Dynamic Order Sourcing Optimization for Online Retail with Deep Reinforcement Learning

Master Thesis

by

Marcus Ritter

Matriculation number: 11004061

January 17, 2018

SRH University Heidelberg

School of Information, Media and Design

Degree course "Applied Computer Science"

Major field "Business Computing"

Reviewers	Professor Barbara Sprick
	Doctor Owen Hickey

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Submitted to the School of Information, Media and Design on January 17, 2018,
in partial fulfillment of the requirements for the degree of Master of Science in
Applied Computer Science

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Affidavit

Herewith I declare:

- that I have composed the chapters for the Master Thesis for which I am named as the author independently,

- that I did not use any other sources and additives than the ones specified,

- that I did not submit this work at any other examination procedure.

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Acknowledgement

Abstract

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List of Figures

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Listings

Chapter 1

Introduction

TODO:

1. Hinführung zum Thema / Praktische, Wissenschaftliche Motivation

2. Problemstellung

3. Eingrenzung der Problemstellung / was ist Teil der Arbeit und was nicht

4. Zielsetzung

5. Methoden und Vorgehen / Welche Methodik wird eingesetzt um die Ziele zu erreichen

6. ML einführen

7. Beiträge der Arbeit

8. Wie die Lösung evaluiert wird

9. Wie man zur Lösung kommt (Inhalt der einzelnen Chapter)

Chapter 2

Chapter2

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$$Q(s_t, a_t) \leftarrow (1 - \alpha) \cdot Q(s_t, a_t) + \alpha \cdot \left(r_t + \gamma \cdot \max_a Q(s_{t+1}, a) \right) \qquad (2.1)$$

As shown in Equation (2.1) the Q-Learning features a quite fancy formula. Though the equation is very useful solving logistic problems like the sourcing optimization. At the same time Figure (2.1) shows a very nice picture of Mars (Mnih et al., 2015, p.150ff). Now we will take a look at some listings and available options.

```python
'Choose maximum q value action and validate it'
    def choose_action_maxq(self, S):
        # choose an action according to the max q value
        action_names = []
        S = S.observation
        S_np = np.array(S)
        S = S_np[np.newaxis, :]
        action_values = self.sess.run(self.q_eval, feed_dict={self.s: S})
        for i in range(len(self.ACTIONS_INDEX)):
            temp = self.ACTIONS_INDEX[i][0]
            temp2 = action_values[0][temp]
            action_names.append([self.ACTIONS_INDEX[i][0], self.
ACTIONS_INDEX[i][1], temp2])
        action_names.sort(key=self.getListKey, reverse=True)
        # check if the actions is valid, if not choose the next best one
        for j in range(len(action_names)):
            action = action_names[j][1]
            action_id = action_names[j][0]
            valid_action, out_of_stock = self.validate_action(action)
            if(valid_action == True):
```

```
20              break
21        return action_id
```

Listing 2.1: Some Caption for the Listing, Source: (Mnih et al., 2015).

Above you can see the Listing (2.1) with a nice formatting that fits the Python language.

