

# Adaptive Collaborative Autonomous Wireless Networks

by

Aytac OZKAN

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TECHNOLOGIE SUPÉRIEURE  
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Ph.D.

MONTREAL, "DEPOSIT DATE"

ÉCOLE DE TECHNOLOGIE SUPÉRIEURE  
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Aytac Ozkan, 2021



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## FOREWORD

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## ACKNOWLEDGEMENTS

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## **French title**

Aytac OZKAN

## **RÉSUMÉ**

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**Mots-clés:** mot-clé1, mot-clé2



# **Adaptive Collaborative Autonomous Wireless Networks**

Aytac OZKAN

## **ABSTRACT**

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**Keywords:** reinforcement-Learning, transfer-learning, wireless-networks, anti-jamming, multi-agent, collaborative-learning



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## **LIST OF ABBREVIATIONS**

ETS	École de Technologie Supérieure
ASC	Agence Spatiale Canadienne



## **LIST OF SYMBOLS AND UNITS OF MEASUREMENTS**

a	Première lettre de l'alphabet
A	Première lettre de l'alphabet en majuscule





## INTRODUCTION

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Figure 0.1 Test of a long caption, using a framebox and a parbox to constrain the caption

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## CHAPTER 1

**LONG CHAPTER TITE, WITH LINEBREAK. LOREM IPSUM DOLOR SIT AMET,  
CONSECTETUR ADIPISCING ELIT. PELLENTESQUE JUSTO JUSTO, PORTA  
SAGITTIS FEUGIAT EGET, ORNARE RHONCUS LIGULA. NUNC NON ODIO SED  
LACUS RUTRUM RHONCUS.**

### 1.1 Layout tests

In this sections, several environments are presented.

#### 1.1.1 Listing tests

Presentation of the main listing environments: enumerations and lists.

##### 1.1.1.1 Enumerations: `enum` environment

Enum environment test:

1. test 1
2. test 2

##### 1.1.1.2 Lists: `itemize` environment

Test of the itemize environment

- test 1
- test 2

#### 1.1.2 Equations tests

Layout of the equations:

$$\beta = 8$$

(1.1)

$$\gamma = \alpha \times 3 \quad (1.2)$$

## 1.2 Second section

Example of a second section, to test the layout in the table of contents.

### Algorithm 1.1 Algorithm example

<b>Input:</b> Gallery with initial templates $\mathcal{G} = \{\mathbf{r}_1, \dots, \mathbf{r}_J\}$ , unlabeled adaptation set $\mathcal{D} = \{\mathbf{d}_1, \dots, \mathbf{d}_L\}$	
<b>Output:</b> Updated Gallery $\mathcal{G}' = \{\mathbf{r}_1, \dots, \mathbf{r}_{J'}\}$ , $J' \geq J$	
1	Estimate updating threshold $\gamma^u \geq \gamma^d$ from $\mathcal{G}$ ;
2	$\mathcal{G} \leftarrow \mathcal{G}'$ ; <span style="float: right;">/* update gallery */</span>
3	<b>for</b> all samples $d_l \in \mathcal{D}$ ( $l = 1, \dots, L$ ) <b>do</b>
4	<b>for</b> all references $r_j \in \mathcal{G}$ ( $j = 1, \dots, J$ ) <b>do</b>
5	$s_j(\mathbf{d}_l) \leftarrow \text{similarity\_measure}(\mathbf{d}_l, \mathbf{r}_j)$ ;
6	<b>end for</b>
7	<b>end for</b>
8	$S(\mathbf{d}_l) \leftarrow \max_{j \in [1, J]} \{s_j(\mathbf{d}_l)\}$ ;
9	<b>if</b> $S(\mathbf{d}_l) \geq \gamma_d$ <b>then</b>
10	Output positive prediction;
11	<b>if</b> $S(\mathbf{d}_l) \geq \gamma^u$ <b>then</b>
12	$\mathcal{G}' \leftarrow \mathcal{G}' \cup \mathbf{d}_l$ ;
13	<b>end if</b>
14	<b>end if</b>

## CHAPTER 2

### SECOND CHAPTER

#### 2.1 Table layout tests

Tables have the same constraints than the figures, except for the caption that has to be on top.

Table 2.1 Test of a long table caption, with linebreak

titre	titre	titre	titre	titre	titre	titre	titre
blá	blá	blá	blá	blá	blá	blá	blá
blá	blá	blá	blá	blá	blá	blá	blá
blá	blá	blá	blá	blá	blá	blá	blá
blá	blá	blá	blá	blá	blá	blá	blá
blá	blá	blá	blá	blá	blá	blá	blá
blá	blá	blá	blá	blá	blá	blá	blá

#### 2.2 References test

##### 2.2.1 References to the bibliography

##### 2.2.2 References to the list of references "refs"

References from the list of references "refs", declared at the beginning of the document mAuth1 (2001).

##### 2.2.3 References to a label of the document

Reference to a Figure associated to a label: Figure 0.1.

## **2.2.4 URL references**

### **2.2.4.1 Test of "href"**

Href is used to integrate a link to a text: Link to the template page..

### **2.2.4.2 Test de url**

Url is used to format a clickable link: <http://www.etsmtl.ca/Etudiants-actuels/Cycles-sup/Realisation-etudes/Guides-gabarits>.

## CHAPTER 3

### EXAMPLE OF A THESIS BY ARTICLE, WITH INTEGRATED ARTICLE

First name Last name<sup>1</sup> , First name Last name<sup>1</sup>

<sup>1</sup> Département de Génie Mécanique, École de Technologie Supérieure,  
1100 Notre-Dame Ouest, Montréal, Québec, Canada H3C 1K3

Article soumis à la revue « Vecteur environnement » en septembre 2010.

#### 3.1 Section 1

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## CONCLUSION AND RECOMMENDATIONS

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**APPENDIX I**

**APPENDIX EXAMPLE**

**1. First section of the appendix**

**1.1 Figures in annexes**



Figure-A I-1    Figure in an appendix

In the annexes, the figures are declared in the same way. Their numbering changes automatically (e.g. Figure I-1).

**1.1.1 Tables in annexes**

Table-A I-1    Table in an appendix

titre	titre	titre	titre	titre	titre	titre	titre
blá	blá	blá	blá	blá	blá	blá	blá
blá	blá	blá	blá	blá	blá	blá	blá
blá	blá	blá	blá	blá	blá	blá	blá
blá	blá	blá	blá	blá	blá	blá	blá
blá	blá	blá	blá	blá	blá	blá	blá

Same behaviour for the tables (e.g., Table I-1).



(a) first figure



(b) second figure



(c) third figure



(d) fourth figure

Figure-A I-2 Subfig example

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