Data Frames

An Aside About Data Sets

An Aside About Data Sets

- Data are typically messy.

An Aside About Data Sets

- Data are typically messy.
  - NA’s might be -9 (numeric), “-9. Refused”, “-8. Don't know”, “-2. Missing, other not codeable to 1-5”, or some combination of these.

An Aside About Data Sets

- Data are typically messy.
  - NA’s might be -9 (numeric), “-9. Refused”, “-8. Don't know”, “-2. Missing, other not codeable to 1-5”, or some combination of these.
  - “Strong Democrat” is a 1

An Aside About Data Sets

- Data are typically messy.
  - NA’s might be -9 (numeric), “-9. Refused”, “-8. Don't know”, “-2. Missing, other not codeable to 1-5”, or some combination of these.
  - “Strong Democrat” is a 1
  - “Other” is "5. Other party {SPECIFY}"

An Aside About Data Sets

- Data are typically messy.
    - NA’s might be -9 (numeric), “-9. Refused”, “-8. Don't know”, “-2. Missing, other not codeable to 1-5”, or some combination of these.
    - “Strong Democrat” is a 1
    - “Other” is "5. Other party {SPECIFY}"
    - Data sets are not “tidy” (rows are observations; columns are variables)

An Aside About Data Sets

- Data are typically messy.
  - NA’s might be -9 (numeric), “-9. Refused”, “-8. Don't know”, “-2. Missing, other not codeable to 1-5”, or some combination of these.
  - “Strong Democrat” is a 1
  - “Other” is "5. Other party {SPECIFY}"
  - Data sets are not “tidy” (rows are observations; columns are variables)
  - Factors are strangely ordered or are character vectors.

An Aside About Data Sets

- Data are typically messy.
  - NA’s might be -9 (numeric), “-9. Refused”, “-8. Don't know”, “-2. Missing, other not codeable to 1-5”, or some combination of these.
  - “Strong Democrat” is a 1
  - “Other” is "5. Other party {SPECIFY}"
  - Data sets are not “tidy” (rows are observations; columns are variables)
  - Factors are strangely ordered or are character vectors.
  - Needed information is stored in different data files.

An Aside About Data Sets

- Data are typically messy.
  - NA’s might be -9 (numeric), “-9. Refused”, “-8. Don't know”, “-2. Missing, other not codeable to 1-5”, or some combination of these.
  - “Strong Democrat” is a 1
  - “Other” is "5. Other party {SPECIFY}"
  - Data sets are not “tidy” (rows are observations; columns are variables)
  - Factors are strangely ordered or are character vectors.
  - Needed information is stored in different data files.
- The data I give you are clean and tidy.

An Aside About Data Sets

- Data are typically messy.
  - NA's might be -9 (numeric), "-9. Refused", "-8. Don't know", "-2. Missing, other not codeable to 1-5", or some combination of these.
  - "Strong Democrat" is a 1
  - "Other" is "5. Other party {SPECIFY}"
  - Data sets are not "tidy" (rows are observations; columns are variables)
  - Factors are strangely ordered or are character vectors.
  - Needed information is stored in different data files.
- The data I give you are clean and tidy.
- The skill of taking messy data files and cleaning and tidying is called "data wrangling." We don't learn any data wrangling.

Terminology

Terminology

- **data set**: a collection of information stored somehow, somewhere.

Terminology

- **data set**: a collection of information stored somehow, somewhere.
- **data file**: a specific file containing a data set.

Terminology

- **data set**: a collection of information stored somehow, somewhere.
- **data file**: a specific file containing a data set.
- **file type**: the specific format in which the data are stored (e.g., .xlsx, .dta, .rds)

Terminology

- **data set**: a collection of information stored somehow, somewhere.
- **data file**: a specific file containing a data set.
- **file type**: the specific format in which the data are stored (e.g., .xlsx, .dta, .rds)
- **data frame**: a type of object in R; think of as a “box of vectors.”

Terminology

- **data set**: a collection of information stored somehow, somewhere.
- **data file**: a specific file containing a data set.
- **file type**: the specific format in which the data are stored (e.g., .xlsx, .dta, .rds)
- **data frame**: a type of object in R; think of as a “box of vectors.”
    - other objects include scalars, vectors, and functions

Terminology

- **data set**: a collection of information stored somehow, somewhere.
- **data file**: a specific file containing a data set.
- **file type**: the specific format in which the data are stored (e.g., .xlsx, .dta, .rds)
- **data frame**: a type of object in R; think of as a “box of vectors.”
    - other objects include scalars, vectors, and functions
    - all vectors in a box have the same length (number of elements)

Terminology

- **data set**: a collection of information stored somehow, somewhere.
- **data file**: a specific file containing a data set.
- **file type**: the specific format in which the data are stored (e.g., .xlsx, .dta, .rds)
- **data frame**: a type of object in R; think of as a "box of vectors."
  - other objects include scalars, vectors, and functions
  - all vectors in a box have the same length (number of elements)
  - most functions for modeling and graphing are designed to work with data frames via a `data =` argument, not vectors

Data reading functions create data frames from data files.

`read_csv()`, `read_dta()`, `read_excel()`, `readRDS`, and `import()`

thinking about data frames

```
x <- c(6, 4, 5, 6, 2, 3)  # create a numeric vector
```

x

x

```
my_logic <- c(TRUE, FALSE, FALSE)  # create logical vector
```

x

my_logic

x

my_logic

```
ch.vec <- c(“word1”, “word2”)  # create character vector
```

ch.vec

x

my_logic

ch.vec

x

my_logic

```
data1 <- read.csv(“data/nominate.csv”)  # read data set
```

ch.vec

x

my_logic

data1

[redacted]

ch.vec

x

my_logic

data1

?

