String,  
5     phoenNumber : String,  
6     email : String  
7   }  
8  
9 getFullName : Person -> String  
10 getFullName person =  
11   person.firstName ++ " " ++ person.lastName  
12
```

# Elm

Types vs.  
Typos

```
1 type alias Person =
2   {
3     firstName : String,
4     lastName : String,
5     phoenNumber : String,
6     email : String
7   }
8
9 getFullName : Person -> String
10 getFullName person =
11   person.firstName ++ " " ++ person.lastName
12
13
14
15 max = getFullName
16   {
17     firstName = "Max",
18     lastName = "Mustermann",
19     phoneNumber = "030-1234567",
20     email = "max@codemo.com"
21   }
```

# Elm

## Types vs. Typos

-- TYPE MISMATCH -----

The argument to function `getFullName` is causing a mismatch.

```
16 |         getFullName
17 | >     {
18 | >         firstName = "Max",
19 | >         lastName = "Mustermann",
20 | >         phoneNumber = "030-1234567",
21 | >         email = "max@codemo.com"
22 | >     }
```

Function `getFullName` is expecting the argument to be:

Person

But it is:

```
{ email : String
, firstName : String
, lastName : String
, phoneNumber : String
}
```

Hint: The record fields do not match up. Maybe you made one of these typos?

phoenNumber <-> phoneNumber

# Elm

The joy of  
constraints

“

Constraints:

- Limit design space
- Limit choices
- Give guarantees

Ilias van Peer

“Elm - The Freedom of Constraints”  
PartialConf 2017

[speakerdeck.com/zwilias/elm-the-freedom-of-constraints](https://speakerdeck.com/zwilias/elm-the-freedom-of-constraints)

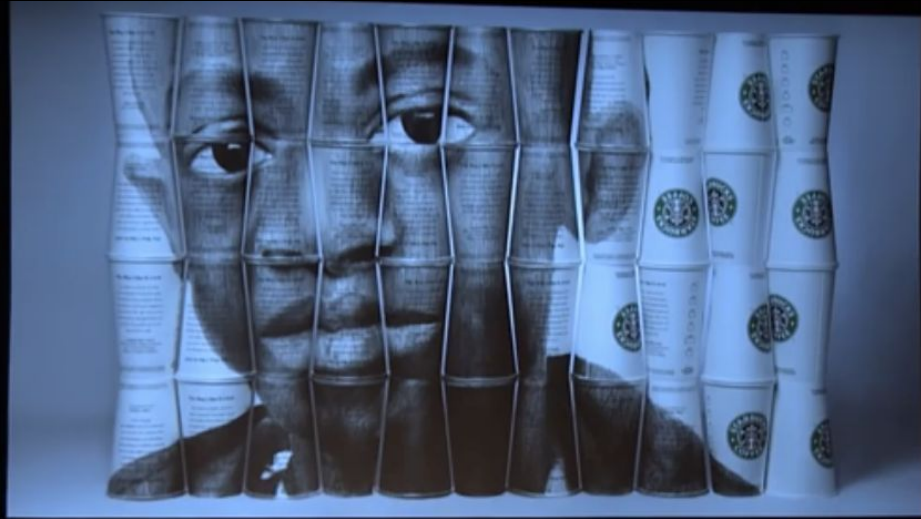
**“ [There are] barriers that  
lead to breakthroughs.**

Patricia D. Stokes  
*Creativity from Constraints*

2006: Springer publishing, New York, p. 7



# Constraints for Creativity



**TED<sup>x</sup>KC**



**“The power of constraints”**

**Phil Hansen**

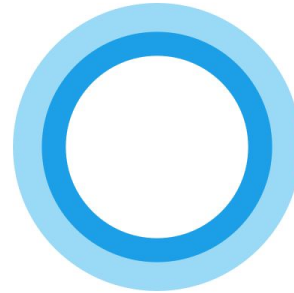
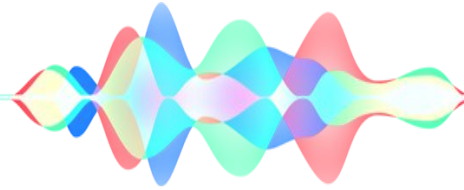
[youtu.be/BgoAFS3xu74](https://youtu.be/BgoAFS3xu74)

