Coming Attractions
Lambdas &Lists

CMPU 101 – Problem Solving and Abstraction

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Function Call vs. Inline Function

- A **function call** is, essentially, a “break in the action” for a CPU
  - Such that it might take a moment to find out where that function actually is:
  - They could be built-in or user written, like the textbook functions we have to include
- An **inline function** is code that the CPU can execute line-by-line
  - Similar to how one would read a book (no skipping around!)

Introducing: λ

```
fun percent-true(t :: Table, col :: String) -> Number:
 doc: "Return the percentage of rows that are true in column 'col'"

 fun true-filter(r :: Row) -> Boolean:
  r[col]
 end

 filter-with(t, true-filter).length() / t.length()
end
```

- # The nested function true-filter is only used (called) in one location
- Do we have to name it and call it if we're only going to do this once?
  - Spoiler alert: No, we don't!

Introducing: λ

```
fun percent-true(t :: Table, col :: String) -> Number:
  doc: "Return the percentage of rows that are true in column 'col'"
  filter-with(t, lam(r): r[col] end).length()
    / t.length()

  filter-with(t, true-filter).length() / t.length()
end
```

- # We can instruct pyret to use an unnamed function!
- It will only ever be executed in-line (and from within filter-with)

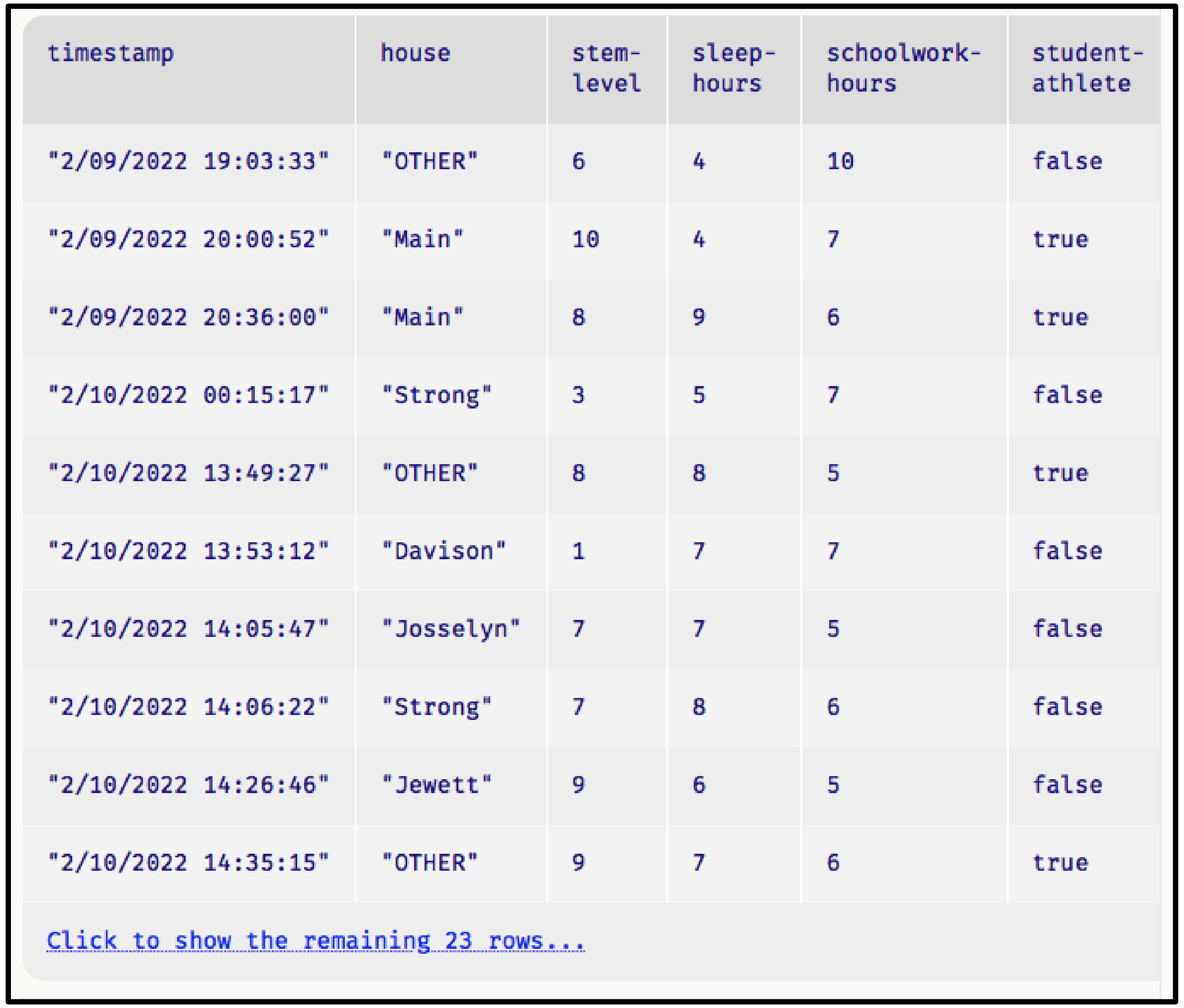
Definition: λ

- A *lambda expression* defines an `anonymous function`
  - i.e. a function that can be passed as an argument but doesn't have an associated name.
  - A lambda expression is executed as an in-line function