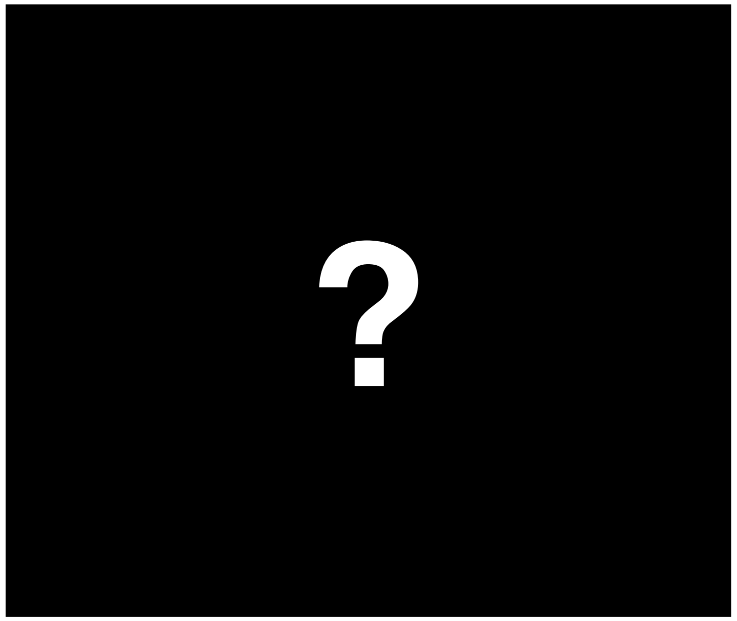
ch.vec

x

my_logic

data1

```
> glimpse(data1)
```

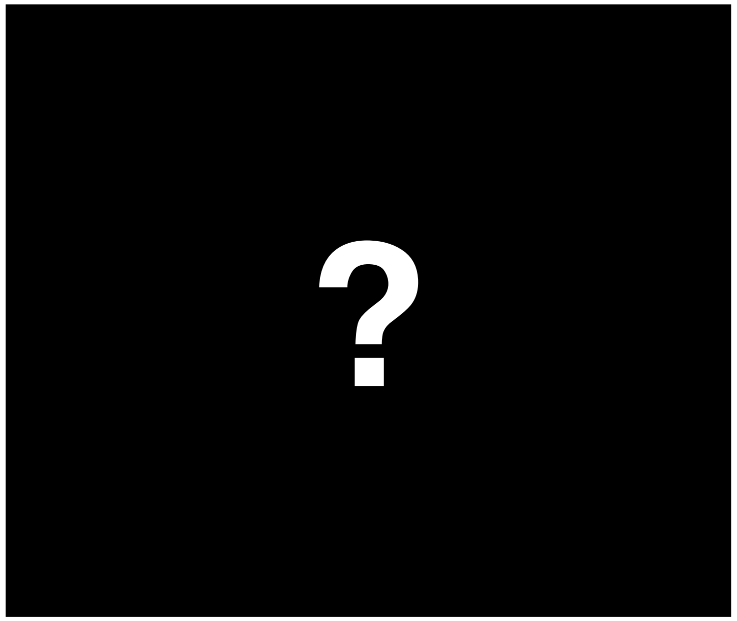


ch.vec

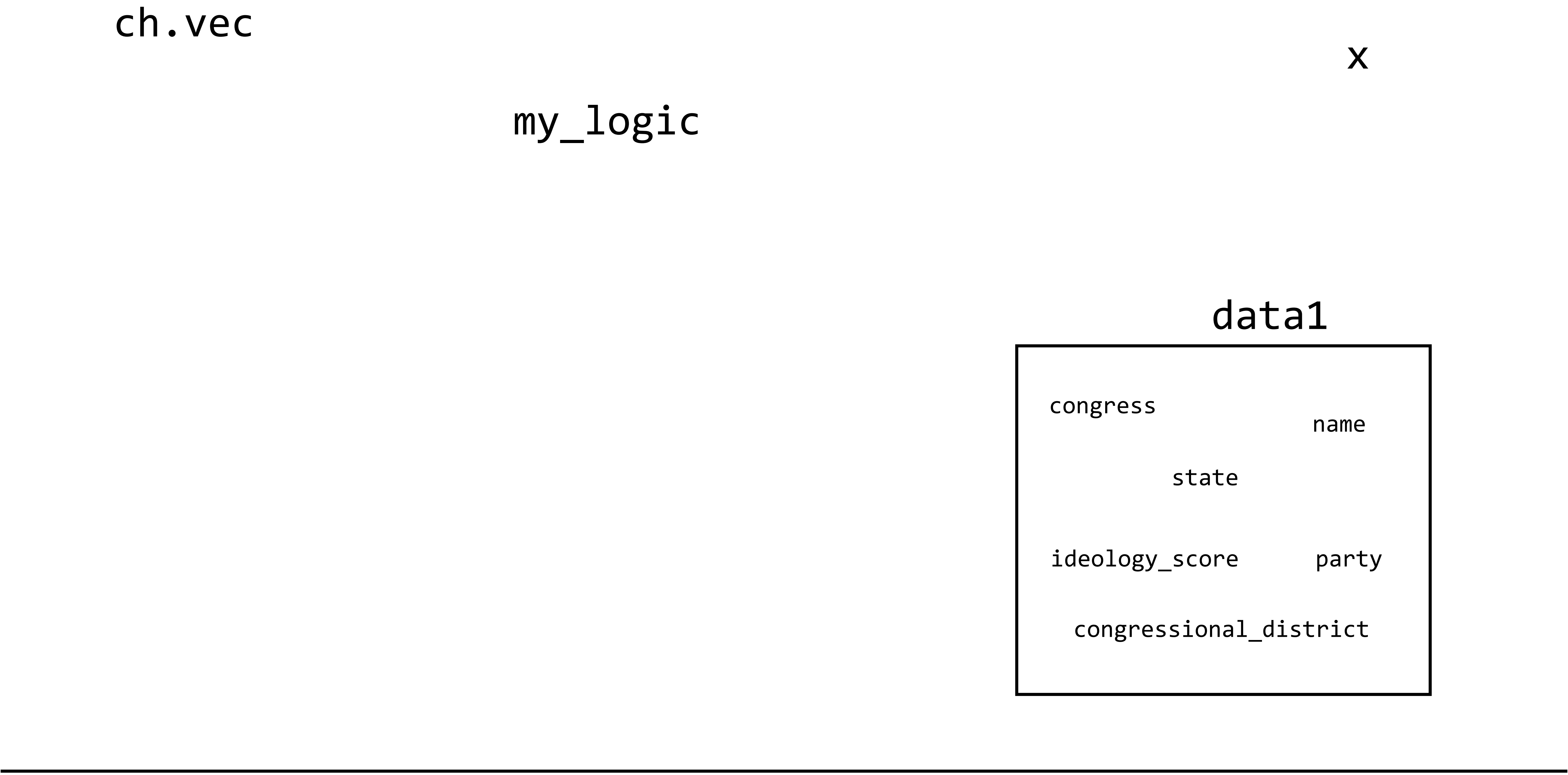
x

my_logic

data1



```
> glimpse(data1)
Observations: 6,159
Variables: 6
$ congress               <int> 100, 100, 100, 100, 100, 100, 1...
$ state                  <fctr> ALABAMA, ALABAMA, ALABAMA, ALA...
$ congressional_district <int> 1, 2, 3, 4, 5, 6, 7, 1, 1, 2, 3...
$ party                  <fctr> Republican, Republican, Democr...
$ name                   <fctr> CALLAHAN, DICKINSON, NICHOLS  ...
$ ideology_score         <dbl> 0.358, 0.349, -0.039, -0.203, -...
```



