

Leveraging LLMs as *Analogical Reasoning* Engines

to enhance

Programming-by-Example Experiences



LOW-CODE USERS

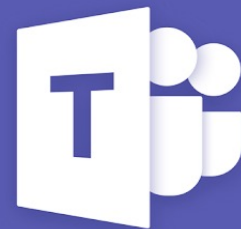


DATA SCIENTISTS

DEVELOPERS



STUDENTS





AutoSave | FlashFill: demo | General | Search | Samit Gulwani | Comments | Share

File Home Insert Draw Page Layout Formulas Data Review View Automate Help Table Design

B2 | aggarwal, VARUN

	A	B
1	Name	Reformatted Name
2	Varun Aggarwal	aggarwal, VARUN
3	Vijay Raghavan	
4	Jayant Krishna	
5	Shailendra Jha	
6	Sarah Iqbal	
7	Shruti Sunderasan	
8	Utsav Thapliyal	
9	Dibyush Jena	
10	Khushi Goel	
11	Moumita Mazumdar	
12	Srushti Chipde	





99% of computer users don't know programming and struggle with repetitive tasks!

	A	B
1	Name	Reformatted Name
2	Varun Aggarwal	aggarwal, VARUN
3	Vijay Raghavan	
4	Jayant Krishna	
5	Shailendra Jha	
6	Sarah Iqbal	
7	Shruti Sunderasan	
8	Utsav Thapliyal	
9	Dibyush Jena	
10	Khushi Goel	
11	Moumita Mazumdar	
12	Srushti Chipde	

MREXCEL.COM
Your One Stop for Excel Tips & Solutions

Forum Search New Posts Zero Reply Posts Subscribed Threads

Excel Forum Download Excel forum android application

MS Office Application Help

Forum What's New? Members List Calendar Forum Rules Winner Board

ExcelExperts.com
Excel Consultancy, VBA Consultancy, Training and Tips Call:+4420812...

Flash Fill: a programming-by-example feature



CNN: “Excel 2013’s coolest new feature that should have been available years ago”

	A	B
1	Name	Reformatted Name
2	Varun Aggarwal	aggarwal, VARUN
3	Vijay Raghavan	raghavan, VIJAY
4	Jayant Krishna	krishna, JAYANT
5	Shailendra Jha	jha, SHAIENDRA
6	Sarah Iqbal	iqbal, SARAH
7	Shruti Sunderasan	sunderasan, SHRUTI
8	Utsav Thapliyal	thapliyal, UTSAV
9	Dibyush Jena	jena, DIBYUSH
10	Khushi Goel	goel, KHUSHI
11	Moumita Mazumdar	mazumdar, MOUMITA
12	Srushti Chipde	chipde, SRUSHTI

Scientific breakthrough:
Efficient synthesis of programs
from 1+ examples.

Programming-by-example is a form of Analogical Reasoning

	A	B	C
1	Name	Student ID	beast-academy Passw
2	Firstname Lastname		
3	Sumay Gulwani	123456	F-1234#lastname
4	Andrew Cencini	567238	S-5672#gulwani
5	Jan Kotas	756497	A-7564#cencini
6	Mariya Sergienko	672934	J-6729#kotas
7	Steven Thorpe	498523	M-4985#sergienko
8	Michael Neipper	123098	S-1230#thorpe
9	Robert Zare	892457	M-8924#neipper
10	Laura Giussani	247467	R-6546#zare
11	Nancy Freehafer	654634	L-2474#giussani
12	Alexander David	768678	N-7686#freehafer
13	Kim Shane	324356	A-3243#david
14	Manish Chopra	787687	K-7876#shane
15	Gerwald Oberleitner	223256	M-2232#chopra
16	Amr Zaki	899543	G-8995#oberleitner
17	Yvonne McKay	789654	A-7896#zaki
18	Amanda Pinto	546587	Y-5465#mckay

If your name is

and ID is

then your password is:

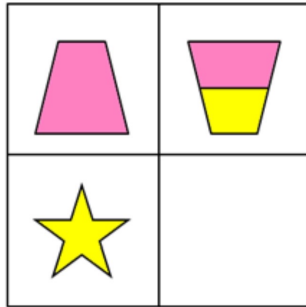
“Madhur Malik”, “123456” → “M-1234#malik”

“Sumay Gulwani”, “567238” →

Analogies for Assessments

green → grass: blue → _____.

- A. cloud B. sky C. sun D. wind E. rain



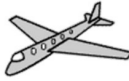
A



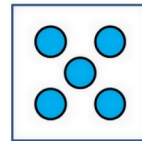
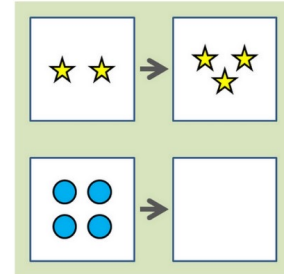
B



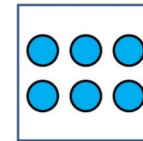
C



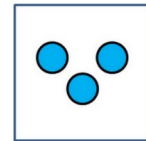
D



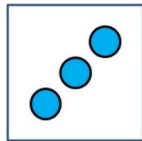
A



B



C



D

USER

Analogical reasoning is at the heart of

ASSISTANT



human cognition and problem-solving. It allows individuals to make sense of new information, transfer knowledge from one context to another, and find solutions to a wide range of challenges. This cognitive process is essential in various aspects of life, such as learning, communication, creativity, and decision-making.

Analogies for Math Theorems

An even number is made of kids who are all paired up. An odd number is made of kids who are all paired up except one lonely kid.

Theorem: $\text{Odd} + \text{Odd} = \text{Even}$

Proof: The two lonely kids can now pair up.

What is $\text{Odd} + \text{Even}$?

(sad voice) **Odd**

Proof: There is no one to pair the lonely kid with.

What is $\text{Even} + \text{Even}$?

(happy voice) **Even**

Proof: There is no lonely kid to begin with.

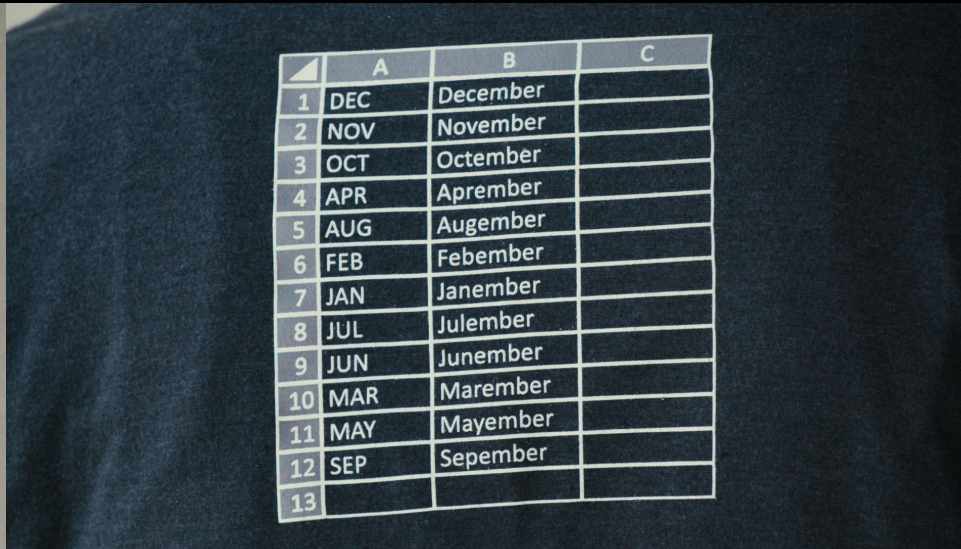
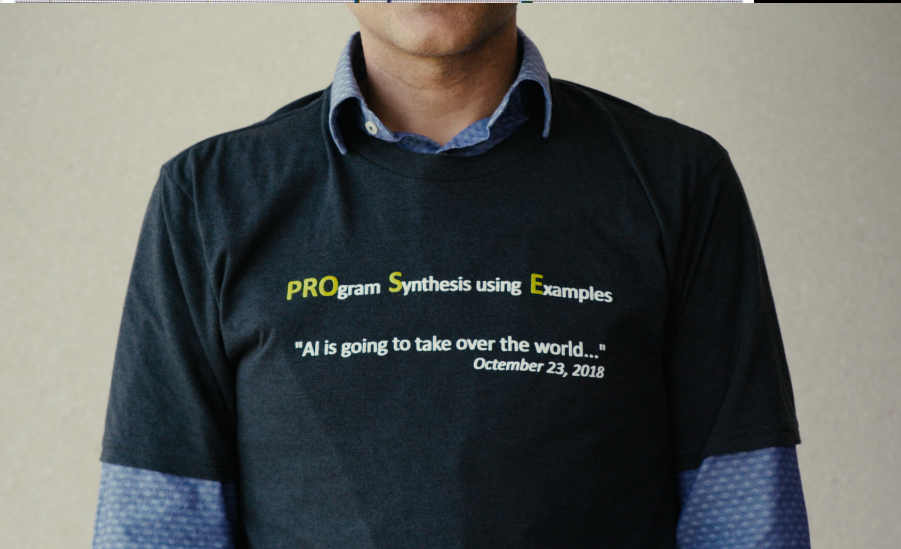




