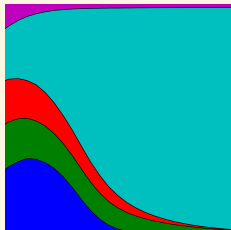
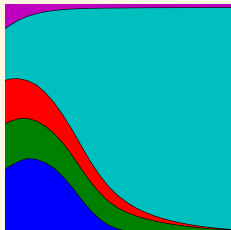


# Reproducible Science Reinforcement Learning Evolution

Vince: @drvinceknight



Software  
Sustainability  
Institute



Software  
Sustainability  
Institute



> 70%

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & -1 & 1 & 0 \\ 0 & 1 & -1 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

"The proof is left as an exercise for the reader."

> 70%



**Ian Holmes**

@ianholmes

 Follow

You can download our code from the URL supplied. Good luck downloading the only postdoc who can get it to run, though [#overlyhonestmethods](#)

RETWEETS

**339**

LIKES

**123**



8:52 a.m.

**Retweet**







**Tim Head**

@betatim

Following



The thing to take away from this whole panicked GitHub (backed by one of the largest software companies in the world) to GitLab (VC funded startup) exodus: you should be putting your code into long term archival like [@ZENODO\\_ORG](#) if you care about it being available

9:10 PM - 5 Jun 2018

3 Retweets 14 Likes



5



3



14





**James Campbell**

@JamesCampbell95

Following



Finally, they use [@opentimestamps](#) to submit hashes of the manuscript and source [#Git](#) commit to the [#Bitcoin](#) [#Blockchain](#). These timestamps are immutable and irrefutable proof that the specified version of the manuscript existed at the specified time.

4/4

5:57 PM - 15 May 2018

1 Retweet 17 Likes



2



1



17





**Lego Grad Student**

@legogradstudent

Following



Heeding some of your suggestions about version control issues, I've just tried installing git.

I can't help but feel that it is designed to be borderline inaccessible so that people who do use it can be smug.

7:46 PM - 30 Mar 2018

81 Retweets 1,016 Likes



93 81 1.0K



Tweet your reply



**Lego Grad Student** @legogradstudent · Mar 31



Interacting with a deluge of impassioned version control proselytizers has led to one of the most alarming days I have ever spent on Twitter.

13 11 237

Technology

Culture

Software  
Sustainability  
Institute

<https://www.software.ac.uk/>



**RSE**

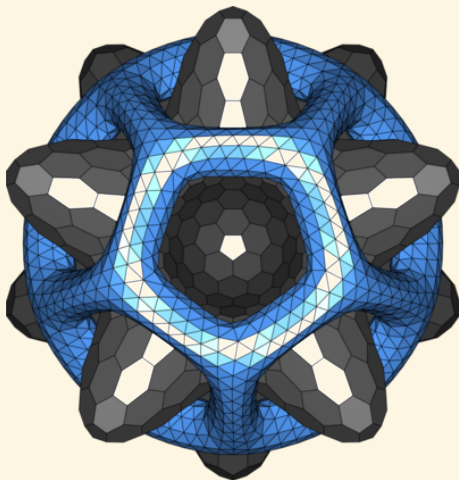
**RESEARCH SOFTWARE  
ENGINEERS ASSOCIATION**

<http://rse.ac.uk/>



**THE  
CARPENTRIES**

<https://carpentries.org/>



<http://joss.theoj.org/>



*For example...*



**Kirsty MacLeod**

@kirstyjean

Following



Me: sets up flawless heat competition trial,  
lizards will fight over hot podium, there can  
only be one winner!

Lizards:

#ALLizards2017



**Kirsty MacLeod**

@kirstyjean

Following



Me: sets up flawless heat competition trial,  
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only be one winner!

Lizards:

#ALlizards2017



$$\begin{pmatrix} 3 & 0 \\ 5 & 1 \end{pmatrix}$$



Robert Axelrod



Robert Axelrod

```
>>> import axelrod as axl

>>> players = (axl.TitForTat(),
...            axl.Cooperator())
>>> axl.Match(players, turns=5).play()
[(C, C), (C, C), (C, C), (C, C), (C, C)]

>>> players = (axl.TitForTat(),
...            axl.Defector())
>>> axl.Match(players, turns=5).play()
[(C, D), (D, D), (D, D), (D, D), (D, D)]

>>> players = (axl.TitForTat(),
...            axl.Alternator())
>>> axl.Match(players, turns=5).play()
[(C, C), (C, D), (D, C), (C, D), (D, C)]
```