**“ Free to do anything, most of us do what's worked best, what has succeeded most often in the past.**

Patricia D. Stokes  
*Creativity from Constraints*

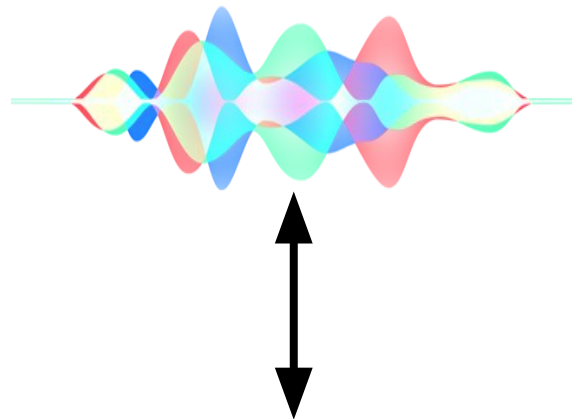
2006: Springer publishing, New York. p. xii

# Speech to Text



# Speech to Text

Acoustic model



/h e ɪ 's ɪ r i/

# Speech to Text



Trained on  
**15,000 hours**  
selected from  
**30 years(!!)**  
of speech

Olga Kapralova et al., "A big data approach to acoustic model training corpus selection", INTERSPEECH 2014  
193.6.4.39/~czap/letoltes/IS14/IS2014/PDF/AUTHOR/IS140948.PDF

# Speech to Text

## Languages Supported

Microsoft

[msdn.microsoft.com/en-us/library/hh378476](https://msdn.microsoft.com/en-us/library/hh378476)

< 30

Apple

[apple.com/ios/feature-availability/#siri](https://apple.com/ios/feature-availability/#siri)

< 40

Google

[cloud.google.com/speech/docs/languages](https://cloud.google.com/speech/docs/languages)

< 70

Humans

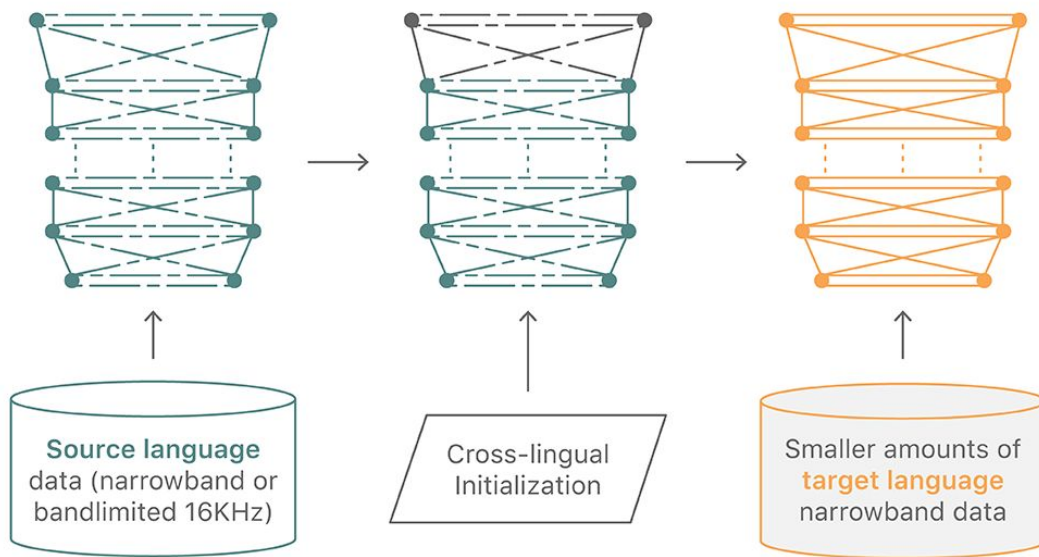
[ethnologue.com/guides/how-many-languages](https://ethnologue.com/guides/how-many-languages)

> 7000

# Speech to Text

constrained

## Innovations in machine learning

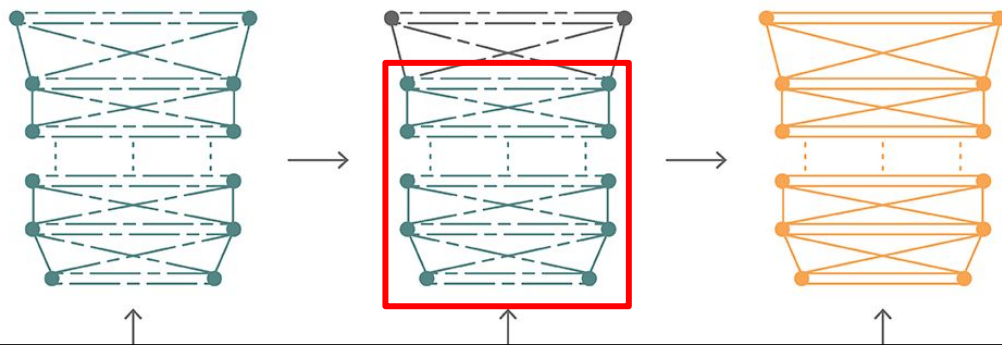


Siri Team, "Improving Neural Network Acoustic Models by Cross-bandwidth and Cross-lingual Initialization",  
Apple Machine Learning Journal, Vol 1, Issue 2, August 2017. [machinelearning.apple.com/2017/08/01/cross-initialization.html](https://machinelearning.apple.com/2017/08/01/cross-initialization.html)

# Speech to Text

constrained

## Innovations in machine learning



“ the **hidden layers** learn feature transformations that are less language-specific and instead **generalize between languages** ”

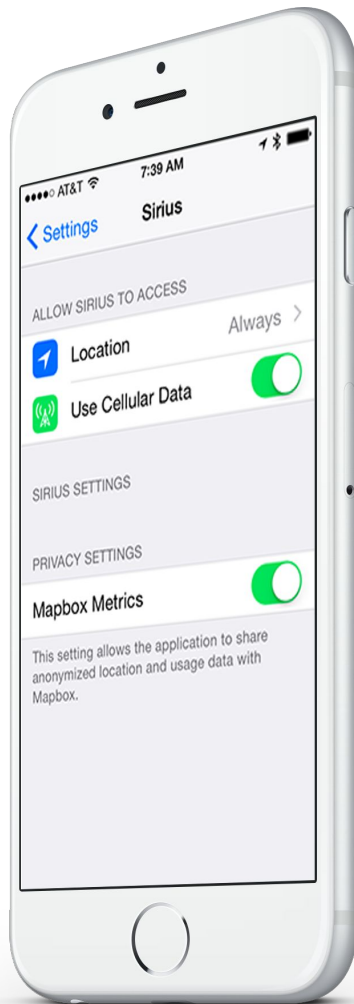
Siri Team, "Improving Neural Network Acoustic Models by Cross-bandwidth and Cross-lingual Initialization",  
Apple Machine Learning Journal, Vol. 1, Issue 2, August 2017. [machinelearning.apple.com/2017/08/01/cross-initialization.html](https://machinelearning.apple.com/2017/08/01/cross-initialization.html)

