Can you trust the humble statistician? An intro to unit testing in R

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THINGS I KNOW ABOUT UNIT TESTING

WHAT IS UNIT TESTING?

- Systematically testing the (feasibly) smallest sections (i.e. units) that make up your project.
- Aim is to verify they work as expected:
  - Given control data, does your function return what you know it should?
  - Is returned information in the correct data form?
  - Do invalid inputs get handled correctly as failures?

Why should you do it?

Code design

- Thinking about correct inputs and outputs early on leads to well designed procedure.
- Write better code—concise, focused functions are easier to test.
- Helps identify special cases—before the someone using your code does.

Bug detection

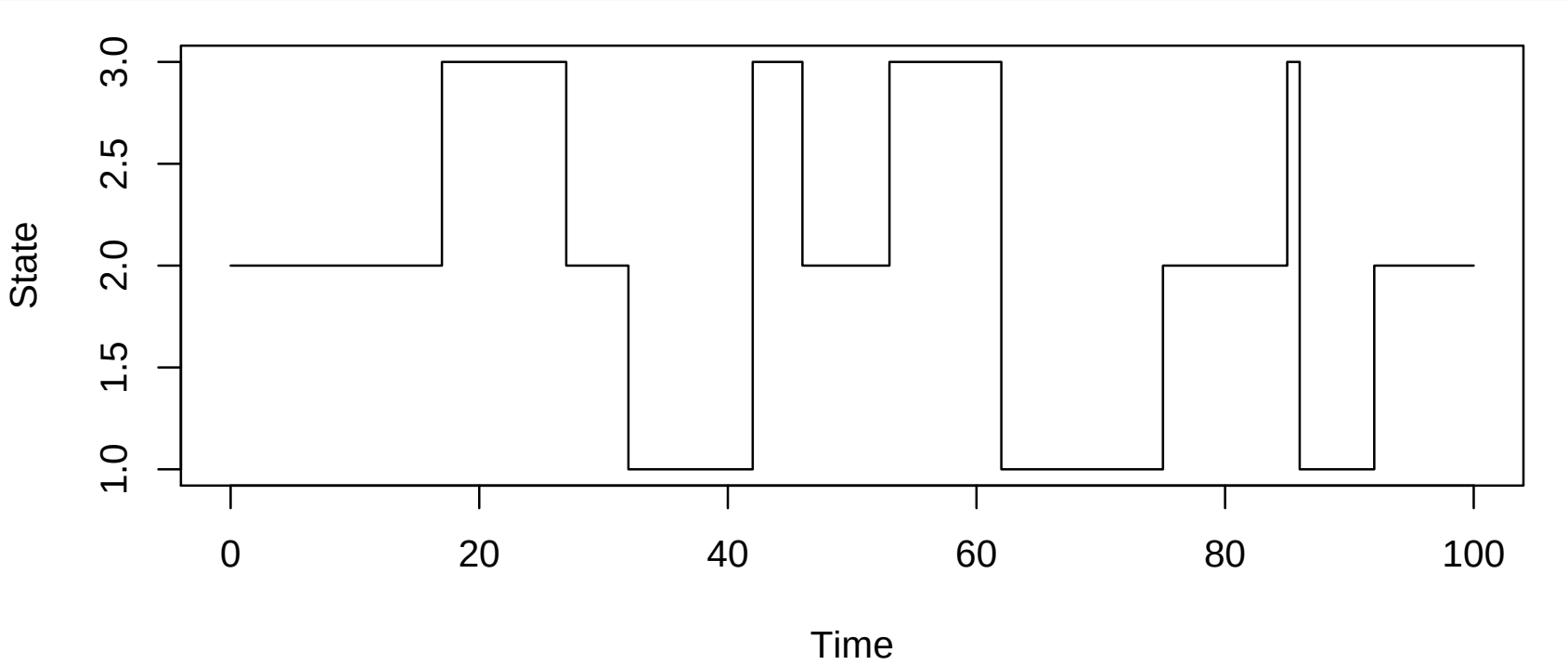
- Easier to identify a bug when a procedure is written rather than after it has been integrated into a larger program.
- Detects change of functionality in updated code.

THERE'S AN R PACKAGE FOR THAT

`RUnit` provides functions that enable unit testing in R

- `checkEquals`—compare your function output is the same as what you expected.
- `checkEqualNumeric`—ignores attributes.
- `checkIdentical`—no tolerance for small errors and checks storage type (e.g. integer vs. float).
- `checkTrue`—equivalent to `checkEquals(..., TRUE)`.
- `checkException`—check that a function with invalid input produces an error message.

Let's crowbar some stats in here



State	2	3	2	1	3	2	3	1	2	3	1	2	2
Time	0	17	27	32	42	46	53	62	75	85	86	92	100

THINGS I WANT HELP WITH

How do you test a simulation?

$$G = \begin{pmatrix} -0.20 & 0.08 & 0.12 \\ 0.05 & -0.10 & 0.05 \\ 0.40 & 0.00 & -0.40 \end{pmatrix}$$

- Set the current time, $t \leftarrow t_0$, and state, $s \leftarrow s_0$
- Generate $t^* \sim \text{Exp}(\lambda_s)$
- While $(t + t^* \leq t_{\text{end}})$:
  - Generate s^* from the discrete distribution with probabilities $q_{s,i}$ for $i = \{1, \ldots, s-1, s+1, \ldots, n\}$
  - Update $t \leftarrow t + t^*$, $s \leftarrow s^*$ and store
  - Generate $t^* \sim \text{Exp}(\lambda_s)$
- Store final state t_{end}, s