AI is going to take over the world... and this is what Excel auto-populated today.

K	L	M	N
	DEC	December	
	NOV	November	
	OCT	October	
	APR	Aprember	

The Flash Fill Fail



Semantic Transformations

City	Airport code
Brussels	BRU
Boston	BOS
Tokyo	HND

Numeral	Dutch word
1	een
2	twee
3	drie

Device	Color
iPhone 11 512GB - Red AT&T	Red
iPhone 11 512GB - Space Gray AT&T	Space Gray
iPhone 11 128GB - Midnight Green Verizon	Midnight Green
iPhone 11 64GB - Silver T-Mobile	Silver

Sentence	Language learning Exercise
I am James.	I ____ James.
We are in our classroom.	We ____ in our classroom.
My parents are in Madrid.	My parents ____ in Madrid.
The ceiling is high.	The ceiling ____ high.

Requires knowledge bases, entity recognition, or natural language understanding

Flash Fill DSL

top-level expr $T := C \mid \textit{ifThenElse}(B, C, T)$

string expr $C := A \mid \textit{Concatenate}(A, C)$

atomic expr $A := \textit{SubString}(x, P, P) \mid \textit{Const}(w)$

position expr $P := K \mid \textit{RegPos}(x, R, K)$

Flash Fill DSL (extended)

top-level expr $T := C \mid \text{if } T \mid \dots$

string expr $C := A \mid \text{Concatenate}(x, y)$

atomic expr $A := \text{SubString}(x, p, l)$

$\mid \text{SemMap}(x, y)$

position expr $P := K \mid \text{RegPos}(x, y)$

$\mid \text{SemPos}(x, y)$



PlanLang +
TypeChat

Key Idea: Combine Flash Fill + LLM-based skills

[OOPSLA '21: Verbruggen et al, "Semantic programming by example with p...

LLMs on syntactic transformations

GPT-3: Often can't do simple tasks or requires too many examples.

Month	First 3 chars	First 4 chars
January	Jan	Janu
February	Feb	Febr
March	Mar	Marc
April	Apr	Apri
September	Sep	Sep

GPT-4: Very powerful analogical reasoning capabilities!



Month	First 4 chars
January	Janu
February	Febr
March	Marc
April	Apri
September	Sept

Analogical Reasoning

EXAMPLE 3 (Directory Name Extraction). Consider the following example taken from an excel online help forum.

<i>Input v_1</i>	<i>Output</i>
<i>Company\Code\index.html</i>	<i>Company\Code\</i>
<i>Company\Docs\Spec\specs.doc</i>	<i>Company\Docs\Spec\</i>

USER

Input: "Company\Code\index.html"

Output: "Company\Code\"

Input: "Company\Docs\Spec\specs.doc"

Output:

ASSISTANT

"Company\Docs\Spec\"



Analogical Reasoning

<i>Input v_1</i>	<i>Output</i>
<i>BTR KRNL WK CORN 15Z</i>	<i>15Z</i>
<i>CAMP DRY DBL NDL 3.6 OZ</i>	<i>3.6 OZ</i>
<i>CHORE BOY HD SC SPNG 1 PK</i>	<i>1 PK</i>
<i>FRENCH WORCESTERSHIRE 5 Z</i>	<i>5 Z</i>
<i>O F TOMATO PASTE 6 OZ</i>	<i>6 OZ</i>



USER

Input: "BTR KRNL WK CORN 15Z"

Output: "15Z"

Inputs: "CAMP DRY DBL NDL 3.6 OZ", "CHORE BOY HD SC SPNG 1 PK", "FRENCH WORCESTERSHIRE 5 Z", "O F TOMATO PASTE 6 OZ"

Outputs:

ASSISTANT

"3.6 OZ", "1 PK", "5 Z", "6 OZ"

Analogical Reasoning

<i>Input v_1</i>	<i>Output</i>
<i>International Business Machines</i>	<i>IBM</i>
<i>Principles Of Programming Languages</i>	<i>POPL</i>
<i>International Conference on Software Engineering</i>	<i>ICSE</i>



USER

Input: "International Business Machines"

Output: "IBM"

Inputs: "Principles Of Programming Languages",
"International Conference on Software Engineering",
"Industrial Credit and Investment Corporation of India"

Outputs:

ASSISTANT

"POPL", "ICSE", "ICICI"

Python Program Generation

SYSTEM

You are an expert Python user. I will give you a string transformation task. The task involves converting input strings to output strings. You have to find the Python program that will generate the output string given the input string.

USER

Input: "International Business Machines"

Output: "IBM"

Input: "Principles Of Programming Languages"

Output: "POPL"

Input: "International Conference on Software Engineering"

Output: "ICSE"

Input: "Industrial Credit and Investment Corporation of India"

Output: "ICICI"

ASSISTANT



You can use the following Python program to generate the output string given the input string:

```
```python
def acronym_generator(input_string):
 words = input_string.split()
 acronym = ""
 for word in words:
 acronym += word[0].upper()
 return acronym
```



# Test-driven Development

Iteratively write down a test and edit code to satisfy it.



Fiction imitates reality!

https://testing.googleblog.com/2014/04/the-real-test-driven-development.html

## Google Testing Blog

### The \*Real\* Test Driven Development

Tuesday, April 01, 2014

**Update: APRIL FOOLS!**

## Test-Driven Synthesis

Daniel Perelman\*  
University of Washington  
perelman@cs.washington.edu

Sumit Gulwani  
Microsoft Research  
sumitg@microsoft.com

Dan Grossman  
University of Washington  
djg@cs.washington.edu

Peter Provost  
Microsoft Corporation  
peterpr@microsoft.com

### Abstract

Programming-by-example technologies empower end-users to create simple programs merely by providing input/output examples. Existing systems are designed around solvers specialized for a specific set of data types or domain-specific language (DSL). We present a program synthesizer which can be parameterized by an arbitrary DSL that may contain conditionals and loops and therefore is able to synthesize programs in any domain. In order to use our synthesizer, the user provides a sequence of increasingly sophisticated input/output examples along with an expert-written DSL definition. These two inputs correspond to the two key ideas that

ing table layouts or reformatting strings merely by providing input/output examples. Present PBE technologies are designed for a specific set of data types usually either by using an SMT solver or similar technology [30, 33] and being limited to efficiently handling only those data types whose operations map well to the SMT solver's theories or by creating a domain-specific language (DSL) for the task in concert with a program synthesis algorithm capable of producing programs in that DSL [8, 11, 18]. LaSy<sup>1</sup> instead is able to synthesize programs in arbitrary domains specified by an expert-written DSL. In order to efficiently support arbitrary domains, we developed a synthesizer that combines two key ideas.

# Python Program Generation

(using failure-guided iteration)

USER

Input: "International Business Machines"

Output: "IBM"

Input: "Principles Of Programming Languages"

Output: "POPL"

Input: "International Conference on Software Engineering"

Output: "ICSE"

Input: "Industrial Credit and Investment Corporation of India"

Output: "ICICI"

ASSISTANT

You can use the following Python program to generate the output string given the input string:



```
```python
def acronym_generator(input_string):
    words = input_string.split()
    acronym = ""
    for word in words:
        acronym += word[0].upper()
    return acronym
```



Python Program Generation

(using failure-guided iteration)

USER

But this generates the output "ICOSE" on the input "International Conference on Software Engineering".