2.1   section1

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2.1.1   subsection1

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2.1.2   subsection2

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2.2   section2

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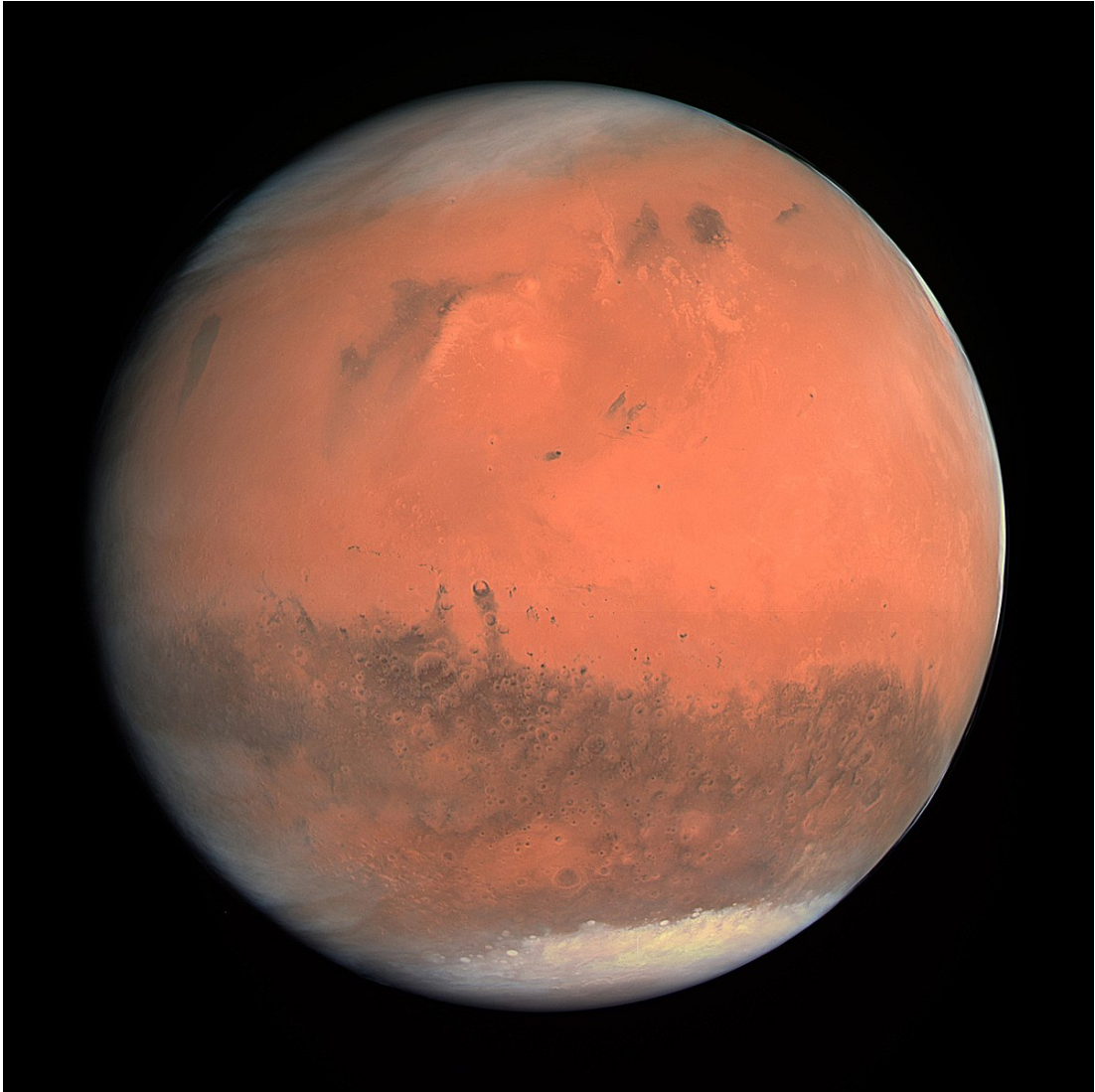
Figure 2.1: Caption Text
Source: **?**.

exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.
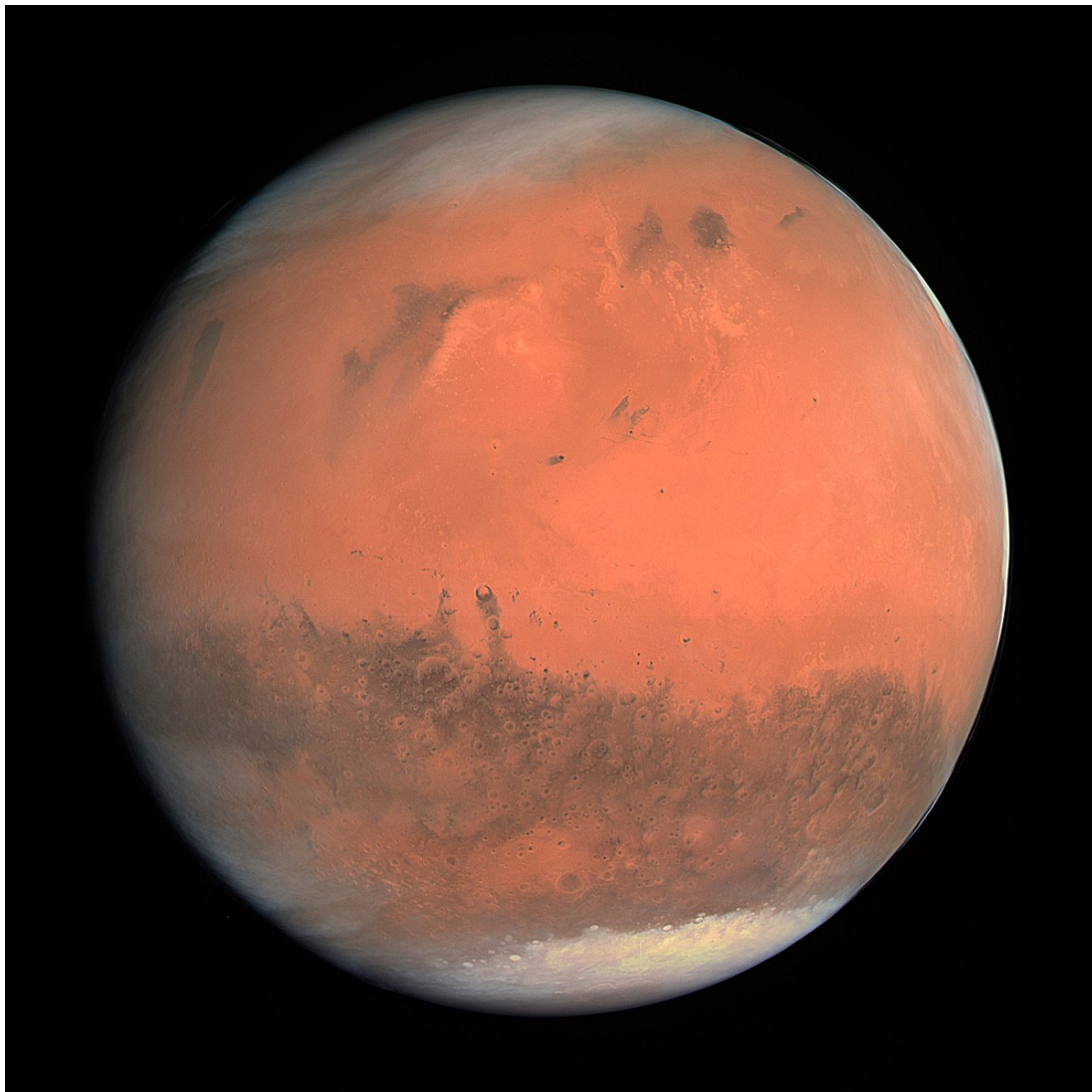
Figure 2.2: Caption Text2 Source: (Silver et al., 2016).

Table 2.1: Even better looking table using booktabs

Dental measurement	Species I		Species II	
	mean	SD	mean	SD
I1MD	6.23	0.91	5.2	0.7
I1LL	7.48	0.56	8.7	0.71
I2MD	3.99	0.63	4.22	0.54
I2LL	6.81	0.02	6.66	0.01
CMD	13.47	0.09	10.55	0.05
CBL	11.88	0.05	13.11	0.04

