Bandit networks

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Abstract

A single-agent multi-armed bandit (MAB) problem is a problem in which a gambler, being in face of several slot machines, has to decide which machines to play, how many times and in which order to play each machine. In this project, we consider a multi-agent MAB scenario in which a group of agents connected through a social network are engaged in playing a stochastic MAB game and focus on minimizing their regret. Every time a player takes an action, the reward is observed by both the agent and its neighbors in the network. The goal of this project is to understand different collaborative policies (NAIC-type and FYL) described in [1], and to compare their performance over different network structures.

1 Introduction

2 ...

3 Theoretical contributions

Preprint. Work in progress.

4 Experimental results

4.1 Reproducing experiments from [1]

4.1.1 Experiment 1

Performance comparison of UCB-Network policy on various 10 node networks: 2 arms, Bernoulli rewards with means 0.5 and 0.7.

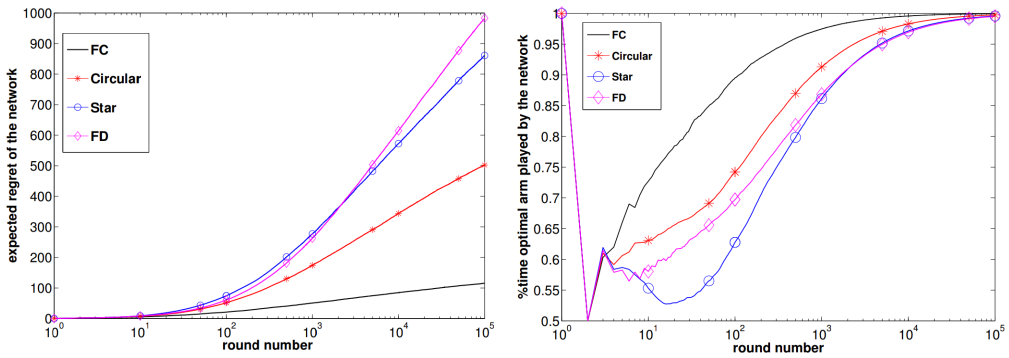

Figure 1: Results for experiment 1 from [1].

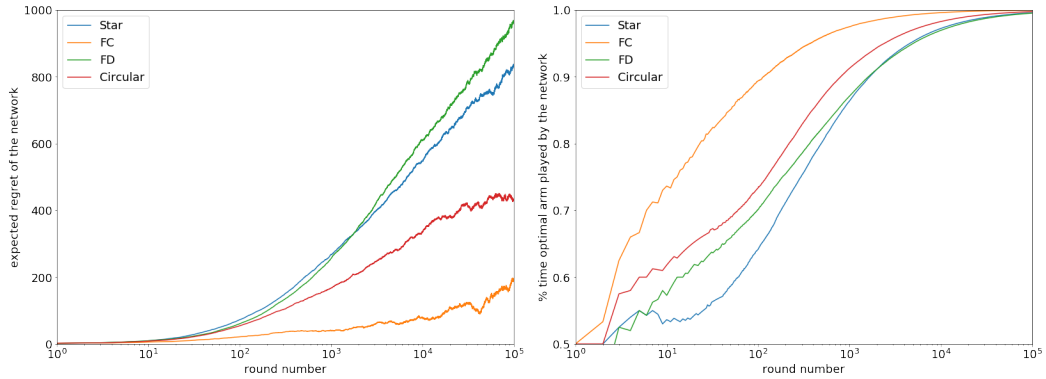

Figure 2: Our results for experiment 1.

4.1.2 Experiment 2

Performance comparison of UCB-Network policy on various 20 node networks: 10 arms, Bernoulli rewards with means $0.1, 0.2, \ldots, 1$.

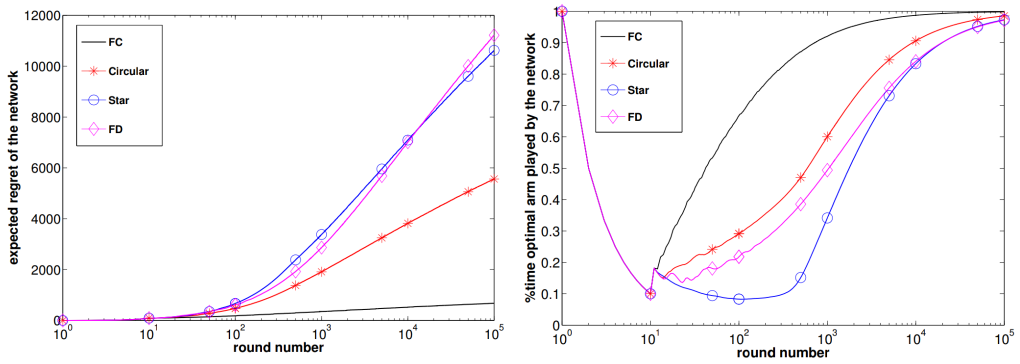

Figure 3: Results for experiment 2 from [1].