ch.vec

x

my_logic

data1

congress

name

state

ideology_score

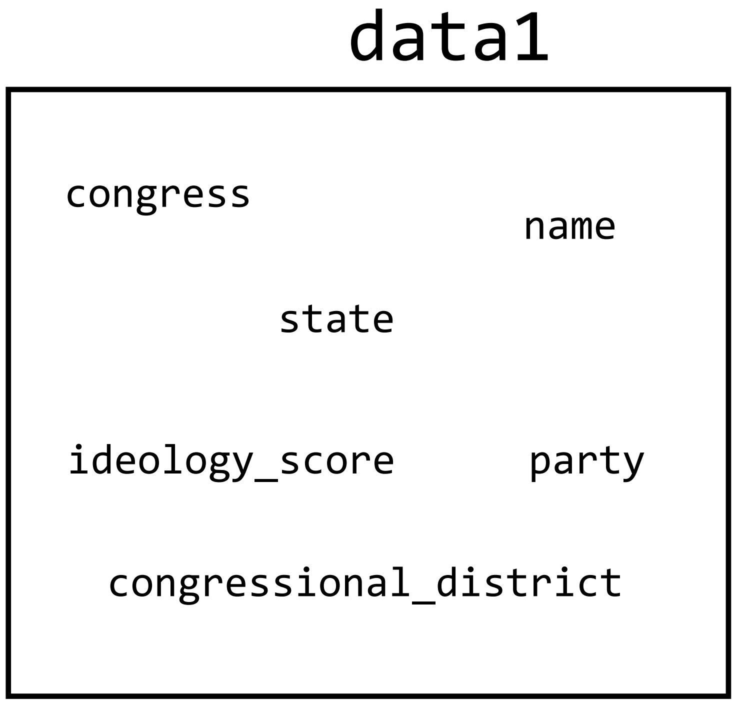
party

congressional_district

ch.vec

x

my_logic



data1

congress

name

state

ideology_score

party

congressional_district

```
submit_times <- readRDS(“data/submit_times.rda”)  # read data
```

ch.vec

x

my_logic

submit_times

[redacted]