Chapter 3

Chapter3

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3.1   section1

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3.1.2   subsection2

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tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in c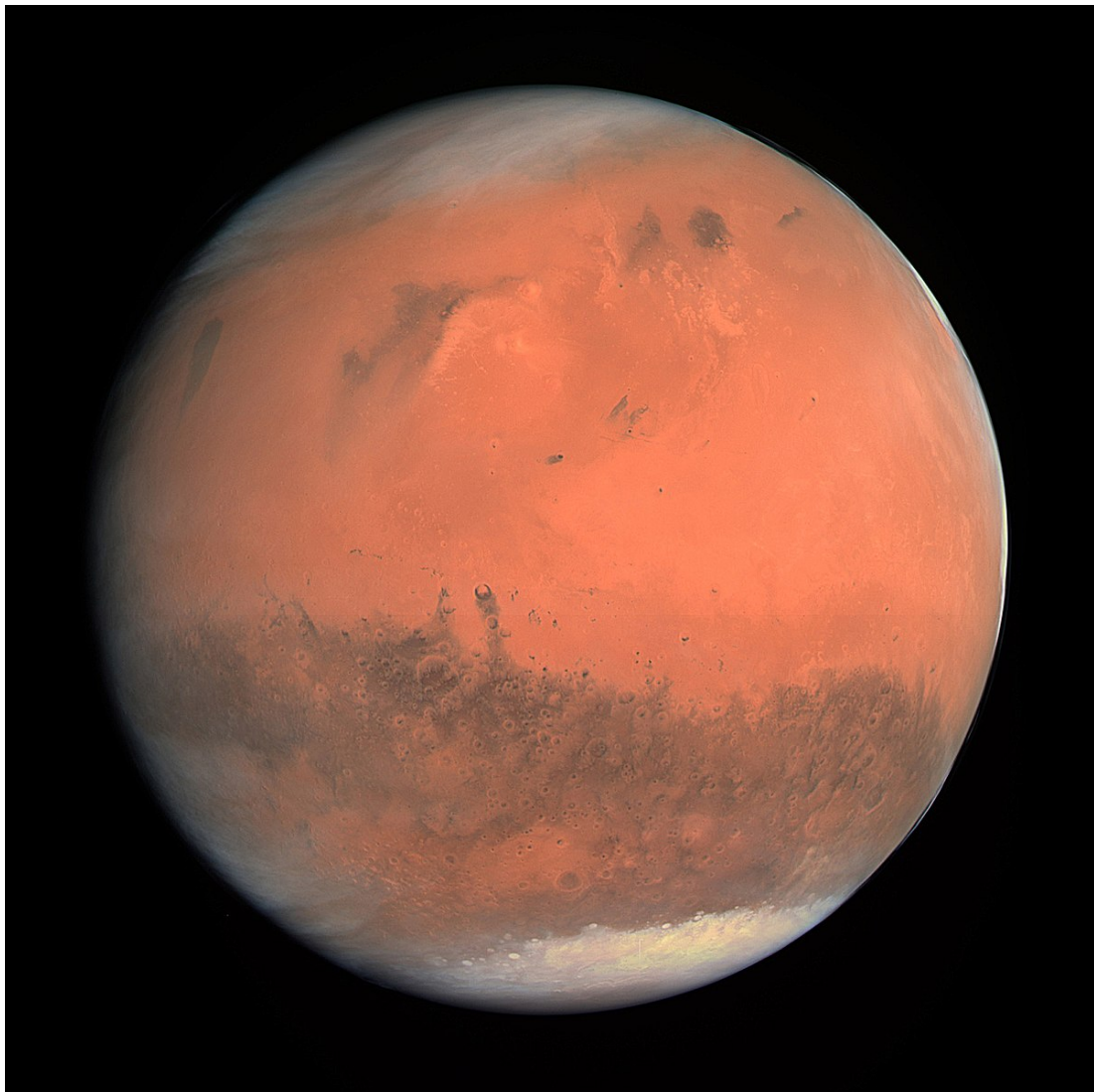ulpa qui officia deserunt mollit anim id est laborum. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Figure 3.1: Caption Text
Source: Some Source .

Appendix A

Appendix

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A.1 Section1

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A.2 Section2

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A.2.1 Subsection1

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A.2.2   Subsection2

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A.2.3   Subsection3

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