ASSISTANT



Apologies for the oversight. I see that the program is not handling the prepositions correctly. Here's an updated version of the program that should work correctly:

```
```python
def acronym_generator(input_string):
 words = input_string.split()
 acronym = ""
 for word in words:
 if word.lower() not in ["on", "and", "of"]: ✖
 acronym += word[0].upper()
 return acronym
```
```


Python Program Generation

(using failure-guided iteration)

USER

But this generates the output "PPL" on the input "Principles Of Programming Languages".

ASSISTANT



Apologies for the confusion. I misunderstood the requirement. Here's the corrected version of the program that should work correctly for all the given examples:

```
```python
def acronym_generator(input_string):
 words = input_string.split()
 acronym = ""
 for word in words:
 if word[0].isupper():
 acronym += word[0]
 return acronym
```

# Python Program Generation

## SYSTEM

You are an expert Python user. I will give you a string transformation task. The task involves converting input strings to output strings. You will have to find the Python program that will generate the output string given the input string.

## USER

Input: "Finish slides 3 and 4 Sumit Gulwani"  
Output: "Sumit"

Input: "Find the video Ben Zorn"  
Output: "Ben"

## ASSISTANT



You can use the following Python program to generate the output string given the input string:

```
```python
def find_name(input_string):
    words = input_string.split()
    for word in words:
        if word[0].isupper():
            return word
```

Analogy Solving

SYSTEM

I will provide you an analogy problem related to string transformations. I will give you few input-output examples of the analogy. I will then provide a list of comma-separated inputs. You should then generate a list of comma-separated outputs.

USER

Input: "Finish slides 3 and 4 Sumit Gulwani"

Output: "Sumit"

Input: "Find the video Ben Zorn"

Output: "Ben"

Inputs:

"Do the conclusion Ashish Tiwari",

"Think of a good title Nikhil Swamy",

"Insert some visuals Nikolaj Bjorner"

Outputs:

ASSISTANT

"Ashish", "Nikhil", "Nikolaj"

Analogy Explanation

USER

Can you explain the analogy?

ASSISTANT



Certainly! The analogy here is that each input string contains a task followed by a person's name. The output is the first name of the person associated with the task. In each example, the first name appears right before the last name, which is the last word in the input string. So, the transformation involves extracting the first name from the input string.

Python Program Generation

USER

Can you find a Python program that converts an above input into the respective output.