data1

congress

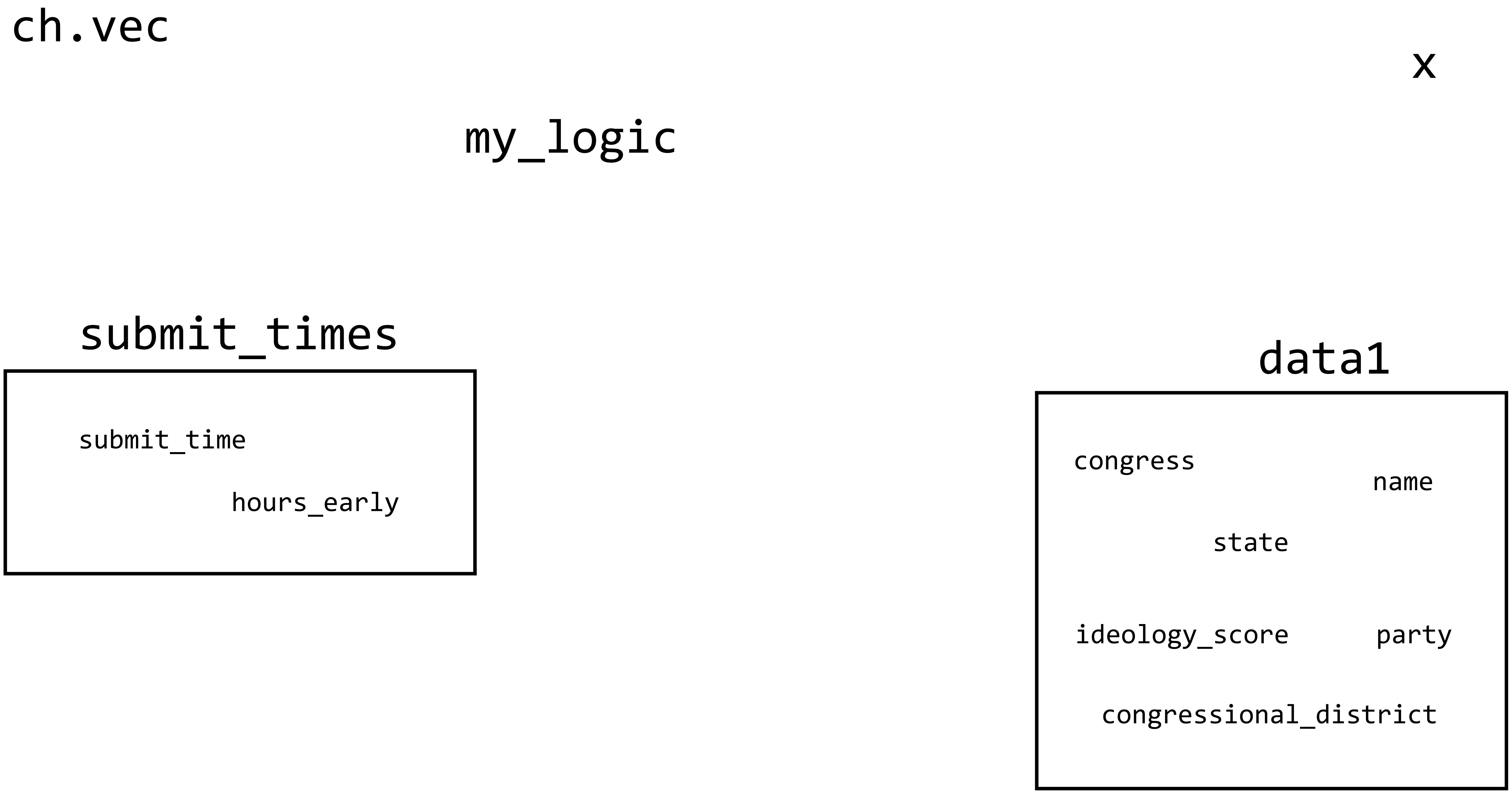
name

state

ideology_score

party

congressional_district



ch.vec

x

my_logic

submit_times

submit_time

hours_early

data1

congress

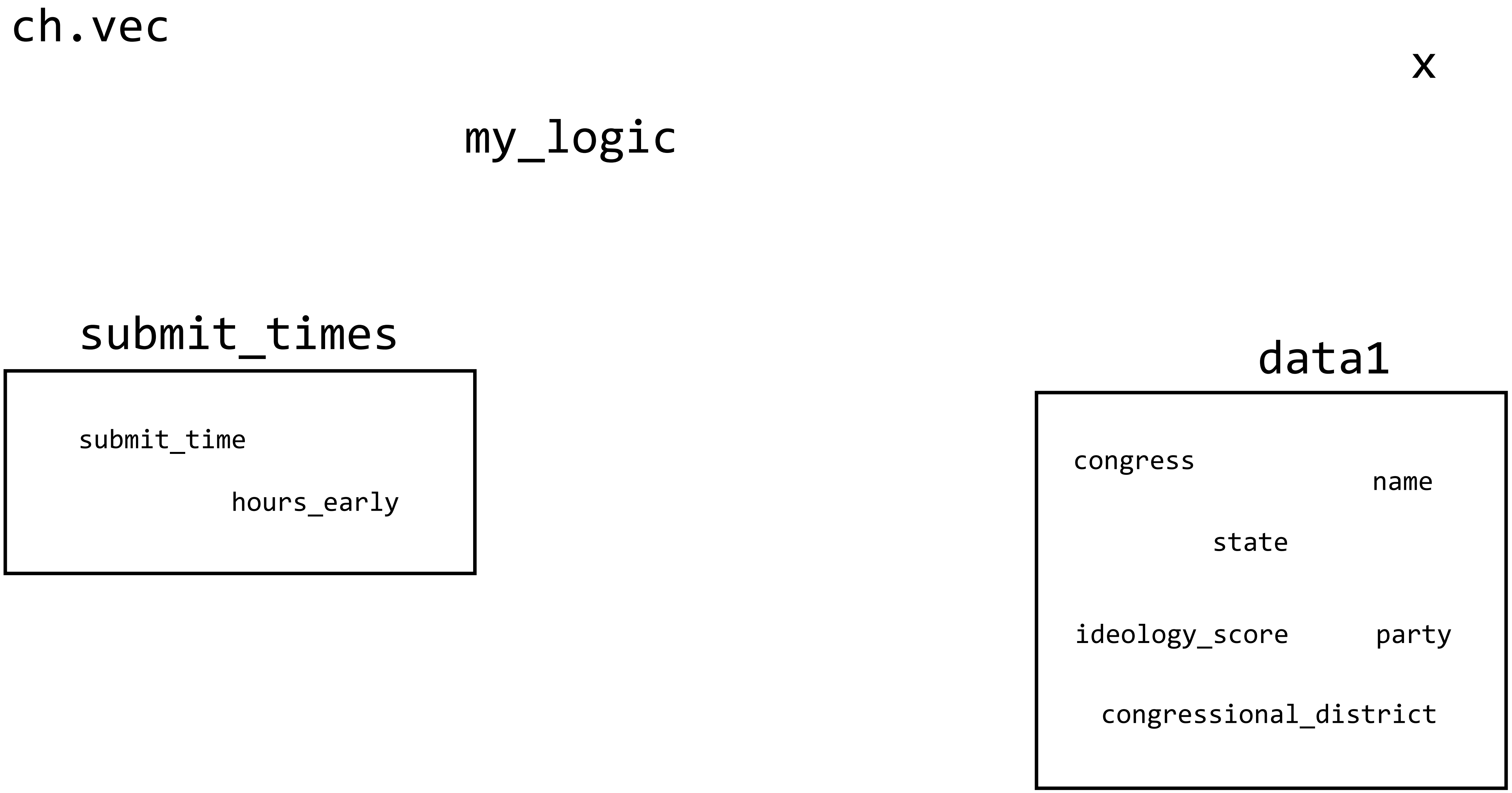
name

state

ideology_score

party

congressional_district



ch.vec

x

my_logic

submit_times

submit_time

hours_early

data1

congress

name

state

ideology_score

party

congressional_district

```
mean(x)  # find the average
```

ch.vec

x