**Vincent Knight**

@drvinceknight

Python/git - Axelrod's 'evolution of cooperation' trnmnt: [Blog post]:  
[goo.gl/zkgSkc](http://goo.gl/zkgSkc) [github]:  
[github.com/drvinceknight/...](https://github.com/drvinceknight/) #gametheory



**drvinceknight/Axelrod**

A repository used to reproduce Axelrod's tournament



[View on web](#)

RETWEETS

2

FAVORITES

3



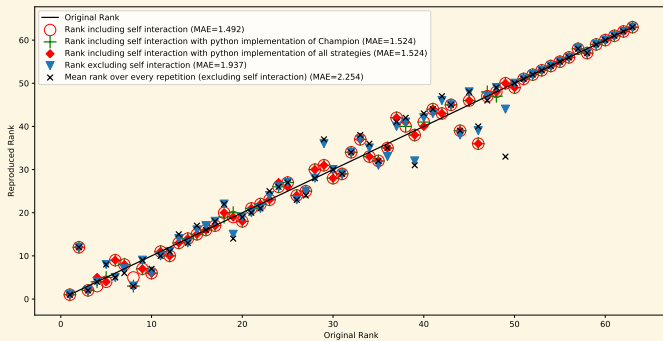
12:54 PM - 20 Feb 2015

59

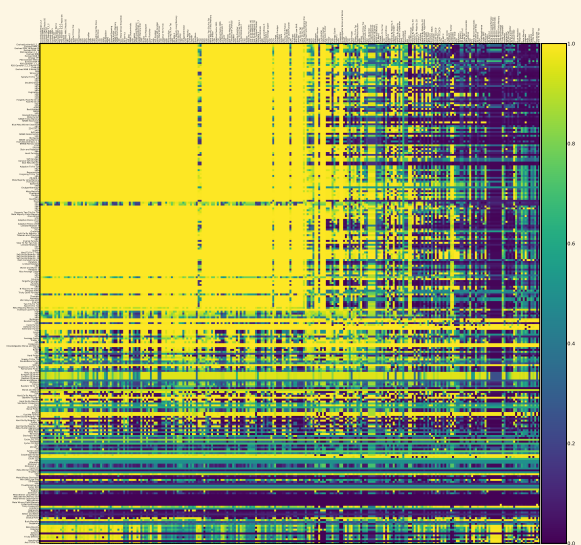


```
FUNCTION K92R(J,M,K,L,R, JA)
C BY ANATOL RAPOPORT
C TYPED BY AX 3/27/79 (SAME AS ROUND ONE TIT FOR TAT)
c replaced by actual code, Ax 7/27/93
c T=0
c K92R=ITFTR(J,M,K,L,T,R)
  k92r=0
  k92r = j
c test 7/30
c write(6,77) j, k92r
c77 format(' test k92r. j,k92r: ', 2i3)
RETURN
END
```