ASSISTANT



Sure! Here's a simple Python program that takes an input string and returns the respective output (the first name of the person mentioned at the end of the sentence):

```
```python
def extract_first_name(input_string):
 words = input_string.split()
 first_name = words[-2]
 return first_name
```

# Can't generate program, but can solve the analogy.

<i>Input <math>v_1</math></i>	<i>Output</i>
<i>Dr. Eran Yahav</i>	<i>Yahav, E.</i>
<i>Prof. Kathleen S. Fisher</i>	<i>Fisher, K.</i>
<i>Bill Gates, Sr.</i>	<i>Gates, B.</i>
<i>George Ciprian Necula</i>	<i>Necula, G.</i>
<i>Ken McMillan, II</i>	<i>McMillan, K.</i>



USER

Input: "Dr. Eran Yahav"

Output: "Yahav, E."

Input: "Prof. Kathleen S. Fisher"

Output: "Fisher, K."

Inputs: "Bill Gates, Sr.", "George Ciprian Necula", "Ken McMillan, II"

Outputs:

ASSISTANT

"Gates, B.", "Necula, G.", "McMillan, K."

# Summary: GPT-4 on Flash Fill Tasks

GPT4 is super-impressive at analogical reasoning, but generating programs from few examples is not its best seasoning.

Python programs it can generate for many cases, but with non-trivial workflows in some places.

For Excel formulas or lower-resource languages, its performance is much worse and can cause damages.

GPT4 is super-impressive at analogical reasoning, It can infer extra examples & explanations, which is very appealing.

This can boost the programming power of Flash Fill, while also enabling semantic transformations at will.

But is it always better at analogies than Flash Fill?

Actually no, sometimes it can make a big spill.

Second  
last word

# Analogical Reasoning Failure

USER

Input: "sumit gulwani"

Output: "sumit"

Input: "doctor ashish tiwari"

Output: "ashish"

Input: "alpha beta gamma delta"

Output: "gamma"

Input: "first second third fourth fifth"

Output: "fourth"

Inputs: "good morning", "life is good", "hope for the best"

Outputs:





First 5  
characters

# Analogical Reasoning Failure

USER

Input: "january"

Output: "janua"

Input: "february"

Output: "febru"

Input: "november"

Output: "novem"

Input: "october"

Output: "octob"

Inputs: "september", "december", "august"

Outputs:



# GPT-3

Month	First 3 chars	First 4 chars
January	Jan	Janu
February	Feb	Febr
March	Mar	Marc
April	Apr	Apri
September	Sep	Sep

# GPT-4

Month	First 4 chars	First 5 chars
January	Janu	Janua
February	Febr	Febru
March	Marc	March
April	Apri	April
September	Sept	Septem

This shall hopefully be solved by GPT5.

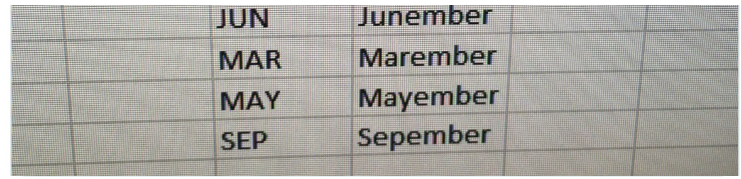


Darin  
@crushspread

USER

An even number is made up of kids who are all paired up.  
An odd number is made up of kids who are all paired up except one lonely kid.

Input: What is odd + odd?  
Output: Happy voice Even. Because the lonely kids in the two odd numbers can now pair with each other.



5:00 AM · Oct 23, 2018 · Twitter for iPhone

12.5K Retweets 32K Likes



# Flash Fill++: Richer Transformations & Readable code generation

Input	Output (3-hr bucket)
CEDAR AVE & COTTAGE AVE; HORSHAM; 2015-12-11 @ 13:34:52;	Fri, 12PM - 3PM
RT202 PKWY; MONTGOMERY; 2016-01-13 @ 09:05:41-Station:STA18;	Wed, 9AM - 12PM
; UPPER GWYNEDD; 2015-12-11 @ 21:11:18;	Fri, 9PM - 12AM

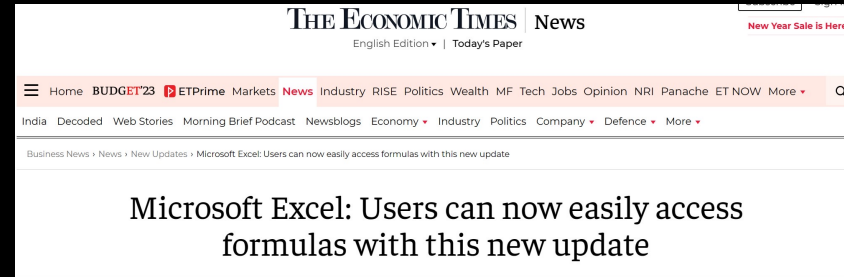
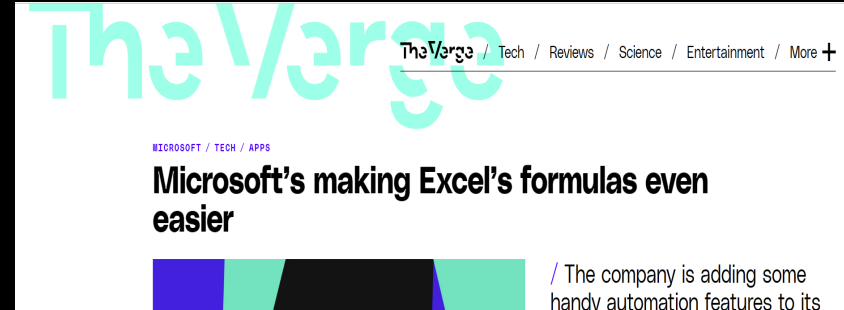
```
def derive_value(_input):
 text = _input.split(";")[2]
 part_0 = text.split(" ")[0]; part_1 = text.split(" ")[2][:8]
 date = datetime.datetime.strptime(part_0, "%Y-%m-%d")
 time = datetime.datetime.strptime(part_1, "%H:%M:%S")
 base_value = datetime.timedelta(hours=time.hour, minutes=time.minute,
 seconds=time.second, microseconds=time.microsecond)
 delta_value = datetime.timedelta(hours=3)
 time_str = (time - base_value % delta_value).strftime("%#I%p")
 rounded_up_next = (time - base_value % delta_value) + delta_value
 computed_value = time_str + "-" + rounded_up_next.strftime("%#I%p")
 return date.strftime("%a") + ", " + computed_value
```

# Available in Excel online, Power Apps, Power Automate!



## NEW Formula by Example 10x Better than Flash Fill

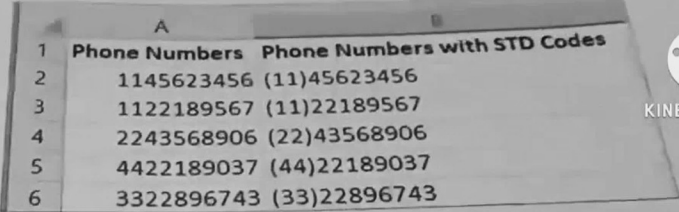
16K views • 6 days ago



“time spent tweaking the expressions, all gone!”  
“**saved 16 hours of work, just 4 days after release**”

# Flash Fill++ for Education

Flash Fill now appears in grade 6 computing textbooks.



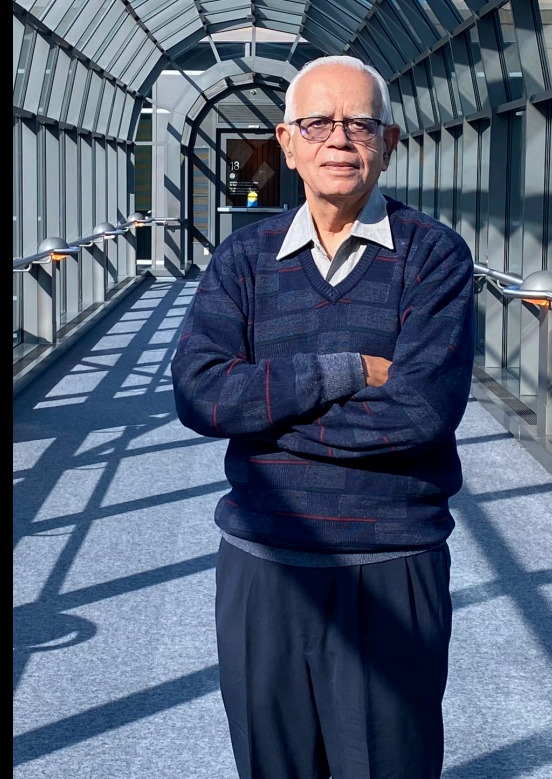
	A	B
1	Phone Numbers	Phone Numbers with STD Codes
2	1145623456	(11)45623456
3	1122189567	(11)22189567
4	2243568906	(22)43568906
5	4422189037	(44)22189037
6	3322896743	(33)22896743

▲ Fig. 3.27 Phone numbers formatted using Flash Fill option

Thus, Flash Fill can be used for extracting, inserting and formatting the data quickly. This feature can even reverse text, numbers, dates and much more.

**#Magic + Keys**

1. The shortcut key combination for Flash Fill is Ctrl + E.
2. The Flash Fill option is also available on the Data tab.



“Son, now I understand your research for the first time.”  
----My dad after Flash Fill paper



# Table Extraction

```
style="text-align: center;"/>
{{Dts|1967|January|15}}
style="background:#d0e7ff;"/>
style="text-align: center;"/>
style="background:#fcc;"/>
{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
style="text-align: center;"/>
style="text-align: center;"/>
style="text-align: center;"/>
{{Dts|1968|January|14}}
style="background:#d0e7ff;"/>
style="text-align: center;"/>
style="background:#fcc;"/>
{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]}}
style="text-align: center;"/>
style="text-align: center;"/>
style="text-align: center;"/>
{{Dts|1969|January|12}}
style="background:#fcc;"/>
style="text-align: center;"/>
style="background:#d0e7ff;"/>
{{Sort|Tulane Stadium 01|[[Tulane Stadium]]}}
{{Sort|New Orleans, Louisiana|[[New Orleans]], [[Louisiana]]}}
style="text-align: center;"/>
style="text-align: center;"/>
```

I,1967,Green Bay Packers 01,35-10,Kansas City Chiefs 01,Los Angeles Memorial Coliseum  
III,1969,New York Jets 01,16-7,Indianapolis Colts 01,Orange Bowl 02 IV,1970,Kansas Ci  
V,1971,Indianapolis Colts 02,16-13,Dallas Cowboys 01,Orange Bowl 03 VI,1972,Dallas Co  
VII,1973,Miami Dolphins 02,14-7,Washington Redskins 01,Los Angeles Memorial Coliseum 6  
IX,1975,Pittsburgh Steelers 01,16-6,Minnesota Vikings 03,Tulane Stadium 03 X,1976,Pit  
XI,1977,Oakland Raiders 02,32-14,Minnesota Vikings 04,Rose Bowl 01 XII,1978,Dallas Co  
XIII,1979,Pittsburgh Steelers 03,35-31,Dallas Cowboys 05,Orange Bowl 05 XIV,1980,Pitt  
XV,1981,Oakland Raiders 03,27-10,Philadelphia Eagles 01,Louisiana Superdome 02 XVI,19  
XVII,1983,Washington Redskins 02,27-17,Miami Dolphins 04,Rose Bowl 03 XVIII,1984,Oakl  
XIX,1985,San Francisco 49ers 02,38-16,Miami Dolphins 05,Stanford Stadium 01 XX,1986,C  
XXI,1987,New York Giants 01,39-20,Denver Broncos 02,Rose Bowl 04 XXII,1988,Washington  
XXIII,1989,San Francisco 49ers 03,20-16,Cincinnati Bengals 02,Joe Robbie Stadium 01 X



```
cat superbowl.txt | awk '$1=$1' ORS=' ' | sed 's/|- |/\n|/g' | grep "^| style=\"t
ext-align: center;\" | grep -v "Championship"
```

92,Washing  
4,Dallas C  
dium 02 XX  
dome 05 X  
a XXXIV 26



Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel

## Output