my_logic

submit_times

submit_time

hours_early

data1

congress

name

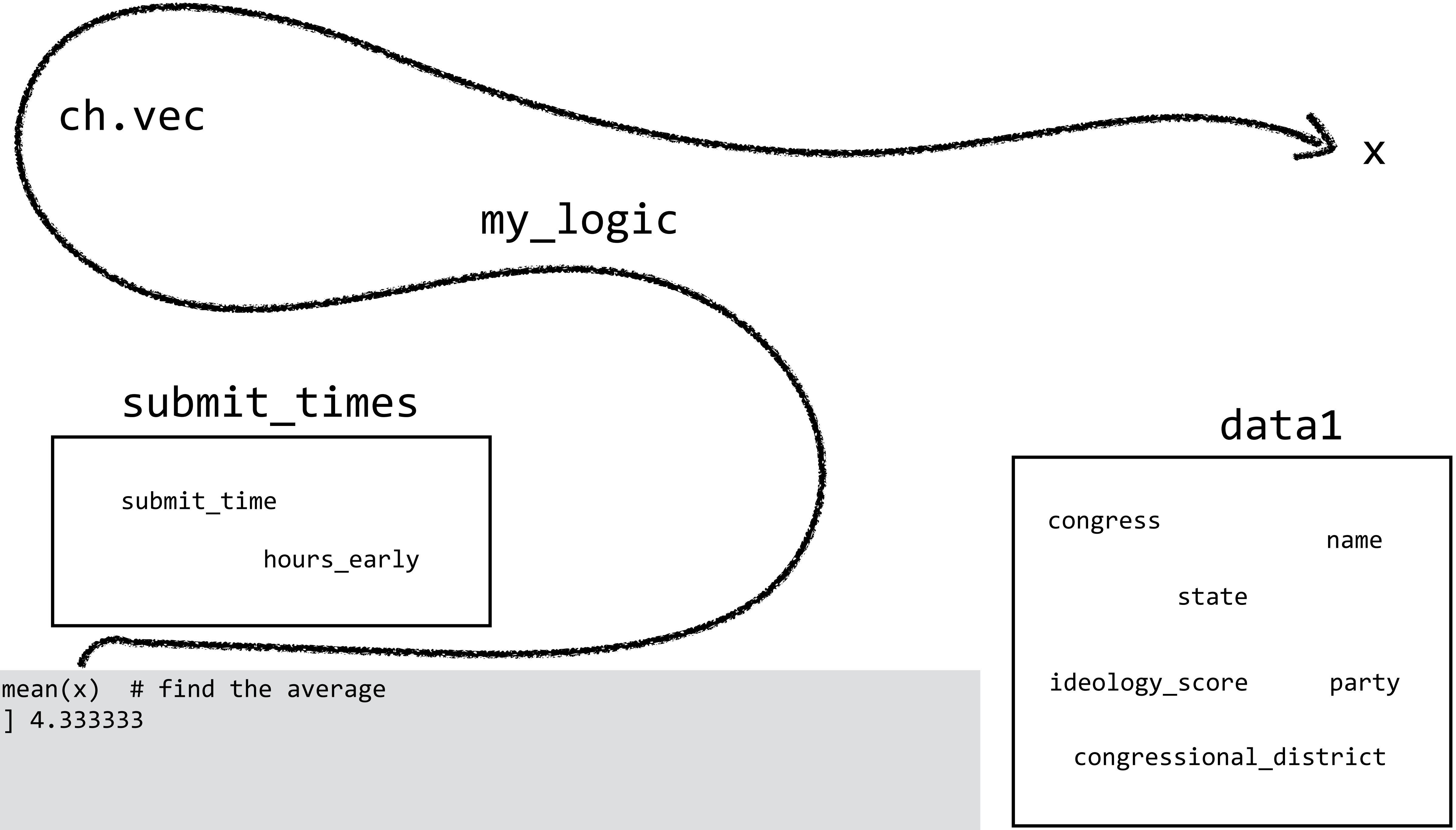
state

ideology_score

party

congressional_district

```
> mean(x)  # find the average
[1] 4.333333
```



ch.vec

x

my_logic

submit_times

submit_time

hours_early

data1

congress

name

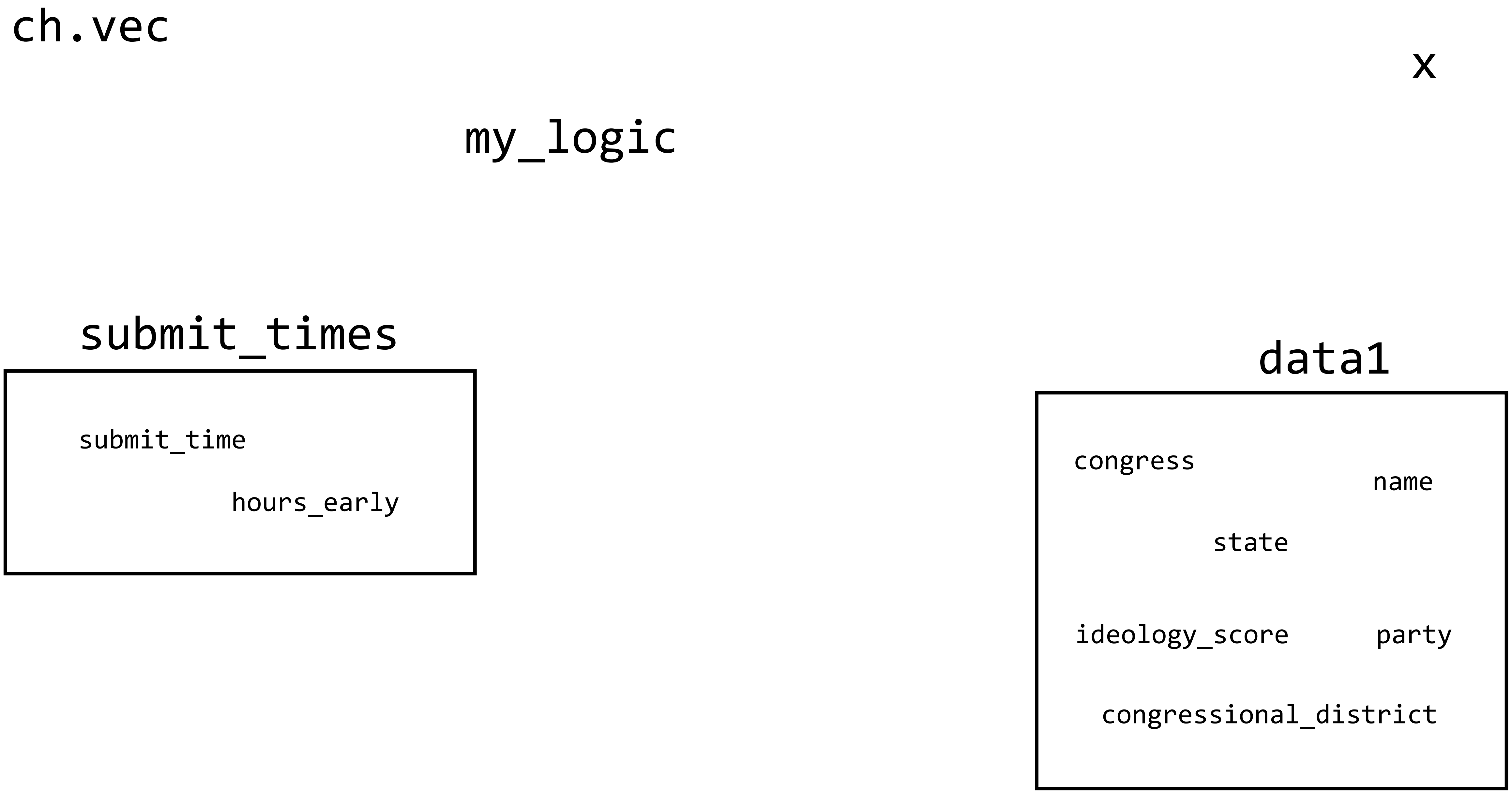
state

ideology_score

party

congressional_district

```
> mean(x)  # find the average
[1] 4.333333
```



ch.vec

x

my_logic

submit_times