    - And can improve application performance (why?)
  - They are a common feature in modern programming languages

  - Recognize them, but use them as you become comfortable using them.
    - Useful as "helper functions"
    - Nothing wrong with named functions!

Rows are easy to access.

.row-n gives us a row in a table…



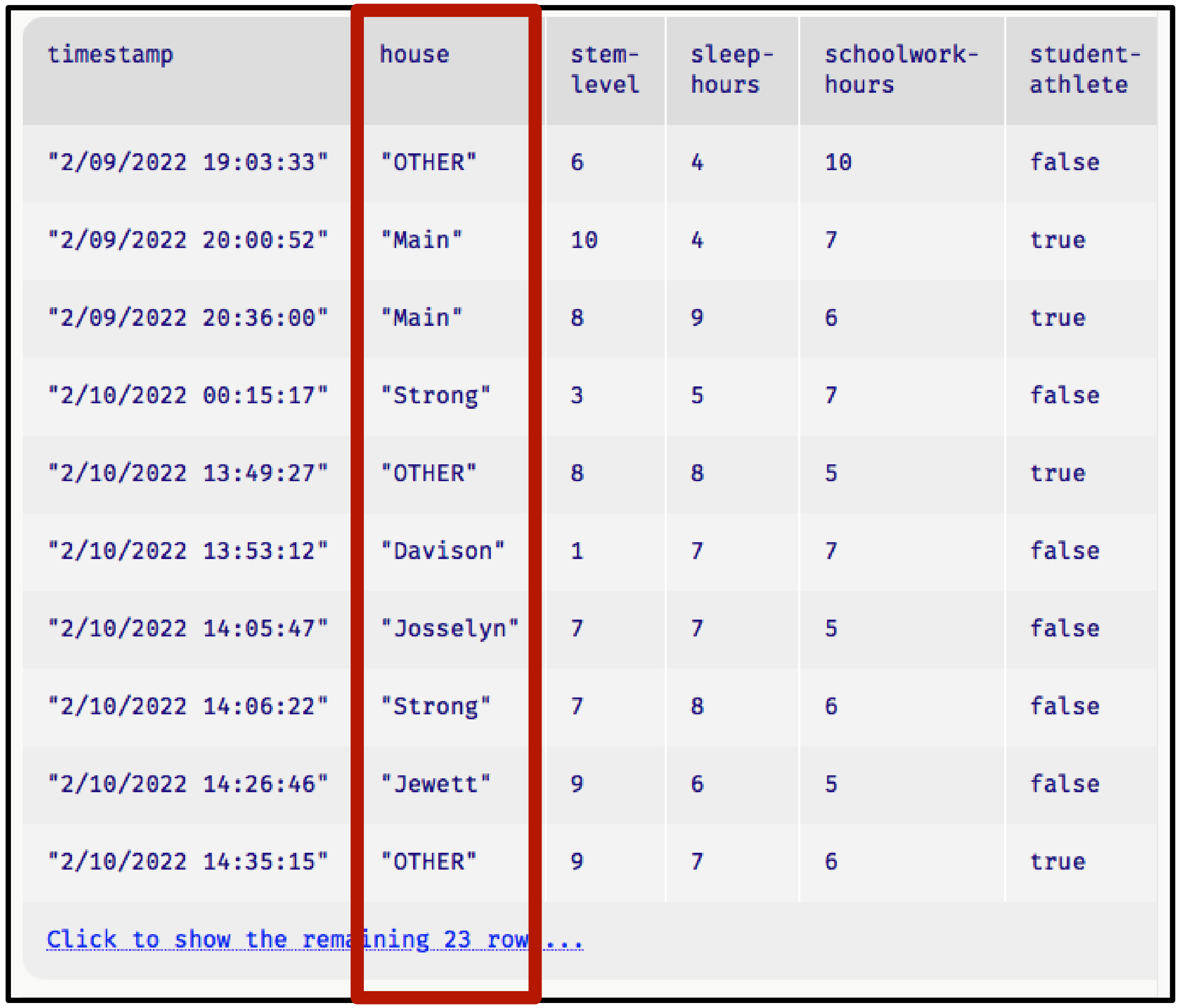
timestamp	house	stem-level	sleep-hours	schoolwork-hours	student-athlete
"2/09/2022 19:03:33"	"OTHER"	6	4	10	false
"2/09/2022 20:00:52"	"Main"	10	4	7	true
"2/09/2022 20:36:00"	"Main"	8	9	6	true
"2/10/2022 00:15:17"	"Strong"	3	5	7	false
"2/10/2022 13:49:27"	"OTHER"	8	8	5	true
"2/10/2022 13:53:12"	"Davison"	1	7	7	false
"2/10/2022 14:05:47"	"Josselyn"	7	7	5	false
"2/10/2022 14:06:22"	"Strong"	7	8	6	false
"2/10/2022 14:26:46"	"Jewett"	9	6	5	false
"2/10/2022 14:35:15"	"OTHER"	9	7	6	true