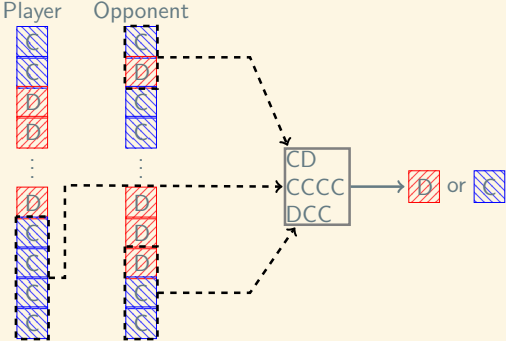
```
import AxelrodFortran
```



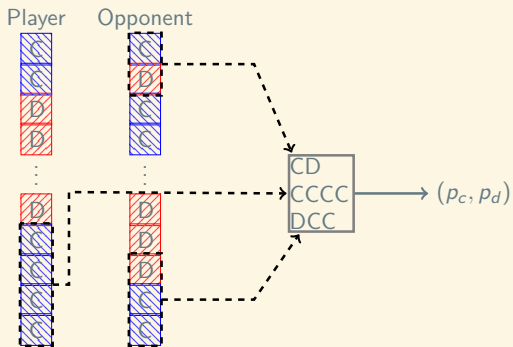




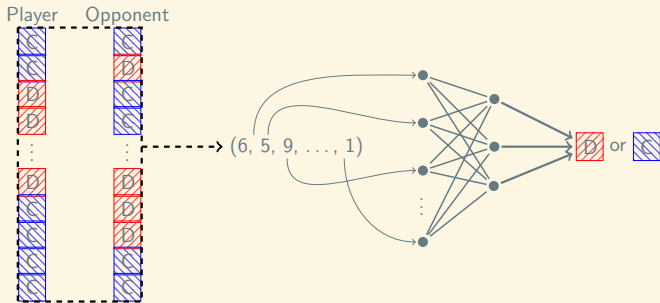
# Lookup



# Gambler

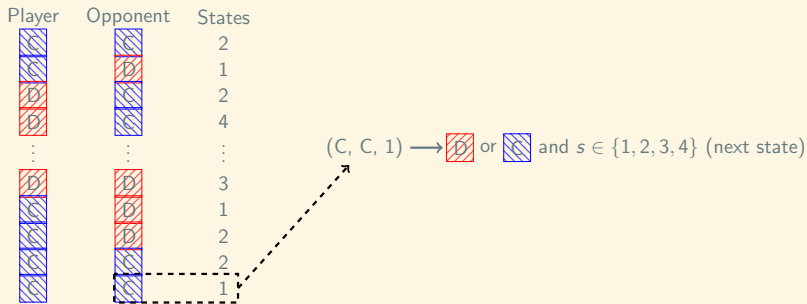


# Neural network

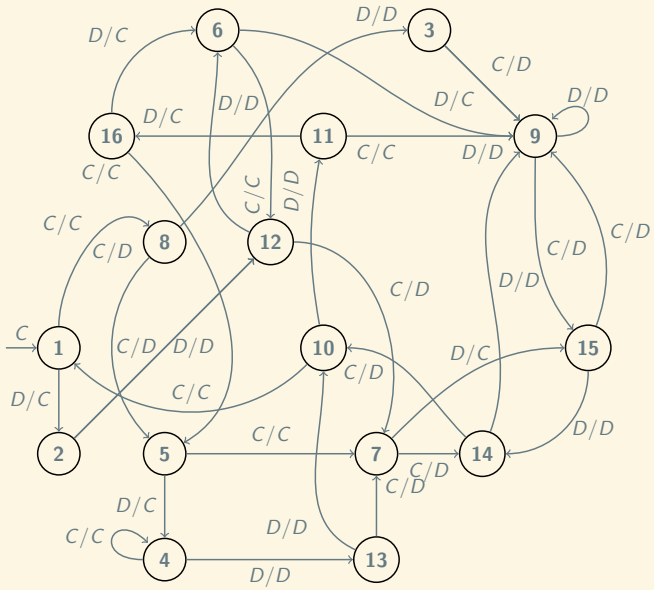


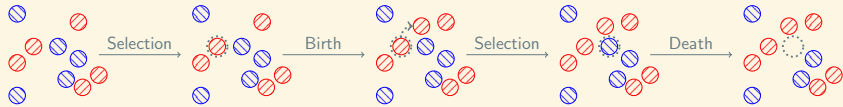


# Finite State Machine



```
import AxelrodDojo
```





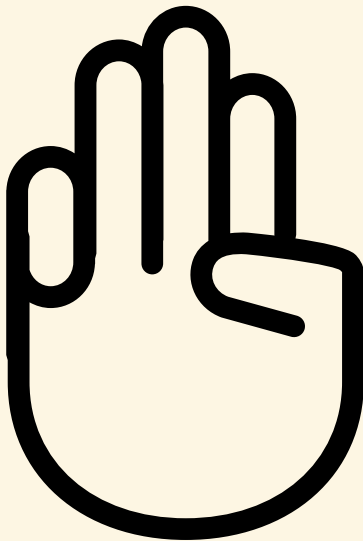


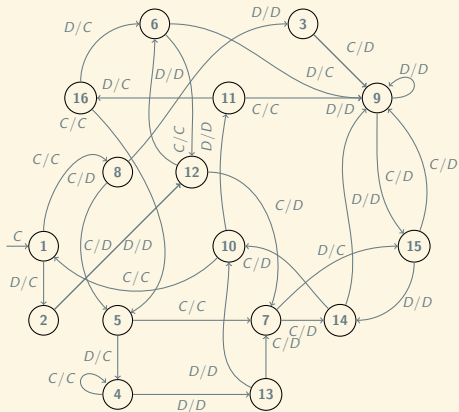
Image made by <http://www.freepik.com> from <https://www.flaticon.com> is licensed by CC BY 3.0