submit_time

hours_early

data1

congress

name

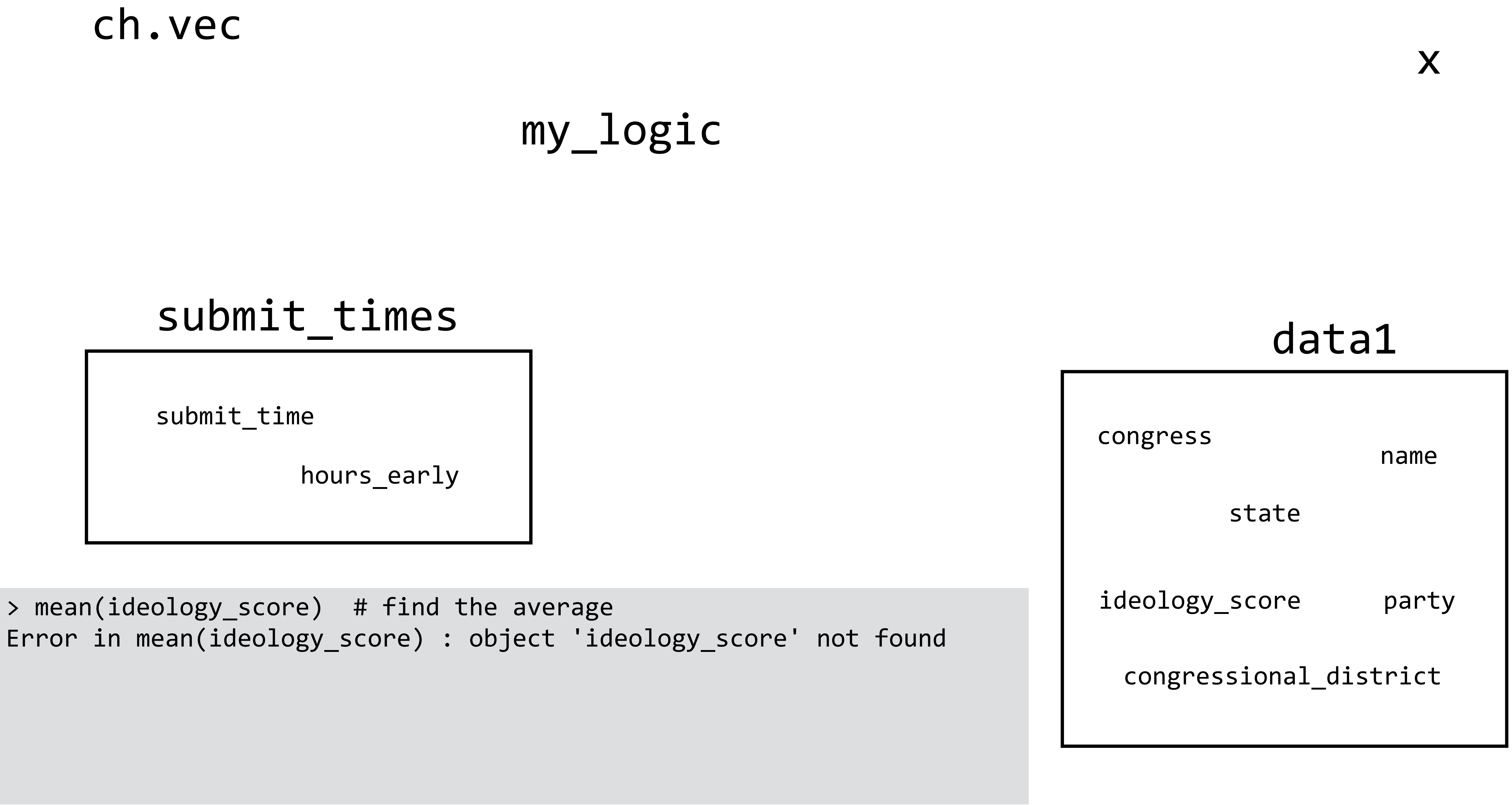
state

ideology_score

party

congressional_district

```
mean(ideology_score)  # find the average
```



ch.vec

x

my_logic

submit_times

submit_time

hours_early

data1

congress

name

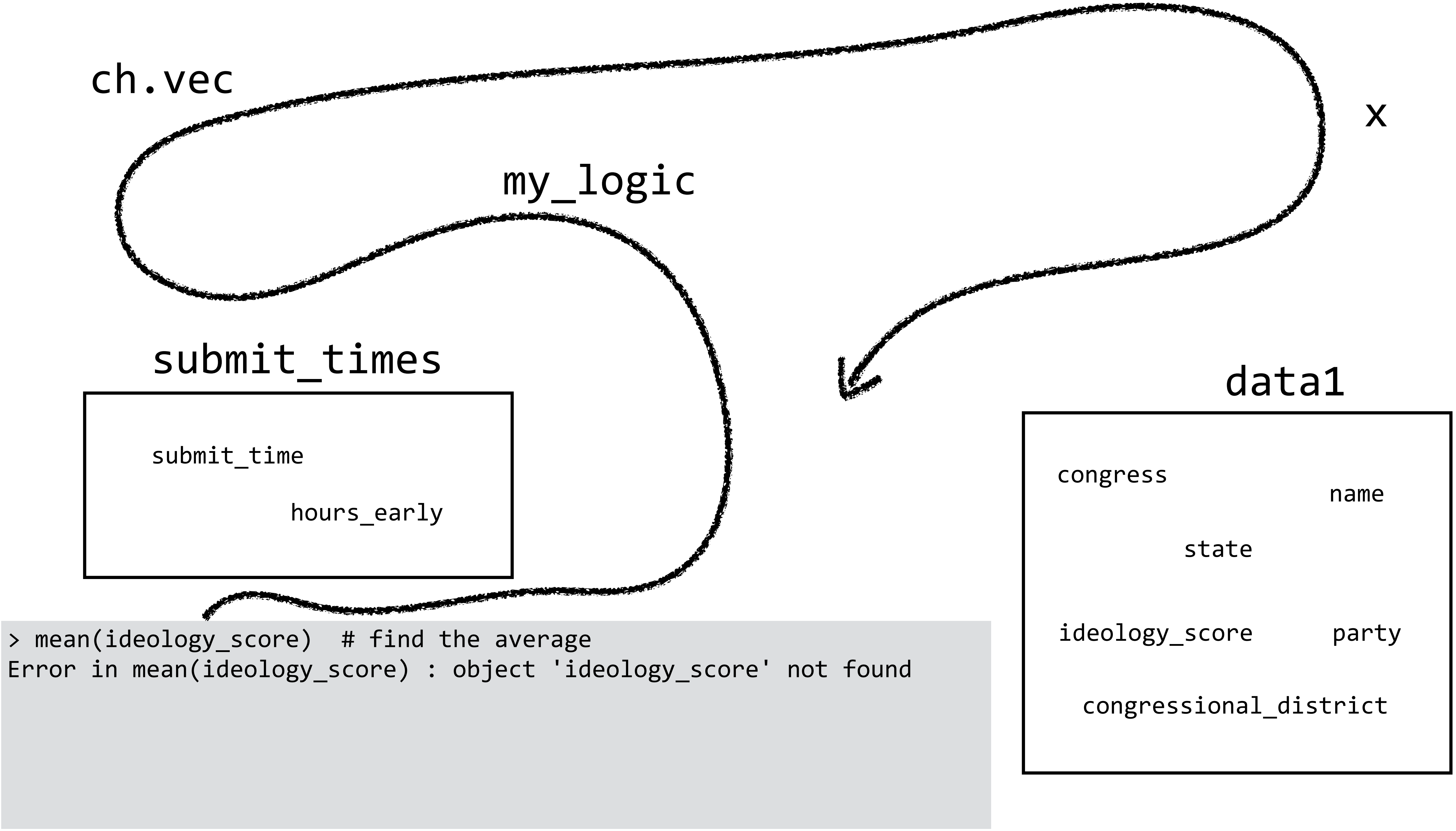
state

ideology_score

party

congressional_district

```
> mean(ideology_score)  # find the average
Error in mean(ideology_score) : object 'ideology_score' not found
```