Click to show the remaining 23 rows...

Rows are easy to access. But what about columns?

.row-n gives us a row in a table…

How can we access all the elements in one column?



timestamp	house	stem-level	sleep-hours	schoolwork-hours	student-athlete
"2/09/2022 19:03:33"	"OTHER"	6	4	10	false
"2/09/2022 20:00:52"	"Main"	10	4	7	true
"2/09/2022 20:36:00"	"Main"	8	9	6	true
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"2/10/2022 14:26:46"	"Jewett"	9	6	5	false
"2/10/2022 14:35:15"	"OTHER"	9	7	6	true

Click to show the remaining 23 rows...

Introducing: lists

.row-n gives us a row in a table…

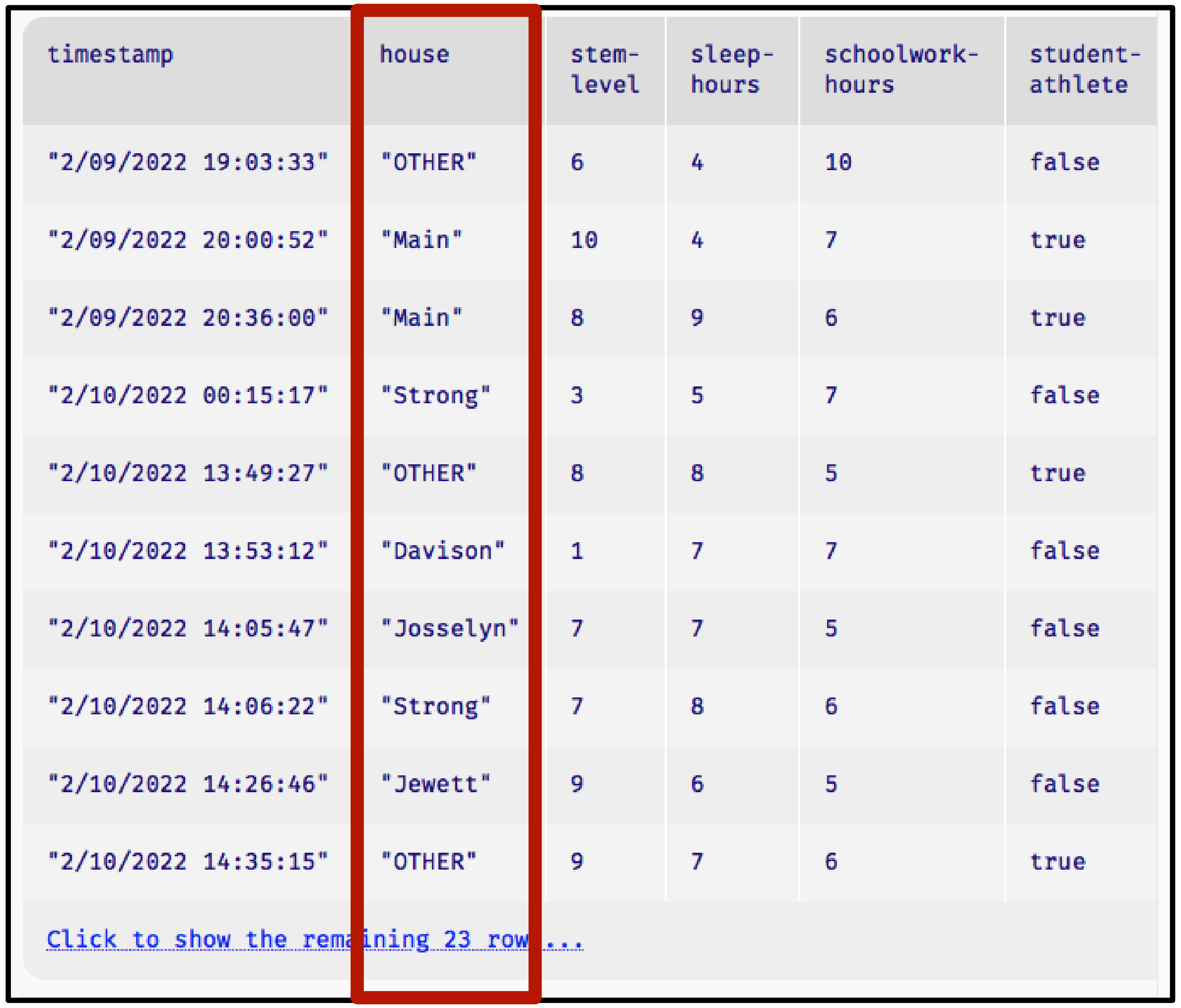
How can we access all the elements in one column?

A: get-column

Example:

student-data-cleaned.get-column("house")

[list: "OTHER", "Main", "Main", "Strong", ...]



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Click to show the remaining 23 rows...