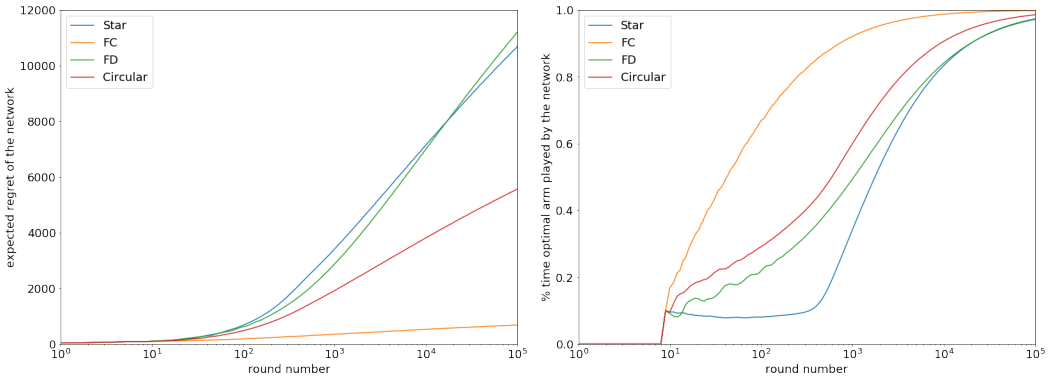

Figure 4: Our results for experiment 2.

4.1.3 Experiment 3

Performance comparison of UCB-Network and FYL policies on various star networks: 2 arms, Bernoulli rewards with means 0.5 and 0.7.

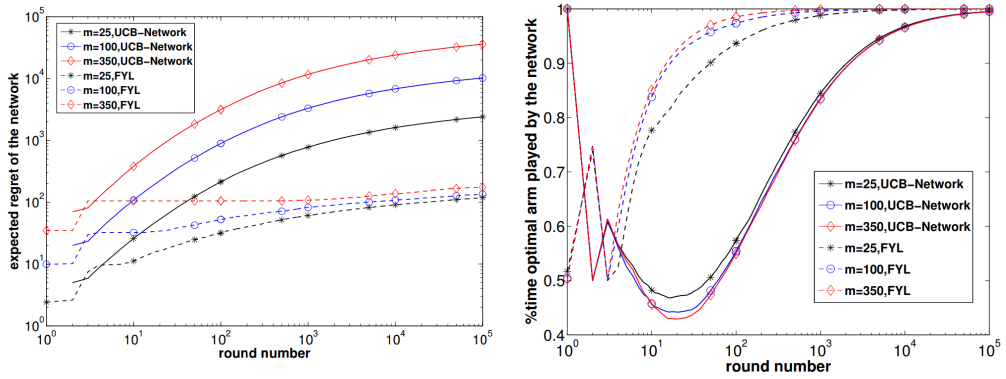

Figure 5: Results for experiment 3 from [1].

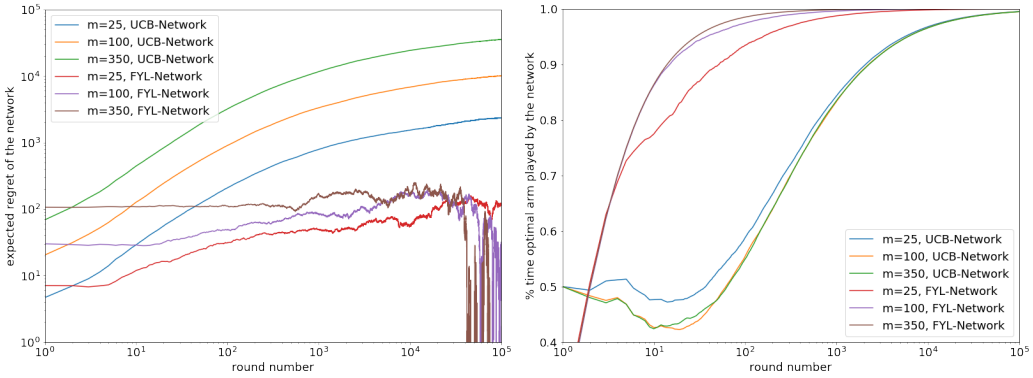

Figure 6: Our results for experiment 3.

4.2 Distributed star network

5 Conclusion

References

[1] Ravi Kumar Kolla, Krishna P. Jagannathan, and Aditya Gopalan. Stochastic bandits on a social network: Collaborative learning with local information sharing. *CoRR*, abs/1602.08886, 2016.

6 Citations, figures, tables, references

These instructions apply to everyone.

6.1 Citations within the text

The `natbib` package will be loaded for you by default. Citations may be author/year or numeric, as long as you maintain internal consistency. As to the format of the references themselves, any style is acceptable as long as it is used consistently.

The documentation for `natbib` may be found at

`http://mirrors.ctan.org/macros/latex/contrib/natbib/natnotes.pdf`

Of note is the command `\citet`, which produces citations appropriate for use in inline text. For example,

```
\citet{hasselmo} investigated\dots
```

produces

> Hasselmo, et al. (1995) investigated…

If you wish to load the `natbib` package with options, you may add the following before loading the `neurips_2018` package:

```
\PassOptionsToPackage{options}{natbib}
```

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```
\usepackage[nonatbib]{neurips_2018}
```

As submission is double blind, refer to your own published work in the third person. That is, use "In the previous work of Jones et al. [4]," not "In our previous work [4]." If you cite your other papers that are not widely available (e.g., a journal paper under review), use anonymous author names in the citation, e.g., an author of the form "A. Anonymous."

6.2 Tables

All tables must be centered, neat, clean and legible. The table number and title always appear before the table. See Table 1.

Place one line space before the table title, one line space after the table title, and one line space after the table. The table title must be lower case (except for first word and proper nouns); tables are numbered consecutively.

Note that publication-quality tables *do not contain vertical rules.* We strongly suggest the use of the `booktabs` package, which allows for typesetting high-quality, professional tables:

`https://www.ctan.org/pkg/booktabs`

This package was used to typeset Table 1.

Table 1: Sample table title

	Part	
Name	Description	Size (μm)
Dendrite	Input terminal	$\sim$100
Axon	Output terminal	$\sim$10
Soma	Cell body	up to 10^6