# Map Data



# Map Data

constrained



mapbox.com/  
telemetry

# Map Data

constrained

Innovations in data collection



# Map Data

constrained

Innovations in data collection



# Map Data

constrained

## Innovations in location services

- ✓ **New streets** Location data is used to identify new streets, hiking trails, and bike paths.
- ✓ **Turn restrictions** Sensor data helps us better understand turn restrictions and identify one-way streets.
- ✓ **Speed profiles and traffic** Understanding posted and time-sliced real-world speeds improves traffic modeling and routing.
- ✓ **Lane detection** High-definition mapping requires intra-road analysis of lane counts and types.

**“ Creativity thrives best  
when constrained.”**

Marissa Mayer

[bloomberg.com/news/articles/2006-02-12/creativity-loves-constraints](https://www.bloomberg.com/news/articles/2006-02-12/creativity-loves-constraints)

**“ But constraints must be  
balanced with a healthy  
disregard for the  
impossible.**

Marissa Mayer

[bloomberg.com/news/articles/2006-02-12/creativity-loves-constraints](https://www.bloomberg.com/news/articles/2006-02-12/creativity-loves-constraints)

**“ [Some constraints]  
preclude the surprising &  
promote the expected**

Patricia D. Stokes  
*Creativity from Constraints*

2006: Springer publishing, New York. p. xii



# **~~Constraints~~ for ~~Conformity~~**

# **“Java” Script**

**“** the language must  
“look like Java”

Netscape to  
Brendan Eich  
1995

[brendaneich.com/2008/04/popularity](http://brendaneich.com/2008/04/popularity)

# “Java” Script

“ The Java influences, especially y2k `Date` bugs but also the primitive vs. object distinction (e.g., `string` vs. `String`), were **unfortunate**.

Brendan Eich  
2008

[brendaneich.com/2008/04/popularity](http://brendaneich.com/2008/04/popularity)

# Pipe Lines

“ True diversity means better teams, better financial returns, better companies and a better, more innovative world.