```
| style="text-align: center;" | {{Sort|01|[[Super Bowl I|I]]}}
|{{Dts|1967|January|15}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3510|35-10}}
| style="background:#fcc;"|{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
|{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
|{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]|{{tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;" | {{Sort|061946|61,946}}
| style="text-align: center;"|<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
|-
| style="text-align: center;" | {{Sort|02|[[Super Bowl II|II]]}}<!--During the AFL-NFL merger, As the Colts mov
|{{Dts|1968|January|14}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3314|33-14}}
| style="background:#fcc;"|{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
|{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
|{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]|{{tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;" | {{Sort|075546|75,546}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-k
|-
| style="text-align: center;" | {{Sort|03|[[Super Bowl III|III]]}}
|{{Dts|1969|January|12}}
| style="background:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;" | {{Sort|1607|16-7 }}
| style="background:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
|{{Sort|Orange Bowl 02|Orange Bowl (2)}}
|{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;" | {{Sort|075389|75,389}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>|</includeonly></onlyinclude>
|-
| style="text-align: center;" | {{Sort|04|[[Super Bowl IV|IV]]}}
|{{Dts|1970|January|11}}
```



Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel

```
| style="text-align: center;" | {{Sort|01|[[Super Bowl I]]}}
|{{Dts|1967|January|15}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3510|35-10}}
| style="background:#fcc;"|{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
|{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
|{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]|{{tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;" | {{Sort|061946|61,946}}
| style="text-align: center;"|<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
|-
| style="text-align: center;" | {{Sort|02|[[Super Bowl II]]}}<!--During the AFL-NFL merger, As the Colts mov
|{{Dts|1968|January|14}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3314|33-14}}
| style="background:#fcc;"|{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
|{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
|{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]|{{tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;" | {{Sort|075546|75,546}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-k
|-
| style="text-align: center;" | {{Sort|03|[[Super Bowl III]]}}
|{{Dts|1969|January|12}}
| style="background:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;" | {{Sort|1607|16-7 }}
| style="background:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
|{{Sort|Orange Bowl 02|Orange Bowl (2)}}
|{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;" | {{Sort|075389|75,389}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>|</includeonly></onlyinclude>
|-
| style="text-align: center;" | {{Sort|04|[[Super Bowl IV]]}}
|{{Dts|1970|January|11}}
```

## Output

BlueLabel

Super Bowl I





Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel

```
| style="text-align: center;" | {{Sort|01|[[Super Bowl I]]}}
|{{Dts|1967|January|15}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3510|35-10}}
| style="background:#fcc;"|{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
|{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
|{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]|{{tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;" | {{Sort|061946|61,946}}
| style="text-align: center;"<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
|-
| style="text-align: center;" | {{Sort|02|[[Super Bowl II]]}}<!--During the AFL-NFL merger, As the Colts mov
|{{Dts|1968|January|14}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3314|33-14}}
| style="background:#fcc;"|{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
|{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
|{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]|{{tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;" | {{Sort|075546|75,546}}
| style="text-align: center;"<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-k
|-
| style="text-align: center;" | {{Sort|03|[[Super Bowl III]]}}
|{{Dts|1969|January|12}}
| style="background:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;" | {{Sort|1607|16-7 }}
| style="background:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
|{{Sort|Orange Bowl 02|Orange Bowl (2)}}
|{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;" | {{Sort|075389|75,389}}
| style="text-align: center;"<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>|</includeonly></onlyinclude>
|-
| style="text-align: center;" | {{Sort|04|[[Super Bowl IV]]}}
|{{Dts|1970|January|11}}
```

## Output

2 rows 1 column

BlueLabel

Super Bowl I

Super Bowl II



Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel

```
| style="text-align: center;" {{Sort|01|[[Super Bowl I]]}}
|{{Dts|1967|January|15}}
| style="background:#d0e7ff;"{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;" {{Sort|3510|35-10}}
| style="background:#fcc;"{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
|{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
|{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]{{#tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;" {{Sort|061946|61,946}}
| style="text-align: center;"<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
|-
| style="text-align: center;" {{Sort|02|[[Super Bowl II]]}}<!--During the AFL-NFL merger, As the Colts mov
|{{Dts|1968|January|14}}
| style="background:#d0e7ff;"{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;" {{Sort|3314|33-14}}
| style="background:#fcc;"{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
|{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
|{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]{{#tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;" {{Sort|075546|75,546}}
| style="text-align: center;"<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-k
|-
| style="text-align: center;" {{Sort|03|[[Super Bowl III]]}}
|{{Dts|1969|January|12}}
| style="background:#fcc;"{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;" {{Sort|1607|16-7 }}
| style="background:#d0e7ff;"{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
|{{Sort|Orange Bowl 02|Orange Bowl (2)}}
|{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;" {{Sort|075389|75,389}}
| style="text-align: center;"<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>}}</includeonly></onlyinclude>
|-
| style="text-align: center;" {{Sort|04|[[Super Bowl IV]]}}
|{{Dts|1970|January|11}}
```

Output

Program viewer

Disambiguation

49 rows 1 column

BlueLabel
Super Bowl I
Super Bowl II
Super Bowl III
Super Bowl IV
Super Bowl V
Super Bowl VI
Super Bowl VII
Super Bowl VIII
Super Bowl IX
Super Bowl X
Super Bowl XI
Super Bowl XII
Super Bowl XIII
Super Bowl XIV
Super Bowl XV
Super Bowl XVI
Super Bowl XVII
Super Bowl XVIII
Super Bowl XIX
Super Bowl XX
Super Bowl XXI
Super Bowl XXII



Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel



YellowLabel



Output

Program viewer

Disambiguation

49 rows 2 columns

BlueLabel	GreenLabel
Super Bowl I	1967
Super Bowl II	
Super Bowl III	
Super Bowl IV	
Super Bowl V	
Super Bowl VI	
Super Bowl VII	
Super Bowl VIII	
Super Bowl IX	
Super Bowl X	
Super Bowl XI	
Super Bowl XII	
Super Bowl XIII	
Super Bowl XIV	
Super Bowl XV	
Super Bowl XVI	
Super Bowl XVII	
Super Bowl XVIII	
Super Bowl XIX	
Super Bowl XX	
Super Bowl XXI	
Super Bowl XXII	

```
| style="text-align: center;" | {{Sort|01|[[Super Bowl I|I]]}}
|{{Dts|1967|January|15}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3510|35-10}}
| style="background:#fcc;"|{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
|{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
|{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]|{{tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;" | {{Sort|061946|61,946}}
| style="text-align: center;"|<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
|-
| style="text-align: center;" | {{Sort|02|[[Super Bowl II|II]]}}<!--During the AFL-NFL merger, As the Colts mov
|{{Dts|1968|January|14}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3314|33-14}}
| style="background:#fcc;"|{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
|{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
|{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]|{{tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;" | {{Sort|075546|75,546}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-k
|-
| style="text-align: center;" | {{Sort|03|[[Super Bowl III|III]]}}
|{{Dts|1969|January|12}}
| style="background:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;" | {{Sort|1607|16-7 }}
| style="background:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
|{{Sort|Orange Bowl 02|Orange Bowl (2)}}
|{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;" | {{Sort|075389|75,389}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>}}</includeonly></onlyinclude>
|-
| style="text-align: center;" | {{Sort|04|[[Super Bowl IV|IV]]}}
|{{Dts|1970|January|11}}
```



Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel



YellowLabel



Output

Program viewer

Disambiguation

49 rows 2 columns

BlueLabel	GreenLabel
Super Bowl I	1967
Super Bowl II	1968
Super Bowl III	1969
Super Bowl IV	1970
Super Bowl V	1971
Super Bowl VI	1972
Super Bowl VII	1973
Super Bowl VIII	1974
Super Bowl IX	1975
Super Bowl X	1976
Super Bowl XI	1977
Super Bowl XII	1978
Super Bowl XIII	1979
Super Bowl XIV	1980
Super Bowl XV	1981
Super Bowl XVI	1982
Super Bowl XVII	1983
Super Bowl XVIII	1984
Super Bowl XIX	1985
Super Bowl XX	1986
Super Bowl XXI	1987
Super Bowl XXII	1988