ch.vec

my_logic

x

submit_times

submit_time

hours_early

data1

congress

name

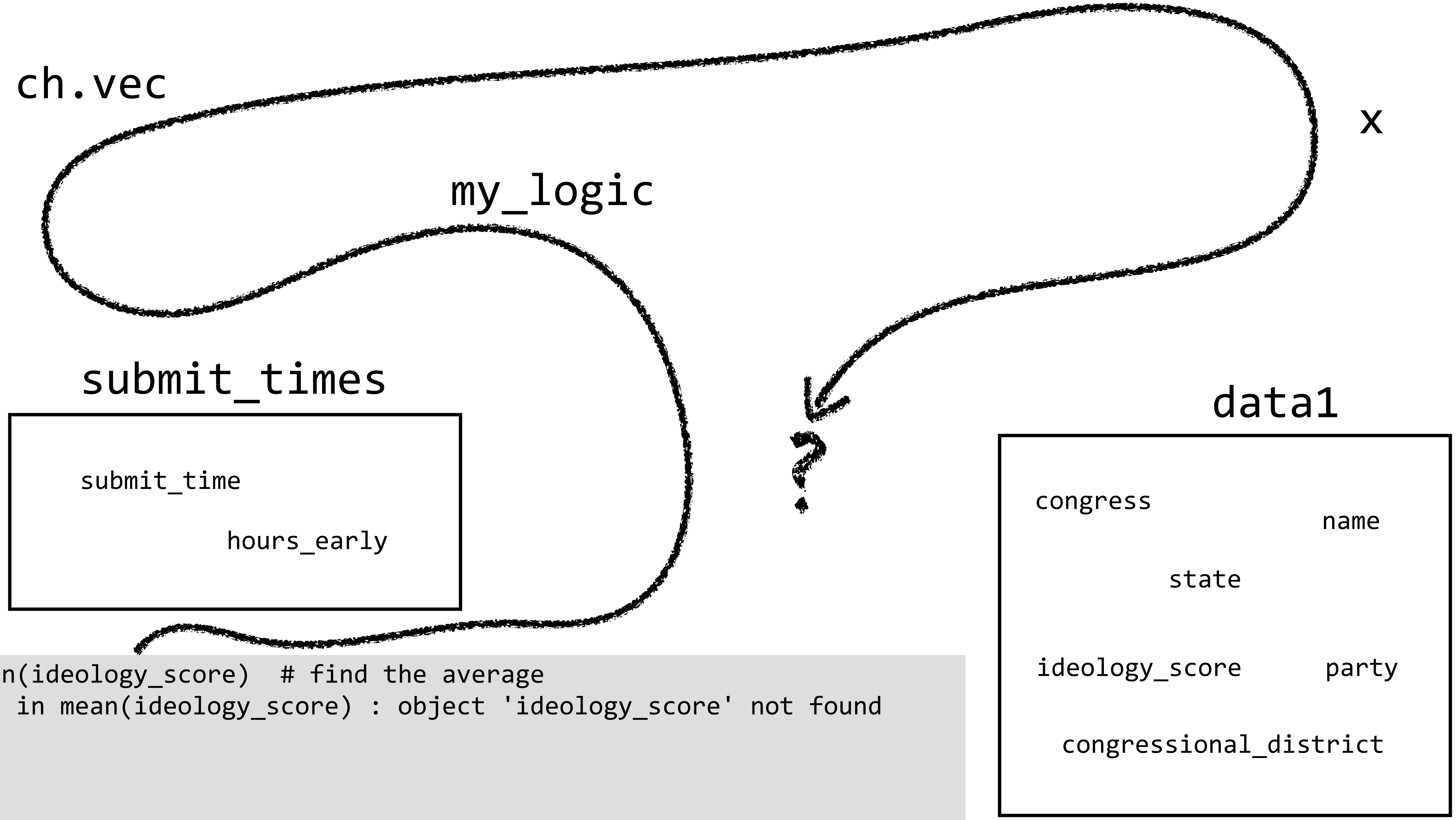
state

ideology_score

party

congressional_district

```
> mean(ideology_score)  # find the average
Error in mean(ideology_score) : object 'ideology_score' not found
```



ch.vec

x

my_logic

submit_times

submit_time

hours_early

?

data1

congress

name

state

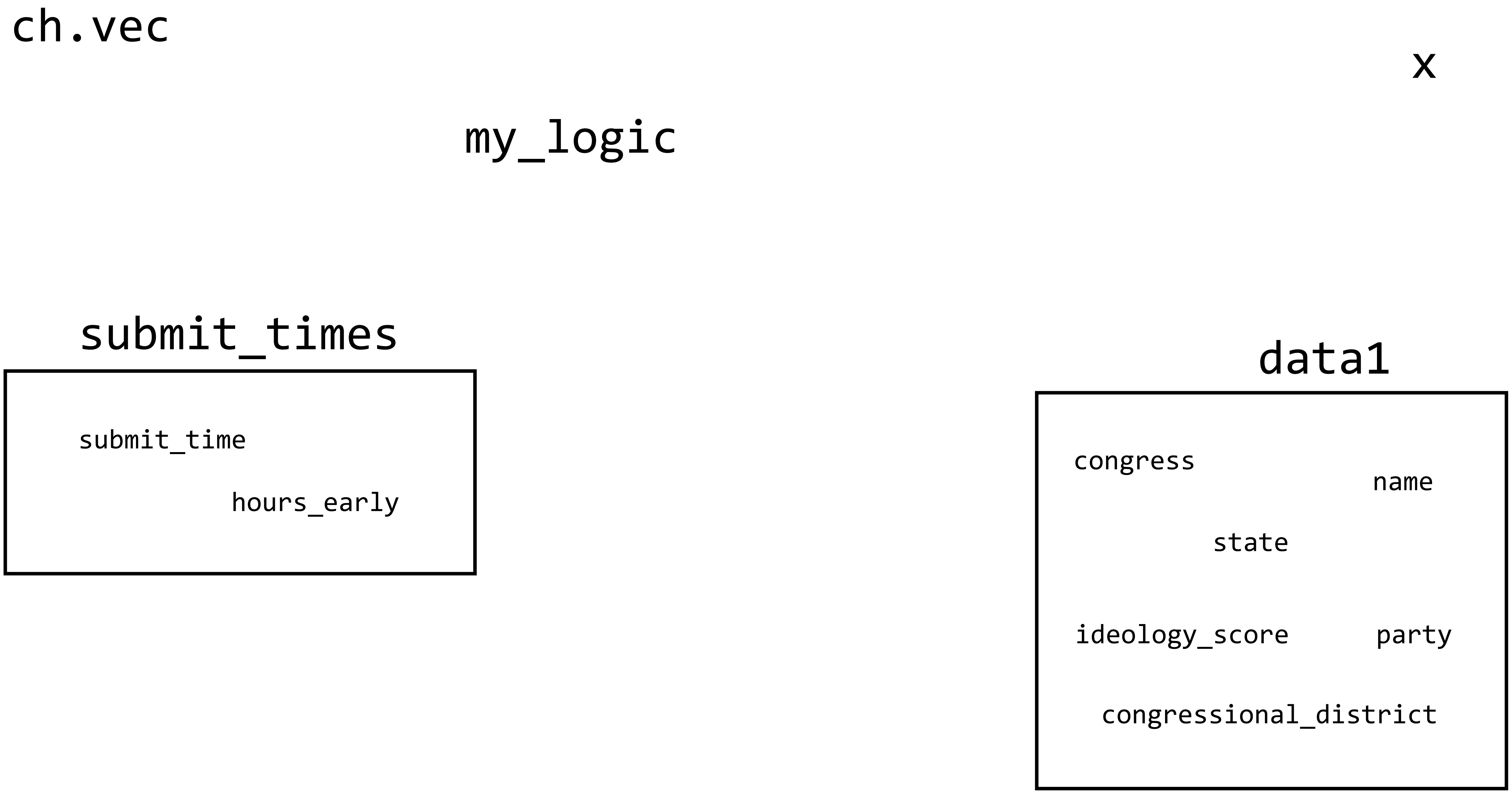
ideology_score

party

congressional_district

```
> mean(ideology_score)  # find the average
Error in mean(ideology_score) : object 'ideology_score' not found
```

When looking for a vector,
R does not look inside data
frames unless you ask it.