Project Include

[projectinclude.org](https://projectinclude.org)

# Pipe Lines



stackoverflow

NEW

Questions

Developer Jobs

Tags

Users

## Python Developer (f/m) for Data Analytics

- Berlin, Germany

### Requirements

- You have successfully completed a degree in Computer Science, Software Engineering, or a similar qualification
- You have minimum 3 years of work experience in software development
- You have good knowledge in working in and with agile teams with SCRUM and you can handle challenging deadlines

# Pipe Lines



stackoverflow

NEW

Questions

Developer Jobs

Tags

Users

## Python Developer (f/m) for Data Analytics

- Berlin, Germany

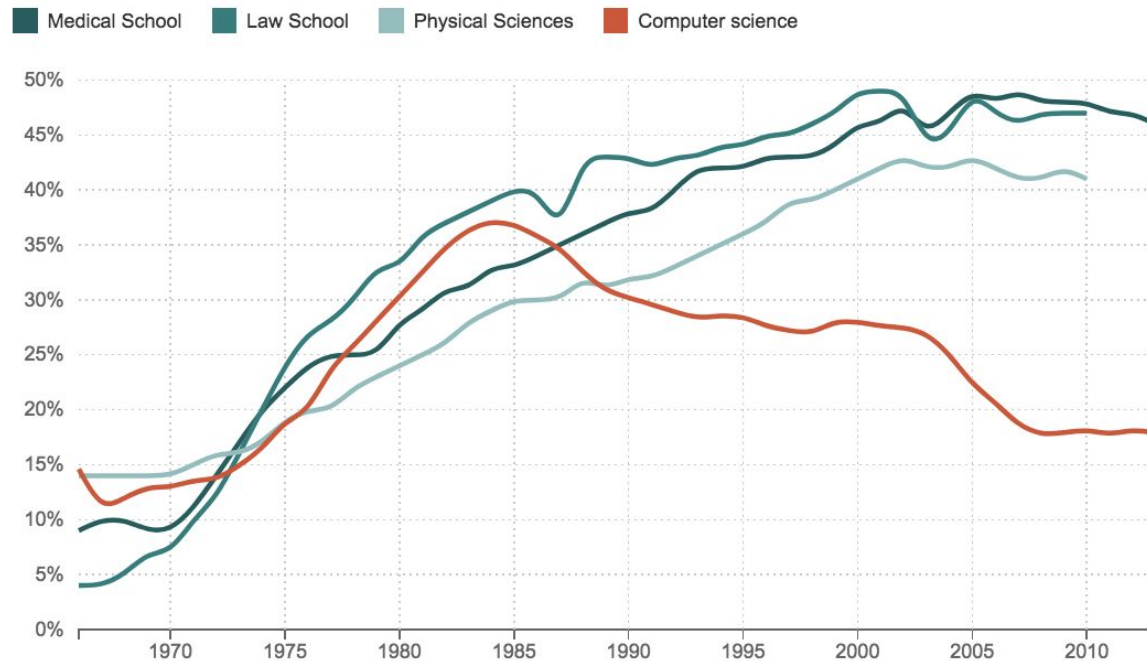
### Requirements

- You have successfully completed a degree in Computer Science, Software Engineering, or a similar qualification
- You have minimum 3 years of work experience in software development
- You have good knowledge in working in and with agile teams with SCRUM and you can handle challenging deadlines

# Pipe Lines

## What Happened To Women In Computer Science?

% Of Women Majors, By Field



Source: National Science Foundation, American Bar Association, American Association of Medical Colleges

Credit: Quoc Trung Bui/NPR

NPR Morning Edition, "When women stopped coding", 21 October 2014  
[npr.org/sections/money/2014/10/21/357629765/when-women-stopped-coding](http://npr.org/sections/money/2014/10/21/357629765/when-women-stopped-coding)

# Pipe Lines



**Sarah Mei**  @sarahmei · Sep 30

There exist jobs that use CS fundamentals more directly. Just look at my mentions, dudes love to tell me about them.



3



15



120



**Sarah Mei** 

@sarahmei

Following

But for most jobs, the CS fundamentals interview serves more as a tribal marker than as a test of anything you'll actually do.