**Invasion ( $N = 14$ )**

	Player	Min	5th %	Mean	Median	95th %	Max
1	Evolved FSM 16	0.000	0.0054	0.2096	0.079	0.7241	0.842
2	PSO Gambler 2_2_2	0.000	0.0113	0.2042	0.079	0.5940	0.842
3	EvolvedLookerUp2_2_2	0.000	0.0270	0.2014	0.079	0.6608	0.840
4	Evolved ANN	0.002	0.0164	0.2014	0.079	0.5939	0.842
5	Evolved ANN 5	0.002	0.0505	0.2004	0.079	0.5940	0.834
6	Evolved HMM 5	0.000	0.0321	0.1972	0.079	0.5940	0.842
7	PSO Gambler 1_1_1	0.001	0.0455	0.1955	0.079	0.6150	0.841
8	Fool Me Once	0.002	0.0058	0.1955	0.079	0.5940	0.842
9	Evolved FSM 16 Noise 05	0.003	0.0607	0.1943	0.079	0.5930	0.842
10	PSO Gambler Mem1	0.000	0.0517	0.1920	0.079	0.6118	0.841
11	Evolved FSM 4	0.000	0.0000	0.1918	0.079	0.5930	0.842
12	Meta Hunter	0.000	0.0049	0.1869	0.079	0.5883	0.840
13	Evolved ANN 5 Noise 05	0.001	0.0303	0.1858	0.079	0.5930	0.840
14	Omega TFT	0.003	0.0704	0.1849	0.079	0.5939	0.840
15	Fortress4	0.000	0.0000	0.1848	0.066	0.5919	0.840
16	<b>TF3</b>	0.002	0.0041	0.1846	0.079	0.6190	0.842

Resistance ( $N = 14$ )

	Player	Min	5th %	Mean	Median	95th %	Max	Std
1	CS	0.921	0.9970	0.9984	1.000	1.0	1.0	0.0062
2	<b>TF1</b>	0.938	0.9950	0.9973	0.999	1.0	1.0	0.0069
3	<b>TF2</b>	0.925	0.9820	0.9949	0.996	1.0	1.0	0.0104
4	Predator	0.836	0.9912	0.9941	0.999	1.0	1.0	0.0212
5	Prober 4	0.895	0.9110	0.9863	0.996	1.0	1.0	0.0250
6	Handshake	0.514	0.9131	0.9812	0.999	1.0	1.0	0.0743
7	Winner21	0.921	0.9210	0.9778	0.996	1.0	1.0	0.0310
8	Hard Prober	0.916	0.9160	0.9731	0.995	1.0	1.0	0.0327
9	Fortress4	0.929	0.9290	0.9726	0.981	1.0	1.0	0.0287
10	Ripoff	0.919	0.9190	0.9669	0.978	1.0	1.0	0.0318
11	Tester	0.919	0.9190	0.9662	0.977	1.0	1.0	0.0320
12	Grudger	0.921	0.9210	0.9592	0.921	1.0	1.0	0.0390
13	<b>TF3</b>	0.921	0.9210	0.9589	0.921	1.0	1.0	0.0388
14	Davis	0.921	0.9210	0.9588	0.921	1.0	1.0	0.0387
15	Retaliate 3	0.921	0.9210	0.9580	0.921	1.0	1.0	0.0383
16	Retaliate	0.921	0.9210	0.9576	0.921	1.0	1.0	0.0382



TF1 #1	TF1 #2
<b>1: C</b>	<b>1: C</b>
<b>8: C</b>	<b>8: C</b>
<b>5: D</b>	<b>5: D</b>
4: C	4: C
4: C	4: C
4: C	4: C
4: C	4: C
4: C	4: C



164

~~164~~ 213+

Julie Rymer - @Chadys - (10 May 2017):

And I really wanted to thank you all, I discovered your project because of a course where we needed to participate in an open source project, and I had the occasion to compare the welcome me and my coworkers received here compared to other people from my class who worked on different project. And I've got to said you are awesome on that part and on the help your provide to newbies I like your project so I'll try to continue to contribute now and then !

- ▶ @NikoletaGlyn
- ▶ @opcampbell
- ▶ marcharper.codes
- ▶ [github.com/Axelrod-Python/Axelrod](https://github.com/Axelrod-Python/Axelrod)
- ▶ [gitter.im/Axelrod-Python/Axelrod](https://gitter.im/Axelrod-Python/Axelrod)
- ▶ [arxiv.org/abs/1707.06920](https://arxiv.org/abs/1707.06920)

@drvinceknight

- ▶ [software.ac.uk](https://software.ac.uk)
- ▶ [rse.ac.uk](https://rse.ac.uk)
- ▶ [carpentries.org](https://carpentries.org)
- ▶ [joss.theoj.org](https://joss.theoj.org)