ch.vec

x

my_logic

submit_times

submit_time

hours_early

data1

congress

name

state

ideology_score

party

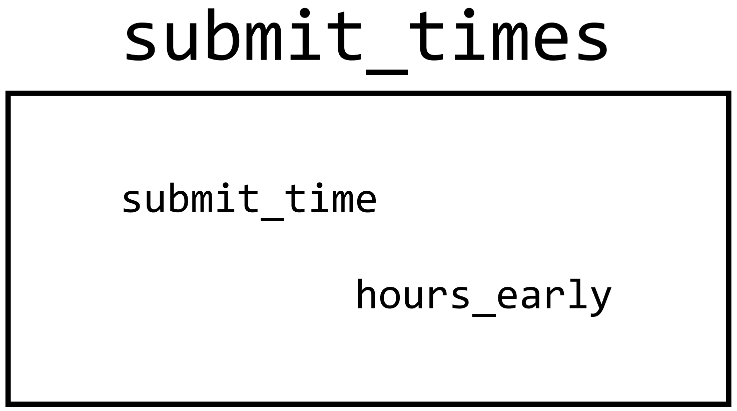
congressional_district

```
mean(data1$ideology_score)  # find the average
```

ch.vec

x

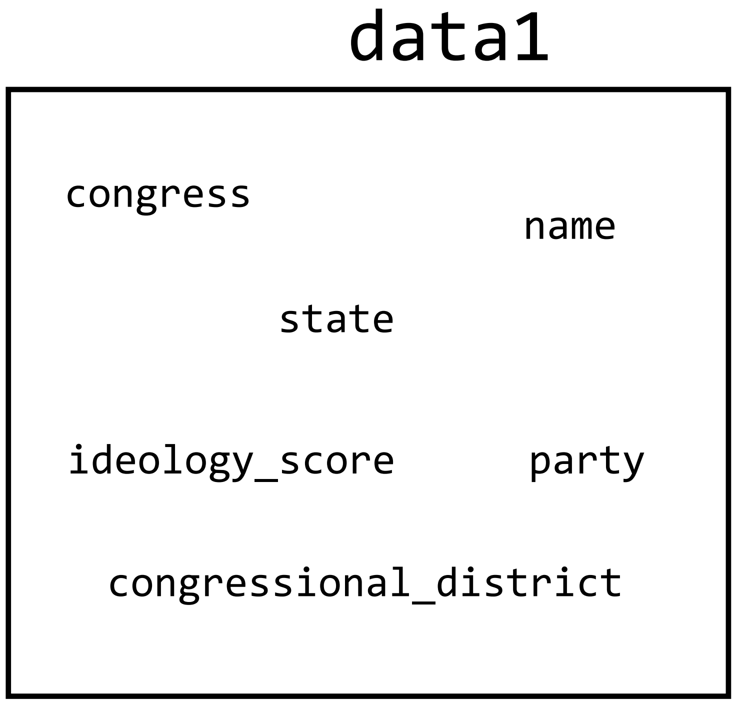
my_logic



submit_times

submit_time

hours_early



data1

congress

name

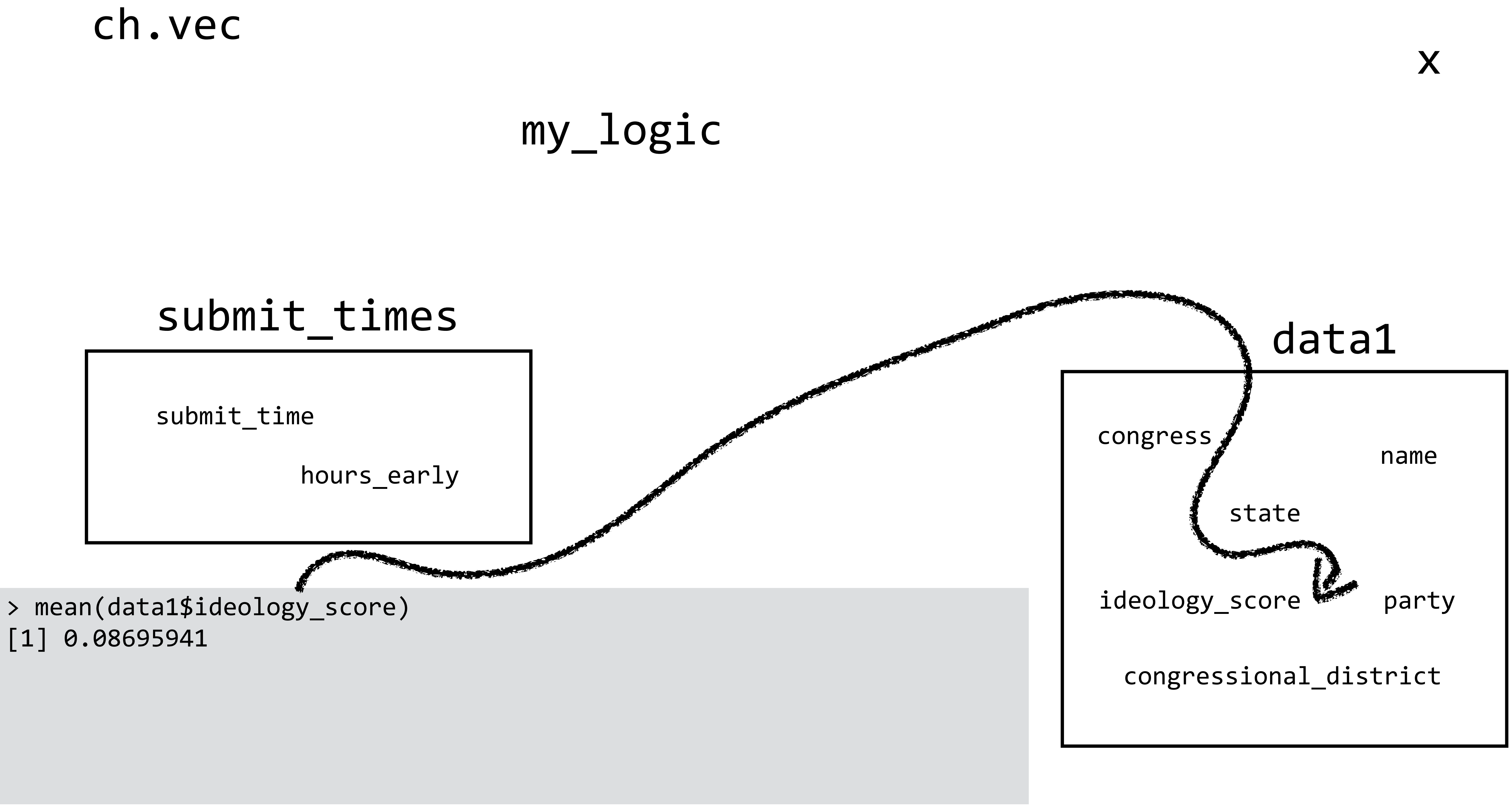
state

ideology_score

party

congressional_district

```
> mean(data1$ideology_score)
[1] 0.08695941
```



```
> mean(data1$ideology_score)
[1] 0.08695941
```

the key syntax

```
data$variable
```

However, **most** functions for modeling and graphing are designed to work with data frames via a `data =` argument, not vectors

However, **most** functions for modeling and graphing are designed to work with data frames via a `data =` argument, not vectors

- no: mean(), sd(), log(), sqrt()

However, **most** functions for modeling and graphing are designed to work with data frames via a `data =` argument, not vectors

- no: mean(), sd(), log(), sqrt()
- yes: ggplot(), lm()

However, **most** functions for modeling and graphing are designed to work with data frames via a `data =` argument, not vectors

- no: mean(), sd(), log(), sqrt()
- yes: ggplot(), lm()

If the function takes (and you supply) a data argument, then you do **not** need to use `data$variable`.