5:52 AM - 30 Sep 2017

175 Retweets 559 Likes



17



175



559



# Pipe Lines

“ The worst kind of group for an organization that wants to be innovative and creative is one in which everyone is alike and gets along too well.

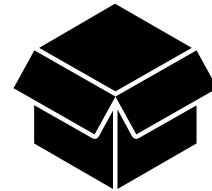
Professor Margaret A. Neale  
Stanford Graduate School of Business

[gsb.stanford.edu/insights/diverse-backgrounds-personalities-can-strengthen-groups](https://gsb.stanford.edu/insights/diverse-backgrounds-personalities-can-strengthen-groups)



**Consider your  
constraints**

# **Question constraints**



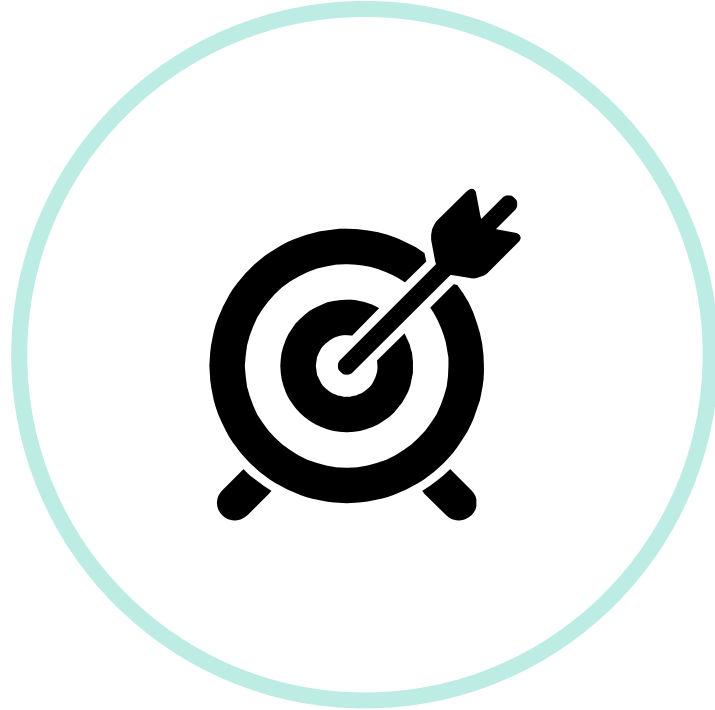
**Reject  
constraints**

for conformity



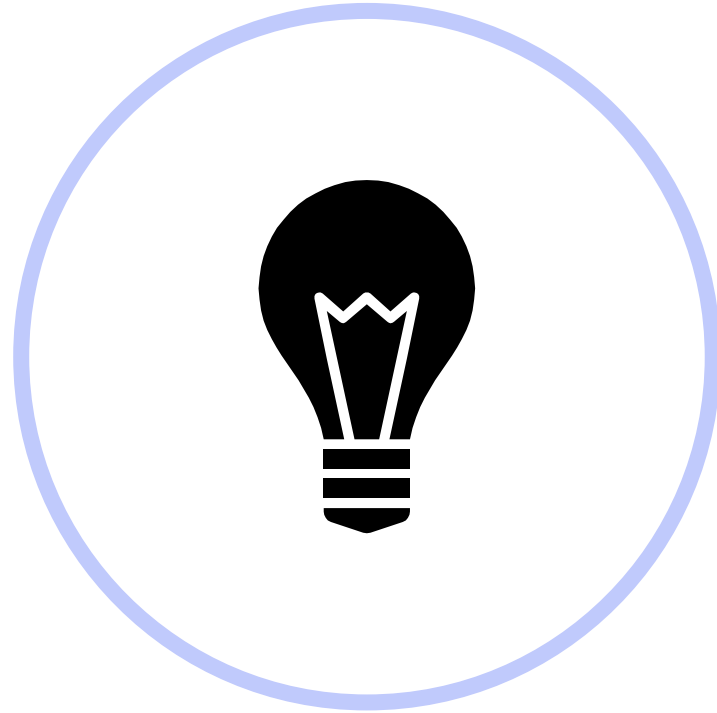
**Embrace  
constraints**

for concentration



**Embrace  
constraints**

for creativity





**Let constraints  
work for you**



**Vielen  
Dank!**

Thanks to:

Mozilla TechSpeakers

Havi Hoffman & Denise Graveline

Mapbox

Young Hahn & Lauren Budorick

Codemotion Berlin organizers

SlidesCarnival.com

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anjana.vakil@mapbox.com