```
| style="text-align: center;" | {{Sort|01|[[Super Bowl I|I]]}}
|{{Dts|1967|January|15}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3510|35-10}}
| style="background:#fcc;"|{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
|{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
|{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]|{{tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;" | {{Sort|061946|61,946}}
| style="text-align: center;"|<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
|-
| style="text-align: center;" | {{Sort|02|[[Super Bowl II|II]]}}<!--During the AFL-NFL merger, As the Colts mov
|{{Dts|1968|January|14}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3314|33-14}}
| style="background:#fcc;"|{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
|{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
|{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]|{{tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;" | {{Sort|075546|75,546}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-k
|-
| style="text-align: center;" | {{Sort|03|[[Super Bowl III|III]]}}
|{{Dts|1969|January|12}}
| style="background:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;" | {{Sort|1607|16-7 }}
| style="background:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
|{{Sort|Orange Bowl 02|Orange Bowl (2)}}
|{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;" | {{Sort|075389|75,389}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>}}</includeonly></onlyinclude>
|-
| style="text-align: center;" | {{Sort|04|[[Super Bowl IV|IV]]}}
|{{Dts|1970|January|11}}
```



Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel



YellowLabel



OrangeLabel



Output

Program viewer

Disambiguation

49 rows 3 columns

BlueLabel	GreenLabel	YellowLabel
Super Bowl I	1967	35-10
Super Bowl II	1968	
Super Bowl III	1969	
Super Bowl IV	1970	
Super Bowl V	1971	
Super Bowl VI	1972	
Super Bowl VII	1973	
Super Bowl VIII	1974	
Super Bowl IX	1975	
Super Bowl X	1976	
Super Bowl XI	1977	
Super Bowl XII	1978	
Super Bowl XIII	1979	
Super Bowl XIV	1980	
Super Bowl XV	1981	
Super Bowl XVI	1982	
Super Bowl XVII	1983	
Super Bowl XVIII	1984	
Super Bowl XIX	1985	
Super Bowl XX	1986	
Super Bowl XXI	1987	
Super Bowl XXII	1988	

```
| style="text-align: center;" | {{Sort|01|[[Super Bowl I|I]]}}
|{{Dts|1967|January|15}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3510|35-10}}
| style="background:#fcc;"|{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
|{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
|{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]|{{tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;" | {{Sort|061946|61,946}}
| style="text-align: center;"|<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
|-
| style="text-align: center;" | {{Sort|02|[[Super Bowl II|II]]}}<!--During the AFL-NFL merger, As the Colts mov
|{{Dts|1968|January|14}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3314|33-14}}
| style="background:#fcc;"|{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
|{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
|{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]|{{tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;" | {{Sort|075546|75,546}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-k
|-
| style="text-align: center;" | {{Sort|03|[[Super Bowl III|III]]}}
|{{Dts|1969|January|12}}
| style="background:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;" | {{Sort|1607|16-7 sp;}}
| style="background:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
|{{Sort|Orange Bowl 02|Orange Bowl (2)}}
|{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;" | {{Sort|075389|75,389}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>}}</includeonly></onlyinclude>
|-
| style="text-align: center;" | {{Sort|04|[[Super Bowl IV|IV]]}}
|{{Dts|1970|January|11}}
```





Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel



YellowLabel



OrangeLabel



Output

Program viewer

Disambiguation

49 rows 3 columns

BlueLabel	GreenLabel	YellowLabel
Super Bowl I	1967	35-10
Super Bowl II	1968	33-14
Super Bowl III	1969	16-7&nbsp;}}   style="background:... {{Sort Indianapolis Colts 01 [[1968 Baltimore Colts season Baltimore Colts]] <sup>†</sup>}}   {{Sort Orange Bowl 02 Orange Bowl (2)}}   {{Sort Miami, Florida 02 Miami, Florida (2)<ref group=note name=b />}}   style="text-align: center;"   {{Sort 075389 75,3...
		23-7&nbsp;}}   style="background:... {{Sort Minnesota Vikings 01 [[1969 Minnesota Vikings season Minnesota Vikings]] <sup>†</sup>}}

```
| style="text-align: center;" | {{Sort|01|[[Super Bowl I|I]]}}
| {{Dts|1967|January|15}}
| style="background:#d0e7ff;" | {{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay Packers]][^]}}
| style="text-align: center;" | {{Sort|3510|35-10}}
| style="background:#fcc;" | {{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Chiefs]][^]}}
| {{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
| {{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]<#tag:ref|Both [[Los Angeles, California|Los Angeles]] and [[Pasadena, California|Pasadena]]}}
| style="text-align: center;" | {{Sort|061946|61,946}}
| style="text-align: center;" | <ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/variety/1967/01/15/super-bowl-1/index.html}}</ref>
| style="text-align: center;" | {{Sort|02|[[Super Bowl II|II]]}}<!--During the AFL-NFL merger, As the Colts moved to Baltimore, the Colts and Packers met in the Super Bowl II.--></ref>
| {{Dts|1968|January|14}}
| style="background:#d0e7ff;" | {{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay Packers]][^]}}
| style="text-align: center;" | {{Sort|3314|33-14}}
| style="background:#fcc;" | {{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]][^]}}
| {{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
| {{Sort|Miami, Florida 01|[[Miami]], [[Florida]]<#tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incorporated in 1965.}}</ref>
| style="text-align: center;" | {{Sort|075546|75,546}}
| style="text-align: center;" | <ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-bowl-ii}}</ref>
| style="text-align: center;" | {{Sort|03|[[Super Bowl III|III]]}}
| {{Dts|1969|January|12}}
| style="background:#fcc;" | {{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]][^]}}<!--The Jets and Colts met in the Super Bowl III.--></ref>
| style="text-align: center;" | {{Sort|1607|16-7 }}
| style="background:#d0e7ff;" | {{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]][^]}}
| {{Sort|Orange Bowl 02|Orange Bowl (2)}}
| {{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;" | {{Sort|075389|75,389}}
| style="text-align: center;" | <ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html |title=Super Bowl III}}</ref>
| style="text-align: center;" | {{Sort|04|[[Super Bowl IV|IV]]}}
| {{Dts|1970|January|11}}
```





Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel



YellowLabel



OrangeLabel



Output

Program viewer

Disambiguation

'YellowLabel' is currently ambiguous. Which highlighting is correct?

```
16-7 }}
| style="...75389|75,389
```

```
16-7 }}
| style="...75389|75,389
```

[Let me edit it myself](#)

```
| style="text-align: center;" {{Sort|01|[[Super Bowl I|I]]}}
{{Dts|1967|January|15}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;"| {{Sort|3510|35-10}}
| style="background:#fcc;"|{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]|{{tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;"| {{Sort|061946|61,946}}
| style="text-align: center;"|<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
-
| style="text-align: center;"| {{Sort|02|[[Super Bowl II|II]]}}<!--During the AFL-NFL merger, As the Colts mov
{{Dts|1968|January|14}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;"| {{Sort|3314|33-14}}
| style="background:#fcc;"|{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]|{{tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;"| {{Sort|075546|75,546}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-t
-
| style="text-align: center;"| {{Sort|03|[[Super Bowl III|III]]}}
{{Dts|1969|January|12}}
| style="background:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;"| {{Sort|1607|16-7 }}
| style="background:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
{{Sort|Orange Bowl 02|Orange Bowl (2)}}
{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;"| {{Sort|075389|75,389}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>|</includeonly></onlyinclude>
-
| style="text-align: center;"| {{Sort|04|[[Super Bowl IV|IV]]}}
{{Dts|1970|January|11}}
```



Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



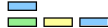
GreenLabel



YellowLabel



OrangeLabel