Introducing: lists

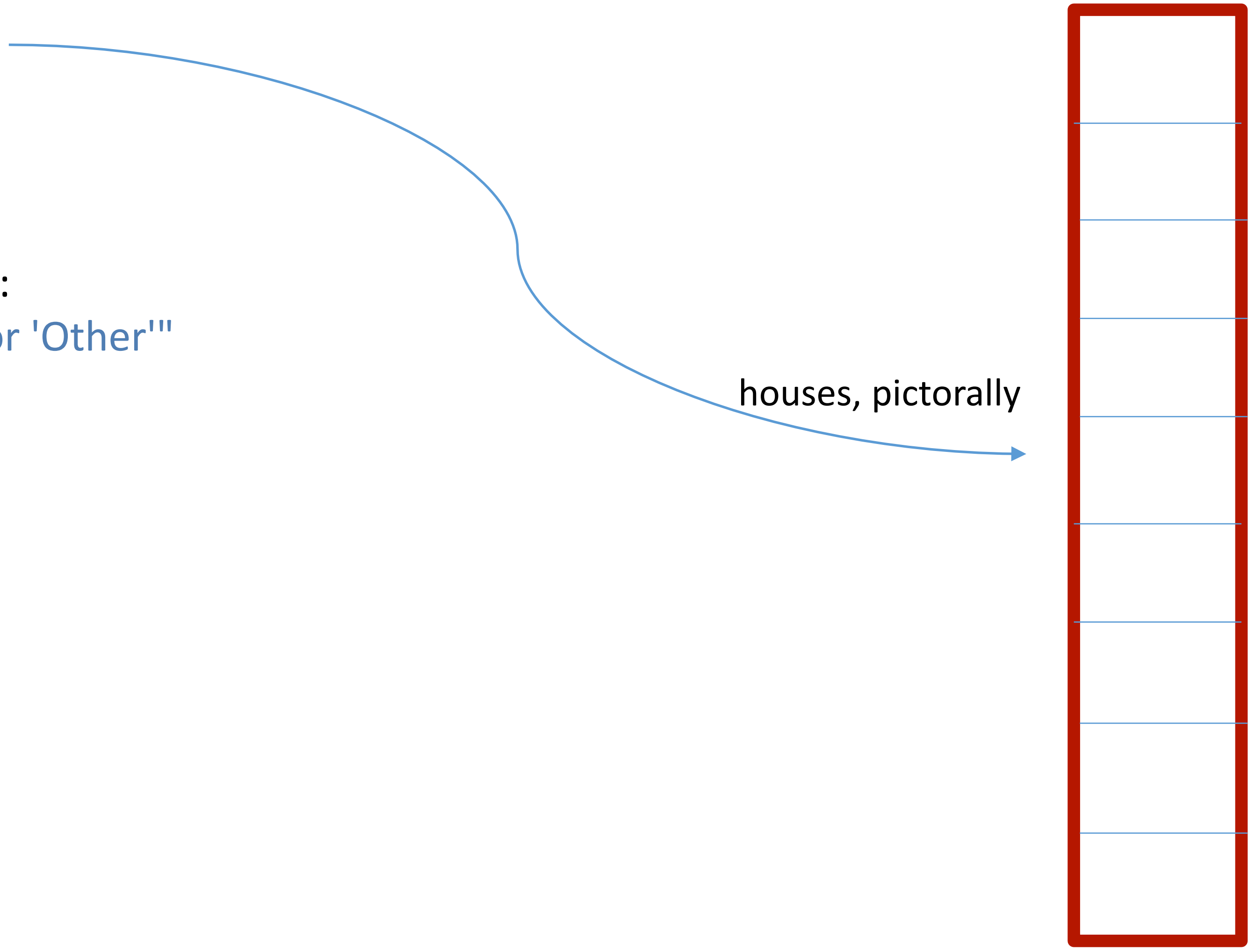
The concept is similar to Zeyu Zheng's solution from earlier in the lecture!

- in that solution, there was one big string with all the house names. (a kind-of list!)
- string-contains was used to find the desired string in "list" of house names
- What if we want to use the "substrings" independently.
  - It is messy to separate each house name!
- What if we wanted to do something similar with numbers or Booleans or…
  - a general all-purpose solution for all data types besides strings is needed

Introducing: lists for student data

```
houses = [list: "Main", "Strong", "Raymond",
  "Davison", "Lathrop", "Jewett", "Josselyn",
  "Cushing", "Noyes"]


fun normalize-house(house :: String) -> String:
  doc: "Return one of the nine Vassar houses or 'Other'"
  if member(houses, house):
    house
  else:
    "Other"
  end
where:
  normalize-house("Main") is "Main"
  normalize-house("Offcampus") is "Other"
end
```



Link to code

- https://code.pyret.org/editor#share=1WXx7yJvtOKJtXjza0CdCi8gdtozF8ZnR&v=31c9aaf

Acknowledgements

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