
Canopy: A Reinforcement Learner

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tl;dr: Naive Bayes Markov Decision Process

1. Bookkeeping

1.1. Canopy code

The Ziptie Python package is hosted in a [Codeberg repository](#) with mirrors on [GitLab](#) and [GitHub](#).

The README of the repo has instructions for installation and examples of how to integrate it into your project.

1.2. Versions

The **latest version** of this document and all the files needed to render it are in [this Codeberg repository](#). There's a backup copy in [this repository on GitHub](#). [this repository on GitLab](#).

I don't expect this doc to ever be done. I'm always learning new things, or thinking of a better way to explain something, or I do a new piece of work I can't help myself from including. And there's always one more bug. Since it's a git repository, you are free to browse past commits to watch the evolution, but I'll try to keep a running record of important updates here.

- **December 2, 2023.** Rough outline of how Ziptie works and how it's related to the rest of the algorithmic world.
- **December 12, 2023.** The first edition is complete enough that I felt OK about telling the world.
- **December 17, 2023.** Added a section on computational complexity and implementation considerations.

1.3. History

Ziptie didn't start life in its current form. It actually has a long and very boring history.

- **2011.** As the method was taking shape, I published a flurry of posters and write-ups in small conferences:

GCNC,¹ AGI,² ICDL/EpiRob,³ BICA,⁴ AAAI Symposium on Designing Intelligent Robots.⁵ Originally Ziptie was developed as part of a larger project, a cognitive architecture originally called the Brain Emulating Cognition and Control Architecture. It shows up in that context until it gets split out on its own later. The cognitive architecture undergoes a lot of evolution, and other components come and go, but Ziptie is the closest thing it has to a fixed point.

- **2012-01-14.**

The **oldest version** of the code I can find. At this point Ziptie was called Grouper and was written in MATLAB. A lot of details have changed since this point, but the accumulation of coactivation as a clustering mechanism has not. [Matt Chapman](#) was an early collaborator and helped me transition the code from the private research repo I'd been developing into something more public.

- **2012-02-20.** This is the **first incarnation** of the code in Python. It was written by [Alejandro Dubrovsky](#) (GitHub user name *alito*) who generously ported the MATLAB code to Python as part of an epic weekend grind fest.
- **2012-04-20.** I started using the term "coactivation" in the code and documentation.
- **2012-06-26.** "Grouper" is renamed "**Perceiver**".
- **2012-06-26.** "Perceiver" is renamed "**Map**".
- **2013-05-09.** "Map" is renamed "**Ziptie**".

¹Rohrer, B., Morrow, J.D., Rothganger, F., Xavier, P. (2011) *BECCA: A functional model of the human brain for arbitrary task learning*. Grand Challenges in Neural Computation 2011.

²Rohrer, B. (2011) *An implemented architecture for feature creation and general reinforcement learning*. Workshop on Self-Programming in AGI Systems, AGI 2011.

³Rohrer, B. (2011) *A developmental agent for learning features, environment models, and general robotics tasks*. ICDL/Epirob 2011.

⁴Rohrer, B. (2011) *Biologically inspired feature creation for multi-sensory perception*. BICA 2011.

⁵Rohrer, B. (2012) *BECCA: Reintegrating AI for natural world interaction*. AAAI Spring Symposium on Designing Intelligent Robots: Reintegrating AI 2012.

- **2015-01-13.** The home repository for the code is moved to [brohrer/robot-brain-project](#).
- **2015-06-10.** I started using Numba to get everything to run faster.
- **2018-10-01.** This is [the last commit](#) in the GitHub robot-brain-project repository.
- **2018-11-08.** The [Ziptie code](#) is split out into its own repository.

1.4. Citations

If you end up using Ziptie in your work, give it a shout out. Here's an APA example you can copy and paste. (You may have to fiddle with the dates.)

Rohrer, B. (2023). Ziptie: Learning Useful Features [White Paper]. Retrieved January 30, 2024, from <https://brandonrohrer.com/ziptie>

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1.6. Contact Me

I'm at brohrer@gmail.com. You're welcome to email me at any time for any reason. I don't guarantee I'll respond, but I try to. If you're so inclined, drop me a note. I love to hear about how Canopy is being used. It gives me ideas for how to make it better. And if you call out a typo you found in the paper, I'll be forever grateful.