```

| style="text-align: center;" | {{Sort|01|[[Super Bowl I|I]]}}
|{{Dts|1967|January|15}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3510|35-10}}
| style="background:#fcc;"|{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
|{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
|{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]|{{tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;" | {{Sort|061946|61,946}}
| style="text-align: center;"<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
|-
| style="text-align: center;" | {{Sort|02|[[Super Bowl II|II]]}}<!--During the AFL-NFL merger, As the Colts mov
|{{Dts|1968|January|14}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;" | {{Sort|3314|33-14}}
| style="background:#fcc;"|{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
|{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
|{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]|{{tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;" | {{Sort|075546|75,546}}
| style="text-align: center;"<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-k
|-
| style="text-align: center;" | {{Sort|03|[[Super Bowl III|III]]}}
|{{Dts|1969|January|12}}
| style="background:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;" | {{Sort|1607|16-7 }}
| style="background:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
|{{Sort|Orange Bowl 02|Orange Bowl (2)}}
|{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;" | {{Sort|075389|75,389}}
| style="text-align: center;"<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>|</includeonly></onlyinclude>
|-
| style="text-align: center;" | {{Sort|04|[[Super Bowl IV|IV]]}}
|{{Dts|1970|January|11}}

```

Output

Program viewer

Disambiguation

49 rows 3 columns

BlueLabel	GreenLabel	YellowLabel
Super Bowl I	1967	35-10
Super Bowl II	1968	33-14
Super Bowl III	1969	16-7
Super Bowl IV	1970	23-7
Super Bowl V	1971	16-13
Super Bowl VI	1972	24-3
Super Bowl VII	1973	14-7
Super Bowl VIII	1974	24-7
Super Bowl IX	1975	16-6
Super Bowl X	1976	21-17
Super Bowl XI	1977	32-14
Super Bowl XII	1978	27-10
Super Bowl XIII	1979	35-31
Super Bowl XIV	1980	31-19
Super Bowl XV	1981	27-10
Super Bowl XVI	1982	26-21
Super Bowl XVII	1983	27-17
Super Bowl XVIII	1984	38-9
Super Bowl XIX	1985	38-16
Super Bowl XX	1986	46-10
Super Bowl XXI	1987	39-20
Super Bowl XXII	1988	42-10

# Table Extraction

From various kinds of semi-structured documents.

- **Text files**  
[PLDI '14, Le & Gulwani]
- **Webpages**  
[SIGMOD '20, Raza & Gulwani]
- **PDF**  
[ICPR '20, Zhang et al.]
- **Semi-structured spreadsheets**  
[PLDI '15, Barowy et al.]
- **Mixed formats**  
[OOPSLA '20, Gulwani et al.]

*“Text by example is freaking awesome... crying and clapping”*

*“Web by example is the best thing since sliced virtual network architectures over 5G”*



Add file



Reset



Undo



Redo



Learn



Settings



Result



BlueLabel



GreenLabel



YellowLabel



OrangeLabel

```
| style="text-align: center;" {{Sort|01|[[Super Bowl I|I]]}}
|{{Dts|1967|January|15}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 01|[[1966 Green Bay Packers season|Green Bay
| style="text-align: center;"| {{Sort|3510|35-10}}
| style="background:#fcc;"|{{Sort|Kansas City Chiefs 01|[[1966 Kansas City Chiefs season|Kansas City Ch
|{{Sort|Los Angeles Memorial Coliseum 01|[[Los Angeles Memorial Coliseum]]}}
|{{Sort|Pasadena, California 01|[[Los Angeles]], [[California]]|{{tag:ref|Both [[Los Angeles, California|Los A
| style="text-align: center;"| {{Sort|061946|61,946}}
| style="text-align: center;"|<ref>{{Cite journal |last=Maule |first=Tex |url=http://sportsillustrated.cnn.com/va
|
| style="text-align: center;"| {{Sort|02|[[Super Bowl II|II]]}}<!--During the AFL-NFL merger, As the Colts mov
|{{Dts|1968|January|14}}
| style="background:#d0e7ff;"|{{Sort|Green Bay Packers 02|[[1967 Green Bay Packers season|Green Bay
| style="text-align: center;"| {{Sort|3314|33-14}}
| style="background:#fcc;"|{{Sort|Oakland Raiders 01|[[1967 Oakland Raiders season|Oakland Raiders]]<s
|{{Sort|Orange Bowl 01|[[Miami Orange Bowl|Orange Bowl]]}}
|{{Sort|Miami, Florida 01|[[Miami]], [[Florida]]|{{tag:ref|[[Miami Gardens, Florida|Miami Gardens]] was incor
| style="text-align: center;"| {{Sort|075546|75,546}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://aol.sportingnews.com/nfl/story/2008-01-15/super-k
|
| style="text-align: center;"| {{Sort|03|[[Super Bowl III|III]]}}
|{{Dts|1969|January|12}}
| style="background:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets season|New York Jets]]<sup>^</s
| style="text-align: center;"| {{Sort|1607|16-7 }}
| style="background:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore Colts season|Baltimore Colts]]<
|{{Sort|Orange Bowl 02|Orange Bowl (2)}}
|{{Sort|Miami, Florida 02|Miami, Florida (2)<ref group=note name=b />}}
| style="text-align: center;"| {{Sort|075389|75,389}}
| style="text-align: center;"|<ref>{{Cite journal |url=http://www.sportingnews.com/archives/superbowl/3.html
<includeonly>|}</includeonly></onlyinclude>
|
| style="text-align: center;"| {{Sort|04|[[Super Bowl IV|IV]]}}
|{{Dts|1970|January|11}}
```

Output

Program viewer

Disambiguation

'YellowLabel' is currently ambiguous. Which highlighting is correct?

```
16-7 }}
| style="...75389|75,389
```

```
16-7 }}
| style="...75389|75,389
```

[Let me edit it myself](#)

[Jha et.al, “Oracle-guided component-based program synthesis”]



Most Influential Paper award  
ICSE 2010



# Automating active learning as Analogical Reasoning

**USER** That's correct. Very impressive indeed! Why did you not get confused and pick strings like "08-25" or "01-12"?

**ASSISTANT** Thank you! I didn't get confused and pick strings like "08-25" or "01-12" because those strings are part of dates in the format YYYY-MM-DD or MM-DD, which are not similar to the examples you provided. The examples "35-10" and "33-14" are both in the format of two numbers separated by a hyphen, which is more similar to a sports score like "16-7". My algorithm is designed to recognize patterns and find the most similar string based on the examples given.

ES: "35-10", "33-14"

style="text-align: center;" | {{Sort|03|[[Super Bowl III|III]]}}  
 nuary|12}}

round:#fcc;"|{{Sort|New York Jets 01|[[1968 New York Jets  
 ork Jets]]<sup>^</sup>}}

align: center;" | {{Sort|1607|16-7&nbsp;}}}

round:#d0e7ff;"|{{Sort|Indianapolis Colts 01|[[1968 Baltimore  
 Baltimore Colts]]<sup>†</sup>}}

Bowl 02|Orange Bowl (2))}

Florida 02|Miami, Florida (2)<ref group=note name=b />}}

align: center;" | {{Sort|075389|75,389}}

align: center;" |<ref>{{Cite journal

w.sportingnews.com/archives/superbowl/3.html |title=Super Bowl

ay Joe Show |accessdate=2009-08-25 |date=1969-01-12 |journal=

vs]]}}</ref> <includeonly>|</includeonly></onlyinclude>|-

g in the TEXT that is most similar to the EXAMPLES is:

**ASSISTANT** "16-7"

# Flash Fill for Repeated Edits in Code

```
var temp = (GetTemp() - 32) * (5 / 9);
 Conversions.FtoC(GetTemp());

...
double MaxTempInC(double[] fTemps) {
 return (fTemps.Max() - 32) * (5 / 9);
 Conversions.FtoC(fTemps.Max());
}

...
double MinTempInC(double[] fTemps) {
 var m = fTemps.Min();
 return (m - 32) * (5 / 9);
 Conversions.FtoC(m);
}
```





{ name: Jerry } 🙌🔒 @jerrynixon · Apr 19

The new **IntelliCode** engine in @VisualStudio.

Almost spooky. @amandasilver

INTELLICODE SUGGESTIONS



VISUAL STUDIO



Alistair Evans

@evocationist

I'm in the middle of changing a load of Memory<byte> and Span<byte> to their ReadOnly variant, and the new @VisualStudio intellisense feature knows what I'm doing and starts suggesting the change to ReadOnly in the right places, which is pretty wild.

3:43

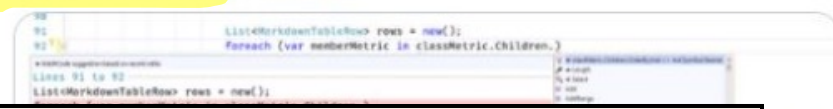


David Pine 🌲 @davidpine7 · 22 m

Wow, this whole #IntelliCode thing is crazy cool.

@VisualStudio : The AI-based model was able to detect that I was updating some of the iterations to order by their name, and then it said - "Hey, this is what you're looking for, right?!".

Me : Yes, please... 🙏 #dotnet



>25M suggestions accepted per month!  
>800K engaged users!



Jochem Bonarius

@BonariusJochem

@MarkPavWT I almost felt a tear coming when #intellisense automatically suggested to make many many repetitive changes in the code I'd otherwise had to do by hand. It's amazing! Thank you!

2:38 AM · Mar 30, 2021 · Twitter for Android



Sam Afshari 🇪🇺 @samafshari · 4 u

This new aggressive #IntelliCode automatic code changing based on previous actions™ sometimes gives me a heart attack because it happens so suddenly.

(This is a compliment btw, it's awesome).



Sam Afshari 🇪🇺 @samafshari · 1 m

Als antwoord op @pgroene

You should put a "boing!" sound effect for every time it happens 🤖

Hold my beer, I need to create the VSIX for it!



MORE VIDEOS

# Semantic Repeated Edits

```
try { ts = ... }
```

```
Catch (Exception ex)
```

```
{
```

```
info.ReportClientError("Scheme is missing");
```

```
info.ReportClientError("Scheme is missing",System.Net.HttpStatusCode.BadRequest);
```

```
return;
```

```
}
```

```
Default:
```

```
info.ReportClientError("No such action");
```

```
info.ReportClientError("No such action",System.Net.HttpStatusCode.NotFound);
```

```
return;
```



# Semantic Repeated Edits using Spatial Context

```
try { ts = ... }
```

```
Catch (Exception ex)
```

```
{
```

```
 info.ReportClientError("Scheme is missing",System.Net.HttpStatusCode.BadRequest);
```

```
 return;
```

```
}
```

```
Default:
```

```
 info.ReportClientError("No such action",);
```

```
 return;
```



# Semantic Repeated Edits using Spatial Context

```
try { ts = ... }
```

```
Catch (Exception ex)
```

```
{
```

```
 info.ReportClientError("Scheme is missing",System.Net.HttpStatusCode.BadRequest);
```

```
 return;
```

```
}
```

```
Default:
```

```
 info.ReportClientError("No such action",System.Net.HttpStatusCode.BadRequest);
```

```
 return;
```



# Semantic Repeated Edits as Analogical Reasoning

USER

Input: "scheme is missing"

Output: System.Net.HttpStatusCode.BadRequest

Input: "no such action"

Output:

---

ASSISTANT

System.Net.HttpStatusCode.NotFound





# Semantic Repeated Edits using Temporal Context

```
try { ts = ... }
Catch (Exception ex)
{
 info.ReportClientError("Scheme is missing");
 info.ReportClientError("Scheme is missing",System.Net.HttpStatusCode.BadRequest);
 return;
}
Default:
 info.ReportClientError("No such action",);
 return;
```



# Semantic Repeated Edits using Temporal Context

```
try { ts = ... }
Catch (Exception ex)
{
 info.ReportClientError("Scheme is missing");
 info.ReportClientError("Scheme is missing",System.Net.HttpStatusCode.BadRequest);
 return;
}
Default:
 info.ReportClientError("No such action",System.Net.HttpStatusCode.NotFound);
 return;
```



# Associated Edits

```
using System;
using NUnit.Framework;
public class TimeConfigurationTests : NLogTestBase
using Xunit;
public class TimeConfigurationTests : NLogTestBase, IDisposable
{
 [TearDown] public void TearDown(){ ... }
 public void Dispose() { ... }
 [Test]
 [Fact]
 public void DefaultTimeSourceTest{ ... }
}
```



# Associated Edits using Spatial Context

```
using System;
```

```
using NUnit.Framework;
```

```
public class TimeConfigurationTests : NLogTestBase
```

```
 {
```

```
 {
```

```
 public void Dispose(){ ... }
```

```
 [Fact]
```

```
 public void DefaultTimeSourceTest{ ... }
```

```
 }
```



# Associated Edits using Spatial Context

```
using System;
```

```
using NUnit.Framework;
```

```
public class TimeConfigurationTests : NLogTestBase
```

```
using NUnit.Framework;
```

```
public class TimeConfigurationTests : NLogTestBase
```

```
{
```

```
 public void Dispose(){ ... }
```

```
 [Fact]
```

```
 public void DefaultTimeSourceTest{ ... }
```

```
}
```



# Associated Edits using Temporal Context

```
using System;
using NUnit.Framework;
public class TimeConfigurationTests : NLogTestBase

{
 [TearDown] public void TearDown(){ ... }
 public void Dispose(){ ... }
 [Test]
 [Fact]
 public void DefaultTimeSourceTest{ ... }
}
```





# Associated Edits using Temporal Context

```
using System;
using NUnit.Framework;
public class TimeConfigurationTests : NLogTestBase
using Xunit;
public class TimeConfigurationTests : NLogTestBase, IDisposable
{
 [TearDown] public void TearDown(){ ... }
 public void Dispose(){ ... }
 [Test]
 [Fact]
 public void DefaultTimeSourceTest{ ... }
}
```



# Associated Edits as Analogical Reasoning

USER

Input: [TearDown] public void TearDown()  
Output: public void Dispose()

Input: [Test]  
Output: [Fact]

Input: using NUnit.Framework  
Output:

ASSISTANT

using Xunit

USER

Input: [TearDown] public void TearDown()  
Output: public void Dispose()

Input: [Test]  
Output: [Fact]

Input: public class  
TimeConfigurationTests: NLogTestBase  
Output:

ASSISTANT

public class TimeConfigurationTests :  
NLogTestBase, IDisposable

# Thanks to PROSE Team (aka.ms/prose)



Anna Fariha



Alex Polozov



Arjun Radhakrishna



Ashish Tiwari



Chris Parnin



Daniel Perelman



Gust Verbruggen



Gustavo Soares



Ivan Radicek



José Cambroner



Mohammad Raza



Rishabh Singh



Vu Le



Austin Henley



Clint Simon



Dan Morris



Danny Simmons



Sherry Shi



Chethan M



Harshit Joshi



Mukul Singh



Priyanshu Gupta



Yasharth Bajpai



Anjali Singh

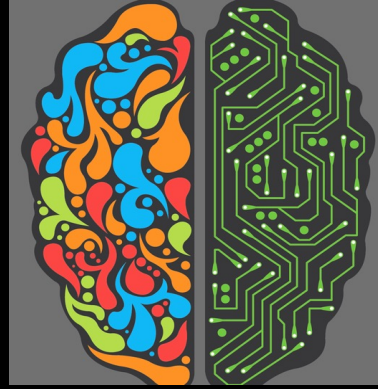


Priyan Vaithilingam



Yang Shi

# Analogical Reasoning is an emergent capability of LLMs!



It can enhance Programming-by-example (PBE) experiences.

- Synthesis from fewer examples.
- Explanation generation
- Semantic transformations

Ways to Improves LLM performance

- Phrasing a problem as analogical reasoning works better.
- Various methods from PBE can improve LLM performance.